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Design of the ETL process

Table creation

```
CREATE DATABASE [COVID19_DW]
```

```
CREATE TABLE [dbo].[time_dim](  
[date_id] [bigint] IDENTITY(1,1) NOT NULL,  
[date] [date] NULL,  
CONSTRAINT [PK_time_dim] PRIMARY KEY CLUSTERED)
```

```
CREATE TABLE [dbo].[test_units_dim](  
[test_id] [bigint] IDENTITY(1,1) NOT NULL,  
[tests_unit] [nvarchar](4000) NULL,  
CONSTRAINT [PK_test_units_dim] PRIMARY KEY CLUSTERED)
```

```
CREATE TABLE [dbo].[location_dim](  
[location_id] [bigint] IDENTITY(1,1) NOT NULL,  
[iso_code] [nvarchar](4000) NULL,  
[continent] [nvarchar](4000) NULL,  
[location] [nvarchar](4000) NULL,  
CONSTRAINT [PK_location_dim] PRIMARY KEY CLUSTERED)
```

```
CREATE TABLE [dbo].[fact_covid_cases](  
[fact_id] [bigint] IDENTITY(1,1) NOT NULL,  
[total_cases] [bigint] NULL,  
[total_deaths] [bigint] NULL,  
[total_cases_per_million] [float] NULL,  
[total_deaths_per_million] [float] NULL,  
[total_tests] [bigint] NULL,  
[positive_rate] [float] NULL,  
[total_vaccinations] [bigint] NULL,  
[people_fully_vaccinated] [bigint] NULL,  
[total_boosters] [bigint] NULL,  
[population] [bigint] NULL,  
[population_density] [float] NULL,  
[date_id] [bigint] NULL,  
[test_id] [bigint] NULL,  
[location_id] [bigint] NULL,  
CONSTRAINT [PK_fact_covid_cases] PRIMARY KEY CLUSTERED)
```

```
ALTER TABLE [dbo].[fact_covid_cases] WITH CHECK ADD CONSTRAINT  
[FK_fact_covid_cases_location_dim] FOREIGN KEY([location_id])  
REFERENCES [dbo].[location_dim] ([location_id])  
GO
```

```
ALTER TABLE [dbo].[fact_covid_cases] CHECK CONSTRAINT [FK_fact_covid_cases_location_dim]
GO
```

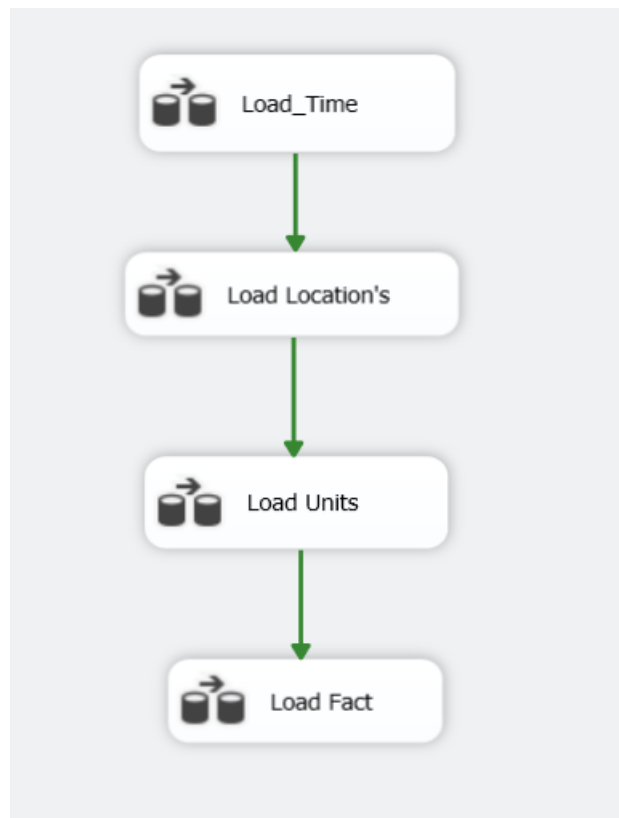
```
ALTER TABLE [dbo].[fact_covid_cases] WITH CHECK ADD CONSTRAINT
[FK_fact_covid_cases_test_units_dim] FOREIGN KEY([test_id])
REFERENCES [dbo].[test_units_dim] ([test_id])
GO
```

```
ALTER TABLE [dbo].[fact_covid_cases] CHECK CONSTRAINT [FK_fact_covid_cases_test_units_dim]
GO
```

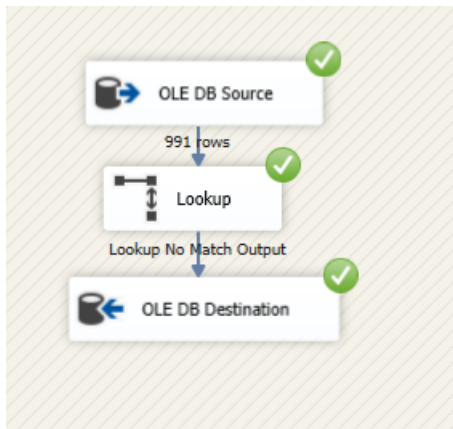
```
ALTER TABLE [dbo].[fact_covid_cases] WITH CHECK ADD CONSTRAINT
[FK_fact_covid_cases_time_dim] FOREIGN KEY([date_id])
REFERENCES [dbo].[time_dim] ([date_id])
GO
```

```
ALTER TABLE [dbo].[fact_covid_cases] CHECK CONSTRAINT [FK_fact_covid_cases_time_dim]
GO
```

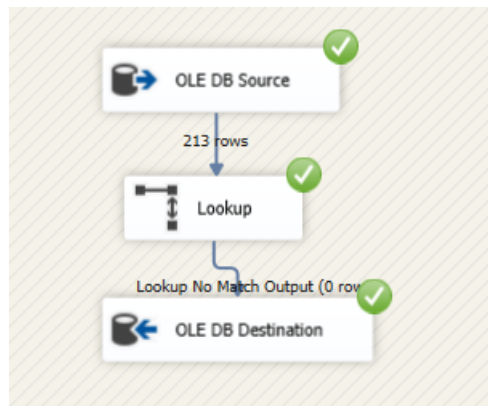
Specification of ETL (Control Flow + Data Flow) processes



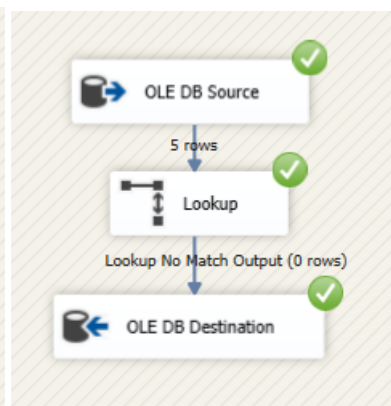
Control Flow Task WorkFlow, Loading Data in Task manner, one by one using control flow task, one at a time



dimension time

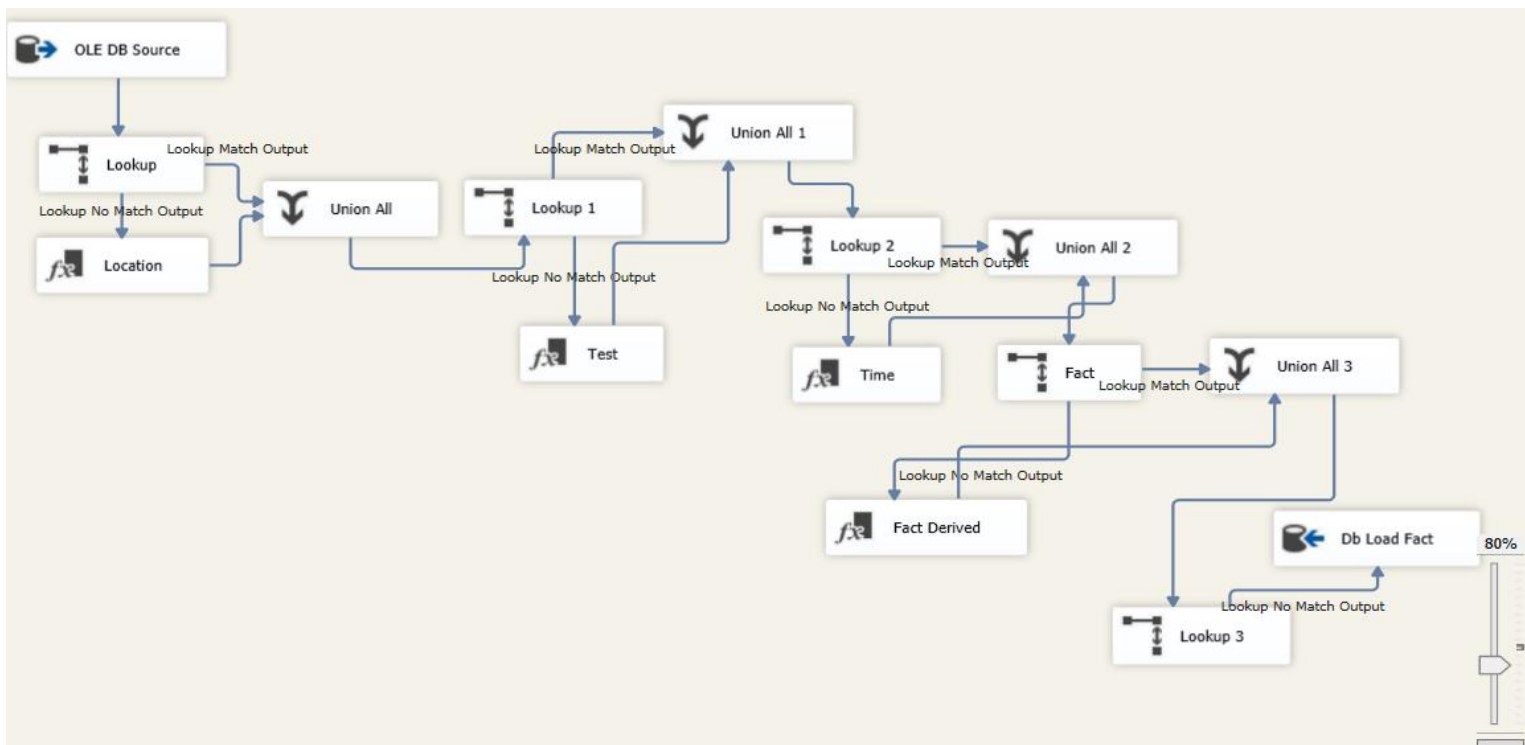


dimension location



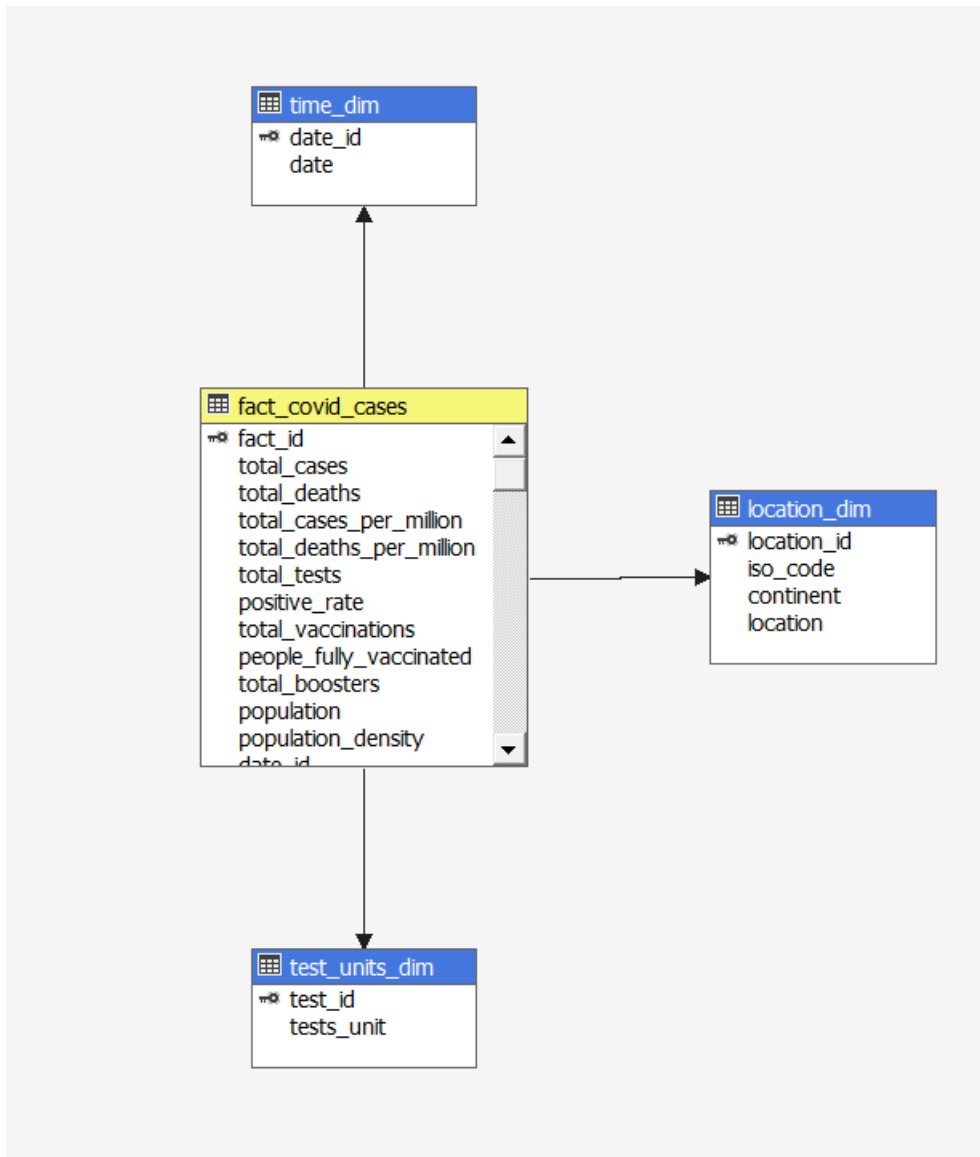
dimension test units

Picture 2: Successfully Implemented Dimension Tables, Using Lookup to find data in table not duplicated, only new records and loading data from sql query so no incorrect records can be inserted



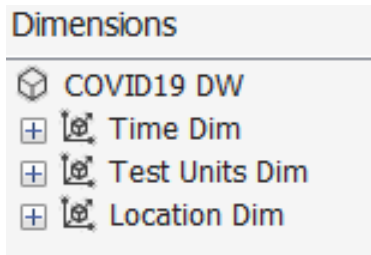
Implementation of multidimensional model - cube

Data View



Data Source View prepared for our multidimensional model it will let us analyze data with respect to all our questions

Dimensions



Measures :

- Total_cases
- Total deaths
- Total cases per million
- Total tests
- Positive rate
- Total vaccinations
- People fully vaccinated
- Total boosters
- Population
- Population density
- Date id
- Test id
- Location id

Process Progress

Command

Processing Cube 'COVID19 DW' completed.

Start time: 12/12/2022 9:18:53 AM; End time: 12/12/2022 9:18:56 AM; Duration: 0:00:03

Processing Measure Group 'Fact Covid Cases' completed.

Status:

✓ Process succeeded.

Stop

Reprocess

View Details...

Copy

Close

Help

Processing Cube

Covid19_Cube

COVID19 DW.cube [Design]

Location Dim.dim [Design]

Test Units Dim.dim [Design]

Time Dim.dim [Design]

[Tool Windows]

Deployment Progress - Covid19_Cube

Measures

COVID19 DW

Fact Covid Cases

Dimensions

Data Source View

time_dim

date_id

date

fact_covid_cases

fact_id

total_cases

total_deaths

total_cases_per_million

total_deaths_per_million

total_tests

positive_rate

total_vaccinations

location_dim

location_id

iso_code

continent

location

Output

Show output from: Build

Build: 1 succeeded or up-to-date, 0 failed, 0 skipped

Deploy: 1 succeeded, 0 failed, 0 skipped

Error List

Output

Successfully Deployed Cube to SSRS, now we can use our multidimensional model for factual analysis

Implementation of analytical processes

Mdx queries

Total cases in continent

| | Total Cases |
|---------------|--------------|
| All | 548591469648 |
| | 402720124010 |
| Africa | 4765068425 |
| Asia | 48230239135 |
| Europe | 57890900752 |
| North America | 6557321604 |
| Oceania | 1971062181 |
| South America | 26456753541 |
| Unknown | (null) |

```
Select [Measures].[Total Cases] on Columns,  
[Location Dim].[Continent].members on Rows  
From [COVID19 DW];
```

Fact table with continent

| | Total Cases | Total Deaths | Total Cases Per Million | Total Deaths Per Million | Total Tests | Positive Rate | Total Vaccinations | People Fully Vaccinated | Total Boosters |
|---------------|--------------|--------------|-------------------------|--------------------------|---------------|-------------------|--------------------|-------------------------|----------------|
| All | 548591469648 | 8294940569 | 10672207073.688 | 115154155.254 | 1058236162277 | 8412.15199999998 | 10100015674848 | 3565134180979 | 963389843790 |
| | 402720124010 | 5832878107 | 493443259.242999 | 7119473.56799998 | 0 | 0 | 7013767650910 | 2778700139839 | 779315801666 |
| Africa | 4765068425 | 109272573 | 518251425.411999 | 6293401.63200004 | 19101532377 | 1131.9273 | 29322348009 | 12320975475 | 1012117482 |
| Asia | 48230239135 | 619475004 | 1748718725.957 | 13457880.4129999 | 457136820664 | 1675.7897 | 2359021517130 | 502368505350 | 78858935364 |
| Europe | 57890900752 | 771972396 | 5250366453.937 | 55263036.7060001 | 460648348871 | 3022.65249999998 | 336343666929 | 133755639977 | 54662261425 |
| North America | 6557321604 | 241209710 | 1591641570.013 | 15877072.6680003 | 36828803517 | 1376.8664 | 90599206119 | 34563494962 | 8737264654 |
| Oceania | 1971062181 | 3872033 | 469736318.880995 | 2002463.011 | 24123955039 | 188.2423000000001 | 21997366996 | 8565934767 | 3520540388 |
| South America | 26456753541 | 716260746 | 600049320.244998 | 15140827.256 | 60396701809 | 1016.6738 | 248963918755 | 94859490609 | 37282922811 |
| Unknown | (null) | (null) | (null) | (null) | (null) | (null) | (null) | (null) | (null) |

```
Select [Location Dim].[Continent].members on Rows,  
MEASUREGROUPMEASURES("Fact Covid Cases") ON COLUMNS  
From [COVID19 DW];
```

Fact table with location poland

| Messages | Results |
|--------------------------|------------------|
| | Poland |
| Total Cases | 2543970756 |
| Total Deaths | 55327346 |
| Total Cases Per Million | 66408816.756 |
| Total Deaths Per Million | 1444286.884 |
| Total Tests | 1865928483 |
| Positive Rate | 94.1194 |
| Total Vaccinations | 19802172889 |
| People Fully Vaccinated | 8577348751 |
| Total Boosters | 2949860160 |
| Population | 35549569728 |
| Population Density | 115097.056000001 |
| Fact Covid Cases Count | 928 |

```
Select [Location Dim].[Location].&[Poland] on COLUMNS,  
MEASUREGROUPMEASURES("Fact Covid Cases") ON ROWS  
From [COVID19 DW];
```

Fact table with location india

| Messages | Results |
|--------------------------|------------------|
| | India |
| Total Cases | 21404741825 |
| Total Deaths | 273197341 |
| Total Cases Per Million | 15206942.082 |
| Total Deaths Per Million | 194092.334 |
| Total Tests | 296477930381 |
| Positive Rate | 39.4274 |
| Total Vaccinations | 646841256342 |
| People Fully Vaccinated | 263470244283 |
| Total Boosters | 12322934374 |
| Population | 1354076416004 |
| Population Density | 433303.077999996 |
| Fact Covid Cases Count | 962 |

```
Select [Location Dim].[Location].&[India] on COLUMNS,  
MEASUREGROUPMEASURES("Fact Covid Cases") ON ROWS  
From [COVID19 DW];
```

Fact table with time

| Messages | Results | | | | | | | | |
|------------|-------------|--------------|-------------------------|--------------------------|-------------|---------------|--------------------|-------------------------|----------------|
| | Total Cases | Total Deaths | Total Cases Per Million | Total Deaths Per Million | Total Tests | Positive Rate | Total Vaccinations | People Fully Vaccinated | Total Boosters |
| 2020-01-15 | 0 | 0 | 0 | 0 | 2549 | 0.026 | 0 | 0 | 0 |
| 2020-01-16 | 0 | 0 | 0 | 0 | 2785 | 0.026 | 0 | 0 | 0 |
| 2020-01-17 | 0 | 0 | 0 | 0 | 2972 | 0.042 | 0 | 0 | 0 |
| 2020-01-18 | 0 | 0 | 0 | 0 | 3049 | 0.049 | 0 | 0 | 0 |
| 2020-01-19 | 0 | 0 | 0 | 0 | 3215 | 0.111 | 0 | 0 | 0 |
| 2020-01-20 | 0 | 0 | 0 | 0 | 3514 | 0.117 | 0 | 0 | 0 |
| 2020-01-21 | 0 | 0 | 0 | 0 | 3801 | 0.118 | 0 | 0 | 0 |
| 2020-01-22 | 1115 | 34 | 2.042 | 0.016 | 4136 | 0.222 | 0 | 0 | 0 |
| 2020-01-23 | 1321 | 36 | 4.095 | 0.017 | 4471 | 0.226 | 0 | 0 | 0 |
| 2020-01-24 | 1904 | 52 | 4.895 | 0.024 | 4199 | 0 | 0 | 0 | 0 |
| 2020-01-25 | 2895 | 84 | 5.911 | 0.038 | 4400 | 0 | 0 | 0 | 0 |
| 2020-01-26 | 4274 | 112 | 11.814 | 0.051 | 5231 | 0.241 | 0 | 0 | 0 |
| 2020-01-27 | 5901 | 164 | 14.435 | 0.075 | 5677 | 0.184 | 0 | 0 | 0 |
| 2020-01-28 | 11215 | 262 | 18.922 | 0.12 | 6075 | 0.1638 | 0 | 0 | 0 |
| 2020-01-29 | 12400 | 266 | 20.08 | 0.121 | 6466 | 0.1716 | 0 | 0 | 0 |
| 2020-01-30 | 16540 | 344 | 22.817 | 0.158 | 6862 | 0.1747 | 0 | 0 | 0 |

```
SELECT [Time Dim].[Date].MEMBERS on ROWS,
MEASUREGROUPMEASURES("Fact Covid Cases") on COLUMNS
FROM [COVID19 DW]
```

Test units with continent

| Messages | Results | | | | | | | | |
|-----------------|--------------|--------------|------------|-------------|-------------|---------------|------------|---------------|---------|
| | All | | Africa | Asia | Europe | North America | Oceania | South America | Unknown |
| All | 548591469648 | 402720124010 | 4765068425 | 48230239135 | 57890900752 | 6557321604 | 1971062181 | 26456753541 | (null) |
| 0 | 448666919225 | 402720124010 | 1467889672 | 14190413995 | 18063929482 | 2225312877 | 1028565415 | 8970683774 | (null) |
| people tested | 20223699749 | (null) | 2027954954 | 7707313392 | 7612762327 | 2556350438 | 39580 | 319279058 | (null) |
| samples tested | 19673565596 | (null) | 217569198 | 18520132361 | 661508560 | 274355477 | (null) | (null) | (null) |
| tests performed | 59846743948 | (null) | 1051654601 | 7631838257 | 31552700383 | 1501302812 | 942457186 | 17166790709 | (null) |
| units unclear | 180541130 | (null) | (null) | 180541130 | (null) | (null) | (null) | (null) | (null) |
| Unknown | (null) | (null) | (null) | (null) | (null) | (null) | (null) | (null) | (null) |

```
SELECT [Test Units Dim].[Tests Unit].MEMBERS on ROWS,
[Location Dim].[Continent].MEMBERS ON COLUMNS
FROM [COVID19 DW]
```

Test units with location

| | All | 0 | people tested | samples tested | tests performed | units unclear | Unknown |
|---------------------------------|--------------|--------------|---------------|----------------|-----------------|---------------|---------|
| All | 548591469648 | 448666919225 | 20223699749 | 19673565596 | 59846743948 | 180541130 | (null) |
| Afghanistan | 94434969 | 68646038 | (null) | (null) | 25788931 | (null) | (null) |
| Africa | 5546296142 | 5546296142 | (null) | (null) | (null) | (null) | (null) |
| Albania | 127874585 | 27008144 | (null) | (null) | 100866441 | (null) | (null) |
| Algeria | 135841853 | 135576556 | (null) | (null) | 265297 | (null) | (null) |
| Andorra | 16381421 | 8974861 | (null) | (null) | 7406560 | (null) | (null) |
| Angola | 41979078 | 28166197 | (null) | (null) | 13812881 | (null) | (null) |
| Anguilla | 911126 | 866102 | (null) | (null) | 45024 | (null) | (null) |
| Antigua and Barbuda | 2735856 | 2545448 | (null) | (null) | 190408 | (null) | (null) |
| Argentina | 3921143994 | 998220368 | (null) | (null) | 2922923626 | (null) | (null) |
| Armenia | 208435979 | 47022017 | (null) | (null) | 161413962 | (null) | (null) |
| Aruba | 14485683 | 14463410 | (null) | (null) | 22273 | (null) | (null) |
| Asia | 58864615885 | 58864615885 | (null) | (null) | (null) | (null) | (null) |
| Australia | 1633795719 | 813301595 | (null) | (null) | 820494124 | (null) | (null) |
| Austria | 1244721314 | 410434578 | (null) | (null) | 834286736 | (null) | (null) |
| Azerbaijan | 350786978 | 111743331 | (null) | (null) | 239043647 | (null) | (null) |
| Bahamas | 15025901 | 7070937 | (null) | (null) | 7954964 | (null) | (null) |
| Bahrain | 237045437 | 56504307 | (null) | (null) | (null) | 180541130 | (null) |
| Bangladesh | 957323917 | 174074270 | (null) | (null) | 783249647 | (null) | (null) |
| Barbados | 21551719 | 13892353 | (null) | (null) | 7659366 | (null) | (null) |
| Belarus | 421682696 | 128610464 | (null) | (null) | 293072232 | (null) | (null) |
| Belgium | 1476882294 | 395562332 | (null) | (null) | 1081319962 | (null) | (null) |
| Belize | 22122648 | 8870723 | (null) | (null) | 13251925 | (null) | (null) |
| Benin | 12075998 | 12049500 | (null) | (null) | 26498 | (null) | (null) |
| Bermuda | 4755291 | 4197229 | (null) | 558062 | (null) | (null) | (null) |
| Bhutan | 11530520 | 10480222 | (null) | 1050298 | (null) | (null) | (null) |
| Bolivia | 407953492 | 94417981 | (null) | (null) | 313535511 | (null) | (null) |
| Bonaire Sint Eustatius and Saba | 2929764 | 2929764 | (null) | (null) | (null) | (null) | (null) |
| Bosnia and Herzegovina | 178288651 | 95162755 | (null) | (null) | 83125896 | (null) | (null) |
| Botswana | 114484220 | 39109500 | (null) | (null) | 75374720 | (null) | (null) |

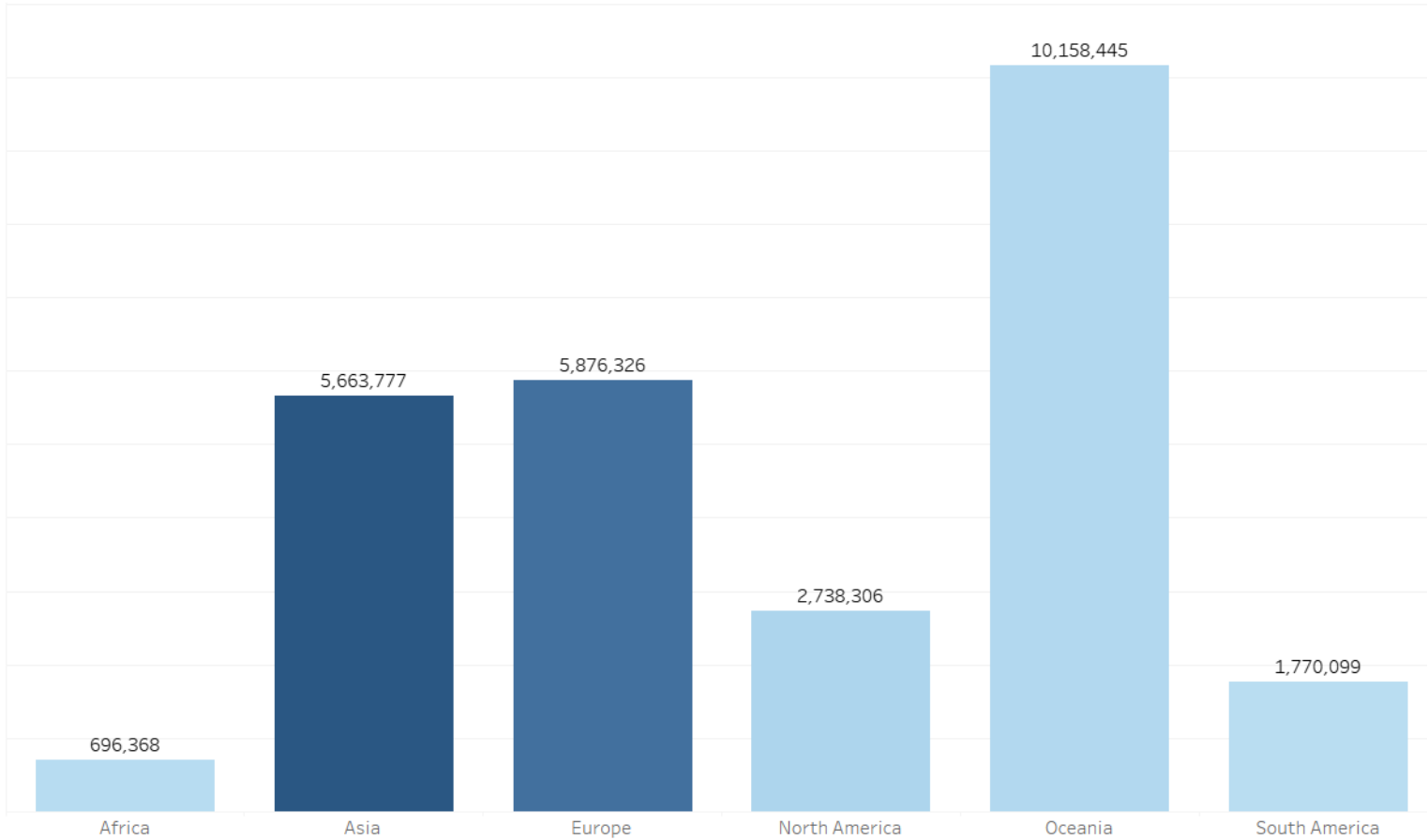
```

SELECT [Test Units Dim].[Tests Unit].MEMBERS on COLUMNS,
[Location Dim].[Location].MEMBERS ON ROWS
FROM [COVID19 DW]

```

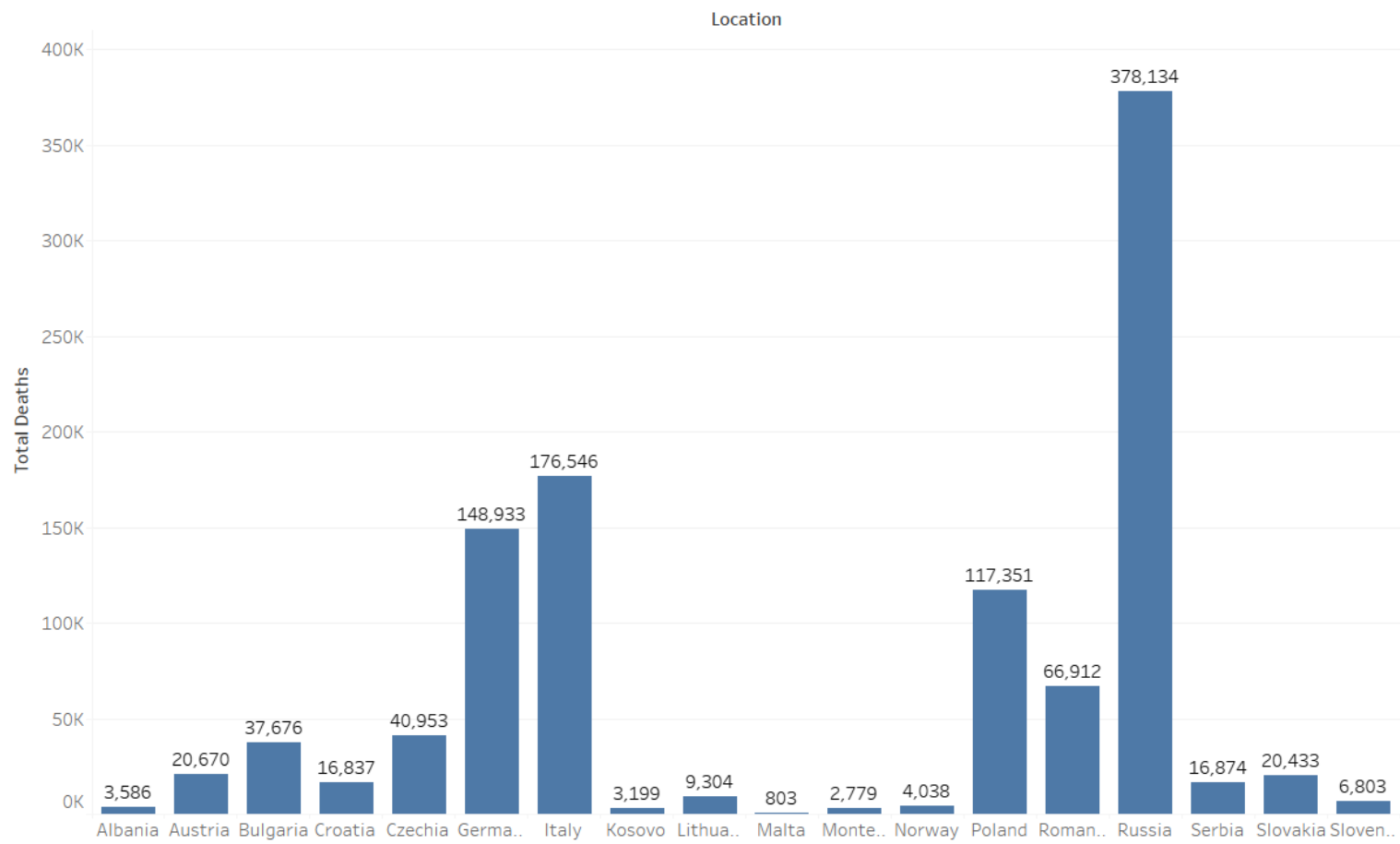
Tableau visualization

total cases



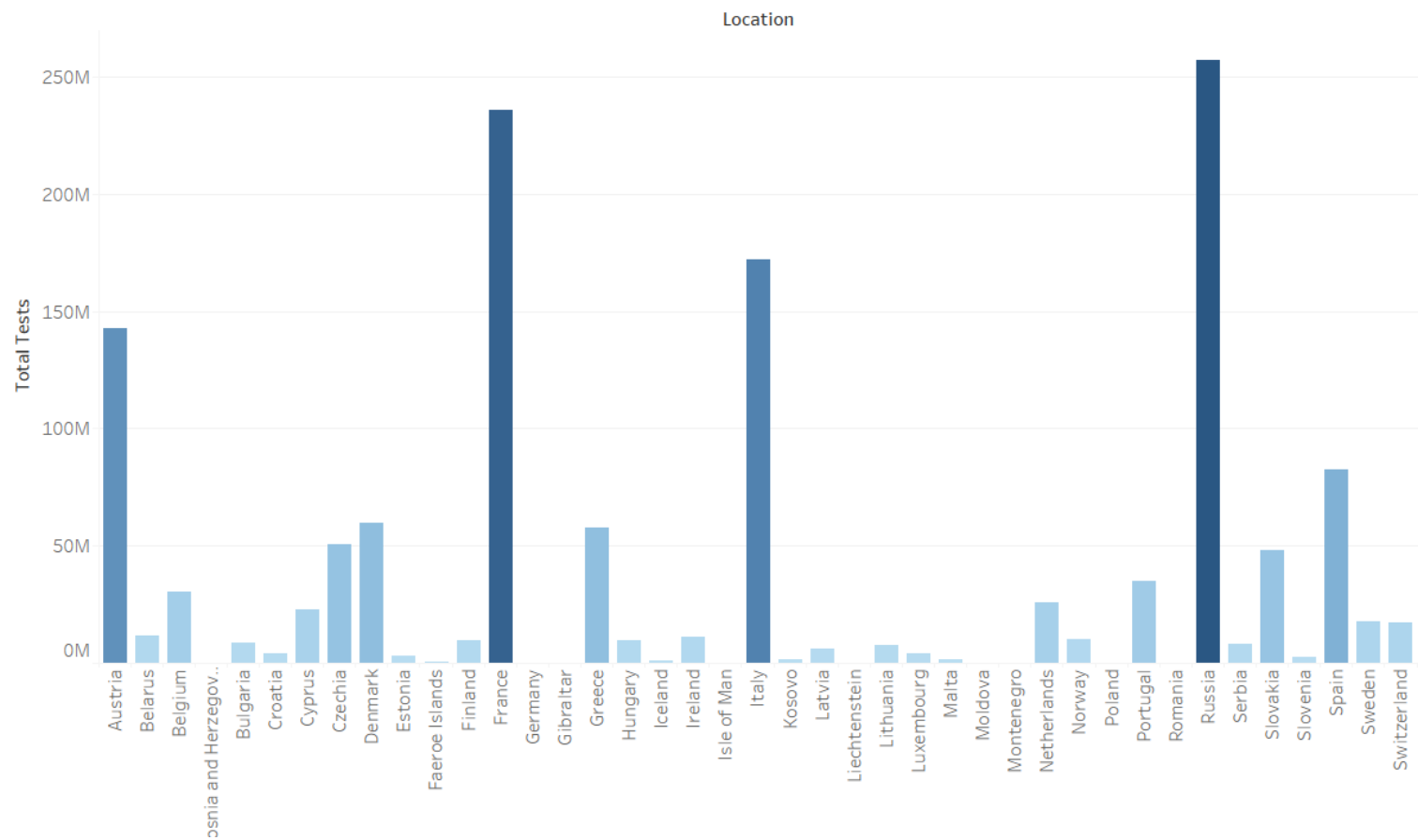
Total cases reported all across the continents from start of covid

total deaths



Total deaths reported all across Europe from start of covid

total tests



Total tests performed all across Europe from start of covid