

# Visualización de datos espaciales

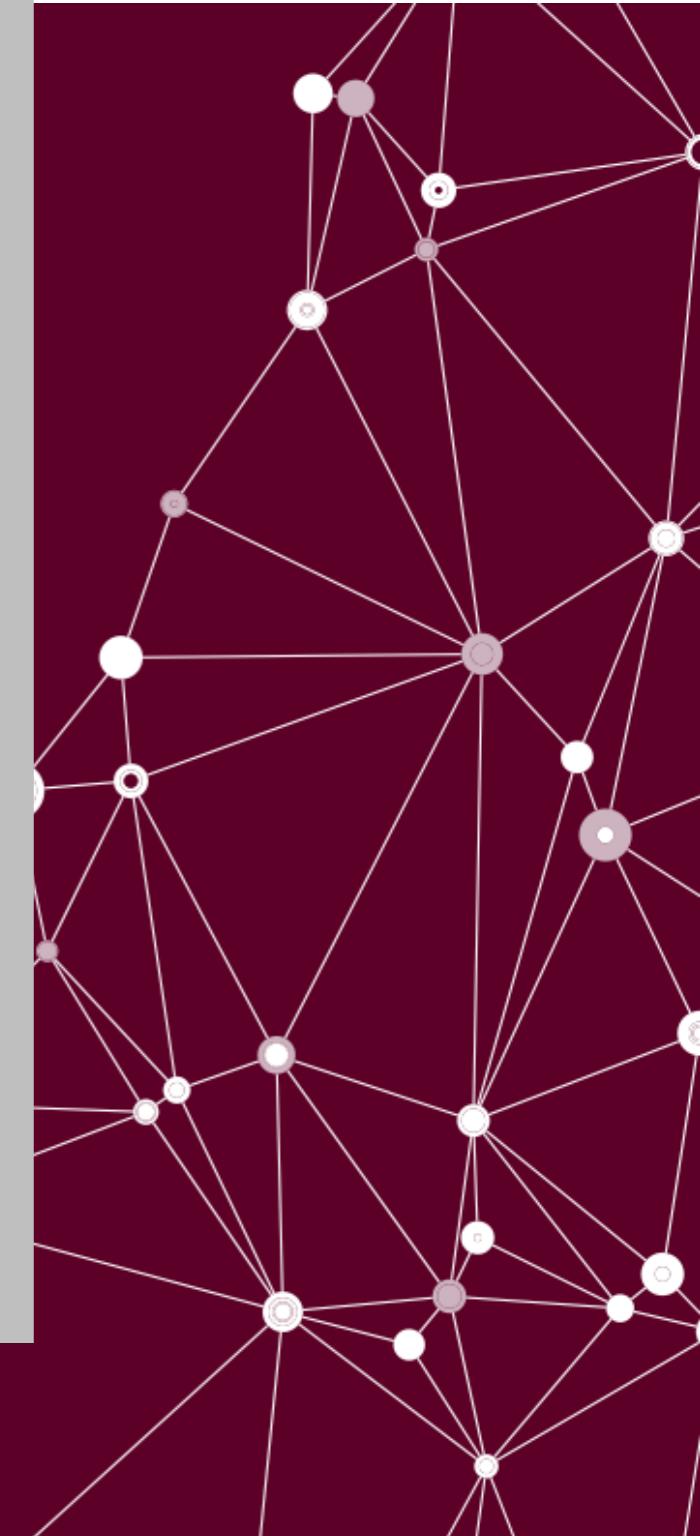
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Programa interdisciplinario  
de Ciencia de Datos

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# Principales librerías en R

1. Que los estudiantes **conozcan las principales librerías** de R para manejar datos geográficos: `{sf}`, `{sp}`, `{cartogram}`, `{leaflet}`, `{mymaps}`, etc. (Ver: [https://rpubs.com/Juve\\_Campos/cinco\\_librerias\\_informacion\\_geografica](https://rpubs.com/Juve_Campos/cinco_librerias_informacion_geografica))
2. Que los estudiantes **aprendan a identificar el nivel de agregación geográfico** de sus bases de datos
3. Que aprendan a **generar mapas en ggplot y leaflet**
4. Que aprendan los siguientes conceptos:
  - a. Mapa **coroplético**
  - b. Mapa de **puntos**
  - c. Mapa de **líneas**
  - d. Mapa **raster**
5. Que los estudiantes **aprendan sobre paletas de colores** para mapas
6. Que los estudiantes aprendan a **dar imagen institucional a sus mapas**

[https://rpubs.com/Juve\\_Campos/cinco\\_librerias\\_informacion\\_geografica](https://rpubs.com/Juve_Campos/cinco_librerias_informacion_geografica)

# Nivel de agregación



El nivel de agregación geográfica se refiere a la **escala o el grado de detalle con el que se presentan los datos geográficos**.

Dependiendo del nivel de agregación, los datos pueden abarcar áreas más grandes y generales o áreas más pequeñas y específicas. Aquí algunos ejemplos de niveles de agregación geográfica.



## Otros ejemplos:

- Sección electoral
- Colonias
- Circunscripciones
- Zona hidrogeológica

!! Es importante tener en cuenta la **agregación** de tu información geográfica, para saber si se puede **mezclar** con otras geometrías o se puede **unir** con alguna base de atributos.

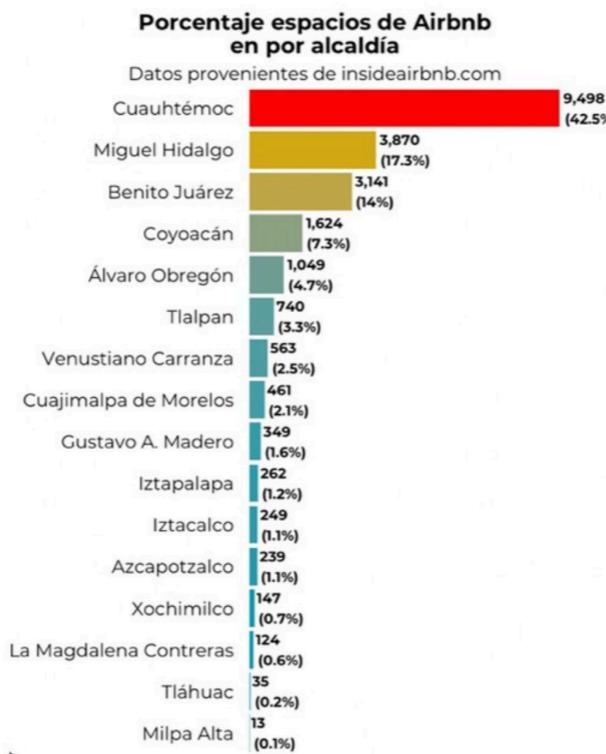
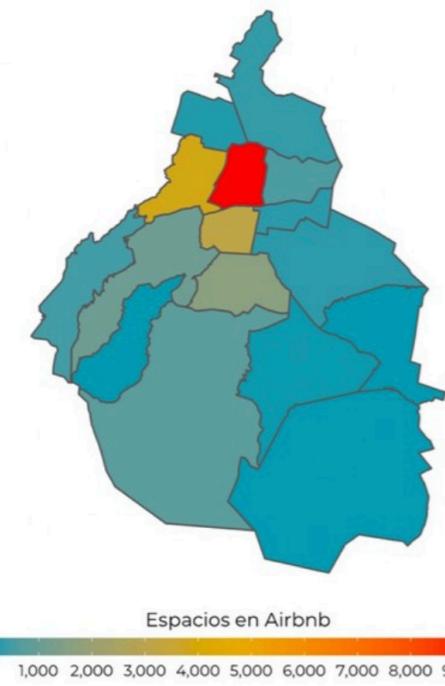
# Mapa coroplético



Mapa en el cual las áreas geográficas se sombrean o colorean de acuerdo a un valor estadístico específico.

Este tipo de mapas se usan para mostrar como varía una variable a través del espacio, llenando las áreas en el mapa con colores o patrones que representan el valor de la variable en cuestión.

**Espacios de Airbnb por alcaldía de la CDMX**  
Datos provenientes de insideairbnb.com



**Universidad Autónoma Chapingo**  
Alumnos por Entidad Federativa, 2018

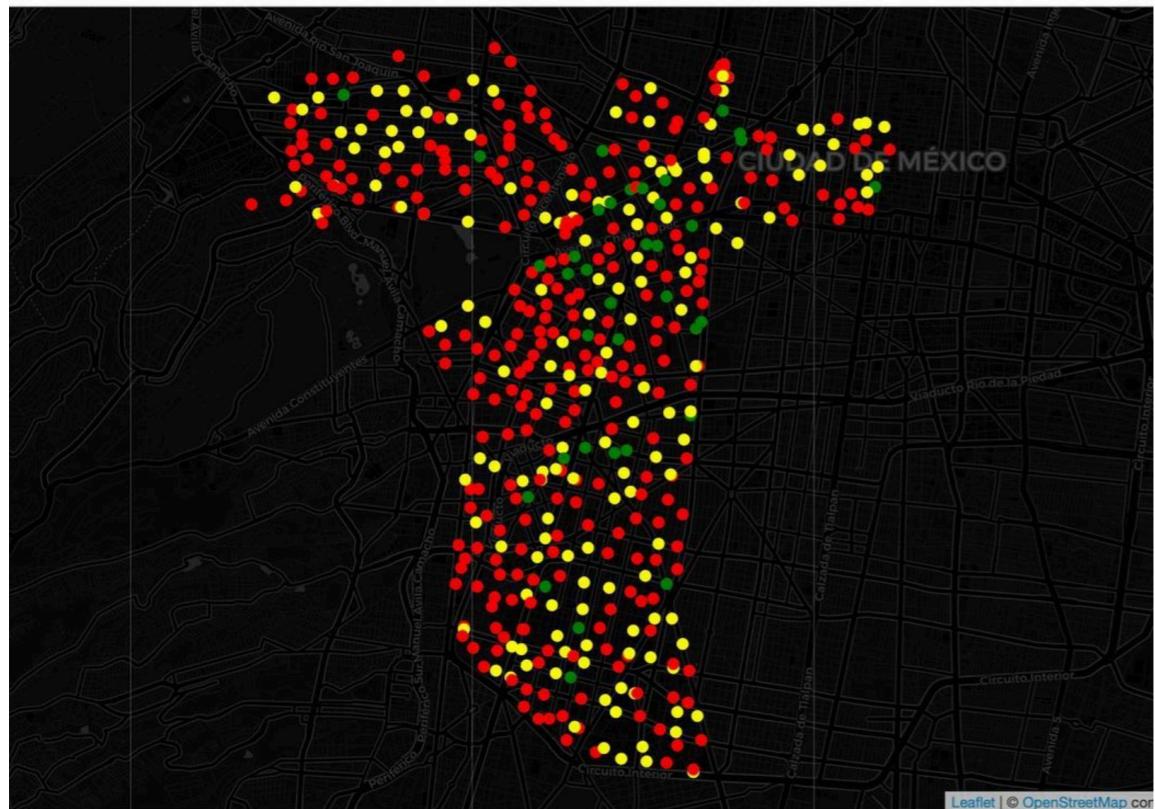


# Mapa de puntos



Son mapas que nos permiten visualizar ubicaciones puntuales, así como atributos relacionados con este tipo de ubicaciones.

## Mapa de disponibilidad de estaciones de Ecobici

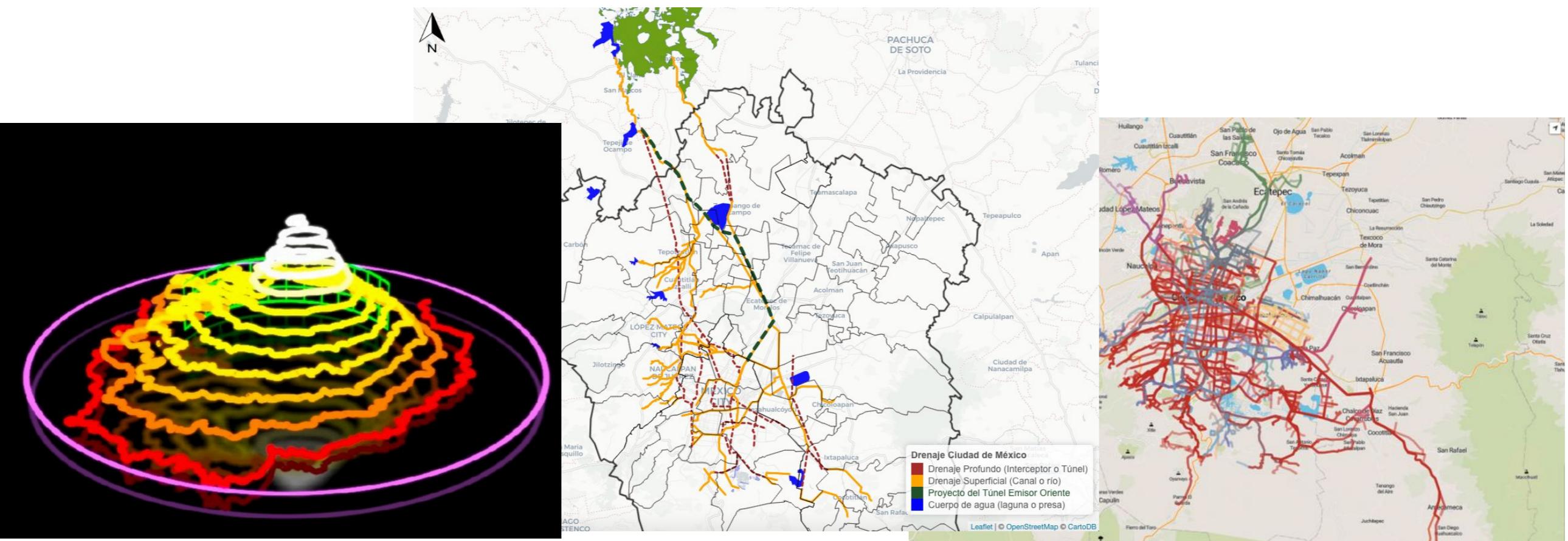


# Mapa de líneas



Un mapa de líneas es una representación gráfica que usa líneas para conectar puntos de igual valor en una superficie geográfica.

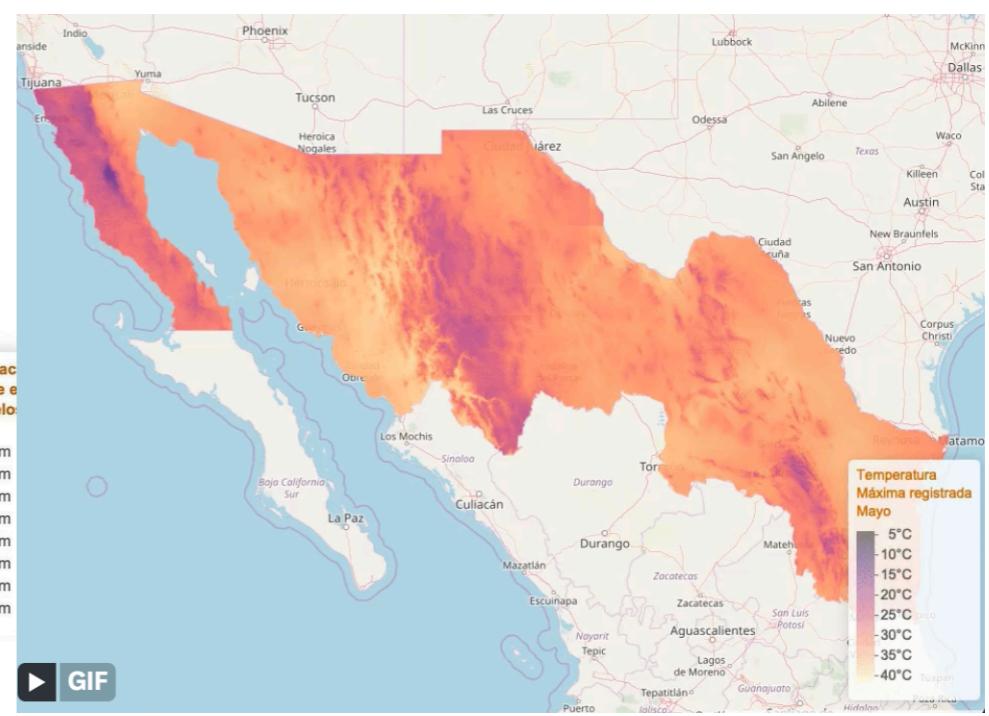
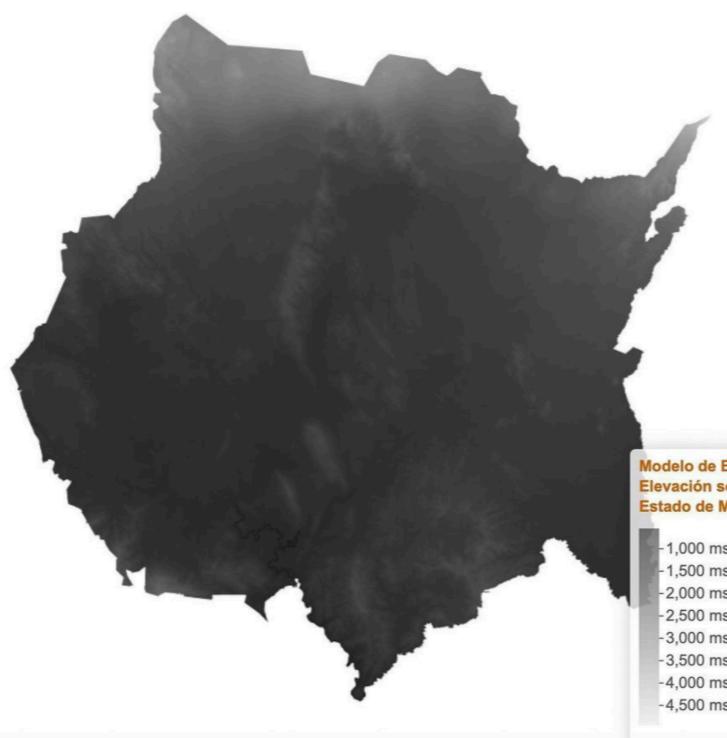
Se pueden utilizar para trazar caminos, trayectorias, curvas de nivel o de contorno, entre otras variables que requieran del uso de líneas.



# Mapa raster



Los mapas ráster son una forma de representación de datos geoespaciales que utiliza una estructura de matriz de celdas o píxeles para almacenar y visualizar información. Cada celda en un mapa ráster tiene un valor que representa una característica específica del área geográfica correspondiente.

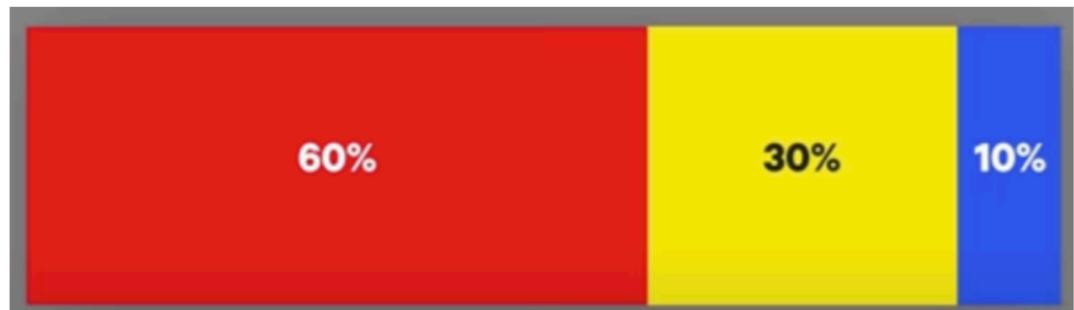


# Paletas de colores



## Algunas reglas para usar colores:

### Regla 60-30-10



### Armonización de colores



Complementary



Analogous



Triadic



Split-Complementary



Rectangle (tetradic)



Square

### Uso de colores neutros



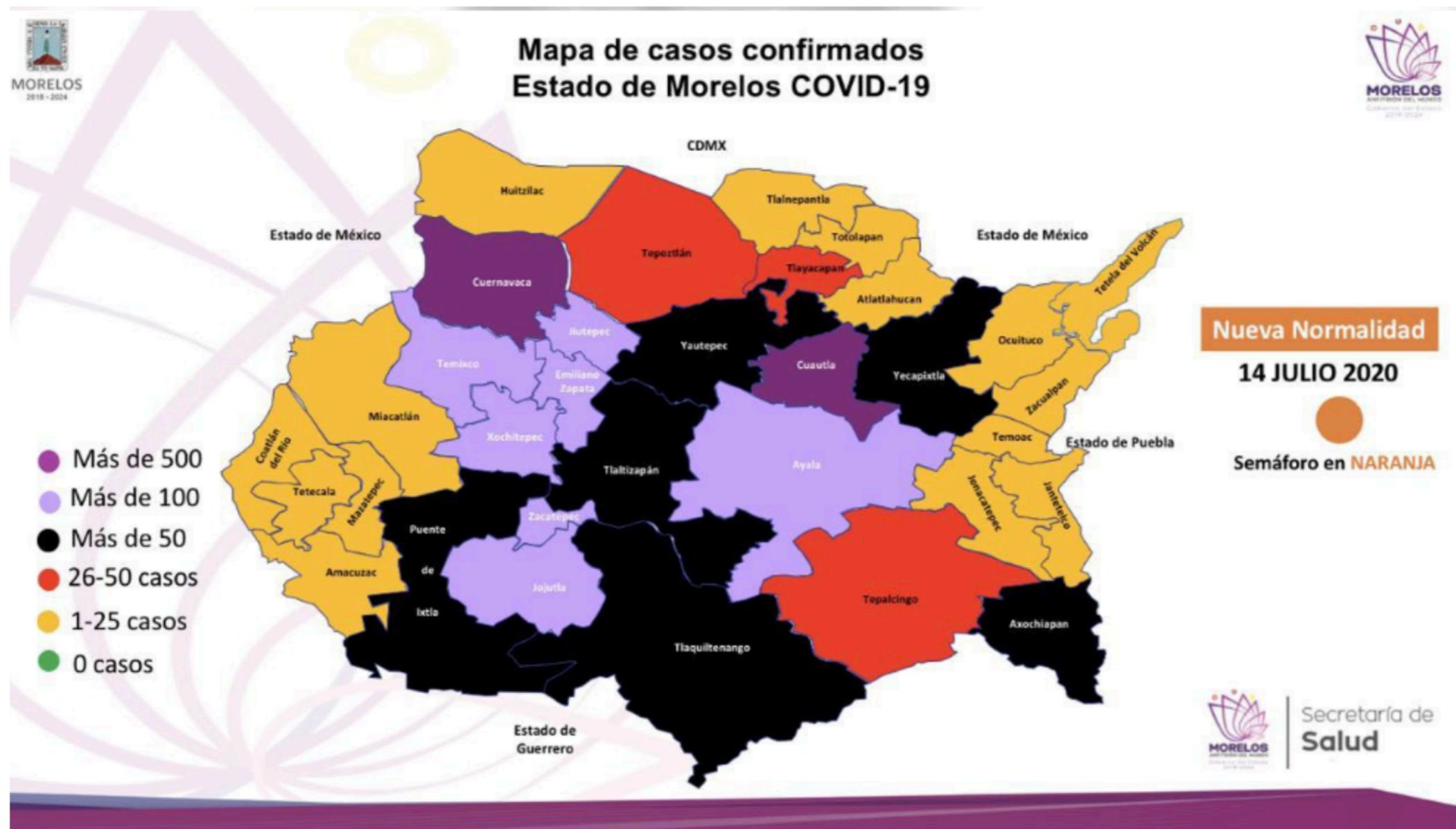
### Menos es más



# Paletas de colores



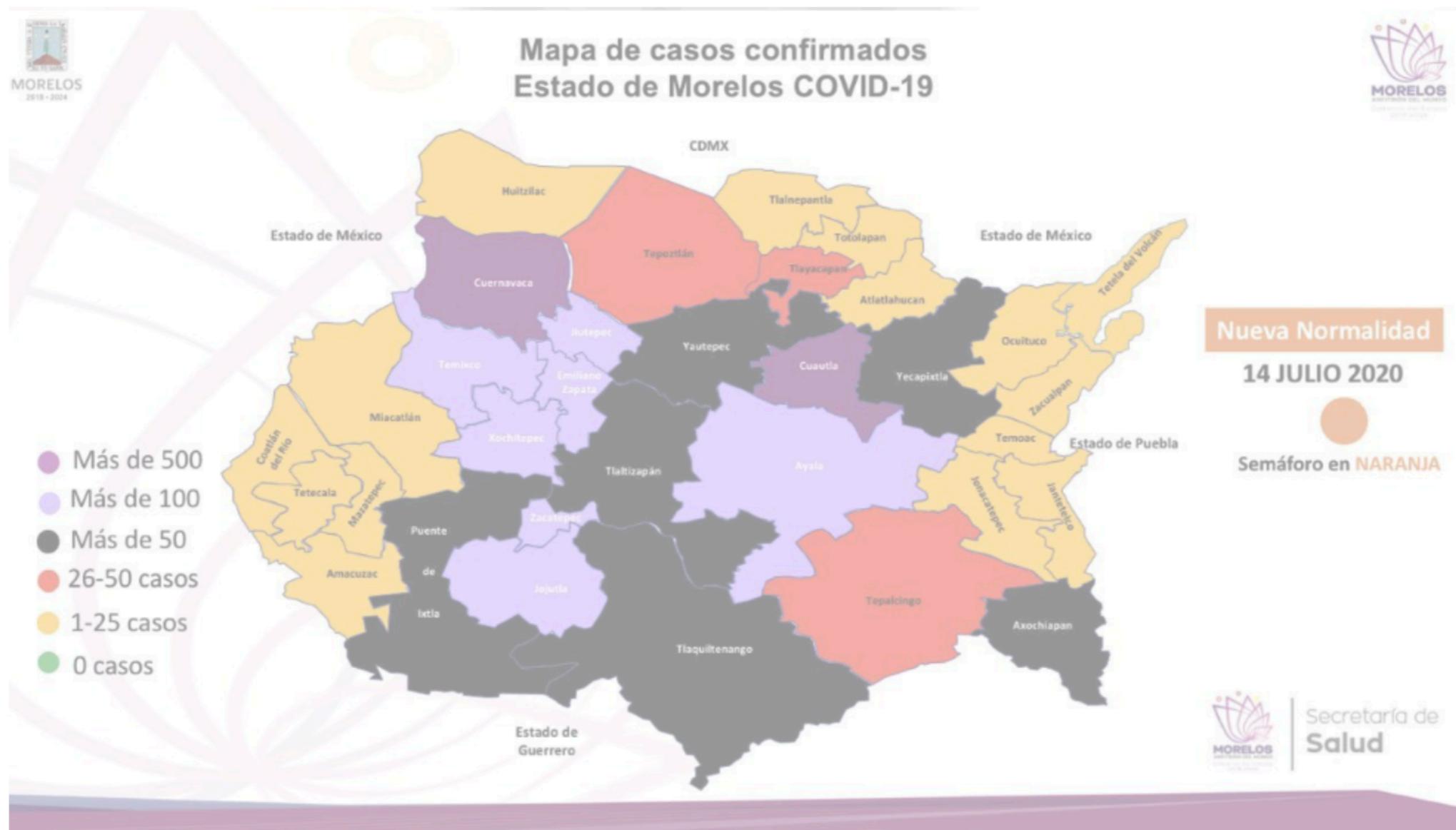
¿Qué está **mal** en este uso de colores?



# Paletas de colores



¿Qué está **mal** en este uso de colores?



Siempre tener en cuenta el **significado cultural** de los colores.

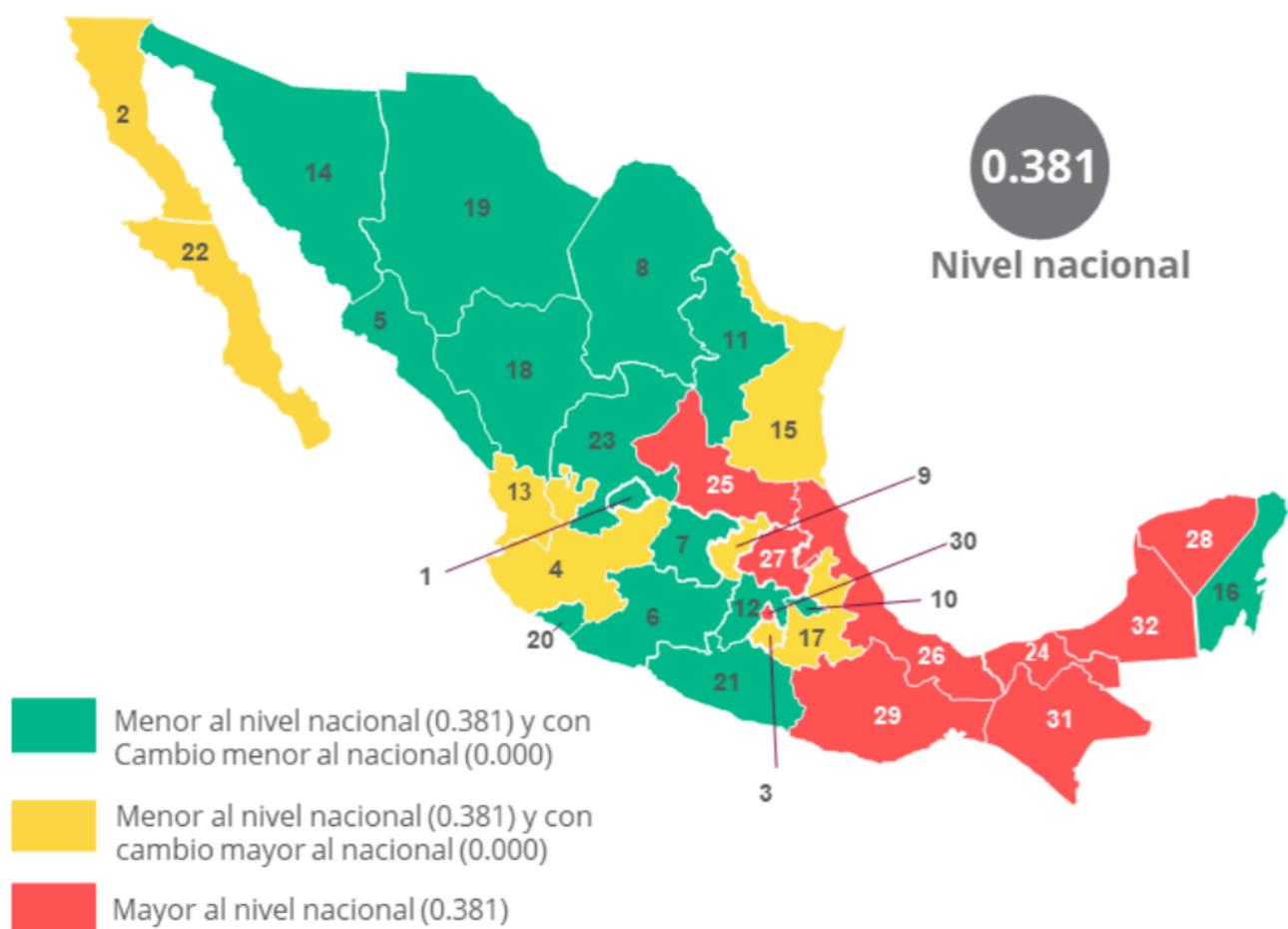
# Paletas de colores



Las paletas “semáforo” igualmente traen una carga **contextual**.

## Desigualdad laboral

1<sup>er</sup> trimestre 2021



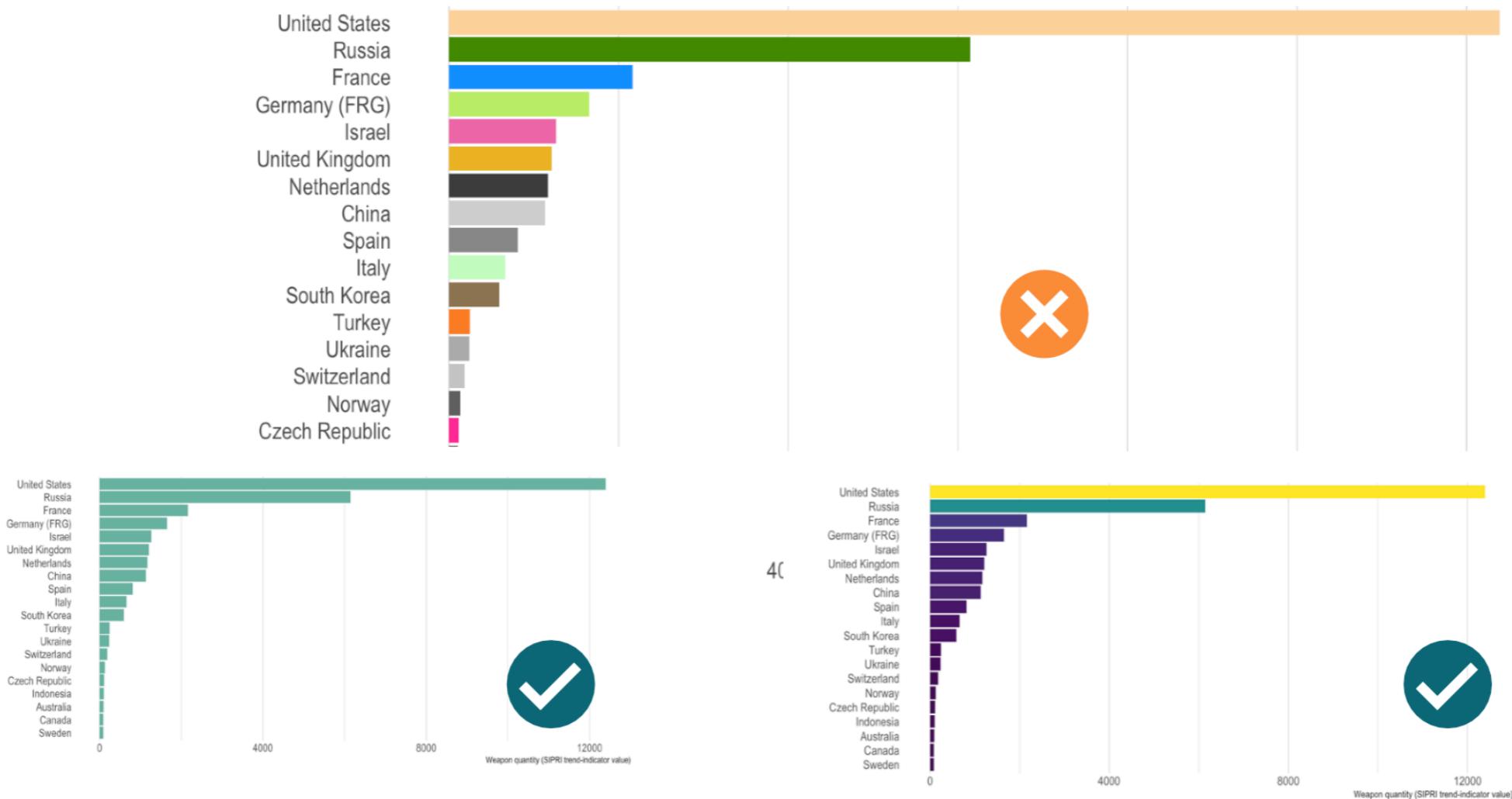
Estado	Coeficiente de Gini
1 Aguascalientes	0.299
2 Baja California	0.301
3 Morelos	0.311
4 Jalisco	0.316
5 Sinaloa	0.329
6 Michoacán	0.334
7 Guanajuato	0.337
8 Coahuila	0.339
9 Querétaro	0.349
10 Tlaxcala	0.351
11 Nuevo León	0.351
12 Edo. Méx.	0.357
13 Nayarit	0.357
14 Sonora	0.358
15 Tamaulipas	0.359
16 Quintana Roo	0.360

Estado	Coeficiente de Gini
17 Puebla	0.364
18 Durango	0.364
19 Chihuahua	0.365
20 Colima	0.367
21 Guerrero	0.369
22 Baja California Sur	0.369
23 Zacatecas	0.375
24 Tabasco	0.405
25 San Luis Potosí	0.405
26 Veracruz	0.410
27 Hidalgo	0.415
28 Yucatán	0.419
29 Oaxaca	0.420
30 CDMX	0.439
31 Chiapas	0.446
32 Campeche	0.452

# Paletas de colores



Si tus colores no representan nada, mejor no los uses.



[https://www.data-to-viz.com/caveat/color\\_com\\_nothing.html](https://www.data-to-viz.com/caveat/color_com_nothing.html)

# Paletas de colores



## Uso de colores

### Usa generadores de paletas de colores



<https://coolors.co/>



<https://mycolor.space>



<https://color.adobe.com/>

### Contrast Checker

[Home > Resources > Contrast Checker](https://webaim.org/resources/contrastchecker/)

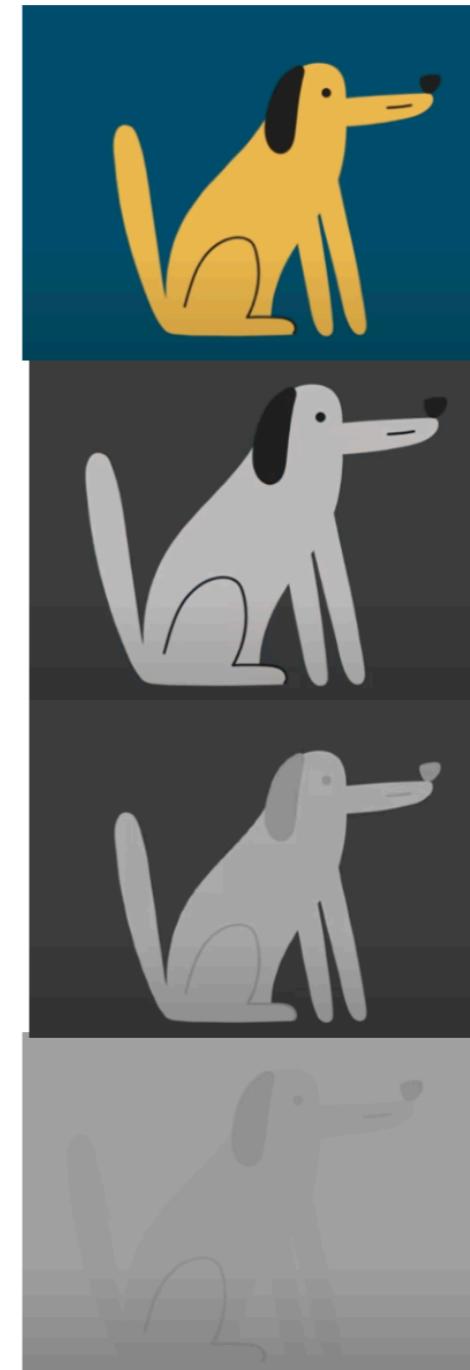


[https://webaim.org/  
resources/contrastchecker/](https://webaim.org/resources/contrastchecker/)

### Google Color Picker

<https://htmlcolors.com/google-color-picker>

## Uso de colores contrastantes



### Genera tus propias reglas de uso

#### Spot Palette



#046A78 #4E9EAC #BFFBFF #FE8E3C

#### Generic Gradient



#046A78 #008A88 #2BAA8C #69C885 #ADE279 #F9F871

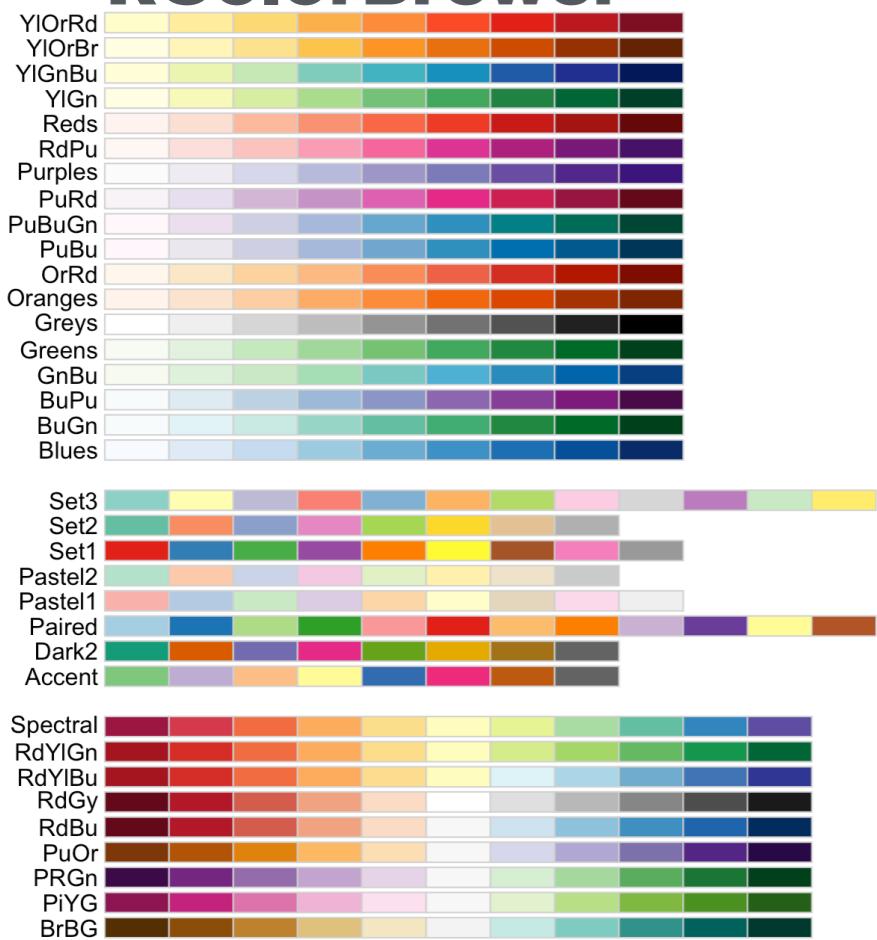
# Paletas de colores



## ¿Cómo construir paletas de colores?

1. Podemos traernos paletas de librerías que ya las tienen hechas

### RColorBrewer



### wesanderson



# Paletas de colores



## ¿Cómo construir paletas de colores?

2. Podemos construir nuestras propias paletas

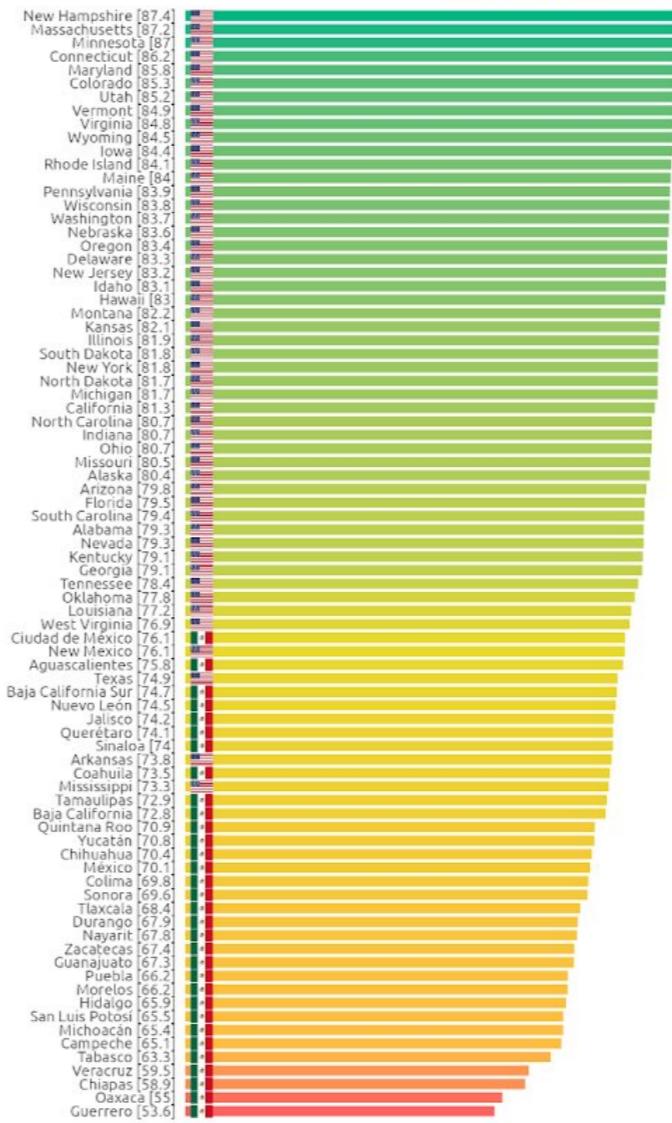
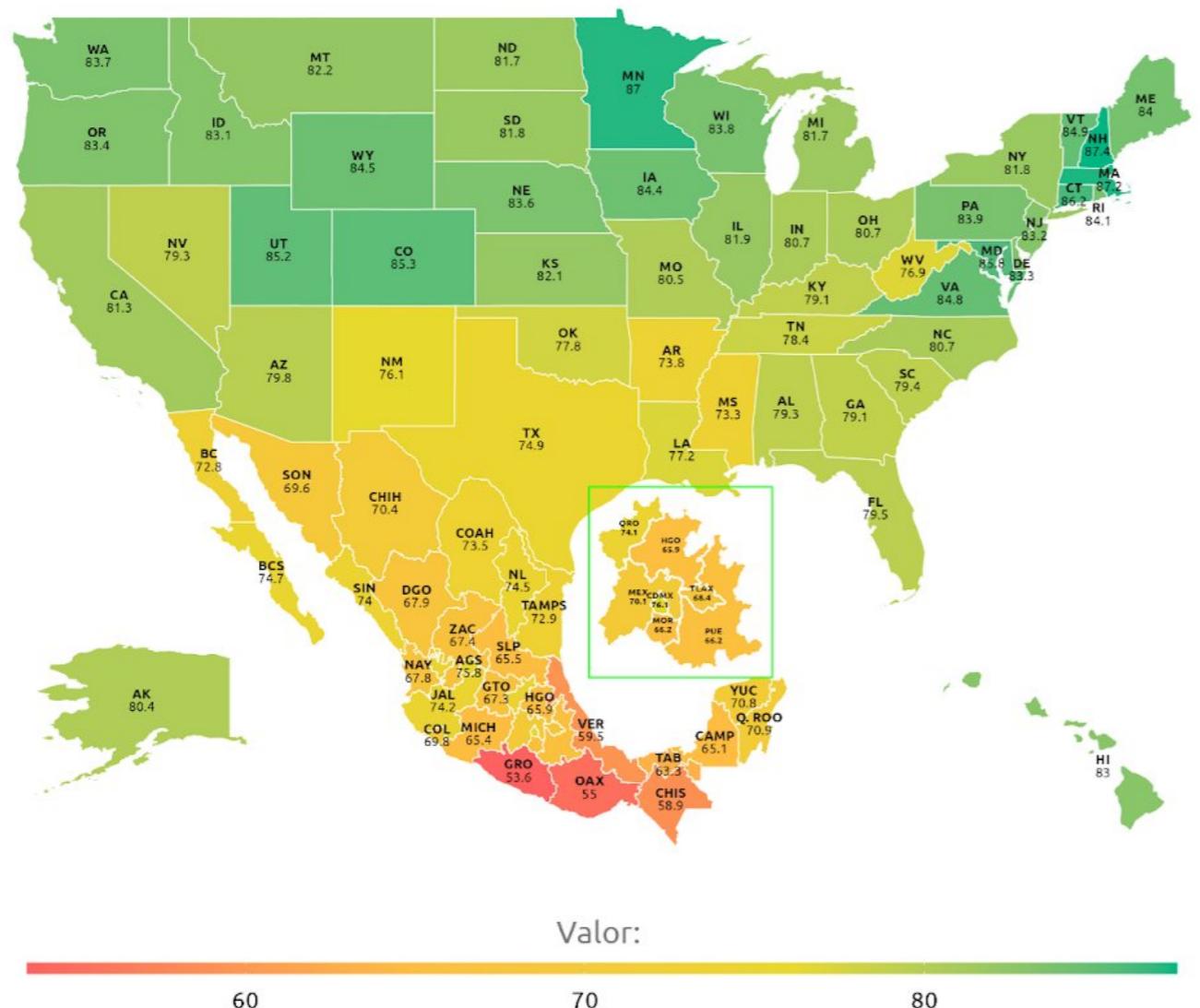
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```

# Imagen institucional



Esto se logra incluyendo elementos de la imagen institucional en nuestras visualizaciones.

## Índice de progreso social IPS Estados Unidos - México



# Imagen institucional

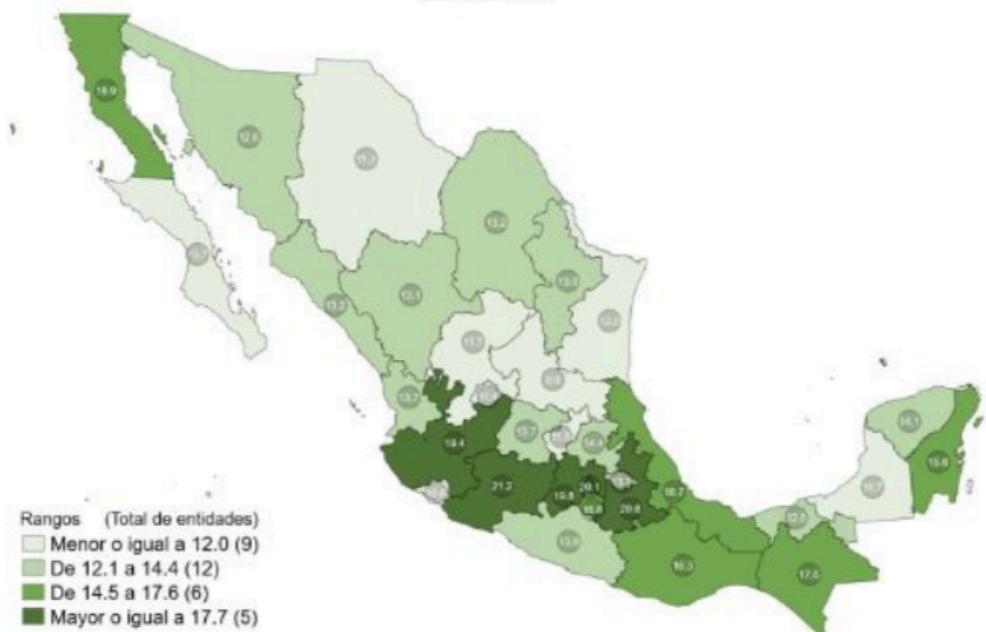


Lo que se mide se puede mejorar

MEDICIÓN  
DE POBREZA  
2020

Porcentaje de la población con carencia por acceso a los servicios de salud  
Entidades federativas  
2018 - 2020

2018



2020



Fuente: estimaciones del CONEVAL con base en la ENIGH 2018 y 2020.

[www.coneval.org.mx](http://www.coneval.org.mx)

# Elementos de un tema de ggplot2



## ggplot2 Theme Elements

```
theme(element_name = element_function())
- element_text()
- element_line()
- element_rect()
- element_blank()
```

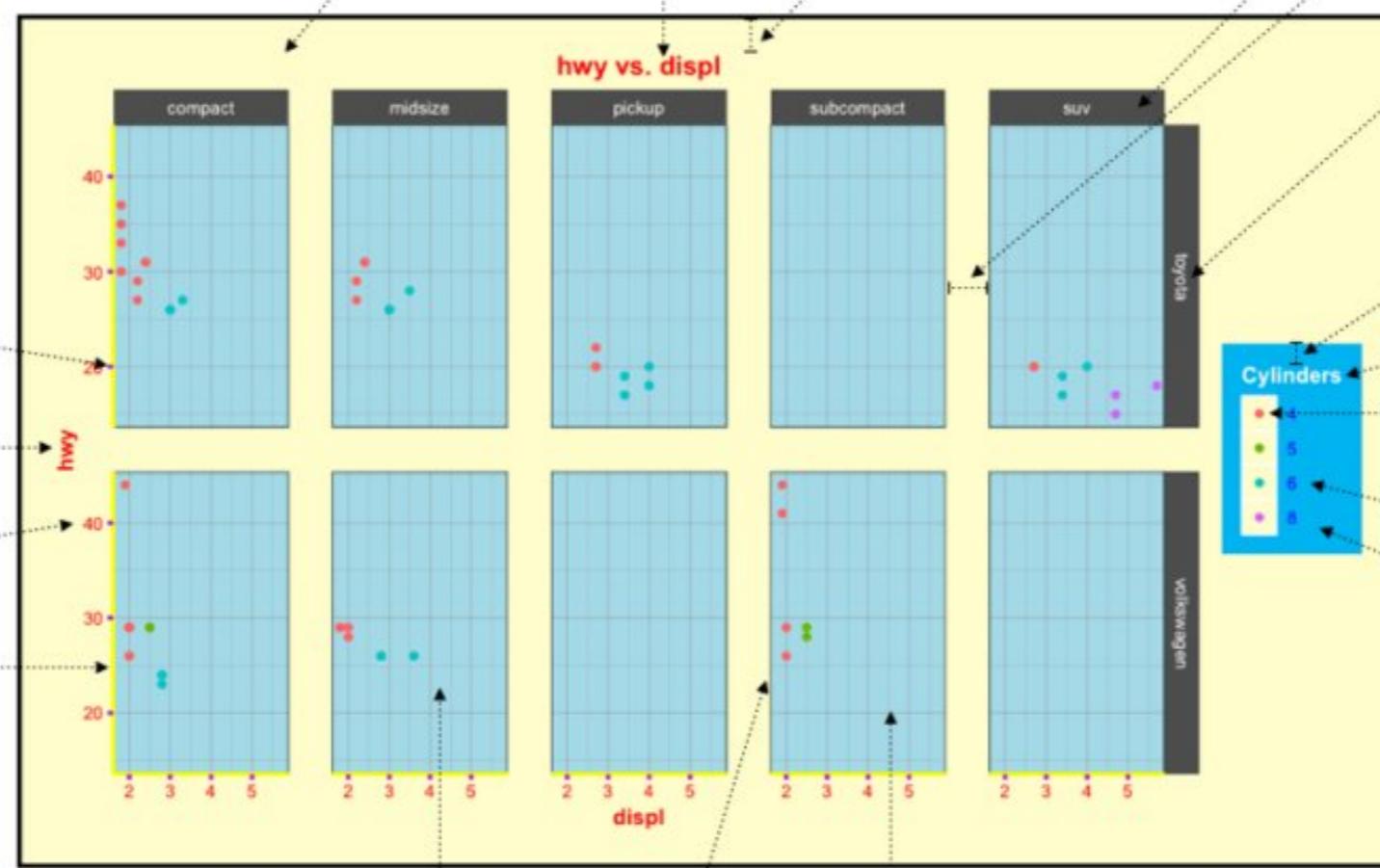
## Axis elements:

axis.ticks  
element\_line()

axis.title  
element\_text()

axis.text  
element\_text()

axis.line  
element\_line()



## Plot elements:

plot.background  
element\_rect()

plot.title  
element\_text()

plot.margin  
margin()

strip.background  
element\_rect()

panel.spacing  
unit()

strip.text  
element\_text()

## Facetting elements:

strip.background  
element\_rect()

panel.spacing  
unit()

strip.text  
element\_text()

## Legend elements:

legend.margin  
margin()

legend.title  
element\_text()

legend.key  
element\_rect()

legend.text  
element\_text()

legend.background  
element\_rect()

panel.background  
element\_rect()

panel.grid  
element\_line()

panel.border  
element\_rect(fill = NA)

## Panel elements:

[henrywang.nl](http://henrywang.nl)

Derived from "ggplot2: Elegant Graphics for Data Analysis"

# Función case\_when()



dplyr::case\_when()

IF ELSE...  
(but you love it?)

df %>% ADD COLUMN  
'danger'  
mutate(danger

IF type is kraken THEN  
T ~ "high")  
danger is extreme!

OTHERWISE, danger is high.

type	age	danger
kraken	baby	extreme!
dragon	adult	high
cyclops	teen	high
kraken	adult	extreme!
dragon	teen	high



# Tags de HTML



Algunas etiquetas en **HTML** para dar formato a nuestros textos

1. **< p >** - Párrafo
2. **< br >** - Salto de línea
3. **< b >** - Negritas
4. **< i >** - Cursiva
5. **< u >** - Subrayado
6. **< strong >** - Texto importante (negritas semánticas)
7. **< em >** - Énfasis (cursiva semántica)
8. **< mark >** - Texto resaltado
9. **< small >** - Texto pequeño
10. **< del >** - Texto tachado
11. **< ins >** - Texto insertado (subrayado por defecto)
12. **< sub >** - Subíndice
13. **< sup >** - Superíndice
14. **< blockquote >** - Cita en bloque
15. **< pre >** - Texto preformatado
16. **< code >** - Código de computadora
17. **< hr >** - Línea horizontal
18. **< a >** - Enlace (hipervínculo)
19. **< h1 >** a **< h6 >** - Encabezados (de mayor a menor jerarquía)



## Sección práctica

# Sección práctica



## Elabora los siguientes ejercicios:

1. Con los datos del PREP municipal (`prep_municipal.csv`) de la carpeta datos y el geojson de municipios (`municipios_2022.geojson`), elabore un mapa donde se observe la participación electoral a nivel municipal.
2. Utilizando la plantilla de mapas coneval (`plantilla.pdf`), dele una imagen institucional al mapa de (1).
3. Realice un nuevo mapa, ahora para la candidata ganadora o para la coalición ganadora.
4. Realice lo mismo, pero ahora para un mapa de los quintiles de participación electoral.

# Sección práctica



## Elabora los siguientes ejercicios:

5. Elabore el mapa de coalición ganadora, pero ahora en Leaflet.  
(Referencia: <https://juvecampos.github.io/presentaciones/PdD2021/Sesion5/presentacion5.pdf>)
  
6. Con los datos siguientes, elabore el mapa de delitos en el transporte público y de rutas de transporte concesionario. Explique qué utilidad podría tener este mapa (si la tiene).

### Datos:

<https://raw.githubusercontent.com/JuveCampos/30DayMapChallenge2019/master/19.%20Urban/roboAPasajerosCDMX.geojson>

<https://raw.githubusercontent.com/JuveCampos/30DayMapChallenge2019/master/19.%20Urban/rutas-y-corredores-del-transporte-publico-concesionado.geojson>

[https://raw.githubusercontent.com/JuveCampos/Shapes\\_Resiliencia\\_CDMX\\_CIDE/master/geojsons/Division%20Politica/mpios2.geojson](https://raw.githubusercontent.com/JuveCampos/Shapes_Resiliencia_CDMX_CIDE/master/geojsons/Division%20Politica/mpios2.geojson)

[https://raw.githubusercontent.com/JuveCampos/Shapes\\_Resiliencia\\_CDMX\\_CIDE/master/geojsons/Division%20Politica/DivisionEstatal.geojson](https://raw.githubusercontent.com/JuveCampos/Shapes_Resiliencia_CDMX_CIDE/master/geojsons/Division%20Politica/DivisionEstatal.geojson)