Data Analytics of Hurricane History, GDP Trends, Population and Total COVID-19 Virus Confirmed Cases and Deaths in the Gulf of Mexico (GOM) States Texas, Florida, Louisiana, Alabama and Mississippi

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ABSTRACT
One of most economically active region in the United States is the Gulf of Mexico (GOM) with five states Texas, Florida, Louisiana, Alabama and Mississippi. The population is over 63 million and the land area of the five states is over 12.8% of the United States 3.8 million square miles. The economical activates are both onshore and offshore. The five states along the GOM are very active in agriculture, fishing, tourism and many types of industries. This region is affected by natural disasters such as hurricanes, tornadoes and flooding and human made disasters such as oil spills, fires and power failures. This study was investigating the correlation between the hurricane history, COVID-19 virus and Gross Development Products (GDP). The two largest states (area and population), Texas and Florida with the high GDP ranked as 2 and 4 in the U.S. also have had the largest amount hurricanes and also highest amount of deaths due to the COVI-19 virus impact for past 41 months. Alabama and Mississippi with lower GDP have had lowest deaths due to COVID-19 virus and also lowest number of hurricanes. Louisiana had lower GDP and lower deaths due to COVID-19 virus but had relatively high number of hurricanes. Total percentage deaths in the GOM based on U.S. deaths due to COVI-19 matched well with the percentage population based on U.S. population. Overall the GDP ranking correlated well with the number of hurricane in 172 years ranking and COVID-19 deaths. The predicted GDP for 2023 for all the GOM states are positive with Texas having the highest growth.

1. INTRODUCTION
Gulf of Mexico (GOM) is one the busiest region in the United Sates and also around the world with the ongoing activities both onshore and offshore. In the U.S.A. there are five states including Texas, Florida, Louisiana, Alabama and Mississippi with a total population of over 63 million. The activities include oil and gas production (offshore and onshore), petrochemical industries, manufacturing industries and also tourism. In the U.S.A, GOM has had the largest number of hurricanes, over 175 hurricanes in past 172 years. Also there are several very active ports in the GOM.

2. OBJECTIVES
Overall objective was to investigate the correlation between number of hurricanes, GDP, population and COVID-19 deaths in the five states along GOM. The main objectives are as follows:

1.   Quantify the population, area, GDP, number of hurricanes and the total COVID-19 virus total confirmed cases and deaths in Texas, Florida, Louisiana, Alabama and Mississippi along GOM.

2.   From data analyses rank the states based on the population, hurricanes, predicted 2023 GDP including the total COVID-19 confirmed cases and deaths.

3. ANALYSES AND DISCUSSION

Many factors will influence the COVID-19 deaths in the GOM states. It will be of interest to investigate the correlation between the historical data such as population, number of hurricanes and GDP to the COVID-19 deaths. The collected data are summarized in Table 1. The ranking listed are for the five GOM states. The national ranking for the listed items are discussed under each state.

Table 1 Summary of the Data Collected on the Five States in the Gulf of Mexico (GOM) (U.S. census 2022; U.S. Bea 2022; and NOAA 2022)

States	Area (Sq.miles) (Ranking)*	Population (Ranking)*	GDP in 2023 ($ trillion) (Ranking)*	Hurricanes/Cat. 3 or greater (Ranking)*	COVID-19 Deaths ** (Ranking)*
Texas	268,596 (1)	28,995,881 (1)	2.40 (1)	52/18 (2)	94,628 (1)
Florida	65,758 (2)	21,477,377 (2)	1.40 (2)	68/22*** (1)	88,896 (2)
Louisiana	52,378 (4)	4,648,794 (4)	0.27 (3)	47/14 (3)	19,041 (4)
Alabama	52,420 (3)	4,903,185 (3)	0.25 (4)	11/4 (4)	21,138 (3)
Mississippi	48,432 (5)	2,976,149 (5)	0.13 (5)	2/1 (5)	13,474 (5)
Remarks	Total area is 487,584 sq. miles and it is 12.8% of the U.S.A. area	Total populations is 63,001,386 and it is 18.4% of the U.S.A. population	Total GDP is $4.45 trillion and it is 19.3% of the U.S.A. GDP of $23.1 trillion	Total hurricanes and cat.3 greater in the GOM were 180 and 60 respectfully. GOM had the highest number of hurricanes in the U.S.A.	Total death was 237,177 in the GOM and it was 20.3% of the U.S.A. deaths. It was 20.6% last year.

*Ranking is for GOM;**Data collected on July 31, 2022;***West coast of Florida

**Table 2 Confirmed cases, Deaths per Million Population and GDP Percentage Change
In the Five States in the Gulf of Mexico (GOM)**

States	COVID-19 Confirmed Cases (Ranking)*	Death/1M Population (Ranking)*	GDP 2023 ($ trillion) (Ranking)*	GDP Percentage Change in 2023 (Ranking)*	COVID-19 Deaths ** (Ranking)*
Texas	8,630,987 (1)	3,263 (5)	2.40 (1)	8% (1)	94,628 (1)
Florida ***	7,673,346 (2)	4,135 (4)	1.40 (2)	7% (2)	88,896 (2)
Louisiana	1,608,954 (4)	4,095 (3)	0.27 (3)	4% (5)	19,041 (4)
Alabama	1,659,936 (3)	4,314 (2)	0.25 (4)	4% (4)	21,138 (3)
Mississippi	1,000,415 (5)	4,521 (1)	0.13 (5)	7% (3)	13,474 (5)
Remarks	Total Confirmed Cases was 19.1% of the U.S.A. cases. Ranking matched with the Total Deaths.	The Ranking was just the Opposite to the GDP Ranking	Total GDP is $4.45 trillion and it is 19.3% of the U.S.A. GDP of $23.1 trillion	Positive growth of 4% to 8%.	Total death was 237,177 in the GOM and it was 20.3% of the U.S.A. deaths. It was 20.6% last year.

*Ranking is for GOM;**Data collected on July 31, 2022;***West coast of Florida

As summarized in Table 1, the total population in each state matched with the total area. The GDP ranking of 1, 2 and 5 matched very well with the population ranking and area ranking. Louisiana and Alabama population and GDP were very close but the ranking did not match as summarized in Table 1.

Texas
Texas is ranked No.2 in the U.S.A. based on the area (U.S.A. Census 2021). Also Texas is ranked No.2 in the U.S.A. based on the population and GDP. Based on the COVID-19 deaths Texas is ranked No. 2 in the U.S.A. Texas ranked No.1 in the GOM based on area, population, GDP and COVID-19 deaths (Table 1). Based on the total number of hurricanes and also number of category 3 or more hurricanes it was ranked No.2 in the GOM. So the hurricane ranking did not match with the COVID-19 virus total confirmed cases and deaths and also deaths per million population (Table 2). Also the 2023 GDP predicted was 2.4 billion, over 8% growth (Table 2).

Florida
Florida is ranked No.23 in the U.S. based on the area (U.S. Census 2021). Also Florida is ranked No.3 based on the population and No. 4 based on GDP. Based on the COVID-19 deaths Florida is ranked No. 4 in the U.S. Florida is ranked No.2 in the GOM based on area, population, GDP and COVID-19 deaths. Based on the total number of hurricanes and also number of category 3 or more hurricanes it was ranked No.1 in the GOM. So the hurricane ranking did not match with the COVID-19 deaths. Also the 2023 GDP predicted was 1.4 billion, over 7% growth (Table 2).

Louisiana
Louisiana is ranked No.31 in the U.S. based on the area (U.S. Census 2021). Also Louisiana is ranked No.25 based on the population and GDP. Based on the COVID-19 deaths Louisiana is ranked No. 19 in the U.S. Louisiana is ranked No.3 in the GOM based GDP. It is ranked No.4 based on the area, population and COVID-19 deaths. Based on the total number of hurricanes and also number of category 3 or more hurricanes it was ranked No.3 in the GOM. So the population ranking matched with the COVID-19 deaths. Also the 2023 GDP predicted was 0.27 billion, over 4% growth (Table 2).

Alabama
Alabama is ranked No.30 in the U.S. based on the area (U.S. Census 2021). Also Alabama is ranked No.24 based on the population and No. 27 based on the GDP. Based on the COVID-19 deaths Alabama is ranked No. 18 in the U.S. Alabama is ranked No.4 in the GOM based GDP. It is ranked No.3 based on the area, population and COVID-19 deaths. Based on the total number of hurricanes and also number of category 3 or more hurricanes it was ranked No.4 in the GOM. So the population ranking matched with the COVID-19 death ranking. Also the 2023 GDP predicted was 0.27 billion, over 4% growth (Table 2).

Mississippi
Mississippi is ranked No.32 in the U.S. based on the area (U.S. Census 2021). Also Mississippi is ranked No.35 based on the population and No. 37 based on the GDP. Based on the COVID-19 deaths Mississippi is ranked No. 25 in the U.S. Mississippi is ranked No.5 in the GOM based GDP, population and COVID-19 deaths. Based on the total number of hurricanes and also number of category 3 or more hurricanes it was ranked No.5 in the GOM. So the population, GDP and hurricane ranking matched with the COVID-19 death ranking. Also the 2023 GDP predicted was 0.27 billion, over 7% growth (Table 2).

4. CONCLUSIONS
The focus of this study was to investigate the trends in hurricane history, population and GDP with the COVID-19 deaths in the five GOM states. Based on the data analyses following conclusions were advanced:

1. The total GDP for GOM was 19.3% of the U.S. GDP reflecting the activities in the GOM. Also Texas and Florida were ranked No. 2 and No.4 in the GDP in the U.S.A.

2. GOM overall population percentage of 18.4% matched with the COVI-19 virus total death percentage of 20.3% which decreased from 20.6% in 2022. Also the GOM population ranking matched with the COVID-19 death ranking.
3. The GDP ranking for Texas, Florida and Mississippi matched well with the COVID-19 death, reflecting the effect of production activity. Louisiana and Alabama population and COVID-19 deaths were very close but did not match with the ranking.
4. Hurricane rankings did not match with the total confirmed cases, total COVID-19 death and deaths per million population rankings.

5. ACKNOWLEDGEMENT

6. REFERENCES AND BIBLIOGRAPHY

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