# Using TxS2 for COVID-19 Surveillance & Analysis

## A Factsheet, Help Document, and Use Case of the COVID-Like Illness query

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Last updated: 12/01/2022

## Purpose

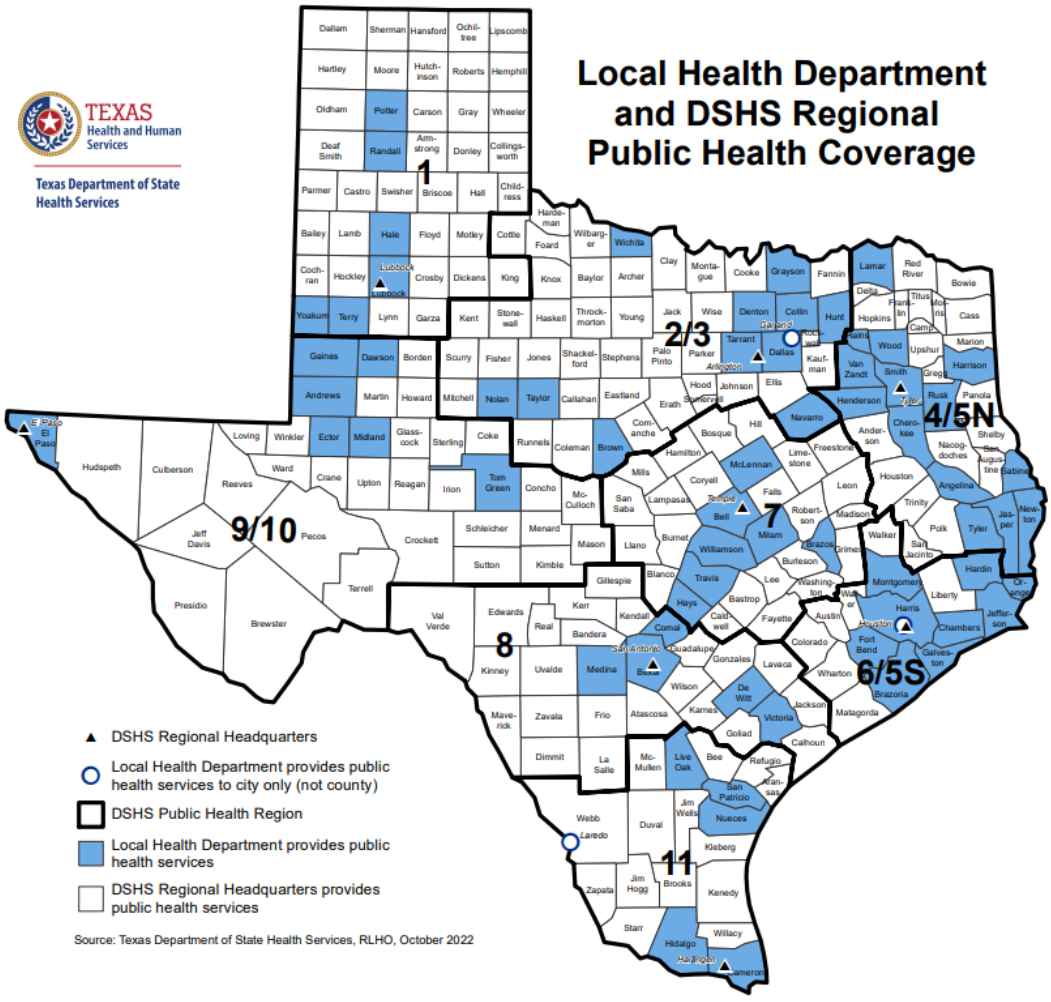
1) To assist in using the ESSENCE platform within Texas Syndromic Surveillance (TxS2) to abstract COVID-19 syndromic surveillance data; and

2) To provide a sample analysis of the COVID-Like illness query and its correlation with COVID-19 molecular testing data by geographic region and time

## Background

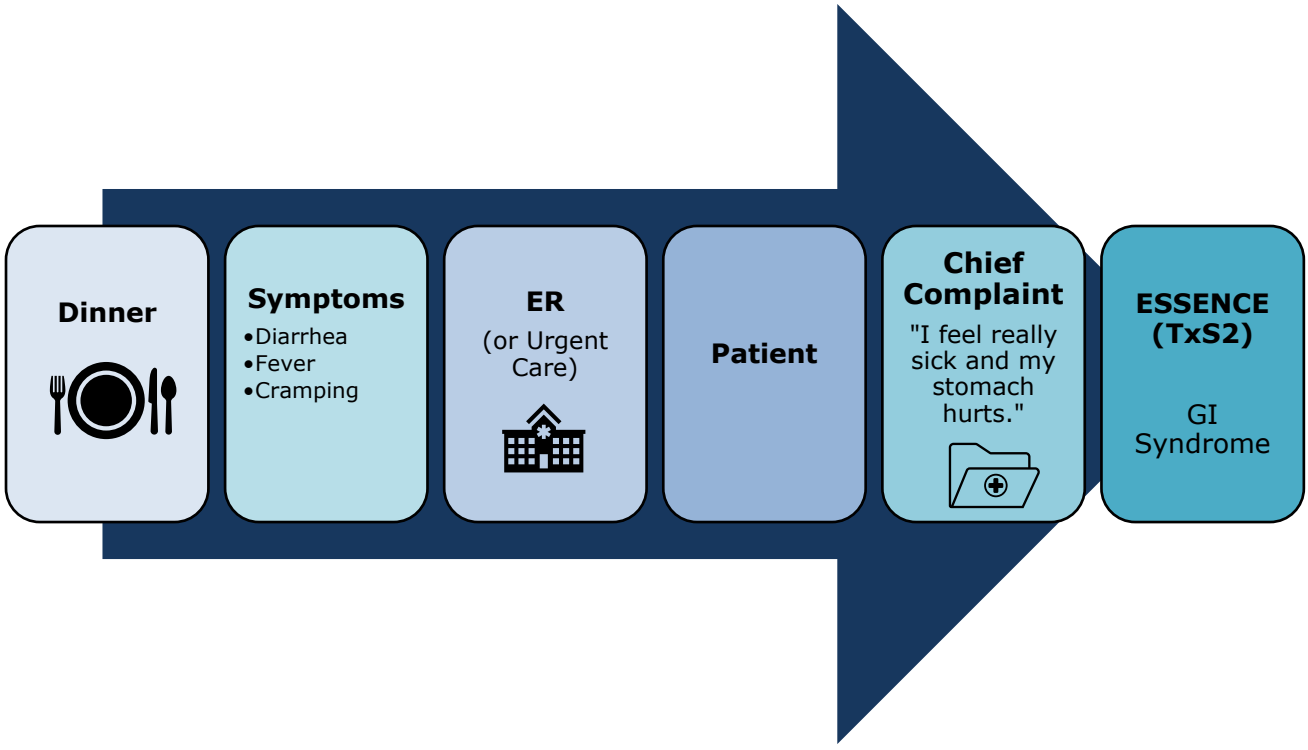
### *Texas Syndromic Surveillance (TxS2)*

Texas Syndromic Surveillance (TxS2) is the statewide syndromic surveillance system hosted by the Texas Department of State Health Services (DSHS) for use by Local Health Departments (LHDs), DSHS Public Health Regions (PHRs), DSHS central office, and data providers (hospitals, free standing emergency centers, and urgent care centers, for example) for enhanced surveillance of emerging public health conditions or threats.



Syndromic surveillance utilizes trend analysis to establish a baseline and then uses algorithms to compare the current data to that baseline and issue alerts when aberrations are detected. The basic steps of how syndromic surveillance works are as follows:

1. An individual goes to an emergency department or urgent care clinic after experiencing symptoms of illness.[1]
2. The patient's information is captured in the facility's electronic health record (EHR).
3. Selected elements[2] of the EHR are sent to the syndromic surveillance system (ESSENCE/TxS2).
    - Chief complaint text
    - ICD-10 diagnosis codes
4. The information is analyzed by the system for trends and abnormalities, and the system creates alerts for aberrations in the data.
5. The information is available for public health authorities to conduct additional analysis.




[1] Hospitals with emergency departments, free standing emergency rooms, and urgent care clinics, as well as medical professionals who work in those facilities are eligible to submit data to TxS2.
[2] Other elements of the EHR are included, but these two are the most important.

### National Syndromic Surveillance Program (NSSP)

In the United States, more than 6,000 healthcare facilities contribute data to the Centers for Disease Control and Prevention's (CDC) National Syndromic Surveillance Program (NSSP). As a community of practice for sharing electronic patient data and advancing and strengthening the practice of syndromic surveillance, NSSP creates and refines queries to capture data related to various syndromes. In October of 2020, NSSP released a refined COVID-19 query (COVID-Like illness, or CLI, query; see Appendix 1).

### *Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE)*

ESSENCE is the secure database in which TxS2 data is stored. It is a web-based tool for querying syndromic data that enables users to monitor health indicators and detect and track disease outbreaks and other events of public health importance.

## How to Obtain Surveillance Data from TxS2

### *Access to ESSENCE*

DSHS and non-DSHS staff can access surveillance data from TxS2.

If you are non-DSHS staff and would like to use TxS2, your organization must have a Memorandum of Understanding (MOU) with DSHS to participate. Please email syndromic.surveillance@dshs.texas.gov and they will provide you the forms and information necessary to complete that process. Once the MOU is complete, you will be able to access TxS2 using the steps below.

Non-DSHS staff and DSHS staff (in both the PHR Offices and at the Central Office) that need access to view data and alerts must sign the TxS2 User Access Agreement to gain access to the TxS2 system:

1. The PHR/Central Office Program staff should email (with management approval) TxS2 Staff at syndromic.surveillance@dshs.texas.gov to request access to TxS2 for viewing data and alerts.
2. TxS2 Staff emails the TxS2 User Access Agreement to each individual identified.
3. The individual TxS2 User completes the TxS2 User Access Agreement and emails the form to syndromic.surveillance@dshs.texas.gov.

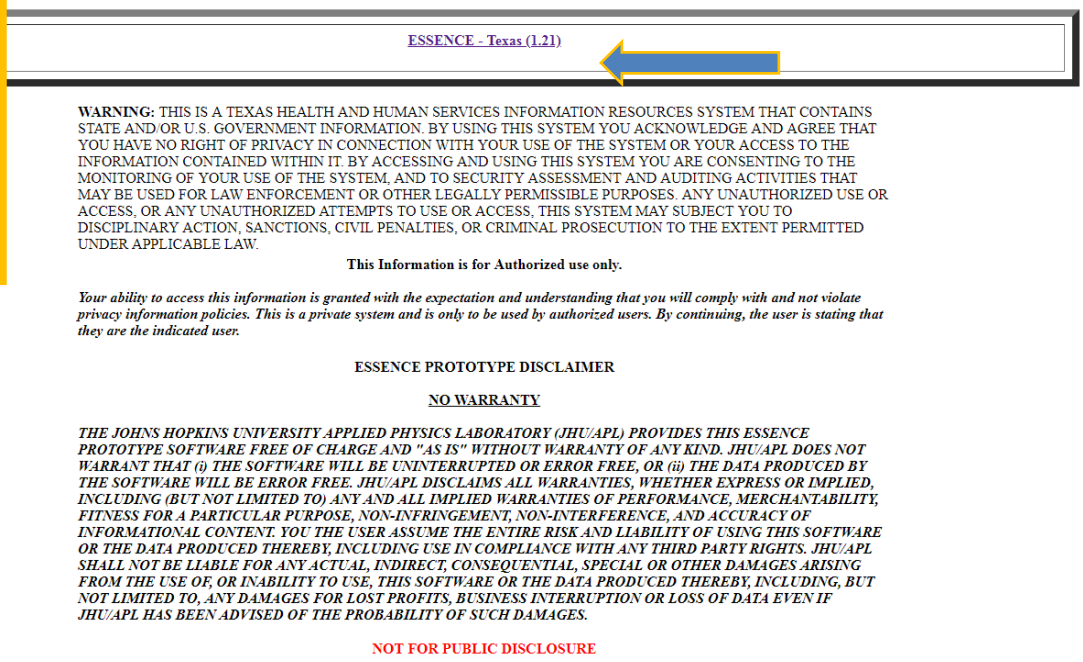
4. DSHS assigns TxS2 User accounts and notifies the User of their account information.

Users may consult the TxS2 Data Provider and User Registration and Onboarding Procedure and TxS2 User Guide for reference.

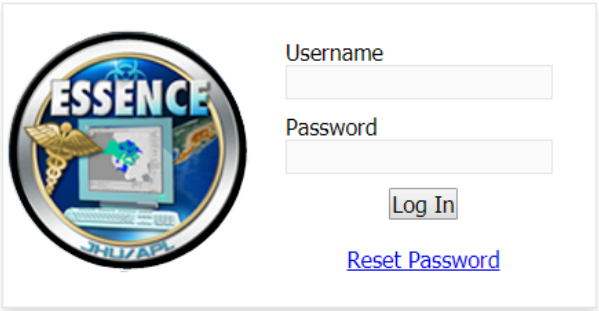
## *Website & Login*

1. The secure website can be assessed at the following link: https://txessence.dshs.texas.gov/

**NOTE: Mozilla Firefox or Chrome are the recommended web browsers for use with ESSENCE. Compatibility is not guaranteed with other browsers.**




2. Click the ESSENCE-Texas hyperlink.

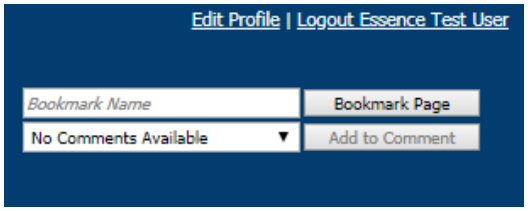



3. Enter your user ID and password and click the Log In button[3].

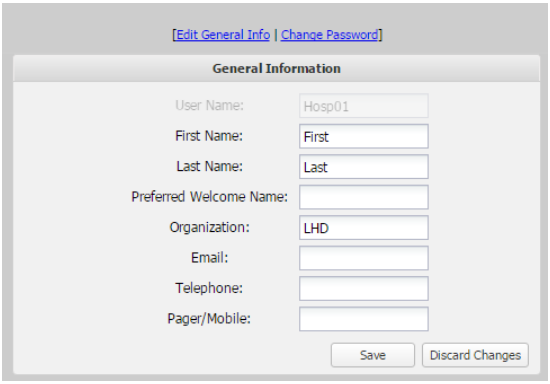
[3] **NOTE**: After logging in for the first time you are prompted to change your password. Passwords should contain at least 5 characters, including at least one numeral, two capital letters, and 2 special characters. The box outline turns from red to green when the password meets all requirements.

*Instructions for users to change their own password:*

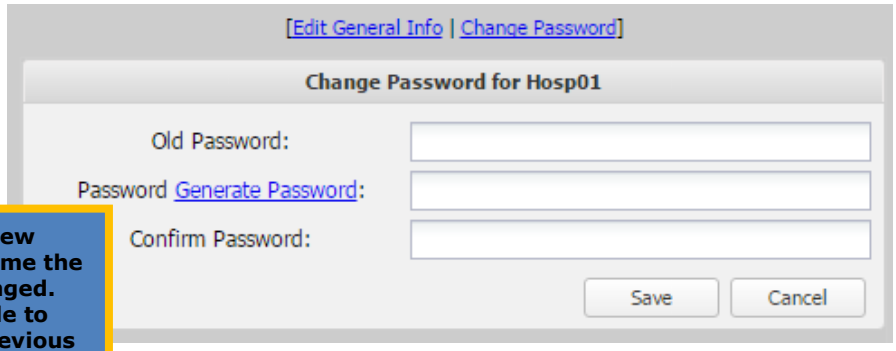
1. Once you are logged in to ESSENCE, in the top right corner there is a link to **Edit Profile**. This option is available for both Administrators and General Users.




2. After you select **Edit Profile**, the following box appears.




3. Select **Change Password** and the following box appears. Enter the current password, and then the new password twice and click **Save**.



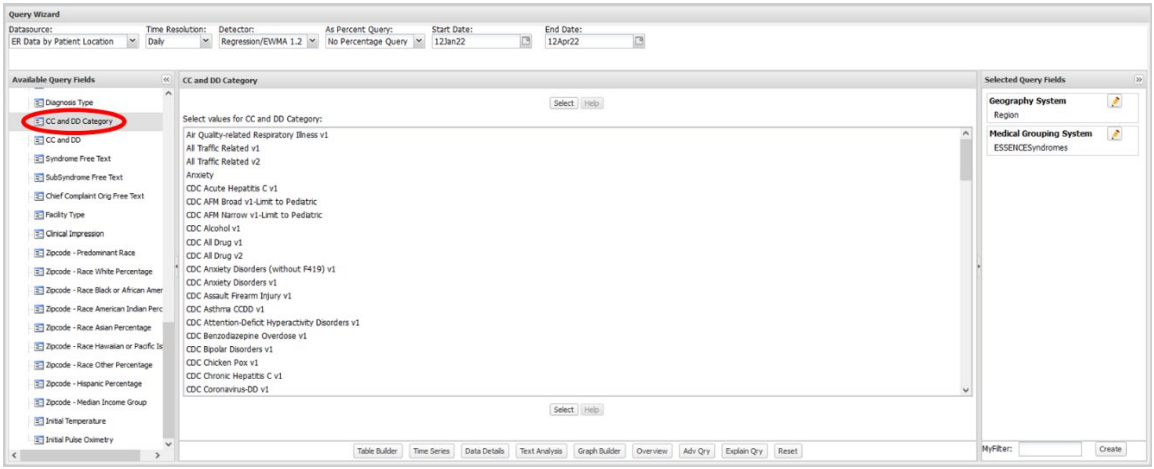

**NOTE: Create a new password each time the password is changed. You will be unable to log on using a previous password even if it appeared to change successfully.**

## Using the COVID-Like Illness (CLI) query

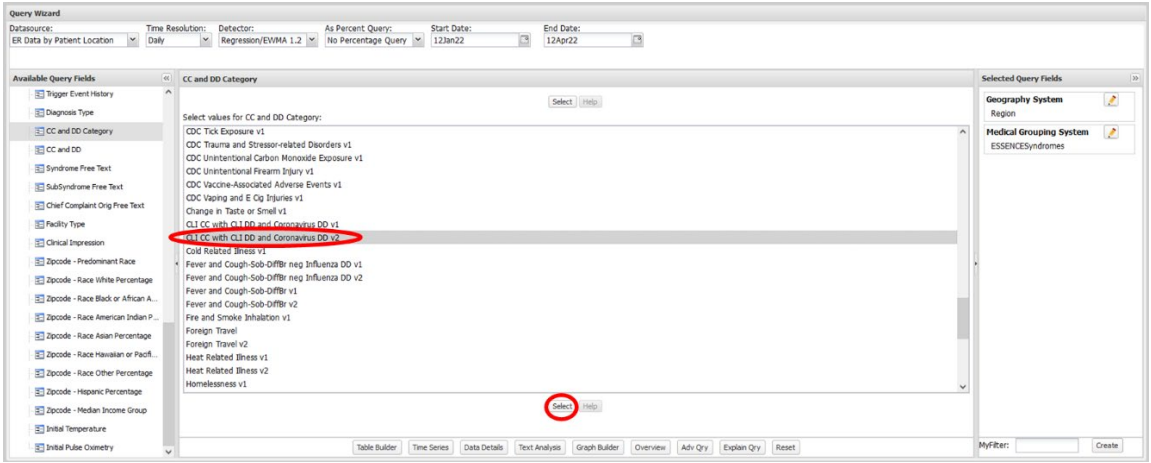
To use the most current query for COVID-Like Illness (CLI):

1) In ESSENCE, navigate to Query Portal in the top ribbon.


2) Under 'Available Query Fields' along the left-hand side, navigate to and select the 'CC and DD Category' query field.

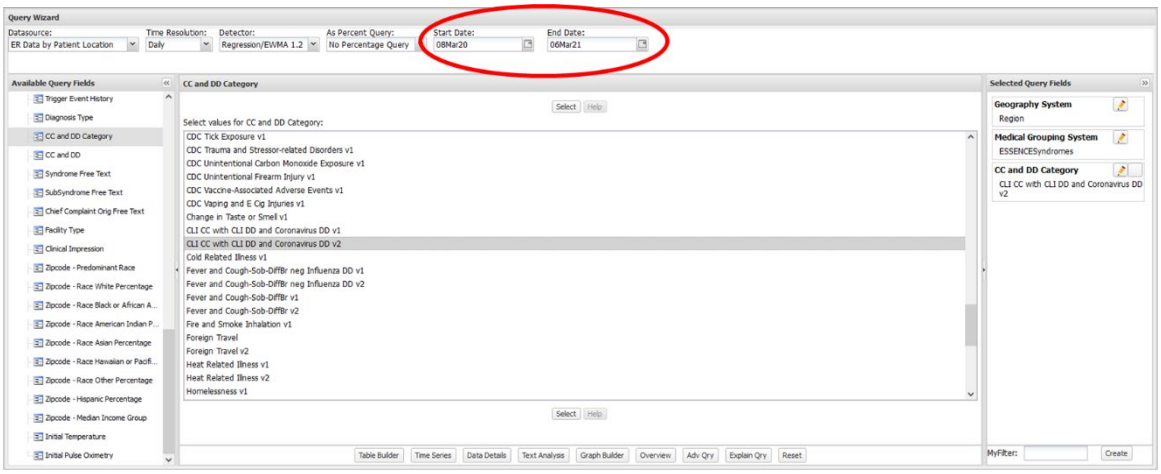



3) From the 'CC and DD Category' selections, select 'CLI CC with CLI DD and Coronavirus DD v2'[4] and click on the 'Select' button.

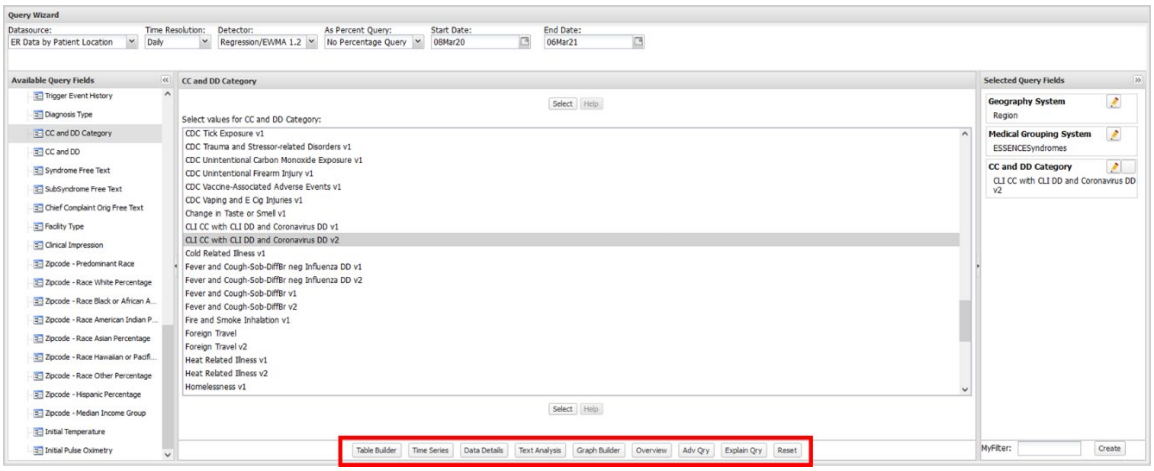



[4] **NOTE:** this query is an updated version of the query that was used in this research. It is reflective of a TxS2 update in March 2022 that enabled TxS2's CLI query to more exactly replicate NSSP's refined October 2020 query (which was then updated in January 2021).

4) Select the desired **time interval** with the 'Time Resolution' drop-down menu and the date range with the 'Start Date' and 'End Date' selectors along the top. To query ER data by patient location (patient's reported ZIP code or county), you can leave the 'Datasource' as the default value of "ER Data by Patient Location". To query other types of data sources[5] in the system, use the drop-down menu. Leave 'Detector' and 'As Percent Query' drop-down menus to their default values.



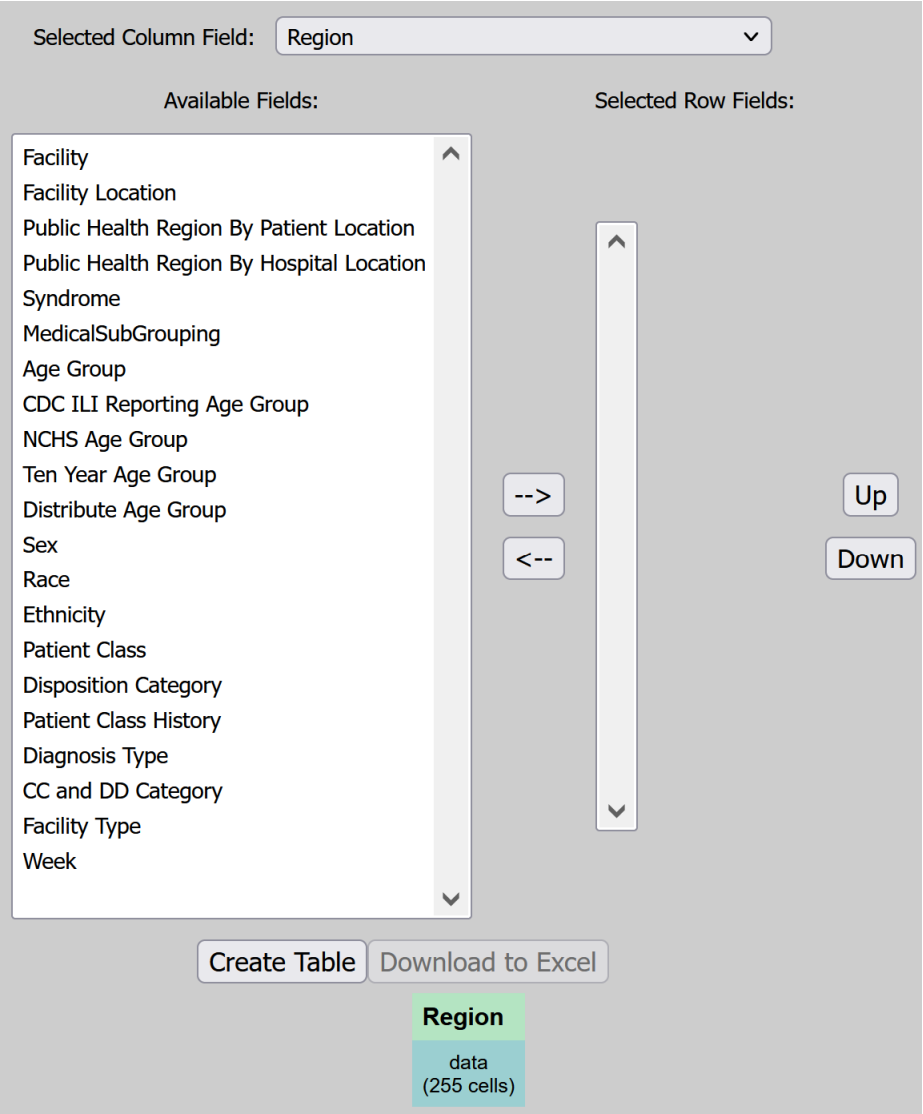

5) There are also several buttons at the bottom of the query portal that offer additional functionality: for example, Table Builder, Time Series, Graph Builder, Adv Query, etc.




[5] **NOTE:** other "Datasource" options include "ER Data by Hospital Location" – all ED visits regardless of patient ZIP code or county of residence (more complete data than patient location); "ER Limited View Data by Hospital Location" – aggregated data of ED visits; "EMS PreHospital Transport"; "Poison Control" - only available in aggregate form; "Weather Data"; and "Air Quality Data".

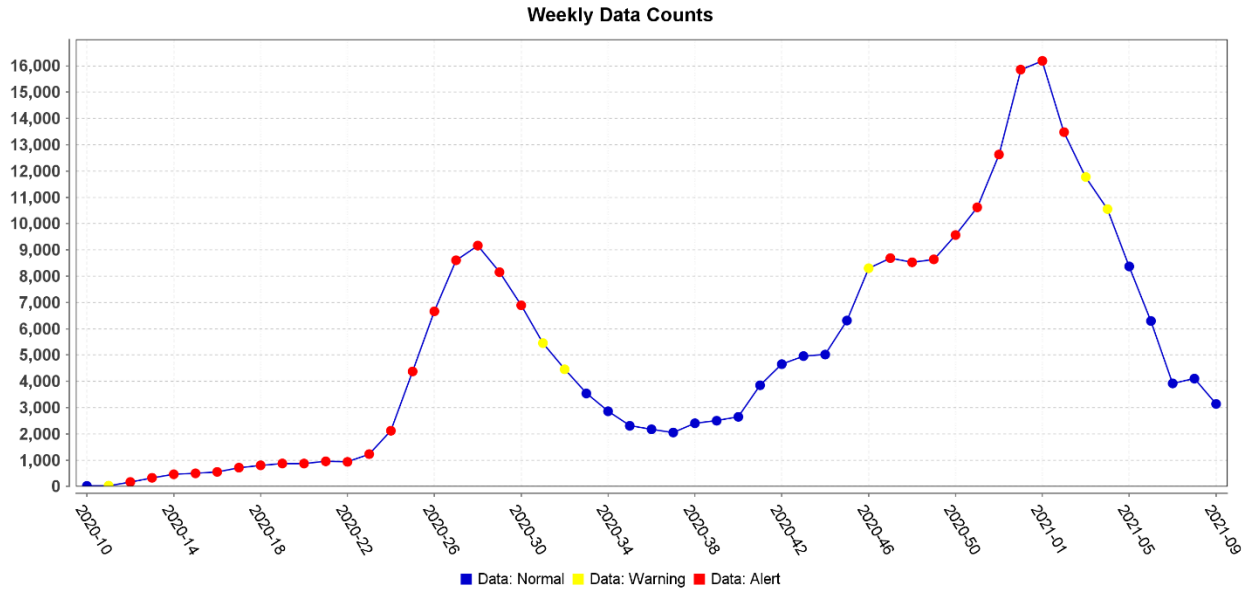
### *Table Builder*

The following are parameters that can be specified to build a table using the *Table Builder* feature.



### *Time Series*

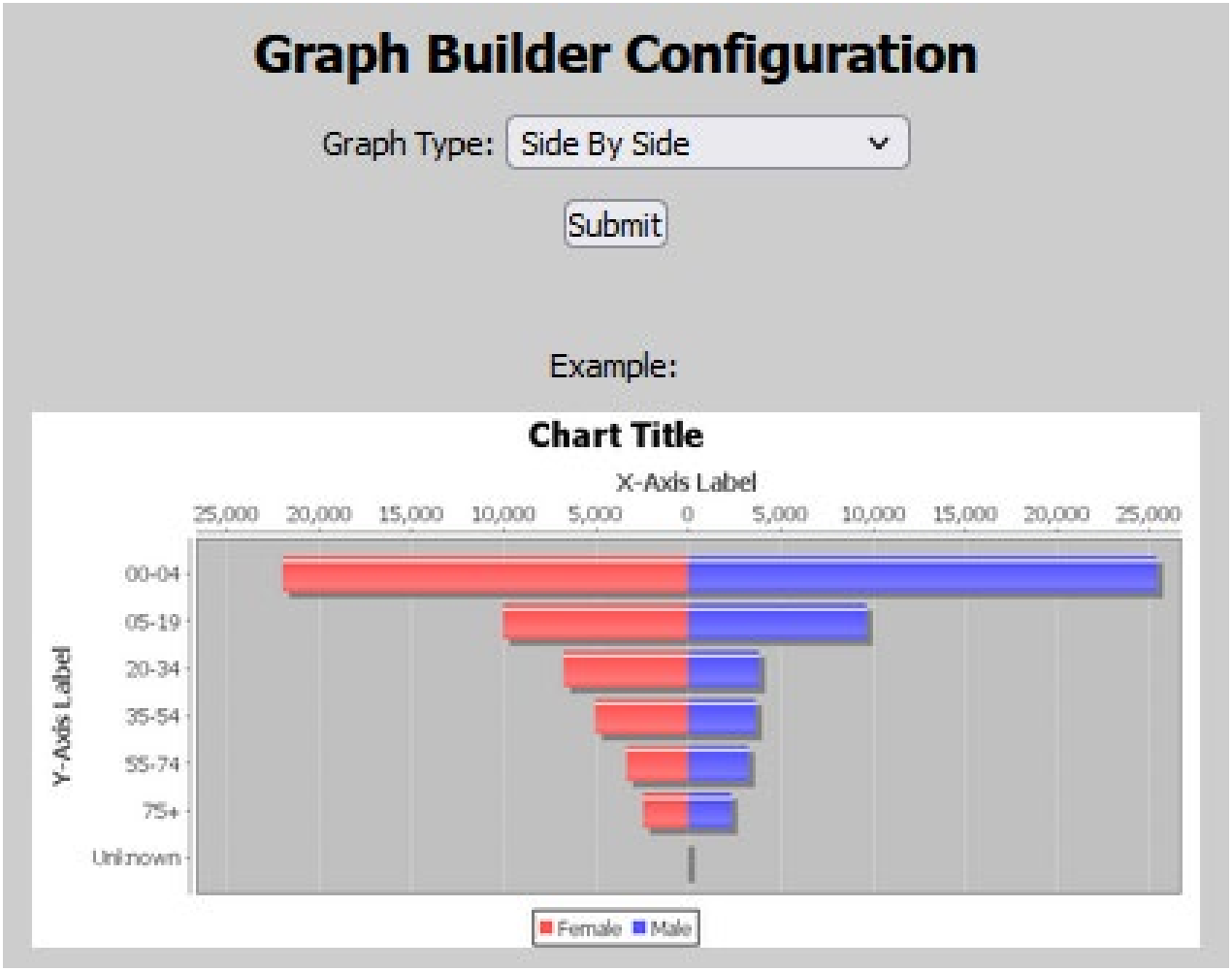
The *Time Series* feature enables users to view trends in syndromic data over time in a graph. Below is a time series graph of this CLI query from March 2020 to March 2021.




Through trends analysis, syndromic surveillance classifies data counts at points in time into normal, warning, and alert levels. The local jurisdiction (LHD or PHR acting as the LHD) then determines the appropriate response to an alert in their jurisdiction.

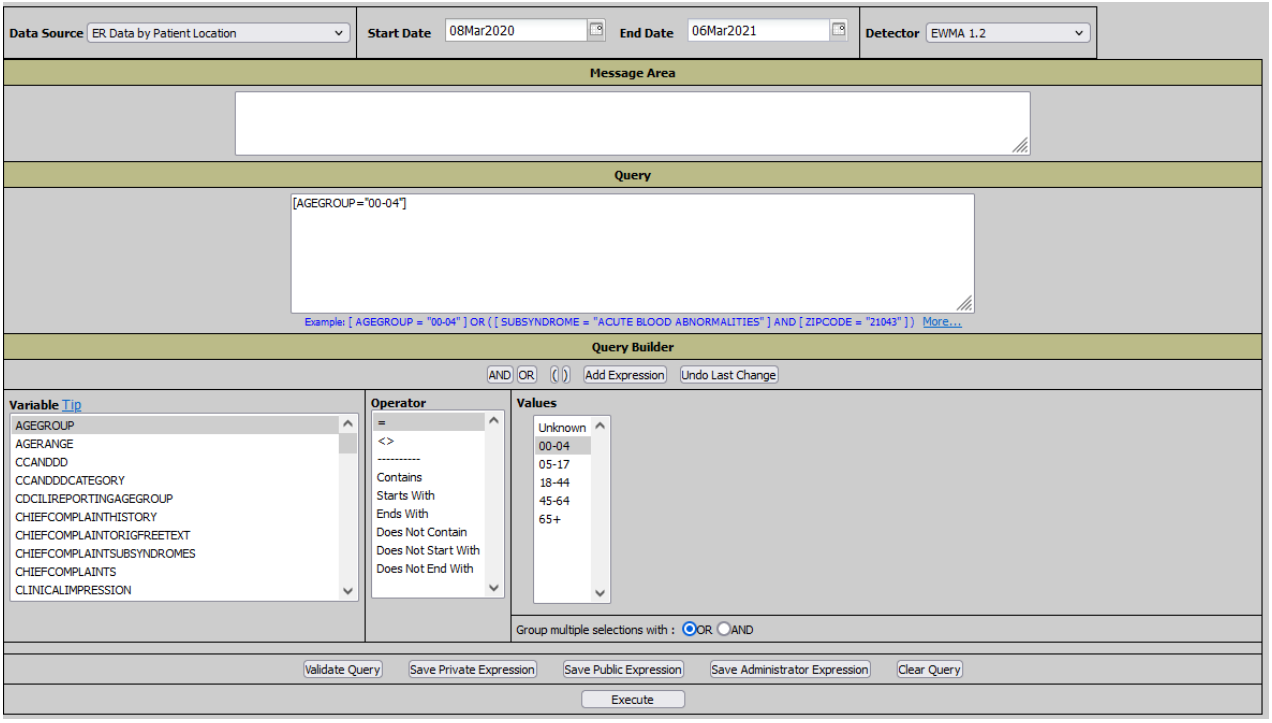
### *Graph Builder*

The following is an example graph from the *Graph Builder* feature. Possible graph types include *Side By Side*, *Dual Axis*, and a *Calendar Heat Map*.



## *Advanced Query*

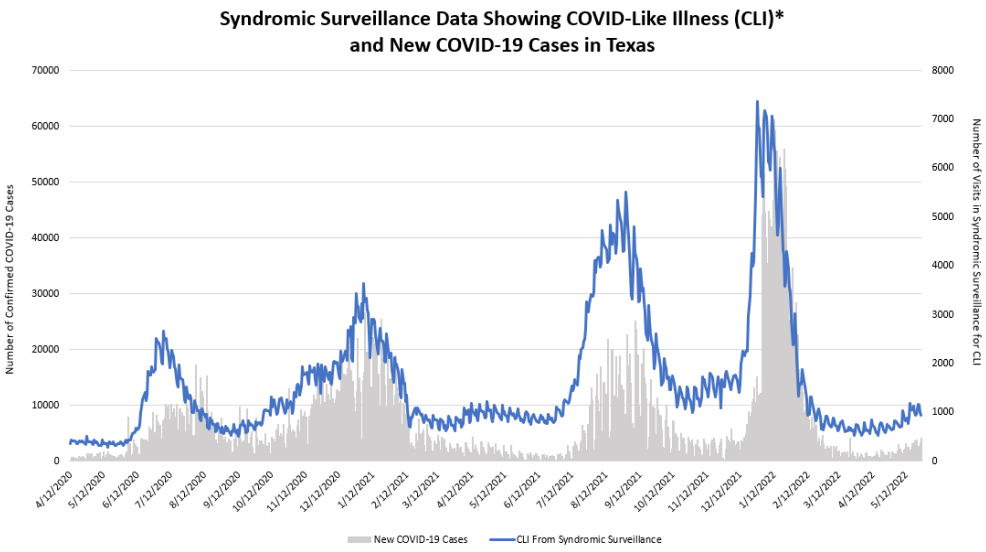
The *Adv Query* feature allows users to create queries in a structured format with defined options as an alternative to using the ESSENCE syntactical query language directly to create the query. However, due to the difficulty of troubleshooting queries in this feature, its use is not recommended.



## What Can I Do with My Data? A sample analysis of COVID-Like Illness visits over time in Texas

Since the beginning of the pandemic, the Texas Syndromic Surveillance (TxS2) Coordinator in the Division for Regional and Local Health Operations tracked COVID-Like Illness (CLI) and new COVID-19 cases in Texas (statewide and by county) and produced a table of data and trend over time visualization.

| Date | CLI From Syndromic Surveillance | New COVID-19 Cases |
|---|---|---|
| 4/12/2020 | 368 | 208 |
| 4/13/2020 | 446 | 652 |
| 4/14/2020 | 416 | 707 |
| 4/15/2020 | 418 | 670 |
| 4/16/2020 | 415 | 629 |
| 4/17/2020 | 405 | 564 |
| 4/18/2020 | 359 | 350 |
| 4/19/2020 | 363 | 264 |
| 4/20/2020 | 421 | 891 |
| 4/21/2020 | 409 | 682 |
| 4/22/2020 | 399 | 746 |
| 4/23/2020 | 424 | 810 |
| 4/24/2020 | 394 | 741 |
| 4/25/2020 | 361 | 579 |
| 4/26/2020 | 338 | 355 |
| 4/27/2020 | 508 | 1378 |
| 4/28/2020 | 409 | 681 |
| 4/29/2020 | 394 | 1409 |
| 4/30/2020 | 397 | 1156 |
| 5/1/2020 | 396 | 1310 |
| 5/2/2020 | 355 | 624 |
| 5/3/2020 | 338 | 388 |
| 5/4/2020 | 446 | 924 |
| 5/5/2020 | 377 | 830 |
| 5/6/2020 | 391 | 1297 |
| 5/7/2020 | 371 | 848 |
| 5/8/2020 | 325 | 1355 |
| 5/9/2020 | 321 | 1545 |
| 5/10/2020 | 324 | 389 |
| 5/11/2020 | 432 | 898 |
| 5/12/2020 | 369 | 1702 |




Using these data from the CLI query in TxS2, we provide a sample analysis including specific aims, methods, results, visualizations, and references to other literature utilizing syndromic surveillance data.

## Association between positive COVID-19 molecular tests and COVID-like illness in Texas during the first year of the pandemic

### *Specific Aims*

The COVID-19 Data Team in the Center for Health Statistics analyzed the relationship between CLI visits from the TxS2 program within ESSENCE, based on NSSP's refined CLI query (the CLI query used in TxS2 prior to March 2022), and COVID-19 molecular testing data by geographic region (TSA) and time for the first year of the pandemic.

### *Methods*

#### Data and Measures

We used data extracted from the TxS2 program within the Texas Department of State Health Services (DSHS) for the 52-week period from March 8, 2020 through March 6, 2021 using NSSP's refined CLI query.

- 409 Texas health facilities contributed to TxS2 during this time period, including hospitals, free standing emergency centers, and urgent care clinics.
- Dates and weeks coincided with the first full week of available molecular test data in Texas, and a year timeframe allowed for seasonal analysis during the early stages of the pandemic.
- The number of CLI visits and the number of positive COVID-19 molecular tests in Texas were considered by week, with weeks beginning on Sundays and ending on Saturdays to coincide with the CDC's Morbidity and Mortality Weekly Report (MMWR) weeks.
- Molecular testing data for Trauma Service Areas (TSAs) in Texas were obtained from data that are shared publicly by Texas DSHS. Molecular testing data were chosen specifically due to the wide use and reliability of molecular tests in relation to other COVID-19 tests, such as antigen or antibody tests (*Interim Guidance for Antigen Testing for SARS-CoV-2*, 2021).
- TSAs (see Appendix 2 for list of counties in each TSA and more information on TSAs) were the geographic unit of analysis.

*Analysis Steps*

**Pearson correlation coefficient**

We calculated Pearson correlation coefficients to analyze 1) the relationship between the number of positive COVID-19 molecular tests and the number of CLI visits in Texas for the entire state, 2) for each individual TSA, and 3) for cases not associated with a TSA.

- We analyzed the strength of correlation between these metrics according to the Hinkle et al. (2003) rule of thumb for interpreting the size of a correlation coefficient.

**Ratio of CLI Visits to Positive COVID-19 Molecular Tests**

We calculated the ratio between CLI visits and positive COVID-19 molecular tests in Texas and by TSA over time.

- A more consistent ratio suggests a more robust temporal association between CLI visits and COVID-19 cases without the influence of other factors.
- Conversely, a less consistent ratio indicates the possible influence of other temporal factors, such as the circulation of seasonal viruses with similar symptoms or variable healthcare seeking behavior during different time periods in relation to the number of positive tests.

**Time Series Plots**

We also used time series plots to explore variation in the CLI visit to positive test ratio throughout Texas and by TSA over time.

**Statistical Software**

All analyses were conducted with R software version 4.1.0 through RStudio Version 1.4.1717.

*Results & Visualizations*

## Summary of Data

- There were 328,224 COVID-Like Illness visits and 2,653,767 positive COVID-19 molecular tests between March 8, 2020 through March 6, 2021.
- Figures 1 and 2 show their per capita distribution throughout the state by TSA.

Figure 1. COVID-Like Illness visits per 100,000 population by TSA in Texas

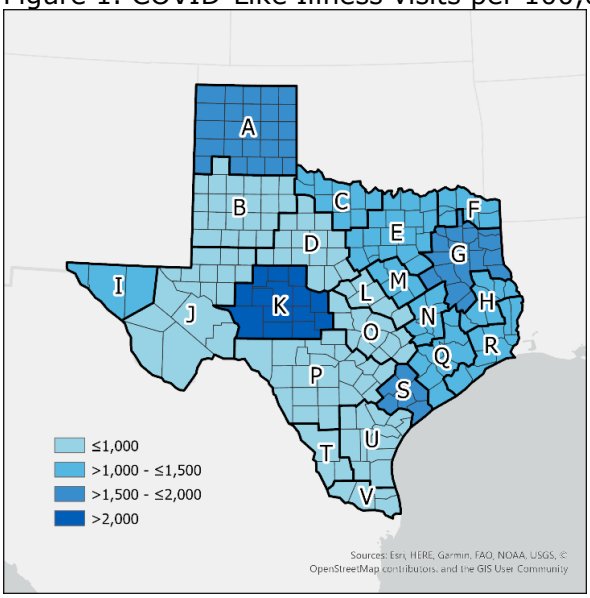
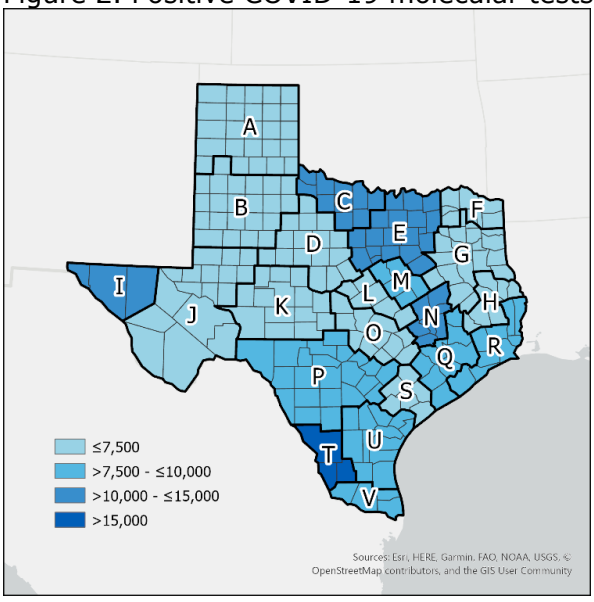



Figure 2. Positive COVID-19 molecular tests per 100,000 population by TSA in Texas



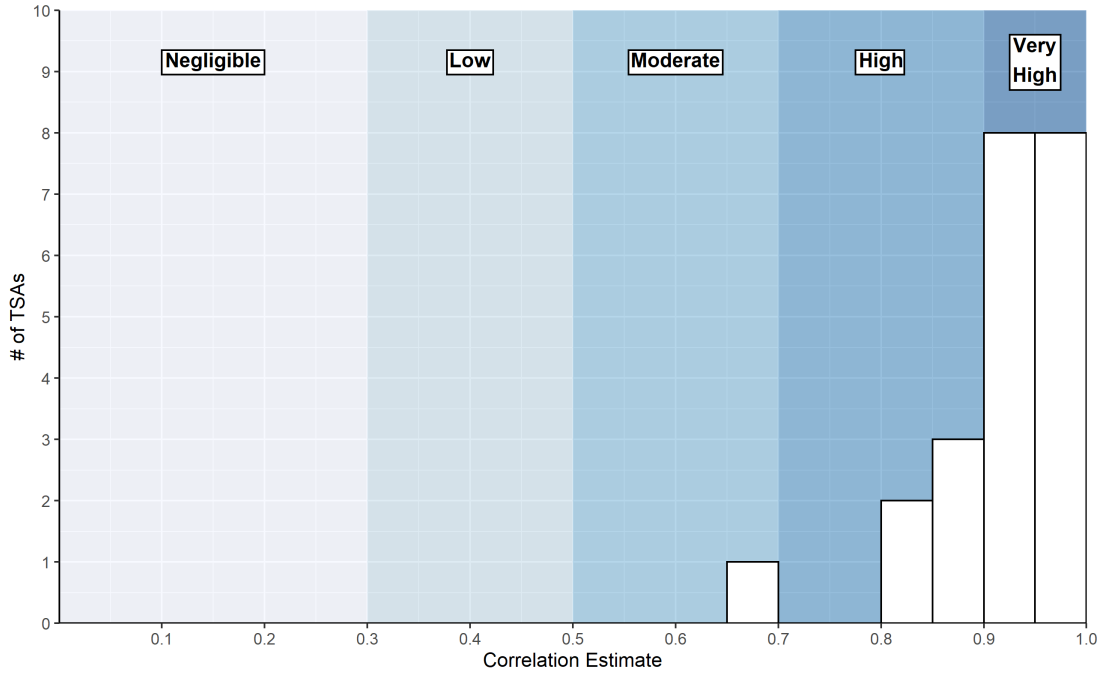
## Pearson Correlation Coefficient Results

Table 1. Pearson correlation coefficients and p-values for CLI and positive COVID-19 molecular tests in Texas TSAs, non-TSA associated values, and statewide.

| TSA/ Location | Pearson Correlation Estimate | p-value |
|---|---|---|
| Statewide | 0.986 | < 0.001 |
| A | 0.8 | < 0.001 |
| B | 0.909 | < 0.001 |
| C | 0.919 | < 0.001 |
| D | 0.85 | < 0.001 |
| E | 0.981 | < 0.001 |
| F | 0.953 | < 0.001 |
| G | 0.901 | < 0.001 |
| H | 0.866 | < 0.001 |
| I | 0.978 | < 0.001 |
| J | 0.901 | < 0.001 |
| K | 0.652 | < 0.001 |
| L | 0.957 | < 0.001 |
| M | 0.863 | < 0.001 |
| N | 0.852 | < 0.001 |
| O | 0.944 | < 0.001 |
| P | 0.964 | < 0.001 |
| Q | 0.961 | < 0.001 |
| R | 0.941 | < 0.001 |
| S | 0.985 | < 0.001 |
| T | 0.913 | < 0.001 |
| U | 0.949 | < 0.001 |
| V | 0.968 | < 0.001 |
| Other/TSA Unknown | -0.049 | 0.729 |

- There was a strong correlation between CLI and positive COVID-19 molecular tests throughout Texas during the study period (r=0.986, p<0.001, Table 1).
- Most TSAs also had high correlation coefficients. Sixteen out of 22 TSAs had very high correlation coefficients above 0.9. Of the remaining six TSAs, five had high correlation coefficients above 0.8 and one (TSA K) had a moderate correlation coefficient of 0.652. Only positive tests not associated with a TSA or geography had a negligible correlation (r=-0.049) and were not significant (p-value = 0.729).

Figure 3. Pearson correlation coefficient distribution for CLI and positive COVID-19 molecular tests in Texas TSAs.




## Ratio of CLI Visits to Positive COVID-19 Molecular Tests

The statewide ratio of CLI visits to positive COVID-19 molecular tests remained relatively steady throughout the study period, indicating a general lack of influence of other temporal factors on CLI during the study period (Figure 4). Throughout the study period, there were roughly 8-25 CLI visits for every 100 positive tests. Regional analysis revealed that some TSAs had large ranges of ratio values. As shown in Figure 5, TSAs A, G, and K all had high ratio values during the last 10 weeks of the study, with TSA K having a particularly higher ratio, including weeks during which there were more CLI visits than positive tests (ratio > 1.0).

Figure 4. Statewide ratio of CLI to positive COVID-19 molecular tests in Texas by MMWR week throughout the study period with number of positive tests overlay.

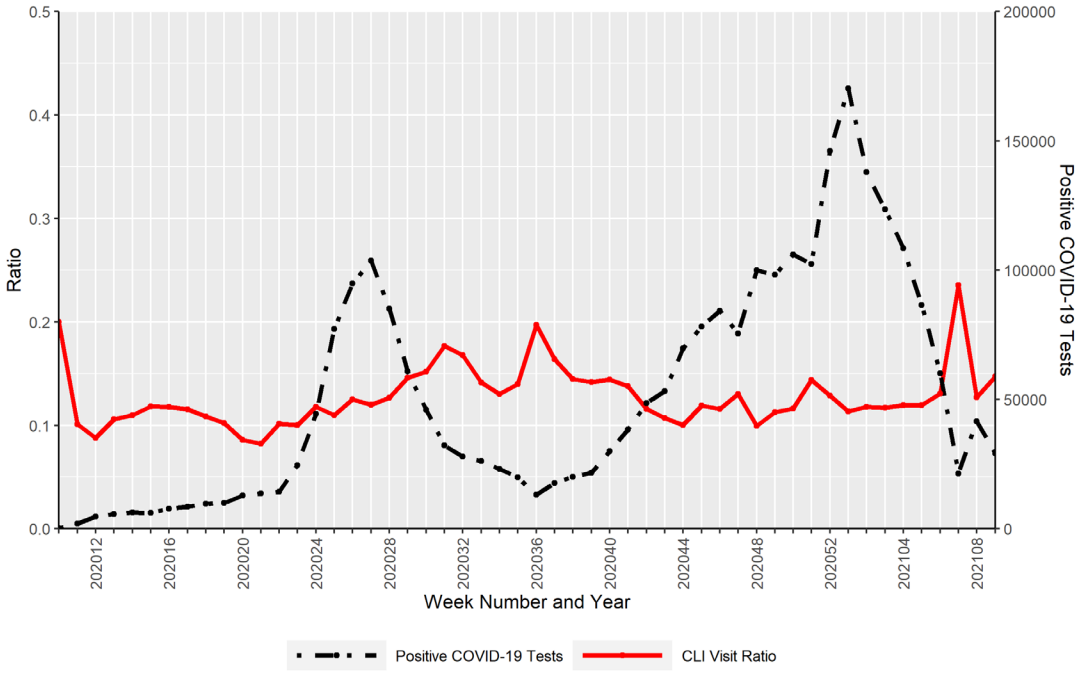
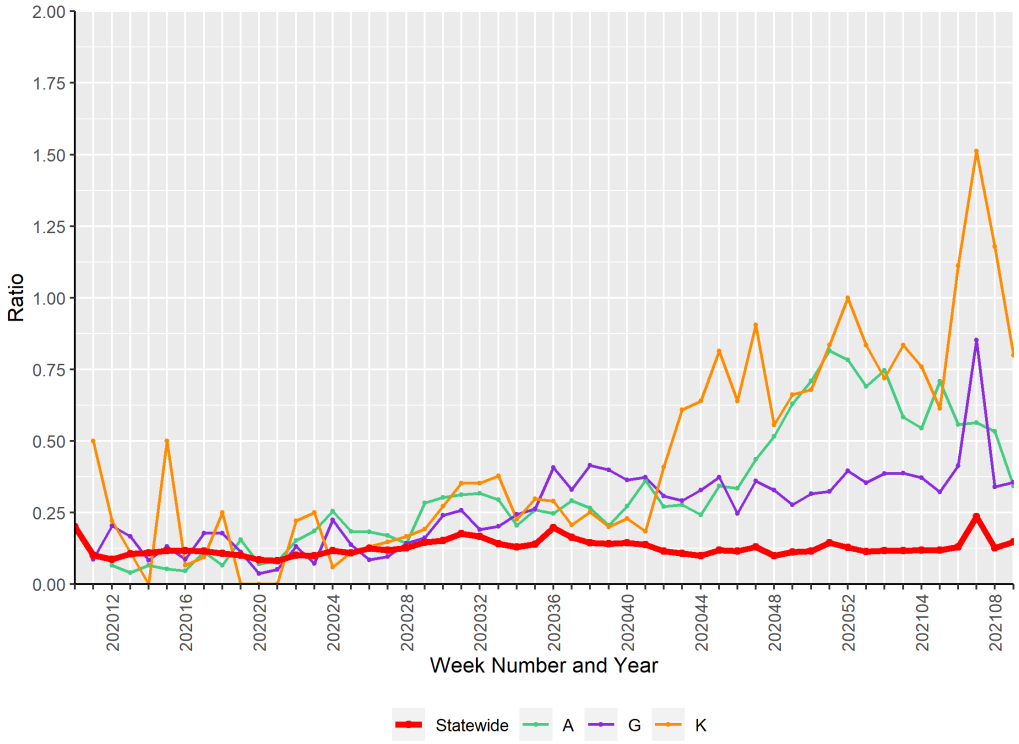



Figure 5. Ratio of CLI to positive COVID-19 molecular tests in Texas by MMWR week throughout the study period statewide and in TSAs A, G, and K



## Conclusion

This descriptive study provides initial evidence for the ability of the CDC's NSSP COVID-19 query to detect COVID-19 cases in Texas. Our findings that certain TSAs had lower correlations prompts further analysis of how temporal factors such as the circulation of other seasonal respiratory viruses and fluctuating healthcare seeking behavior at different times throughout the pandemic may be contributing to variations in CLI visits across the state of Texas.

## Appendix 1 – CLI Query

### Previous CLI Query (Introduced February 2020):

Chief complaint (Also apply to Triage Notes & Clinical Impression):

^fever^,and,(,^cant breath^,or,^cannot breath^,or,^difficulty breath^,or,^difficult to breath^,or,^hard to breath^,or,^unable to breath^,or,^dyspenea^,or,^dyspnea^,or,^bronchospasam^,or,^bronchospasm^,or,^grasping for breath^,or,^gasping for breath^,or,^problem breath^,or,^trouble breath^,or,^working to breath^,or,^not breath^,or,^SOB^,or,^short of breath^,or,^shortness of breath^,or,(,^cough^,andnot,(,^cough up^,or,^coughed up^,or,^coughing up^,),),),andnot,^no fever^,or,^[;/ ]J12.81^,or,^[;/ ]J1281^,or,^[;/ ]079.89[;/ ]^,or,^[;/ ]07989[;/ ]^,or,^[;/ ]079.82[;/ ]^,or,^[;/ ]07982[;/ ]^,or,^[;/ ]480.3[;/ ]^,or,^[;/ ]4803[;/ ]^,or,^[;/ ]V01.82^,or,^[;/]V0182[;/ ]^,or,^[;/ ]27619001[;/ ]^,or,^[;/ ]186747009[;/ ]^,or,^[;/ ]651000146102[;/ ]^,or,^[;/ ]713084008[;/ ]^,or,^[;/ ]398447004[;/ ]^,or,^[;/ ]408688009[;/ ]^,or,^[;/ ]441590008[;/ ]^,or,^[;/ ]715882005[;/ ]^

Discharge Diagnosis:

ISNULL,or,^,^U07.1^,or,^J12.89^,or,^B97.29^,or,^J20.8^,or,^B97.29^,or,^J40^,or,^J22^,or,^J98.8^,or,^J80^,or,^Z03.818^,or,^Z20.828^,or,^R05^,or,^R06.02^,or,^R50.9^,or,^Z20.828^,or,^B34.2^,or,^U07.1^,andnot,(,^[;/ ]J09^,or,^[;/ ]J10^,or,^[;/ ]J11^,or,^[;/ ]487.[018][;/ ]^,or,^[;/ ]487[018][;/ ]^,or,^488.[018][19]^,or,^488[018][19]^,or,^442696006^,or,^442438000^,or,^6142004^,or,^195878008^,or,^24662006^,or,^57089007^,)

### Revised CLI Query (Introduced October 2020):

CC and DD:

(,(,^[;/ ]R50.9^,or,^[;/ ]R509^,),and,(,^[;/ ]R05^,or,^[;/ ]R06.02^,or,^[;/ ]R0602^,or,^[;/ ]R07.0^,or,^[;/ ]R070^,),),andnot,(,^[;/ ]J09^,or,^[;/ ]J10^,or,^[;/ ]J11^,or,^[;/ ]487.[018][;/ ]^,or,^[;/ ]487[018][;/ ]^,or,^[;/ ]488.[018][19][;/ ]^,or,^[;/ ]488[018][19][;/ ]^,or,^[;/ ]442696006[;/ ]^,or,^[;/ ]442438000[;/ ]^,or,^[;/ ]6142004[;/ ]^,or,^[;/ ]195878008[;/ ]^,),or,^[;/ ]J98.8^,or,^[;/ ]J988^,or,^[;/ ]J22^,or,^[;/ ]J80^,ISNULL,or,^

Discharge Diagnosis:

^[;/ ]B34.2^,or,^[;/ ]B342^,or,^[;/ ]B97.2^,or,^[;/ ]B972^,or,^[;/ ]J12.81^,or,^[;/ ]J1281^,or,^[;/ ]079.82[;/ ]^,or,^[;/ ]07982[;/ ]^,or,^[;/ ]480.3[;/ ]^,or,^[;/ ]4803[;/ ]^,or,^[;/ ]V01.82[;/ ]^,or,^[;/ ]V0182[;/ ]^,or,^[;/ ]27619001[;/ ]^,or,^[;/ ]186747009[;/ ]^,or,^[;/ ]651000146102[;/ ]^,or,^[;/ ]713084008[;/ ]^,or,^[;/ ]398447004[;/ ]^,or,^[;/ ]408688009[;/

]^,or,^[;/ ]441590008[;/ ]^,or,^[;/ ]715882005[;/ ]^,or,^[;/ ]840539006[;/ ]^,or,^[;/ ]840544004[;/ ]^,or,^[;/ ]840546002[;/ ]^,or,^[;/ ]840536004[;/ ]^,or,^[;/ ]840535000[;/ ]^,or,^[;/ ]840533007[;/ ]^,or,^[;/ ]U07.1^,or,^[;/ ]U071^,or,^[;/ ]J12.82^,or,^[;/ ]J1282^

Chief Complaint:

ISNULL,or,^,ANDNOT,(,^Denies fever^,or,^Afebrile^,or,^Denies cough fever^,or,^Denies any fever^,or,^Denies shortness of breath cough fever^,or,^DENIES NAUSEA VOMITING DIARRHEA FEVER^,or,^DENIES COUGH OR FEVER^,or,^Denies shortness of breath fever^,or,^DENIES NAUSEA VOMITING FEVER^,or,^DENIES CHEST PAIN SHORTNESS OF BREATH FEVER^,or,^DENIES COUGH SHORTNESS OF BREATH FEVER^,or,^DENIES CHEST PAIN FEVER^,or,^DENIES ANY COUGH FEVER^,or,^DENIED FEVER^,or,^Denies nausea vomiting diarrhea or fever^,or,^DENIES ANY SHORTNESS OF BREATH COUGH FEVER^,or,^Denies diarrhea fever^,or,^DENIES SHORTNESS OF BREATH COUGH SORE THROAT FEVER^,or,^DENIES PAIN FEVER^,or,^Denies vomiting diarrhea fever^,or,^DENIES CHEST PAIN SHORTNESS OF BREATH COUGH FEVER^,or,^DENIES VOMITING FEVER^,or,^DENIES NAUSEA VOMITING DIARRHEA COUGH FEVER^,or,^Denies any shortness of breath fever^,or,^DENIES SHORTNESS OF BREATH OR FEVER^,or,^DENIES SHORTNESS OF BREATH CHEST PAIN FEVER^,or,^DENIES CHEST PAIN COUGH FEVER^,or,^DENIES NAUSEA VOMITING OR FEVER^,or,^DENIES ANY COUGH OR FEVER^,or,^DENIES SHORTNESS OF BREATH COUGH OR FEVER^,or,^DENIES SHORTNESS OF BREATH CHEST PAIN COUGH FEVER^,or,^DENIES DIARRHEA OR FEVER^,or,^DENIES RECENT FEVER^,or,^DENIES VOMITING OR FEVER^,or,^DENIED COUGH FEVER^,or,^DENIES PAIN OR FEVER^,or,^DENIES DYSURIA FEVER^,or,^DENIES KNOWN FEVER^,or,^DENIES COUGH SHORTNESS OF BREATH OR FEVER^,or,^Denied fever cough^,or,^DENIES CHEST PAIN SHORTNESS OF BREATH NAUSEA VOMITING DIARRHEA FEVER^,or,^DENIES DRAINAGE FEVER^,or,^DENIES ABDOMINAL PAIN FEVER^,or,^DENIES ANY COUGH SHORTNESS OF BREATH FEVER^,or,^DENIES ANY NAUSEA VOMITING DIARRHEA FEVER^,or,^DENIES COUGH SORE THROAT FEVER^,or,^DENIES ANY NAUSEA VOMITING DIARRHEA OR FEVER^,or,^DENIES VOMITING DIARRHEA OR FEVER^,or,^Denies trauma fever^,or,^DENIES SHORTNESS OF BREATH NAUSEA VOMITING DIARRHEA FEVER^,or,^DENIES CHEST PAIN OR FEVER^,or,^Denies sore throat fever^,or,^Denies abdominal pain nausea vomiting diarrhea shortness of breath cough fever^,or,^DENIES CHEST PAIN NAUSEA VOMITING DIARRHEA FEVER^,or,^DENIES INJURY FEVER^,or,^DENIES CHILLS FEVER^,or,^DENIES CHEST PAIN COUGH OR FEVER^,or,^DENEIS ANY FEVER^,or,^DENIES CHEST PAIN SHORTNESS OF BREATH NAUSEA VOMITING FEVER^,or,^DENIES COUGH CONGESTION FEVER^,or,^DENIES ANY SHORTNESS OF BREATH OR FEVER^,or,^DENIES HEADACHE FEVER^,or,^DENIES ABDOMINAL PAIN OR

FEVER^,or,^DENIES ANY SHORTNESS OF BREATH COUGH OR FEVER^,or,^DENIES DRAINAGE OR FEVER^,or,^Denies chest pain shortness of breath or fever^,or,^DENIES HEMATURIA FEVER^,or,^DENIES ANY PAIN FEVER^,or,^DENIES ANY CHEST PAIN FEVER^,or,^DENIES NAUSEA FEVER^,or,^DENEIS SHORTNESS OF BREATH COUGH FEVER^,or,^DENIES URINARY SYMPTOMS FEVER^,or,^DENIES ANY CHEST PAIN SHORTNESS OF BREATH COUGH FEVER^,or,^Denies any chest pain shortness of breath fever^,or,^DENIES ANY NAUSEA VOMITING FEVER^,or,^DENIED ANY FEVER^,or,^DENIES COUGH CHEST PAIN FEVER^,or,^DENIES ANY COUGH SHORTNESS OF BREATH OR FEVER^,or,^DENIES COVID EXPOSURE FEVER^,or,^DENIES_HAVING_FEVER^,or,^DENIES NAUSEA VOMITING COUGH FEVER^,or,^DENIES NAUSEA VOMITING DIARRHEA SHORTNESS OF BREATH FEVER^,or,^DENIES SICK CONTACTS FEVER^,or,^DENIES DYSURIA OR FEVER^,or,^DENIES ANY DIARRHEA OR FEVER^,or,^DENIES ANY PAIN OR FEVER^,or,^DENIES PAIN SHORTNESS OF BREATH FEVER^,or,^DENIES SHORTNESS OF BREATH NAUSEA VOMITING FEVER^,or,^DENIES ANY CHEST PAIN SHORTNESS OF BREATH NAUSEA VOMITING DIARRHEA FEVER^,or,^DENIES VOMITING DIARRHEA COUGH FEVER^,or,^DENIES CHEST PAIN NAUSEA VOMITING FEVER^,or,^DENIES ANY NAUSEA VOMITING OR FEVER^,or,^DENIES COUGHING FEVER^,or,^DENIES CHEST PAIN DIZZINESS FEVER^,or,^DENIES COUGH SHORTNESS OF BREATH SORE THROAT FEVER^,or,^DENIES COUGH SORE THROAT OR FEVER^,or,^DENIES PAIN COUGH FEVER^,or,^DENIES COUGH COLD FEVER^,)

## Appendix 2 – TSAs in Texas

- In Texas, TSAs are the administrative boundaries of a Regional Advisory Council (RAC) responsible for trauma system oversight within that TSA.
- TSAs comprise several counties and serve the function of developing, implementing, and monitoring regional emergency medical service trauma system plans.
- Each RAC is organized differently but has the same objective of reducing the incidence and improving outcomes of trauma through education, data collection, data analysis, and performance improvement (*Regional Advisory Councils*, 2021).
- During the COVID-19 pandemic, the RACs have organized resources and collected, analyzed, and disseminated data to prepare for, monitor, and respond to the effects of the pandemic at local and regional levels.

| County | TSA |
|---|---|
| Anderson | G |
| Andrews | J |
| Angelina | H |
| Aransas | U |
| Archer | C |
| Armstrong | A |
| Atascosa | P |
| Austin | Q |
| Bailey | B |
| Bandera | P |
| Bastrop | O |
| Baylor | C |
| Bee | U |
| Bell | L |
| Bexar | P |
| Blanco | O |
| Borden | B |
| Bosque | M |
| Bowie | F |
| Brazoria | R |
| Brazos | N |
| Brewster | J |
| Briscoe | A |

| County | TSA |
|---|---|
| Brooks | U |
| Brown | D |
| Burleson | N |
| Burnet | O |
| Caldwell | O |
| Calhoun | S |
| Callahan | D |
| Cameron | V |
| Camp | G |
| Carson | A |
| Cass | F |
| Castro | B |
| Chambers | R |
| Cherokee | G |
| Childress | A |
| Clay | C |
| Cochran | B |
| Coke | K |
| Coleman | D |
| Collin | E |
| Collingsworth | A |
| Colorado | Q |
| Comal | P |

| County | TSA |
|---|---|
| Comanche | D |
| Concho | K |
| Cooke | E |
| Coryell | L |
| Cottle | B |
| Crane | J |
| Crockett | K |
| Crosby | B |
| Culberson | I |
| Dallam | A |
| Dallas | E |
| Dawson | B |
| De Witt | S |
| Deaf Smith | A |
| Delta | F |
| Denton | E |
| Dickens | B |
| Dimmit | P |
| Donley | A |
| Duval | U |
| Eastland | D |
| Ector | J |
| Edwards | P |

| County | TSA |
|---|---|
| El Paso | I |
| Ellis | E |
| Erath | E |
| Falls | M |
| Fannin | E |
| Fayette | O |
| Fisher | D |
| Floyd | B |
| Foard | C |
| Fort Bend | Q |
| Franklin | G |
| Freestone | G |
| Frio | P |
| Gaines | B |
| Galveston | R |
| Garza | B |
| Gillespie | P |
| Glasscock | J |
| Goliad | S |
| Gonzales | P |
| Gray | A |
| Grayson | E |
| Gregg | G |
| Grimes | N |
| Guadalupe | P |
| Hale | B |
| Hall | A |
| Hamilton | L |
| Hansford | A |
| Hardeman | C |
| Hardin | R |
| Harris | Q |
| Harrison | G |
| Hartley | A |
| Haskell | D |
| Hays | O |
| Hemphill | A |
| Henderson | G |
| Hidalgo | V |

| County | TSA |
|---|---|
| Hill | M |
| Hockley | B |
| Hood | E |
| Hopkins | F |
| Houston | G |
| Howard | J |
| Hudspeth | I |
| Hunt | E |
| Hutchinson | A |
| Irion | K |
| Jack | C |
| Jackson | S |
| Jasper | R |
| Jeff Davis | J |
| Jefferson | R |
| Jim Hogg | T |
| Jim Wells | U |
| Johnson | E |
| Jones | D |
| Karnes | P |
| Kaufman | E |
| Kendall | P |
| Kenedy | U |
| Kent | B |
| Kerr | P |
| Kimble | K |
| King | B |
| Kinney | P |
| Kleberg | U |
| Knox | D |
| La Salle | P |
| Lamar | F |
| Lamb | B |
| Lampasas | L |
| Lavaca | S |
| Lee | O |
| Leon | N |
| Liberty | R |
| Limestone | M |

| County | TSA |
|---|---|
| Lipscomb | A |
| Live Oak | U |
| Llano | O |
| Loving | J |
| Lubbock | B |
| Randall | A |
| Lynn | B |
| Madison | N |
| Marion | G |
| Martin | J |
| Mason | K |
| Matagorda | Q |
| Maverick | P |
| McCulloch | K |
| McLennan | M |
| McMullen | U |
| Medina | P |
| Menard | K |
| Midland | J |
| Milam | L |
| Mills | L |
| Mitchell | D |
| Montague | C |
| Montgomery | Q |
| Moore | A |
| Morris | F |
| Motley | B |
| Nacogdoches | H |
| Navarro | E |
| Newton | R |
| Nolan | D |
| Nueces | U |
| Ochiltree | A |
| Oldham | A |
| Orange | R |
| Palo Pinto | E |
| Panola | G |
| Parker | E |
| Parmer | A |

| County | TSA |
|---|---|
| Pecos | J |
| Polk | H |
| Potter | A |
| Presidio | J |
| Rains | G |
| Upshur | G |
| Reagan | K |
| Real | P |
| Red River | F |
| Reeves | J |
| Refugio | U |
| Roberts | A |
| Robertson | N |
| Rockwall | E |
| Runnels | K |
| Rusk | G |
| Sabine | H |
| San Augustine | H |
| San Jacinto | H |
| San Patricio | U |
| San Saba | O |
| Schleicher | K |
| Scurry | B |
| Shackelford | D |
| Shelby | G |
| Sherman | A |
| Smith | G |
| Somervell | E |
| Starr | V |
| Stephens | D |
| Sterling | K |
| Stonewall | D |
| Sutton | K |
| Swisher | A |
| Tarrant | E |
| Taylor | D |
| Terrell | J |
| Terry | B |
| Throckmorton | D |

| County | TSA |
|---|---|
| Titus | F |
| Tom Green | K |
| Travis | O |
| Trinity | G |
| Tyler | H |
| Upton | J |
| Uvalde | P |
| Val Verde | P |
| Van Zandt | G |
| Victoria | S |
| Walker | Q |
| Waller | Q |
| Ward | J |
| Washington | N |
| Webb | T |
| Wharton | Q |
| Wheeler | A |
| Wichita | C |
| Wilbarger | C |
| Willacy | V |
| Williamson | O |
| Wilson | P |
| Winkler | J |
| Wise | E |
| Wood | G |
| Yoakum | B |
| Young | C |
| Zapata | T |
| Zavala | P |

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