

## 1. Importation of dataset from sql server:

In [50]:

```
import pyodbc
import pandas as pd

sql_conn = pyodbc.connect("Driver={SQL Server Native Client 11.0};"
                          "Server=NACIRA\SQLEXPRESS;"
                          "Database=Avian_diseases;"
                          "Trusted_Connection=yes,")

df_sql_server = pd.read_sql_query("SELECT * FROM dbo.avian", sql_conn)

df_sql_server
```

C:\Users\X220\AppData\Local\Temp\ipykernel\_1988\417070697.py:9: UserWarning: pandas only supports SQLAlchemy connectable (engine/connection) or database string URI or sqlite3 DBAPI2 connection. Other DBAPI2 objects are not tested. Please consider using SQLAlchemy.

```
df_sql_server = pd.read_sql_query("SELECT * FROM dbo.avian", sql_conn)
```

Out[50]:

	Year	Semester	World region	Country	Administrative Division	Disease	Serotype/Subtype/Genotype	Animal Category	Species	Outbreak_id	New outbreaks	Sum
0	2011.0	Jul-Dec 2011	Asia	India	Tripura	Newcastle disease virus (Inf. with)		NA	Both animal categories	NA	NA	212
1	2011.0	Jul-Dec 2011	Asia	India	Tripura	Newcastle disease virus (Inf. with)		NA	Domestic	Birds	NA	NA
2	2011.0	Jul-Dec 2011	Asia	India	West Bengal	High pathogenicity avian influenza viruses (po...		H5N1	Both animal categories	NA	NA	1
3	2011.0	Jul-Dec 2011	Asia	India	West Bengal	High pathogenicity avian influenza viruses (po...		H5N1	Domestic	Birds	NA	NA
4	2011.0	Jul-Dec 2011	Asia	India	West Bengal	Newcastle disease virus (Inf. with)		NA	Both animal categories	NA	NA	74
...	...	...	...	...	...	...	...	...	...	...	...	...
43084	2005.0	Jan-Jun 2005	Asia	China (People's Rep. of)	Hubei	Avian infectious bronchitis		NA	Domestic	Birds	NA	NA
43085	2005.0	Jan-Jun 2005	Asia	China (People's Rep. of)	Hubei	Avian infectious laryngotracheitis		NA	Both animal categories	NA	NA	3
43086	2005.0	Jan-Jun 2005	Asia	China (People's Rep. of)	Hubei	Avian infectious laryngotracheitis		NA	Domestic	Birds	NA	NA
43087	2005.0	Jan-Jun 2005	Asia	China (People's Rep. of)	Hubei	Newcastle disease virus (Inf. with)		NA	Both animal categories	NA	NA	33
43088	2005.0	Jan-Jun 2005	Asia	China (People's	Hubei	Newcastle disease virus		NA	Domestic	Birds	NA	NA

Year	Semester	World region	Rep. of Country	Administrative Division	(Inf. with) Disease	Serotype/Subtype/Genotype	Animal Category	Species	Outbreak_id	New outbreaks	Su
43089 rows x 18 columns											

## 1. What are the total number of reported avian disease cases across all years and countries?

```
In [51]: Total_cases = pd.read_sql_query("""
SELECT [Year]
 ,[Country]
 ,sum(case when [Cases] ='NA' then 0 else Cases end) as 'number_of_cases'
 FROM [Avian_diseases].[dbo].[avian]
 GROUP BY [Year]
 ,[Country]
 ORDER BY Year

"""
 , sql_conn)

Total_cases
```

Out[51]:

	Year	Country	number_of_cases
0	2005.0	Ethiopia	3689
1	2005.0	Palestine	33119
2	2005.0	Switzerland	12
3	2005.0	Zimbabwe	27238
4	2005.0	Nicaragua	33
...	...	...	...
1774	2023.0	Czech Republic	1181
1775	2023.0	Romania	224310
1776	2023.0	Russia	300783
1777	2023.0	Türkiye	127781
1778	2023.0	Bolivia	296663

1779 rows × 3 columns

## 2. Which country had the highest number of avian disease outbreaks during the year 2022?:

In [52]:

```
Number_outbreaks = pd.read_sql_query("""
SELECT Country, Disease, SUM(case when [New outbreaks] ='NA' then 0 else [New outbreaks] end) AS Total_Outbreaks
FROM [Avian_diseases].[dbo].[avian]
WHERE Year= 2022
GROUP BY Country, Disease
ORDER BY Total_Outbreaks DESC
"""
, sql_conn)

Number_outbreaks.head(10)
```

Out[52]:

	Country	Disease	Total_Outbreaks
0	France	High pathogenicity avian influenza viruses (po...	1587
1	United States of America	High pathogenicity avian influenza viruses (po...	397
2	Hungary	High pathogenicity avian influenza viruses (po...	274
3	Canada	High pathogenicity avian influenza viruses (po...	241
4	Philippines	High pathogenicity avian influenza viruses (po...	228
5	United Kingdom	High pathogenicity avian influenza viruses (po...	177
6	Nigeria	High pathogenicity avian influenza viruses (po...	162
7	Palestine	Avian infectious bronchitis	110
8	Korea (Rep. of)	High pathogenicity avian influenza viruses (po...	84
9	Netherlands	High pathogenicity avian influenza viruses (po...	78

### 3. What are the top 5 most common avian diseases worldwide, and how many cases were reported for each disease?

In [53]:

```
top_disease = pd.read_sql_query("""
SELECT TOP 5 WITH TIES
Disease, SUM(case when [Cases] ='NA' then 0 else Cases end) AS TotalCases
FROM [Avian_diseases].[dbo].[avian]
GROUP BY Disease
ORDER BY TotalCases DESC
"""
, sql_conn)

top_disease
```

Out[53]:

	Disease	TotalCases
0	Avian infectious bronchitis	413117367
1	Newcastle disease virus (Inf. with)	227945380
2	Low pathogenic avian influenza (poultry) (2006...)	162279324
3	High pathogenicity avian influenza viruses (po...)	71867477
4	Mycoplasma gallisepticum (Avian mycoplasmosis)...)	42628187

## 4. How many avian diseases were reported in each administrative division, and what was the average number of cases per disease?

In [54]:

```
adm_division = pd.read_sql_query("""  
SELECT [Administrative Division], COUNT(DISTINCT Disease) AS TotalDiseases, AVG(case when [Cases] ='NA' then 0 else Cases end) /  
AvgCasesPerDisease  
FROM [Avian_diseases].[dbo].[avian]  
GROUP BY [Administrative Division]  
ORDER BY AvgCasesPerDisease DESC  
""",  
sql_conn)  
adm_division.head(10)
```

Out[54]:

	Administrative Division	TotalDiseases	AvgCasesPerDisease
0	Iran	6	3780106
1	Iraq	3	910608
2	Scandolara Ravara	1	289681
3	South Khorasan	1	245291
4	Andalucía	2	238407
5	Poalo	1	236696
6	Ramos Arizpe	1	232000
7	San Miguel el Alto	1	200036
8	Birnin-Magaji/Kiyaw	1	180000
9	Santa Catarina	3	171245

## 5.What are the top 5 countries with the highest number of deaths due to avian diseases?

In [55]:

```
Top_deaths = pd.read_sql_query("""
SELECT TOP 5 WITH TIES
Country ,SUM(case when Deaths='NA' then 0 else Deaths   end ) AS TotalDeaths
FROM [Avian_diseases].[dbo].[avian]
GROUP BY Country
ORDER BY TotalDeaths DESC
"""
, sql_conn)

Top_deaths
```

Out[55]:

	Country	TotalDeaths
0	Iran	280651073
1	Iraq	6601643
2	Libya	4997148
3	Russia	4859389
4	China (People's Rep. of)	4503850

## 6.Calculate the total number of cases, deaths, and vaccinated animals for each disease and semester in 2022:

In [56]:

```
Indicators = pd.read_sql_query("""
SELECT Semester, Disease, SUM(case when Cases='NA' then 0 else Cases end ) AS TotalCases,
SUM(case when Deaths='NA' then 0 else Deaths end ) AS TotalDeaths,
SUM(case when Vaccinated='NA' then 0 else Vaccinated end) AS TotalVaccinated
FROM [Avian_diseases].[dbo].[avian]
WHERE Year= 2022
GROUP BY Semester, Disease;

"""
, sql_conn)
```

Indicators

Out[56]:

	Semester	Disease	TotalCases	TotalDeaths	TotalVaccinated
0	Jan-Jun 2022	Avian chlamydiosis	640	100	0
1	Jul-Dec 2022	Avian chlamydiosis	353	139	0
2	Jan-Jun 2022	Avian infectious bronchitis	247576	105399	160514
3	Jul-Dec 2022	Avian infectious bronchitis	200404	66894	260550
4	Jan-Jun 2022	Avian infectious laryngotracheitis	260	248	0
5	Jul-Dec 2022	Avian infectious laryngotracheitis	91	71	0
6	Jan-Jun 2022	High pathogenicity avian influenza viruses (po...	18021604	2644578	1500
7	Jul-Dec 2022	High pathogenicity avian influenza viruses (po...	8683420	3602518	0
8	Jan-Jun 2022	Low pathogenicity avian influenza viruses tran...	10000	5400	0
9	Jul-Dec 2022	Low pathogenicity avian influenza viruses tran...	100	80	0
10	Jan-Jun 2022	Mycoplasma gallisepticum (Avian mycoplasmosis)...	388	36	0
11	Jul-Dec 2022	Mycoplasma gallisepticum (Avian mycoplasmosis)...	9483	6959	0
12	Jan-Jun 2022	Mycoplasma synoviae (Avian mycoplasmosis) (Inf...	36517	9	0
13	Jul-Dec 2022	Mycoplasma synoviae (Avian mycoplasmosis) (Inf...	6333	6282	0
14	Jan-Jun 2022	Newcastle disease virus (Inf. with)	499569	290759	1433292
15	Jul-Dec 2022	Newcastle disease virus (Inf. with)	186332	74806	755030

## 7. Which world regions had avian disease outbreaks that affected multiple species?

In [57]:

```
affected_regions = pd.read_sql_query("""
SELECT [World region], COUNT(DISTINCT Species) AS AffectedSpeciesCount
FROM [Avian_diseases].[dbo].[avian]
GROUP BY [World region]
HAVING COUNT(DISTINCT Species) > 1
ORDER BY AffectedSpeciesCount DESC
```

```
"""
    , sql_conn)
affected_regions
```

```
Out[57]:   World region  AffectedSpeciesCount
0          Europe           121
1          Asia             111
2          Africa            37
3        Americas            36
4       Oceania              7
```

## 8.Calculate the average number of cases and deaths per outbreak for each disease:

```
In [58]: Outbreak = pd.read_sql_query("""
SELECT  [Outbreak_id], Disease,  AVG(case when Cases='NA' then 0 else Cases  end ) AS AvgCasesPerOutbreak, AVG(case when Deaths=
FROM [Avian_diseases].[dbo].[avian]
GROUP BY [Outbreak_id],  Disease
ORDER BY [Outbreak_id]
"""
    , sql_conn)
Outbreak
```

Out[58]:

	Outbreak_id	Disease	AvgCasesPerOutbreak	AvgDeathsPerOutbreak
0	100028	High pathogenicity avian influenza viruses (po...	147	147
1	100030	High pathogenicity avian influenza viruses (po...	120	97
2	100110	High pathogenicity avian influenza viruses (po...	0	0
3	100111	High pathogenicity avian influenza viruses (po...	0	0
4	100112	High pathogenicity avian influenza viruses (po...	0	73
...	...	...	...	...
4499	NA	Low pathogenic avian influenza (poultry) (2006...	91217	37280
4500	NA	Low pathogenicity avian influenza viruses tran...	2525	1370
4501	NA	Mycoplasma gallisepticum (Avian mycoplasmosis)...	14533	4509
4502	NA	Mycoplasma synoviae (Avian mycoplasmosis) (Inf...	19525	249
4503	NA	Newcastle disease virus (Inf. with)	16363	6768

4504 rows × 4 columns

## 9. Identify the top 5 years and disease with the highest cases across all world regions and countries

In [60]:

```
top_year = pd.read_sql_query("""
SELECT Top 5
Year, [World Region], Country, Disease,Max(case when Cases='NA' then 0 else Cases end ) AS HighestCases
FROM [Avian_diseases].[dbo].[avian]
GROUP BY Year, [World Region],Disease,Country
ORDER BY HighestCases DESC
"""
, sql_conn)
```

top\_year

Out[60]:

	Year	World Region	Country	Disease	HighestCases
<b>0</b>	2012.0	Asia	Iran	Avian infectious bronchitis	62501329
<b>1</b>	2010.0	Asia	Iran	Avian infectious bronchitis	62030209
<b>2</b>	2013.0	Asia	Iran	Avian infectious bronchitis	61415086
<b>3</b>	2009.0	Asia	Iran	Avian infectious bronchitis	55400144
<b>4</b>	2011.0	Asia	Iran	Avian infectious bronchitis	47347430