Correlation Between Positive COVID-19 Cases in Southeastern Louisiana Schools

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**Abstract**—COVID-19 has had a significant impact on learning in a classroom setting. The Center for Disease Control and Prevention has maintained that in-person learning is vital to the education of children and adolescents. While this is true, we should not ignore the fact that children and adolescents can be infected with and spread COVID-19. This project explores the impact of COVID-19 on a designated geographic area – the parishes adjacent to Lake Ponchatrain in Louisiana – and hasty decision-makimg by disaparate educators and policymakers to reopen schools to full capacity.

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# 1 Introduction

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N March 13, 2020, Governor John Bel Edwards signed an executive order that closed all Louisiana K-12 schools for one month. As COVID-19 spread dangerously throughout the state, Edwards extended the closure to April 30th. With no end of the pandemic in sight, ther governor decided that all Louisisna schools would stay closed for the remainder of the academic year.

As the 2020-21 school year approached, Governor Edwards and the Louisiana Department of Education allowed public school districts, charters, and private school entities to decide when students and staff could safely return to in-person learning under guidelines issued by the state and the Center for Disease for Control and Prevention. Across the state, various teaching methods were adopted for the start of the school year.

To date, all Louisiana students have not returned to the classroom. As vaccination against COVID-19 has become readily available to most adults and 1.7 million doses have been administered in the state, many public-school districts, charters, and private school entities have already decided to reopen their schools to full capacity for the 2021-22 academic school year.

# 2 Data

## 2.1 Source Data

The parents of students and school district

employees are asked to report positive SARS-CoV-2 molecular or antigen test results to their designated schools. Each school is responsible for reporting positive cases to their supervising body. Those reports are given to the Louisiana Department of Health (LDH).

Beginning October 21, 2020, the LDH made table-style reports of school outbreaks accessible to the public via its website. Each report include outbreaks includes K-12 schools in Louisiana’s 62 parishes, the number of schools in each parish, the total number of cases and newly reported cases involving faculty, staff, volunteers, and students. LDH generates a new report weekly.

## 2.2 Data Organization

The designated geographical area (St. Bernard, Orleans, Jefferson, St. Charles, St. John, Livingston, Tangipahoa, and St. Tammany Parishes) was selected in light of the fact that the metropolitan statistics of New Orleans saw one of the earliest and consequential outbreaks of COVID-19 during the pandemic. Each of the selected parishes sit next to Lake Ponchatrain and are easily commutable to the Metro New Orleans Area.

Because the information provided on the LDH website is in a non-useable format, data about positive cases in K-12 schools in the designated area was extracted from reports dated October 21, 2020 to March 17, 2021. To make sense of and to organize the information, it was transposed to Excel spreadsheets. Finally, these spreadsheets were placed in Tableau for further exploration.

For this project, only new cases were studied. Because symptoms are usually milder for children and adolescents, the number of positive cases involving faculty, staff, and volunteers (FSV) were compared to positive cases involving students.

# 3 Features and Preprocessing

Initially, I really did not know where to go with this data, but I suspected that as positive cases rose among the student body, positive cases would also increase among FSV.

Comparing positive FSV cases to positive student cases was not visually possible using Tableau. Both variables on the x axis had to be synced. The various changes in the dataset were not too extreme, and log-distributions were not necessary. The distributions are provided in Figure 1.

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| --- | --- |
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|  |  |

**Figure 1: Positive positive SARS-CoV-2 Molecular or Antigen Test Results for FSV (blue) and Students (orange)**

# 4 models and strategies

My assumption is that as the virus spreads, there will be a relationship between the FSV and students. As positive student cases change by a certain amount, I expect to see positive FSV cases change on average by a certain amount. To examine the data, I decided to try using using multivariate regression using Excel Output (Figures 2 -9).

**Jefferson Parish**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |
| **Multiple R** | 0.591749 |  |  |  |  |  |
| **R Square** | 0.350167 |  |  |  |  |  |
| **Adjusted R Square** | 0.317675 |  |  |  |  |  |
| **Standard Error** | 6.095304 |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |
| **Regression** | 1 | 400.3999 | 400.3999 | 10.77713 | 0.00372 |  |
| **Residual** | 20 | 743.0547 | 37.15273 |  |  |  |
| **Total** | 21 | 1143.455 |  |  |  |  |
|  |  |  |  |  |  |  |
|  | ***Coefficients*** | ***Standard Error*** | ***t Stat*** | ***P-value*** | ***Lower 95%*** | ***Upper 95%*** |
| **Intercept** | 3.732665 | 2.17409 | 1.716886 | 0.101448 | -0.80241 | 8.267737 |
| **X Variable 1** | 0.241615 | 0.073599 | 3.282854 | 0.00372 | 0.08809 | 0.39514 |

**Figure 2: Regression Analysis of Positive positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in Jefferson Parish**

**Livingston Parish**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |
| **Multiple R** | 0.575163 |  |  |  |  |  |
| **R Square** | 0.330812 |  |  |  |  |  |
| **Adjusted R Square** | 0.297353 |  |  |  |  |  |
| **Standard Error** | 1.97511 |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |
| **Regression** | 1 | 38.56971 | 38.56971 | 9.886984 | 0.005104 |  |
| **Residual** | 20 | 78.02119 | 3.90106 |  |  |  |
|  |  |  |  |  |  |  |
| **Total** | 21 | 116.5909 |  |  |  |  |
|  |  |  |  |  |  |  |
|  | ***Coefficients*** | ***Standard Error*** | ***t Stat*** | ***P-value*** | ***Lower 95%*** | ***Upper 95%*** |
| **Intercept** | 0.95085 | 0.51146 | 1.859089 | 0.077792 | -0.11604 | 2.017736 |
| **X Variable 1** | 0.393751 | 0.125225 | 3.144357 | 0.005104 | 0.132537 | 0.654965 |

**Figure 3: Regression Analysis of Positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in Livingston Parish**

**Orleans Parish**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |  |
| **Multiple R** | 0.894391 |  |  |  |  |  |  |
| **R Square** | 0.799936 |  |  |  |  |  |  |
| **Adjusted R Square** | 0.789933 |  |  |  |  |  |  |
| **Standard Error** | 7.655217 |  |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |  |
| **Regression** | 1 | 4686.317 | 4686.317 | 79.96806 | 2E-08 |  |  |
| **Residual** | 20 | 1172.047 | 58.60235 |  |  |  |  |
| **Total** | 21 | 5858.364 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* |
| **Intercept** | -0.68064 | 2.805683 | -0.24259 | 0.810791 | -6.53319 | 5.171912 | -6.53319 |
| **X Variable 1** | 0.525731 | 0.05879 | 8.942486 | 2E-08 | 0.403097 | 0.648365 | 0.403097 |

**Figure 4: Regression Analysis of Positive positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in Orleans Parish**

**St. Bernard Parish**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |  |
| **Multiple R** | 0.321216 |  |  |  |  |  |  |
| **R Square** | 0.10318 |  |  |  |  |  |  |
| **Adjusted R Square** | 0.058339 |  |  |  |  |  |  |
| **Standard Error** | 7.886606 |  |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |  |
| **Regression** | 1 | 143.1198 | 143.1198 | 2.301014 | 0.144938 |  |  |
| **Residual** | 20 | 1243.971 | 62.19856 |  |  |  |  |
| **Total** | 21 | 1387.091 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* |
| **Intercept** | 2.000872 | 2.417808 | 0.827556 | 0.417688 | -3.04259 | 7.044331 | -3.04259 |
| **X Variable 1** | 0.276099 | 0.182014 | 1.516909 | 0.144938 | -0.10358 | 0.655774 | -0.10358 |

**Figure 5: Regression Analysis of Positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in St. Bernard Parish**

**St. Charles Parish**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |  |  |
| **Multiple R** | 0.691874 |  |  |  |  |  |  |  |
| **R Square** | 0.47869 |  |  |  |  |  |  |  |
| **Adjusted R Square** | 0.452624 |  |  |  |  |  |  |  |
| **Standard Error** | 5.25502 |  |  |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |  |  |
| **Regression** | 1 | 507.1499 | 507.1499 | 18.36486 | 0.000361 |  |  |  |
| **Residual** | 20 | 552.3047 | 27.61523 |  |  |  |  |  |
| **Total** | 21 | 1059.455 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | ***Coefficients*** | ***Standard Error*** | ***t Stat*** | ***P-value*** | ***Lower 95%*** | ***Upper 95%*** | ***Lower 95.0%*** | ***Upper 95.0%*** |
| **Intercept** | -0.2892 | 1.746894 | -0.16555 | 0.870172 | -3.93316 | 3.354755 | -3.93316 | 3.354755 |
| **X Variable 1** | 0.50545 | 0.117946 | 4.285424 | 0.000361 | 0.259418 | 0.751481 | 0.259418 | 0.751481 |

**Figure 6: Regression Analysis of Positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in St. Charles Parish**

**St. John Parish**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |
| **Multiple R** | 0.575163 |  |  |  |  |  |
| **R Square** | 0.330812 |  |  |  |  |  |
| **Adjusted R Square** | 0.297353 |  |  |  |  |  |
| **Standard Error** | 1.97511 |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |
| **Regression** | 1 | 38.56971 | 38.56971 | 9.886984 | 0.005104 |  |
| **Residual** | 20 | 78.02119 | 3.90106 |  |  |  |
| **Total** | 21 | 116.5909 |  |  |  |  |
|  |  |  |  |  |  |  |
|  | ***Coefficients*** | ***Standard Error*** | ***t Stat*** | ***P-value*** | ***Lower 95%*** | ***Upper 95%*** |
| **Intercept** | 0.95085 | 0.51146 | 1.859089 | 0.077792 | -0.11604 | 2.017736 |
| **X Variable 1** | 0.393751 | 0.125225 | 3.144357 | 0.005104 | 0.132537 | 0.654965 |

**Figure 7: Regression Analysis of Positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in St. John Parish**

**St. Tammany Parish**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |  |  |
| **Multiple R** | 0.872408 |  |  |  |  |  |  |  |
| **R Square** | 0.761096 |  |  |  |  |  |  |  |
| **Adjusted R Square** | 0.74915 |  |  |  |  |  |  |  |
| **Standard Error** | 13.57923 |  |  |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |  |  |
| **Regression** | 1 | 11748.86 | 11748.86 | 63.71551 | 1.21E-07 |  |  |  |
| **Residual** | 20 | 3687.912 | 184.3956 |  |  |  |  |  |
| **Total** | 21 | 15436.77 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | ***Coefficients*** | ***Standard Error*** | ***t Stat*** | ***P-value*** | ***Lower 95%*** | ***Upper 95%*** | ***Lower 95.0%*** | ***Upper 95.0%*** |
| **Intercept** | 1.502806 | 4.340638 | 0.346218 | 0.732795 | -7.55161 | 10.55722 | -7.55161 | 10.55722 |
| **X Variable 1** | 0.260403 | 0.032623 | 7.9822 | 1.21E-07 | 0.192352 | 0.328453 | 0.192352 | 0.328453 |

**Figure 8: Regression Analysis of Positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in St. Tammany Parish**

**Tangipahoa Parish**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Regression Statistics* | |  |  |  |  |  |  |  |
| **Multiple R** | 0.591749 |  |  |  |  |  |  |  |
| **R Square** | 0.350167 |  |  |  |  |  |  |  |
| **Adjusted R Square** | 0.317675 |  |  |  |  |  |  |  |
| **Standard Error** | 6.095304 |  |  |  |  |  |  |  |
| **Observations** | 22 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **ANOVA** |  |  |  |  |  |  |  |  |
|  | ***df*** | ***SS*** | ***MS*** | ***F*** | ***Significance F*** |  |  |  |
| **Regression** | 1 | 400.3999 | 400.3999 | 10.77713 | 0.00372 |  |  |  |
| **Residual** | 20 | 743.0547 | 37.15273 |  |  |  |  |  |
| **Total** | 21 | 1143.455 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | ***Coefficients*** | ***Standard Error*** | ***t Stat*** | ***P-value*** | ***Lower 95%*** | ***Upper 95%*** | ***Lower 95.0%*** | ***Upper 95.0%*** |
| **Intercept** | 3.732665 | 2.17409 | 1.716886 | 0.101448 | -0.80241 | 8.267737 | -0.80241 | 8.267737 |
| **X Variable 1** | 0.241615 | 0.073599 | 3.282854 | 0.00372 | 0.08809 | 0.39514 | 0.08809 | 0.39514 |

**Figure 9: Regression Analysis of Positive SARS-CoV-2 Molecular or Antigen Test Results for FSV and Students in Tangipahoa Parish**

# 5 Results/ Data Analysis

## 5.1 Multiple R

The Multiple R indicates the strength of the relationship and how closely positive FSV cases and positive student cases move simultaneously with each other. It does not show if the correlation is positive or negative.

There is a strong correlation between positive FSV cases and positive student cases in each of the designated parishes, the strongest being in Orleans and St. Tammany Parishes.

## 5.2 R Square

The R Square shows how well the model of regression line corresponds with the data. As expected from the Multiple R, Orleans and St. Tammany Parishes are better fits. Other factors may explain the correlation in other parishes.

## 5.3 Significance F

The Signicance F indicate are small and indicate that all the models are reliable.

# Conclusion

In no way different from so many institutions and organizations, the Covid-19 pandemic has taken a In-person learning was immediately halted across the country as a means for reducing transmission of the virus. The ration expressed by policymakers was to simply not allow youngsters to become conduits for the virus to reach vulnerable members of their households, extended family units, and the general population. Many school districts adopted virtual learning in the absence of the physical classroom.

As the pangs of the pandemic wear on, the resolve wanes, and from school system to another, policymakers have elected to return to in-person learning. The problem here, though, is that the decision to return to the classroom, is not based on science. In fact, data suggest validity to the initial assumptions that schools were places for wherein opportunities for transmission.

This research paper analyzed data from a designated geographic area, the school systems of parishes immediately neighboring Lake Pontchartrain in southeastern Louisiana. This region was one of the hardest hit areas of the pandemic in its early days, and the decision by policymakers to close schools in response was a universal one. Now, as those school systems in the designated geographic area reopen to in-person learning, new data is emerging that shows a material correlation between the positive infection rates of students and the positive infection rates of faculty, staff, and volunteers. This data suggests that, as a setting, schools pose a particular risk for higher likelihoods of transmissions of the virus among the students and FSV, as well as to the greater community.

Understanding the importance of data in the decision-making process can save lives. Policymakers in school systems would be well-serviced to consider the data demonstrating strong correlations between infection rates among students and rates among FSV, before these policymakers decide to return students to classrooms.

**References**

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