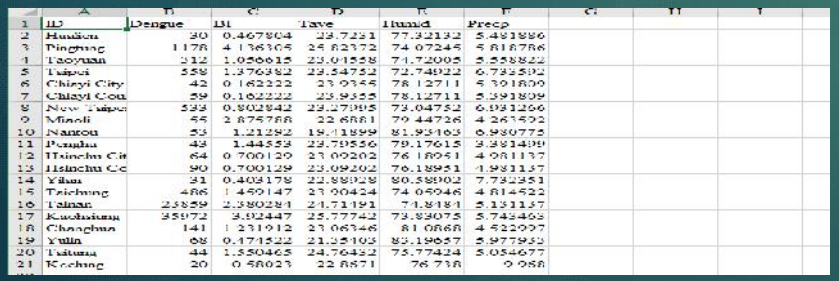
0513367_陳中堅 R_2020
Project Introduction

	County	ID for each county	Year-Week (2012-01 = 1 ... 2019-22 = 389)	Number of people with Dengue Fever (confirmed cases)	Bretsen Index	Average Temperature (°C)	Maximum Temperature (°C)	Minimum Temperature (°C)	Relative Humidity (%)	Precipitation
1										
2		County ID	Time	Dengue Cases	BI	Tave	Tmax	Tmin	Humid	Precp
3	Hualien	1	1	0	0.5	18.61	18.62571429	14.17142857	75.71	
4	Hualien	1	2	0	0	18.94	21.22571429	16.8	76.43	
5	Hualien	1	3	0	0	18.5	21.97142857	17.1	76.43	
6	Hualien	1	4	0	0	0	18.6	12.17142857	79.17	
7	Hualien	1	5	0	0	17.96	20.41428571	16.05714286	76.57	
8	Hualien	1	6	0	0	18.24	21.37142857	15.58571429	74.57	
9	Hualien	1	7	0	0	18.8	22.57142857	17.51428571	75.29	
10	Hualien	1	8	0	0.06	19.61	22.24285714	17.57142857	81.7	
11	Hualien	1	9	0	0	19.98	22.68571286	17.37142857	82.43	
12	Hualien	1	10	0	0	21.5	24.44285714	18.77142857	80	
13	Hualien	1	11	0	0.07	20.17	23.61428571	17.14285714	80.29	
14	Hualien	1	12	0	0	21.34	24.5	18.67142857	76.06	
15	Hualien	1	13	0	0	19.61	23.71428571	16.5	63.14	
16	Hualien	1	14	0	0	20.41	24.2	17.52857143	69.43	
17	Hualien	1	15	0	0.13	23.26	26.34285714	20.25714286	79.43	
18	Hualien	1	16	0	0.18	23.24	26.6	20.08571429	79.43	
19	Hualien	1	17	0	0.5	23.49	27.4	20.32857143	78.14	
20	Hualien	1	18	0	0	24.67	27.64285714	22.18571429	79.43	
21	Hualien	1	19	0	0.11	24.9	28.6	22.04285714	75.43	
22	Hualien	1	20	0	0	26.08	30	22.7	74.14	
23	Hualien	1	21	0	0	25.27	28.82857143	22.64285714	75.29	



	A	B	C	D	E	F	G	H	I
1	ID	Dengue	BI	Tave	Humid	Precp			
2	Hualien	30	0.467804	23.7221	77.32132	5.481886			
3	Yinghing	1178	4.136305	24.82372	74.07245	5.818786			
4	Taoyuan	312	1.056615	23.01558	71.72005	5.558822			
5	Taipei	558	1.376342	22.84752	72.74922	6.725592			
6	Chiayi City	42	0.162222	23.9345	78.12711	5.391809			
7	Chiayi Cou	59	0.162222	23.9355	78.12711	5.391809			
8	New Taipe	593	0.802842	23.27095	79.04752	6.031266			
9	Miaoli	55	2.875768	22.6881	79.44726	4.263592			
10	Nantou	53	1.21282	18.41899	81.93163	6.930775			
11	Penghu	43	1.44553	23.79556	79.17615	3.881499			
12	Hsinchu Cit	64	0.700129	23.09202	76.18951	4.981137			
13	Hsinchu Cc	90	0.700129	23.09202	76.18951	4.981137			
14	Yilan	31	0.403178	22.88928	80.58902	7.732351			
15	Taichung	486	1.469147	23.90424	74.05946	4.814522			
16	Tainan	23859	2.380281	24.71191	74.8181	5.131137			
17	Kaohsiung	35972	3.02447	25.77742	73.83075	5.742463			
18	Changhua	141	1.231912	23.06346	81.0868	4.522997			
19	Yulin	98	0.474522	23.25193	83.18957	5.977923			
20	Taitung	44	1.550465	24.76422	75.77424	5.054677			
21	Keelung	20	0.58023	22.8671	76.716	9.958			

- Data Source
- Dengue case surveillance data: In Taiwan, dengue fever (台灣瘧疾)is classified as a notifiable infectious disease and suspected cases must be reported to a clinic for diagnosis within 24 hours.
- These data obtained from the web-based National Infectious Disease Statistics System (https://nidss.cdc.gov.tw/en/SingleDisease.aspx?dc=1&dt=4&disease=061&position=1)under the Notifiable Disease Surveillance System (NDSS) of the Taiwan Center for Disease Control.(from January 2012 to May 2019)

Introduction

- According to the computerized database of the surveillance system by Taiwan Center for Disease Control (Taiwan-CDC) [29], in the period of 2006 to 2012, there were 10,094 confirmed cases of dengue virus infections, or an average of about 1442 cases per year. However, from 2012 to 2018, the Taiwan-CDC recorded 63,471 confirmed cases of dengue, or an average of about 9067 cases per year. Thus, the annual average number of dengue cases has increased by 529% in the past seven years compared with the period from 2006 to 2012.

	Breteau Index	Average Temperature (°C)	Maximum Temperature (°C)	Minimum Temperature (°C)	Relative Humidity (%)	Precipitation (mm)	Population (persons)	Population Density (per km2)
2	BI	Tave	Tmax	Tmin	Humid	Precp	Pop	Pop_Den
3	0.5	16.61	18.65714286	14.71428571	75.71	0.57	336704.9965	72.77498711
4	0	18.91	21.55714286	16.8	75.43	0.36	336676.9953	72.74998202
5	0	19.5	21.91428571	17.1	76.45	2.4	336648.9965	72.72498711
6	0	0	18.6	13.77142857	79.71	5	336621	72.7
7	0	17.96	20.41428571	16.05714286	76.57	1	336596.9948	72.7
8	0	18.74	21.42857143	16.58571429	74.57	1.2	336572.9931	72.7
9	0	19.8	22.57142857	17.51428571	75.29	0.4	336548.9948	72.7
10	0.06	19.64	22.24285714	17.57142857	81.71	9.58	336483	72.7
11	0	19.52	22.65714286	17.27142857	82.42	7.21	336442.2422	72.7
12	0	21.5	24.41285714	18.77142857	80	2.58	336401.4896	72.7
13	0.07	20.17	23.61428571	17.14285714	80.29	3.57	336359.7422	72.7
14	0	21.34	24.5	18.67142857	76.86	4.93	336318	72.7
15	0	19.61	23.71428571	16.5	63.14	0.07	336276.263	72.7
16	0	20.41	24.2	17.52857143	69.43	1.5	336237.4837	72.67498709
17	0.13	23.26	26.34285714	20.25714286	79.43	1.17	336196.9782	72.64998279
18	0.18	23.24	26.6	20.68571429	79.43	2.25	336156.4837	72.62498771
19	0.5	23.19	27.1	20.52857143	78.14	5.33	336076	72.6
20	0	24.67	27.64285714	22.18571429	78.43	5.16	336061.9991	72.6
21	0.17	24.9	28.6	22.04285714	78.43	2.75	336047.9988	72.6
22	0	26.03	30	22.7	74.14	1	336033.9991	72.6
23	0	25.27	28.82857143	22.64285714	75.29	8.64	336020	72.6

- Analysis of this data is primarily intended to determine the geographic distribution of dengue cases across Taiwan's provinces.
- Simultaneously with the visualization of the density distribution of mosquito larvae, providing convincing proof of the leading cause of dengue fever, plus the influence of population density has led to the difference in rate as well as the number of cases between Taiwan's provinces.

Code

```
#code at kaggle
#https://www.kaggle.com/lefeulien/notebook0f66b16139
library(tidyverse) # metapackage of all tidyverse packages
list.files(path = "../input")
library(caret)
install.packages("geojsonio")

library("geojsonio")
require("dplyr")
require("stringr")
require("data.table")
require("ggplot2")
require("maptools")
require("knitr")
require("kableExtra")
require("mapproj")
require("sf")
require("RColorBrewer")
```

```
path = "../input/data-deng-bi/plotTW.csv"
df <- read.csv(path, h=T)
df <- data.frame(df)
distill_data <- df
kable(distill_data)
summary(distill_data)

taiwan.map <- st_read("../input/tw-map-shp/gadm36_TWN_2.shp")
print(taiwan.map, n = 22)

plot(taiwan.map[1])
#plot(taiwan.map[2:13], max.plot = 12)
plot(st_geometry(taiwan.map))
#plot(taiwan.map["NAME_2"], axes = TRUE)
st_geometry(taiwan.map)
```

```
ggplot(data = taiwan.map) +
  geom_sf(aes(fill = NAME_2)) +
  scale_fill_manual(name = "縣市區",
                    values = colorRampPalette(brewer.pal(8, "Accent"))(22)) +
  labs(title = "Taiwan map")

print(distill_data$ID)

distill_data$ID <- as.character(distill_data$ID)
head(distill_data)

tmp <- (min(distill_data$Dengue) - max(distill_data$Dengue))
tmp

distill_data$Dengue_Nornalize <- (distill_data$Dengue - min(distill_data$Dengue)) / (max(distill_data$Dengue) -
```

```
my.taiwan.map <- taiwan.map[c("NAME_2", "geometry")]
my.taiwan.map$NAME_2 <- as.character(my.taiwan.map$NAME_2)
head(my.taiwan.map)

my.taiwan.map.data <- left_join(my.taiwan.map, distill_data,

c("NAME_2" = "ID"))

dim(my.taiwan.map.data)


ggplot(data = my.taiwan.map.data) +
  geom_sf(aes(fill = Dengue_Nornalize)) +
# scale_fill_distiller(name="Count", palette = "RdYlGn")
scale_fill_distiller(palette = "Spectral", name = "Dengue Cases")
```

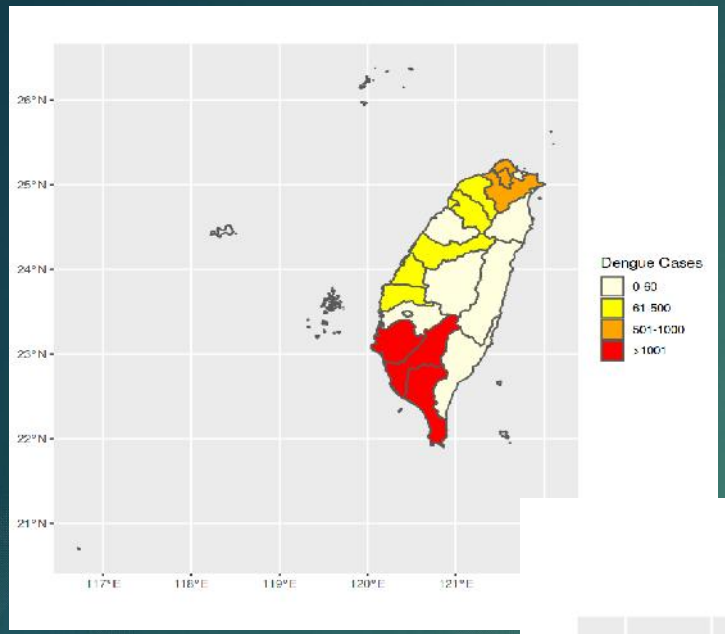
```
my.taiwan.map.data$Dengue3 <- cut(my.taiwan.map.data$Dengue,breaks = c(-Inf, 61, 501, 1001, Inf),right = FALSE)# divide into 4 section for clearly revealization

ggplot(data = my.taiwan.map.data) +
  geom_sf(aes(fill = Dengue3)) +
  #scale_fill_distiller(name="Count", palette = "RdYlGn")
  #scale_fill_distiller(palette = "Spectral", name = "台灣瘧疾 Denguge Cases") +

  scale_fill_manual(breaks=c("[-Inf,61)", "[61,501)", "[501,1e+03)","[1e+03, Inf)"),
                    name = "Dengue Cases",
                    values = c("lightyellow", "yellow","orange", "red"),
                    labels = c("0-60","61-500","501-1000",">1001"))

my.taiwan.map.data$BI3 <- cut(my.taiwan.map.data$BI,breaks = c(-Inf, 1, 2, 3, Inf),right = FALSE)# divide into 4 section for clearly revealization

#BI is Mosquito larva density parameter
ggplot(data = my.taiwan.map.data) +
  geom_sf(aes(fill = BI)) +
# scale_fill_distiller(name="Count", palette = "RdYlGn")
scale_fill_distiller(palette = "Spectral", name = "Mosquito larva density distribution")


ggplot(data = my.taiwan.map.data) +
  geom_sf(aes(fill = BI3)) +
  scale_fill_manual(breaks=c("[-Inf,1)", "[1,2)", "[2,3)","[3, Inf)"),
                    name = "Mosquito larva density distribution",
                    values = c("lightyellow", "yellow","orange", "red"),
                    labels = c("0-1","1-2","2-3","3-4"))
```

Project Questions

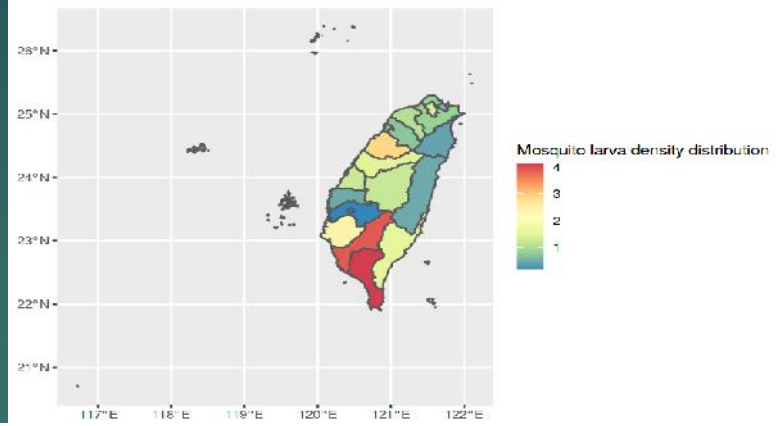
Where is the area with the most mosquitoes in Taiwan?

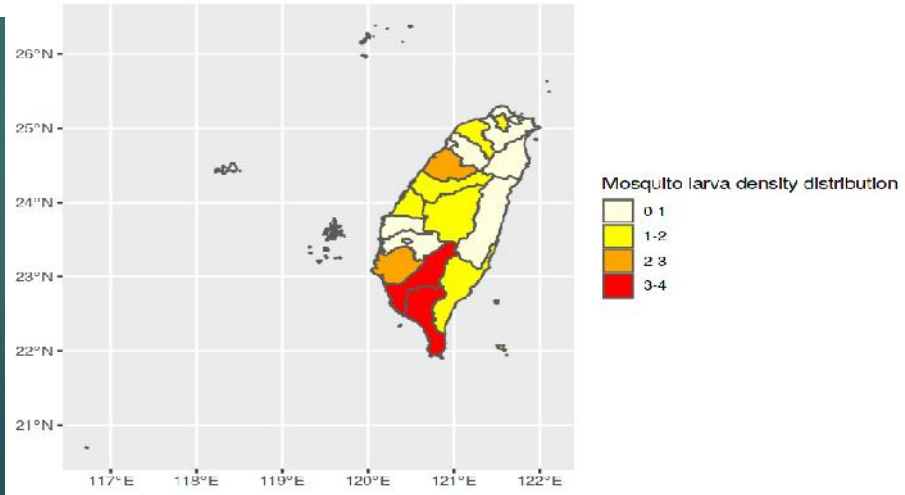
Which is the region with the most dengue cases?

Analysis the relationship between number of Dengue cases with mosquito density and provincial population density



台灣瘧疾分佈
Jan 2012 to May 2019





台灣孑孓密度分佈

- Result analysis

- From the visualization graphs we can see the significant relationship between about Mosquito larva density and the number cases of Dengue, It also reveal an important relationship between cases of Dengue and population density with temperature of each Taiwan's province.
- We can see that BI, mosquito larval distribution density is an important parameter affecting the number of dengue cases in the regions. However, there are some exceptions. For example, the Miaoli area has a high density of mosquito larvae but the incidence is low, most likely because this is a sparsely populated area, there are many mosquitoes in the wilderness, so there is no Affect the dengue fever.
- Similarly, the Xinbei area with low mosquito density but high prevalence, it can only be explained because it's high population density.