analisis

December 21, 2023

- 1 Proyecto Seminario de Sistemas 2 Fase 2
- 2 EDA Monovariable y Multivariable
- 2.1 Lectura de Datos (SQL Server -> Pandas Dataframe) + Importaciones

```
[3]: import pandas as pd
import geopandas as gpd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sqlalchemy import create_engine
```

```
[4]: # Configuración de conexión a SQL Server
     server = 'FROI-PC\\SQLEXPRESS'
     database = 'covid-data'
     trusted_connection = 'yes'
     # Especificar el controlador de pyodbc en la cadena de conexión
     conn_str = f'mssql+pyodbc://{server}/{database}?
      strusted connection={trusted connection}&driver=ODBC+Driver+17+for+SQL+Server'
     # Crear el motor de SQLAlchemy
     engine = create_engine(conn_str)
     # Consulta SQL para extraer datos
     sql query municipality = 'SELECT * FROM MUNICIPALITY'
     sql_query_department = 'SELECT * FROM DEPARTMENT'
     sql_query_municipality_deaths = 'SELECT MD.municipality_code, MD.date, MD.
      →total_deaths, MD.day_deaths, M.name AS \'municipality_name\', D.name AS_
      →\'department_name\' FROM MUNICIPALITY_DEATHS AS MD LEFT JOIN MUNICIPALITY AS_
      →M ON MD.municipality_code=M.code LEFT JOIN DEPARTMENT AS D ON M.
      ⇔department_code=D.code'
     sql_query_country_deaths = 'SELECT * FROM COUNTRY_DEATHS'
```

```
sql_query_department_population = 'SELECT D.[code] AS DepartmentCode, D.[name]__
      →AS DepartmentName, SUM(M.[population]) AS TotalPopulation FROM [dbo].
      ⇔[DEPARTMENT] D JOIN [dbo].[MUNICIPALITY] M ON D.[code] = M.[department_code] ⊔
      GROUP BY D. [code], D. [name] ORDER BY CONVERT(INT, D. [code]);
     # Ejecutar la consulta y cargar los resultados en DataFrames
     df_municipality = pd.read_sql(sql_query_municipality, engine)
     df_department = pd.read_sql(sql_query_department, engine)
     df_municipality_deaths = pd.read_sql(sql_query_municipality_deaths, engine)
     df_country_deaths = pd.read_sql(sql_query_country_deaths, engine)
     df_department_population = pd.read_sql(sql_query_department_population, engine)
[5]: df municipality.head(4)
     df_municipality.tail(4)
[5]:
         code
                                 name department_code population
     333 921
                               GENOVA
                                                            45162
                                                    9
     334 922
                    FLORES COSTA CUCA
                                                    9
                                                            23851
                                                            24199
     335 923
                         LA ESPERANZA
                                                    9
     336 924 PALESTINA DE LOS ALTOS
                                                    9
                                                            20299
[6]: df department.head(4)
     df_department.tail(4)
[6]:
        code
                        name
     18
           6
                  SANTA ROSA
     19
                      SOT.OT.A
     20
           8
                 TOTONICAPAN
     21
           9 QUETZALTENANGO
[7]: df_municipality_deaths.head(4)
     df municipality deaths.tail(4)
           municipality_code
[7]:
                                   date total_deaths
                                                       day_deaths \
     85931
                         924 2020-12-28
                                                    0
                                                               138
     85932
                         924 2020-12-29
                                                    0
                                                               132
     85933
                         924 2020-12-30
                                                    0
                                                              846
     85934
                         924 2020-12-31
                                                              879
                 municipality_name department_name
     85931 PALESTINA DE LOS ALTOS
                                    QUETZALTENANGO
     85932 PALESTINA DE LOS ALTOS QUETZALTENANGO
           PALESTINA DE LOS ALTOS
     85933
                                    QUETZALTENANGO
     85934 PALESTINA DE LOS ALTOS QUETZALTENANGO
[8]: df_country_deaths.head(4)
     df_country_deaths.tail(4)
```

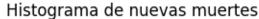
```
[8]:
                date country_code new_cases cumulative_cases new_deaths
      357 2020-12-28
                                                         135309
                               GT
                                          138
                                                                           5
      358 2020-12-29
                               GT
                                          132
                                                         135441
                                                                           5
      359 2020-12-30
                               GT
                                          846
                                                         136287
                                                                           8
      360 2020-12-31
                               GT
                                          879
                                                         137166
                                                                          22
           cumulative_deaths
      357
                        4768
      358
                        4773
      359
                        4781
      360
                        4803
 [9]: df_department_population.tail(4)
 [9]:
         DepartmentCode DepartmentName TotalPopulation
                                ZACAPA
                                                  267718
      18
                     19
      19
                     20
                            CHIQUIMULA
                                                  441579
      20
                     21
                                JALAPA
                                                  394234
      21
                     22
                                JUTIAPA
                                                  546005
[10]: df_country_deaths.dtypes
                           datetime64[ns]
[10]: date
      country_code
                                    object
      new_cases
                                     int64
      cumulative_cases
                                     int64
     new_deaths
                                     int64
      cumulative_deaths
                                     int64
      dtype: object
     2.2
          Transformaciones
[11]: # Se
      # Asegurar que la columna 'date' sea de tipo datetime64[ns]
      df_country_deaths['date'] = pd.to_datetime(df_country_deaths['date'])
      # Filtrar registros directamente en el mismo DataFrame
      df_country_deaths = df_country_deaths[df_country_deaths['date'] > '2020-03-15']
```

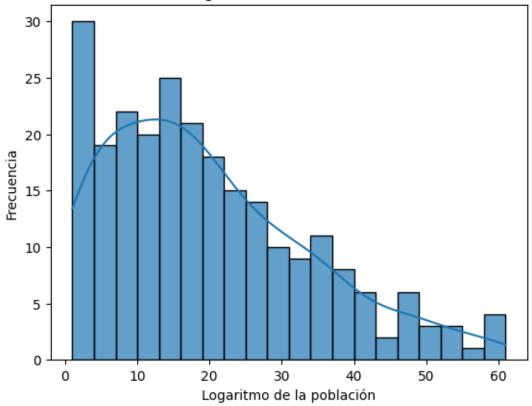
2.3 EDA Monovariable

2.3.1 Análisis de Nuevas Muertes

```
[12]: # Estadísticas Descriptivas
describe = df_country_deaths['new_deaths'].describe()
print(f"Estadísticas descriptivas\n{describe}\n")
```

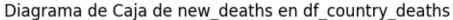
```
# Estadísticas de Conteo
count = df_country_deaths['new_deaths'].count()
print(f"Estadísticas de Conteo\n{count}\n")
# Valores únicos
unique = df_country_deaths['new_deaths'].unique()
nunique = df_country_deaths['new_deaths'].nunique()
print(f"Valores Únicos\n{unique}")
print(f"Valores Únicos (cantidad): {nunique}\n")
# Promedio
mean = df_country_deaths['new_deaths'].mean()
print(f"Promedio\n{mean}\n")
# Cuartiles
# Mediana (50%)
median_new_deaths = df_country_deaths['new_deaths'].median()
# Cuartiles (25%, 75%)
q1_new_deaths = df_country_deaths['new_deaths'].quantile(0.25)
q3_new_deaths = df_country_deaths['new_deaths'].quantile(0.75)
print("\nMediana para 'new_deaths':", median_new_deaths)
print("\nCuartil 25% para 'new_deaths':", q1_new_deaths)
print("\nCuartil 75% para 'new_deaths':", q3_new_deaths)
Estadísticas descriptivas
count 288.000000
         16.684028
mean
std
        14.775468
min
          0.000000
25%
          4.000000
50%
          14.000000
75%
          25.250000
          61.000000
max
Name: new_deaths, dtype: float64
Estadísticas de Conteo
288
Valores Únicos
[ 0 1 2 3 5 4 12 10 6 8 7 20 15 58 14 22 27 18 17 16 19 34 31 35
49 21 44 26 37 40 23 39 47 33 25 48 54 53 29 42 59 30 32 57 38 24 11 45
28 13 9 61 41]
Valores Únicos (cantidad): 53
Promedio
16.6840277777778
```

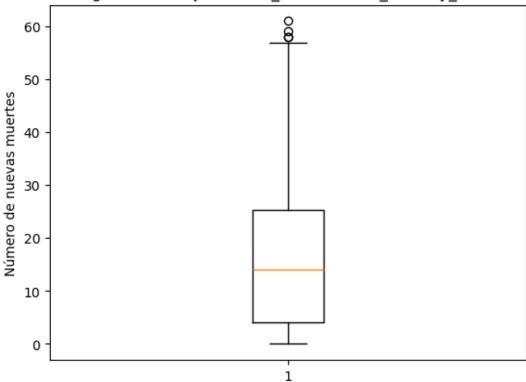




```
[14]: plt.boxplot(df_country_deaths['new_deaths'])

plt.title('Diagrama de Caja de new_deaths en df_country_deaths')
 plt.ylabel('Número de nuevas muertes')
 plt.show()
```





2.3.2 Análisis de Cantidad de Muertes Acumuladas

```
[15]: # Estadísticas Descriptivas
describe = df_country_deaths['cumulative_deaths'].describe()
print(f"Estadísticas descriptivas\n{describe}\n")

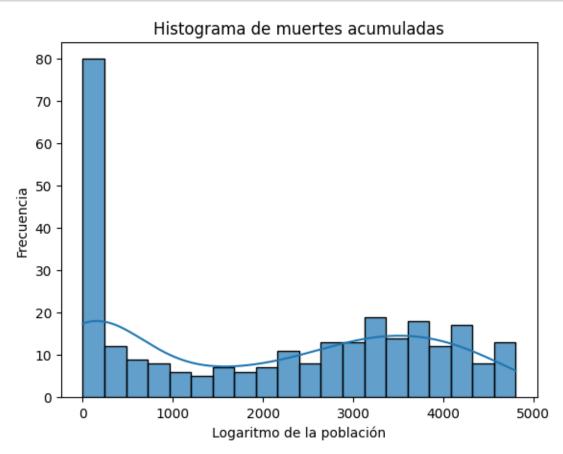
# Estadísticas de Conteo
count = df_country_deaths['cumulative_deaths'].count()
print(f"Estadísticas de Conteo\n{count}\n")

# Valores únicos
unique = df_country_deaths['cumulative_deaths'].nunique()
print(f"Valores Únicos\n{unique}\n")

# Promedio
```

```
mean = df_country_deaths['cumulative_deaths'].mean()
      print(f"Promedio\n{mean}\n")
      # Cuartiles
      # Mediana (50%)
      median_new_deaths = df_country_deaths['cumulative_deaths'].median()
      # Cuartiles (25%, 75%)
      q1_new_deaths = df_country_deaths['cumulative_deaths'].quantile(0.25)
      q3_new_deaths = df_country_deaths['cumulative_deaths'].quantile(0.75)
      print("\nMediana para 'cumulative_deaths':", median_new_deaths)
      print("\nCuartil 25% para 'cumulative_deaths':", q1_new_deaths)
      print("\nCuartil 75% para 'cumulative_deaths':", q3_new_deaths)
     Estadísticas descriptivas
     count
               288.000000
              2017.288194
     mean
     std
              1669.618975
     min
                 0.000000
     25%
                77.000000
     50%
              2204.000000
     75%
              3542.250000
              4803.000000
     max
     Name: cumulative_deaths, dtype: float64
     Estadísticas de Conteo
     288
     Valores Únicos
     249
     Promedio
     2017.288194444443
     Mediana para 'cumulative_deaths': 2204.0
     Cuartil 25% para 'cumulative_deaths': 77.0
     Cuartil 75% para 'cumulative_deaths': 3542.25
[16]: # Filtra los valores mayores que cero
      filtered data =
       ⇔df_country_deaths['cumulative_deaths'][df_country_deaths['cumulative_deaths']_⊔
       →> 0]
```

```
# Crea el histograma con la transformación logarítmica
sns.histplot(filtered_data, bins=20, kde=True, edgecolor='black', alpha=0.7)
plt.xlabel('Logaritmo de la población')
plt.ylabel('Frecuencia')
plt.title('Histograma de muertes acumuladas')
plt.show()
```

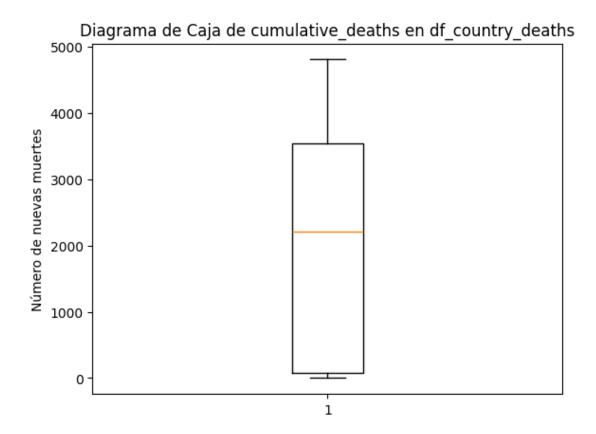


```
[17]: plt.boxplot(df_country_deaths['cumulative_deaths'])

plt.title('Diagrama de Caja de cumulative_deaths en df_country_deaths')

plt.ylabel('Número de nuevas muertes')

plt.show()
```



2.3.3 Análisis de Población en los Municipios

```
[18]: # Estadísticas Descriptivas
  describe = df_municipality['population'].describe()
  print(f"Estadísticas descriptivas\n{describe}\n")

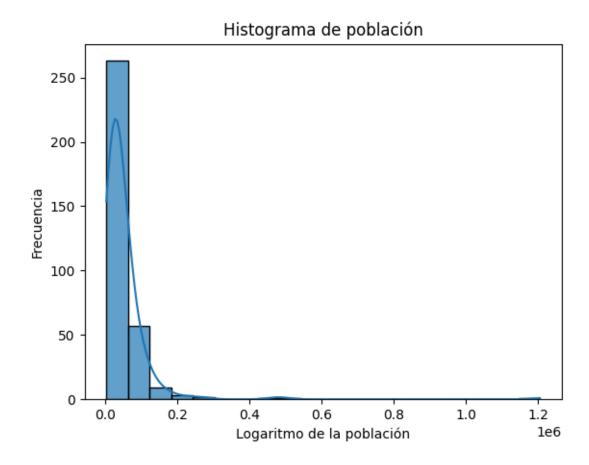
# Estadísticas de Conteo
  count = df_municipality['population'].count()
  print(f"Estadísticas de Conteo\n{count}\n")

# Valores únicos
  unique = df_municipality['population'].nunique()
  print(f"Valores Únicos\n{unique}\n")

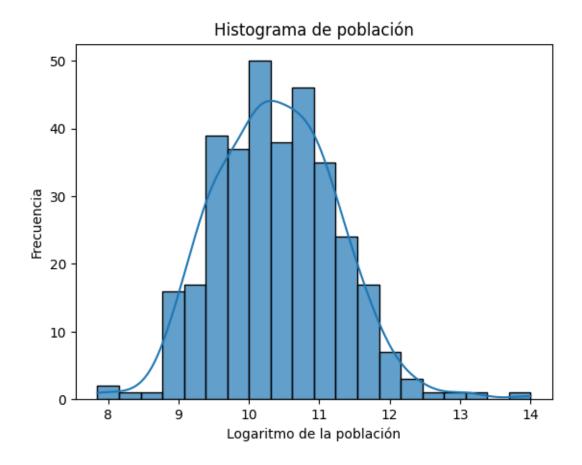
# Promedio
  mean = df_municipality['population'].mean()
  print(f"Promedio\n{mean}\n")

# Cuartiles
  # Mediana (50%)
  median_new_deaths = df_municipality['population'].median()
```

```
# Cuartiles (25%, 75%)
      q1_new_deaths = df_municipality['population'].quantile(0.25)
      q3_new_deaths = df_municipality['population'].quantile(0.75)
      print("\nMediana para 'cumulative_deaths':", median_new_deaths)
      print("\nCuartil 25% para 'cumulative_deaths':", q1_new_deaths)
      print("\nCuartil 75% para 'cumulative_deaths':", q3_new_deaths)
     Estadísticas descriptivas
     count 3.370000e+02
     mean
             4.997144e+04
            8.158246e+04
     std
            2.563000e+03
     min
     25%
            1.746500e+04
     50%
             3.091200e+04
     75%
             5.852600e+04
              1.205668e+06
     max
     Name: population, dtype: float64
     Estadísticas de Conteo
     337
     Valores Únicos
     336
     Promedio
     49971.44213649852
     Mediana para 'cumulative_deaths': 30912.0
     Cuartil 25% para 'cumulative_deaths': 17465.0
     Cuartil 75% para 'cumulative_deaths': 58526.0
[19]: filtered_data = df_municipality['population'][df_municipality['population'] > 0]
      # Crea el histograma con la transformación logarítmica
      sns.histplot(filtered data, bins=20, kde=True, edgecolor='black', alpha=0.7)
      plt.xlabel('Logaritmo de la población')
      plt.ylabel('Frecuencia')
      plt.title('Histograma de población')
      plt.show()
```



• El diagrama posee un sesgo, por lo cuál, se hará una transformación logarítmica



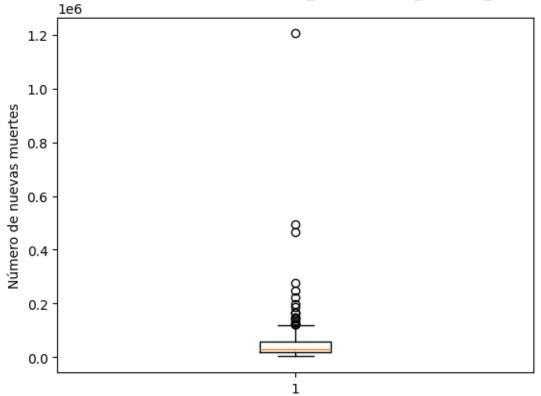
```
[21]: plt.boxplot(df_municipality['population'])

plt.title('Diagrama de Caja de cumulative_deaths en df_country_deaths')

plt.ylabel('Número de nuevas muertes')

plt.show()
```





2.3.4 Diagramas de Barras para Variables cualitativas

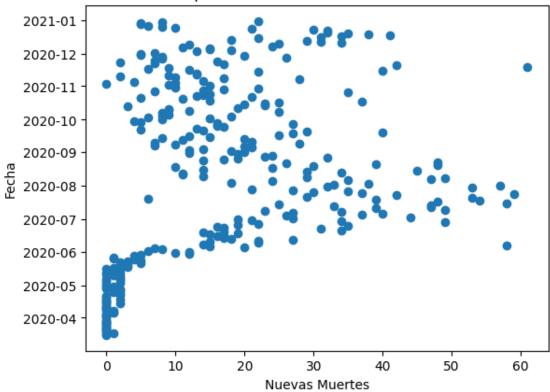
[]:

2.4 EDA Multivariable

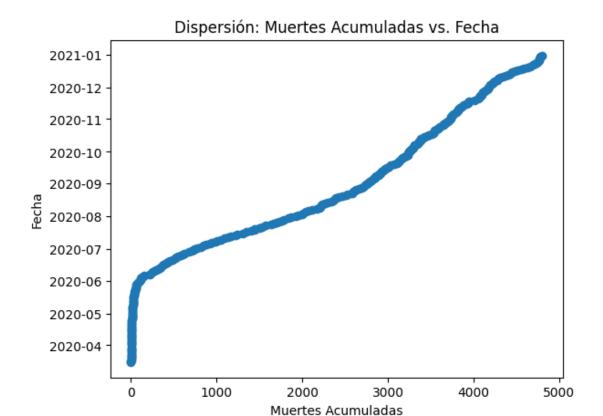
2.4.1 Gráficas de Dispersión

```
[22]: plt.scatter(df_country_deaths['new_deaths'], df_country_deaths['date'])
    plt.xlabel('Nuevas Muertes')
    plt.ylabel('Fecha')
    plt.title('Dispersión: Nuevas Muertes vs. Fecha')
    plt.show()
```

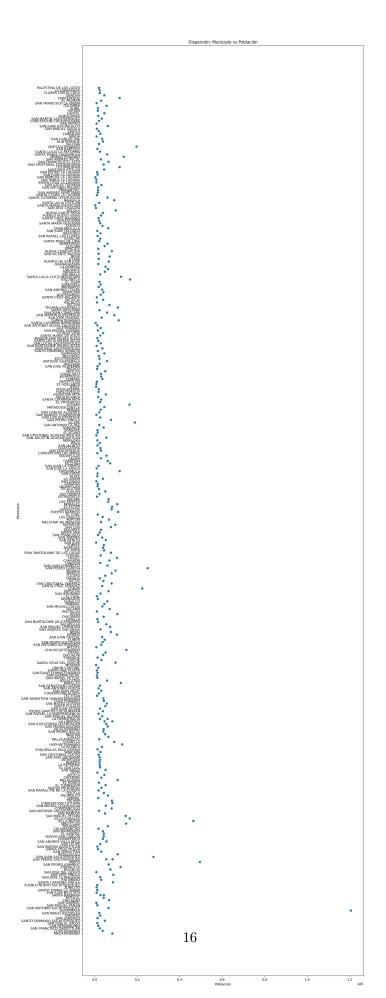


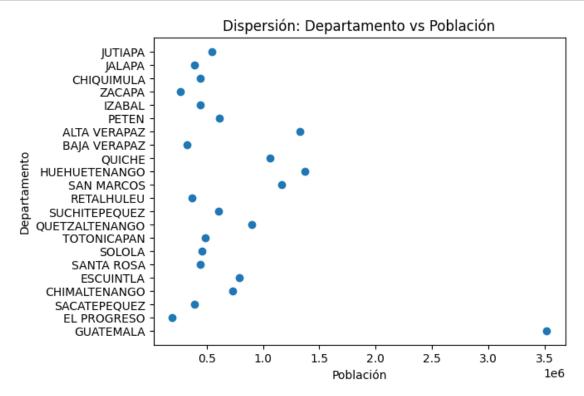


```
[23]: plt.scatter(df_country_deaths['cumulative_deaths'], df_country_deaths['date'])
    plt.xlabel('Muertes Acumuladas')
    plt.ylabel('Fecha')
    plt.title('Dispersión: Muertes Acumuladas vs. Fecha')
    plt.show()
```



```
[24]: plt.figure(figsize=(15, 50))
   plt.scatter(df_municipality['population'], df_municipality['name'])
   plt.xlabel('Población')
   plt.ylabel('Municipio')
   plt.title('Dispersión: Municipio vs Población')
   plt.show()
```





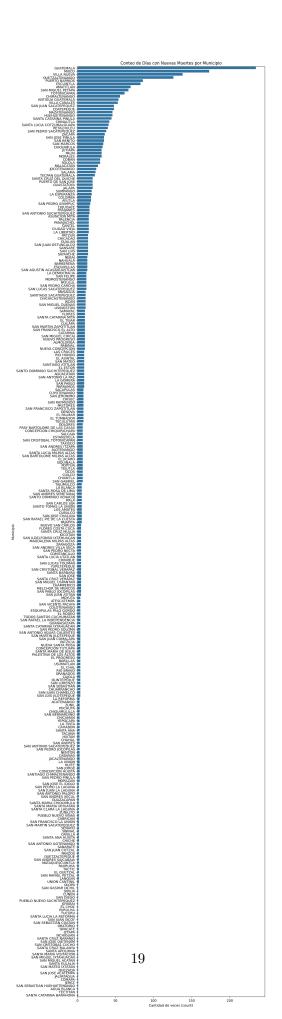
2.4.2 Gráficas de Barras

```
plt.figure(figsize=(10, 50)) # Ajusta el tamaño de la figura según tusunecesidades
sns.barplot(x='count', y='municipality_name', data=df_municipality_count) #__

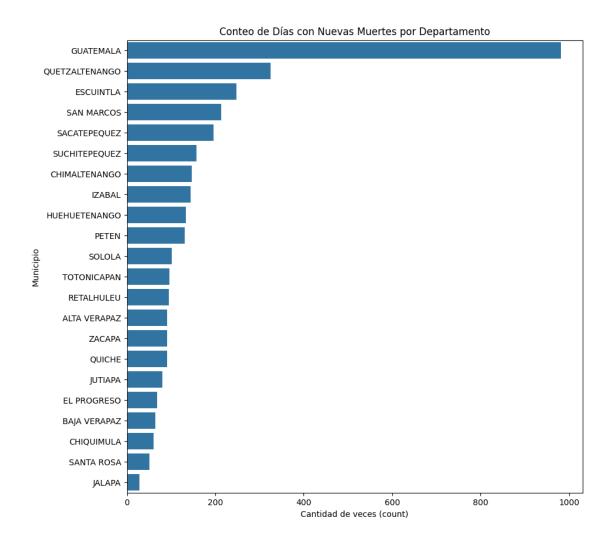
→Muestra las 10 primeras para legibilidad

# Añadir etiquetas y título
plt.xlabel('Cantidad de veces (count)')
plt.ylabel('Municipio')
plt.title('Conteo de Días con Nuevas Muertes por Municipio')

# Mostrar el gráfico
plt.show()
```



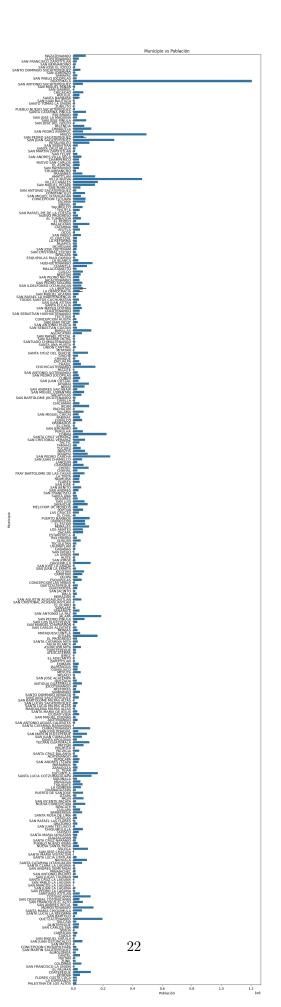
```
[27]: df_filtered = df_municipality_deaths[df_municipality_deaths['total_deaths'] !=__
       ⇔0]
      # Contar las ocurrencias de cada "name" en el DataFrame filtrado
      df_municipality_count = df_filtered['department_name'].value_counts().
       →reset_index()
      df_municipality_count.columns = ['department_name', 'count']
      # Crear una gráfica de barras con seaborn
      plt.figure(figsize=(10, 10)) # Ajusta el tamaño de la figura según tusu
      ⇔necesidades
      sns.barplot(x='count', y='department_name', data=df_municipality_count) #__
       →Muestra las 10 primeras para legibilidad
      # Añadir etiquetas y título
      plt.xlabel('Cantidad de veces (count)')
      plt.ylabel('Municipio')
      plt.title('Conteo de Días con Nuevas Muertes por Departamento')
      # Mostrar el gráfico
      plt.show()
```

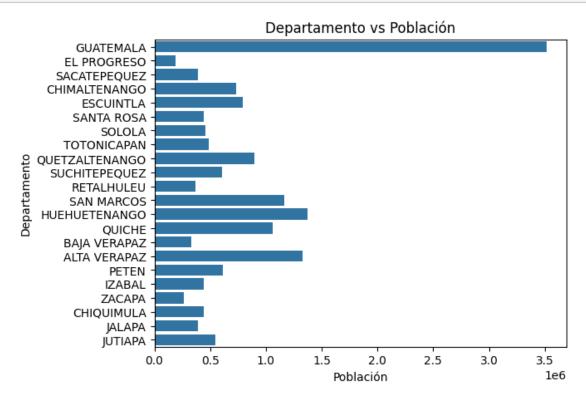


```
[28]: # Crear una gráfica de barras con seaborn
plt.figure(figsize=(10, 50)) # Ajusta el tamaño de la figura según tusunecesidades
sns.barplot(x='population', y='name', data=df_municipality) # Muestra las 10uprimeras para legibilidad

# Añadir etiquetas y título
plt.xlabel('Población')
plt.ylabel('Municipio')
plt.title('Municipio vs Población')

# Mostrar el gráfico
plt.show()
```





2.4.3 Mapas de Calor

[33]: df_municipality.head(22)

[33]:		code	name	department_code	population
	0	1001	MAZATENANGO	10	83448
	1	1002	CUYOTENANGO	10	37283
	2	1003	SAN FRANCISCO ZAPOTITLAN	10	24289
	3	1004	SAN BERNARDINO	10	16817

```
4
          1005
                          SAN JOSE EL IDOLO
                                                          10
                                                                   11870
      5
          1006
               SANTO DOMINGO SUCHITEPEQUEZ
                                                                   48188
                                                          10
          1007
      6
                                SAN LORENZO
                                                         10
                                                                   13811
      7
          1008
                                    SAMAYAC
                                                          10
                                                                   26350
          1009
                        SAN PABLO JOCOPILAS
                                                         10
                                                                   22048
          101
                                  GUATEMALA
                                                          1
                                                                 1205668
      9
      10 1010
                  SAN ANTONIO SUCHITEPEQUEZ
                                                          10
                                                                   64441
         1011
                           SAN MIGUEL PANAN
                                                          10
                                                                   12261
      11
      12 1012
                                SAN GABRIEL
                                                          10
                                                                    7945
      13 1013
                                   CHICACAO
                                                         10
                                                                   67994
      14 1014
                                    PATULUL
                                                          10
                                                                   41984
      15 1015
                              SANTA BARBARA
                                                         10
                                                                   27567
      16 1016
                          SAN JUAN BAUTISTA
                                                          10
                                                                    9238
      17 1017
                       SANTO TOMAS LA UNION
                                                          10
                                                                   12569
      18 1018
                                   ZUNILITO
                                                          10
                                                                   8724
      19 1019
                 PUEBLO NUEVO SUCHITEPEQUEZ
                                                          10
                                                                   11980
      20
          102
                      SANTA CATARINA PINULA
                                                                   86150
                                                          1
      21 1020
                                  RIO BRAVO
                                                          10
                                                                   30776
[37]: # Crear un mapa de calor con seaborn
      plt.figure(figsize=(12, 70)) # Ajusta el tamaño de la figura según tus∟
      \rightarrownecesidades
      sns.heatmap(df_municipality.pivot_table(index='name', values='population',__
       ⇒aggfunc='sum'), cmap='YlGnBu', annot=True, fmt='g')
      # Añadir título
      plt.title('Mapa de Calor: Población por Municipio')
      # Mostrar el gráfico
```

plt.show()

	Was to the total of the state of
ACATEMANIO AGUA BLANCA AGUAC AGUA	Mapa de Calor: Población por Municipio 20043 17922
ACATTENADO ACATEMAN ACATEMAN AMACADA	16679 27787 347664
AMITTAGO AUGUTIAN ATRI MOZIANURA AGUSTASSAN ATRIAS	
MARKAGANA MARKAG CAMANA	60274 122446 14440
GURADON CAPADON CAPOLA	97807 93107 18996
CAMILA CANTEL CASILAG	12577 65229 20239
CARARNA CHAMAL CHAMAL	32104 28990 50614
CHARMAN MATLA ORIGINAL CHARMAN	9394 6764
OHORATEMINO OHORATEMINO OHMATIMAN	3008 348943 122776
ATMANHO OHOMBUA OHOMBUA	223721 11294 137014
CHIQUMULA OULLA CHILARIAN CONTROL CONT	6,5097 184438 17957
CONTENCION COLUMBA COLUMBA	117579 224109 55790
CONTENANO COMMUNICALO CONTENANCALO	43622 38047 79667
CONCEPCION CHIQUESCHAIN CONCEPCION HUSTA CONCEPCION LS MINUS CONCEPCION LS MINUS CONCEPCION LS MINUS	20354 23354 12509 12075
CONDUNCO CUBLICO CULAPA	29121 59496 46409
CINCO CINETO CINOTENANO	65178 6650 37283
DELANTO DELASTA DELAST	8272 42001 15225
ELCHOL ELESTAN ELECANO	10229 81385 13508
EL PROCRIESO EL GUETZA	25109 25475 16900
ELTEMA ELTIMADOR ESCUNTA	22018 51299 186078
ESQUEULAS PALO GORDO ESTANZAGLA	57723 13785 10859
FLORES COSTA CUCA FRAY BARTOCOME DE LAS CASES FRAY BARTOCOME DE LAS CASES	23951 61664 70047
GENOVA GRANADOS CUALAN	65.62 14.90 69.10
GLANDAL PAR GLANTATORA GLANTA GLANDAL PAR GLANTA GLANDAL PAR FARNA	17794 27001 1.70567e+06
	129372 16522 11940
IMAA BICAM BICHEGIAN	23425 397265 24592
MCATENNOO MAA	42375 188522 3012
ISASE SOCIONA	8766 72093 23100
gyddal yrthol L BLANCA	394861 163665 23764
LA DEMOCRACIA LA SEPRANZA LA GOMERA J. A. MERITAN	93,557 24199 31024 136064
LA REFORMA LA TINTA LA VINTON	22294 44619 86(70
LANGUM LAS CHICKS LIVINGSTON	
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