

Hybrid instructional approaches and COVID-19 infection trends in a sample of Pennsylvania school districts, fall 2020

January 2021

Brian Gill and Danielle DeLisle

Submitted to:

Pennsylvania Department of Education

Introduction and summary

To educate students while mitigating the spread of COVID-19 during the fall of 2020, schools across the country used different operational approaches, ranging from fully remote instruction to fully in-person instruction with various “hybrid” approaches in between. These hybrid or mixed approaches incorporate remote and in-person elements at different times to reduce the number and frequency of contacts and promote increased physical distance between students and teachers in the school building.

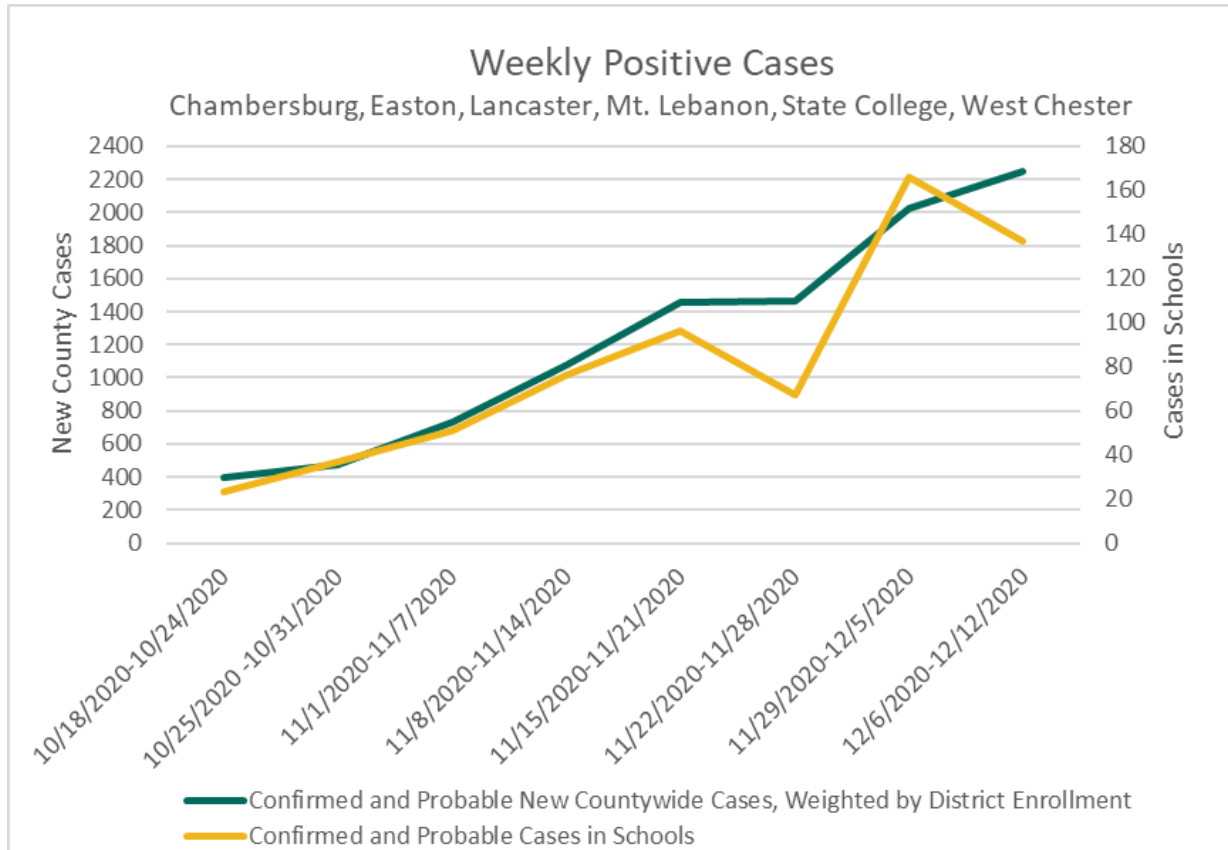
Beginning in August 2020, the Pennsylvania Department of Education (PDE) recommended hybrid instruction for school entities located in counties with disease incidence rates up to 99 per 100,000 residents over the most recent seven days. These recommendations were informed by emerging research about virus transmission and computational simulations of COVID-19 transmission in schools. Specifically, simulations conducted by Mathematica (Gill, Goyal, and Hotchkiss, 2020) and the Mid-Atlantic Regional Educational Laboratory (Gill, Goyal, Hartog, Hotchkiss, and DeLisle, 2020) for PDE suggested that hybrid approaches could substantially reduce virus transmission in schools compared to “business as usual” full-time in-person schooling.

Even as COVID-19 vaccine distribution gets under way, virus mitigation strategies will remain important, since students are not high on the priority list for the vaccine. PDE would like to know whether there is evidence that districts using hybrid instructional approaches (alongside precautions such as mandatory mask-wearing) can successfully mitigate in-school transmission, consistent with the simulation predictions. This report seeks such evidence by examining whether COVID-19 incidence trends for students and staff in Pennsylvania districts using hybrid instruction paralleled or exceeded trends in the local community during the fall of 2020.

Through suggestions from PDE and a search of Pennsylvania district websites, Mathematica identified seven school districts across the state that (1) used hybrid operational approaches with precautions for at least part of the fall semester, and (2) reported counts of COVID-19 infections among their students and staff at regular intervals. Infection rates were rising across Pennsylvania in the fall, so infection rates among staff and students were likely to rise even if school buildings were closed. A district’s success in mitigating virus transmission in schools therefore might be reflected in infection rates among students and staff that were not increasing *faster* than those of others in the community. To make such comparisons, we gathered county-level data on infection rates over time and plotted these graphically alongside COVID-19 case counts among students and staff.

For six of the seven districts, we can combine data for a consistent period of time, mid-October through mid-December. A chart of the combined data (below) shows a trajectory of infections among students and staff that closely parallels infections in their surrounding counties. **For these districts implementing hybrid instruction with precautions, increases in infections among students and staff were no greater than increases experienced by others in their communities outside of school, suggesting that the districts successfully mitigated in-school transmission risks.**

Combined Weekly Cases



*Note: Mt. Lebanon School District reported monthly case counts at the school level. To incorporate this data into the combined graph, we assumed the cases were evenly distributed throughout the month and divided the monthly total by four, assigning each week a case count equivalent to one-quarter of the monthly total.

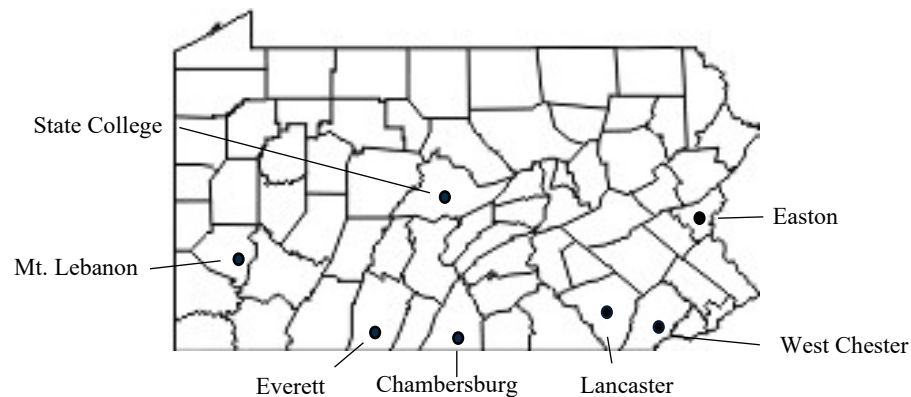
Several caveats should be mentioned. First, these descriptive graphs cannot definitively demonstrate that hybrid instruction with precautions eliminates the possibility that schools become super-spreaders. Additionally, because each district operationalized a hybrid approach in the way most appropriate for its individual community context, we do not attempt to distinguish specific hybrid approaches in our analysis. Furthermore, the analysis does not include comparative data from districts where schools were operating entirely remotely or entirely in-person, so it cannot show the relative effectiveness of hybrid approaches versus other operational approaches. Finally, the data presented reflect a period of time when incidence rates across the state were lower than levels reached in December. Whether schools might contribute to higher transmission when the community infection rate is substantially higher cannot be determined from this data.

The next section of the report describes the data used; it is followed by individual charts for each of the seven districts we examined.

Data

We identified seven districts across the state that: 1) opened school buildings for part-time, hybrid instruction with precautions, for at least part of the fall semester, and 2) publicly reported counts of

infections among students and staff over time: Chambersburg Area School District, Easton Area School District, Everett Area School District, Mt. Lebanon School District, School District of Lancaster, State College Area School District, and West Chester Area School District. These districts are not a comprehensive set of districts using hybrid instruction in Pennsylvania, but they are well distributed across the commonwealth (see map) and reflect a range of community, household, and student characteristics such as urbanicity, student demographics, and school resources. Everett Area School District is not included in the combined graph because it stopped reporting cases too early to usefully overlap the timeframe used for the other districts, but its results are reported in its own graph.



For each district, we examined the district’s weekly case counts among school staff and students, county-level case counts, and the type of instruction (hybrid or remote) offered each week. The main data sources are as follows:

- District-level case counts are publicly available on each district’s website.
- County-level case counts are aggregated daily counts from the Pennsylvania Department of Health COVID-19 dashboard.
- Information on the type of instruction was provided by PDE.

We used the following decision rules in assigning cases to specific time periods and displaying the data:

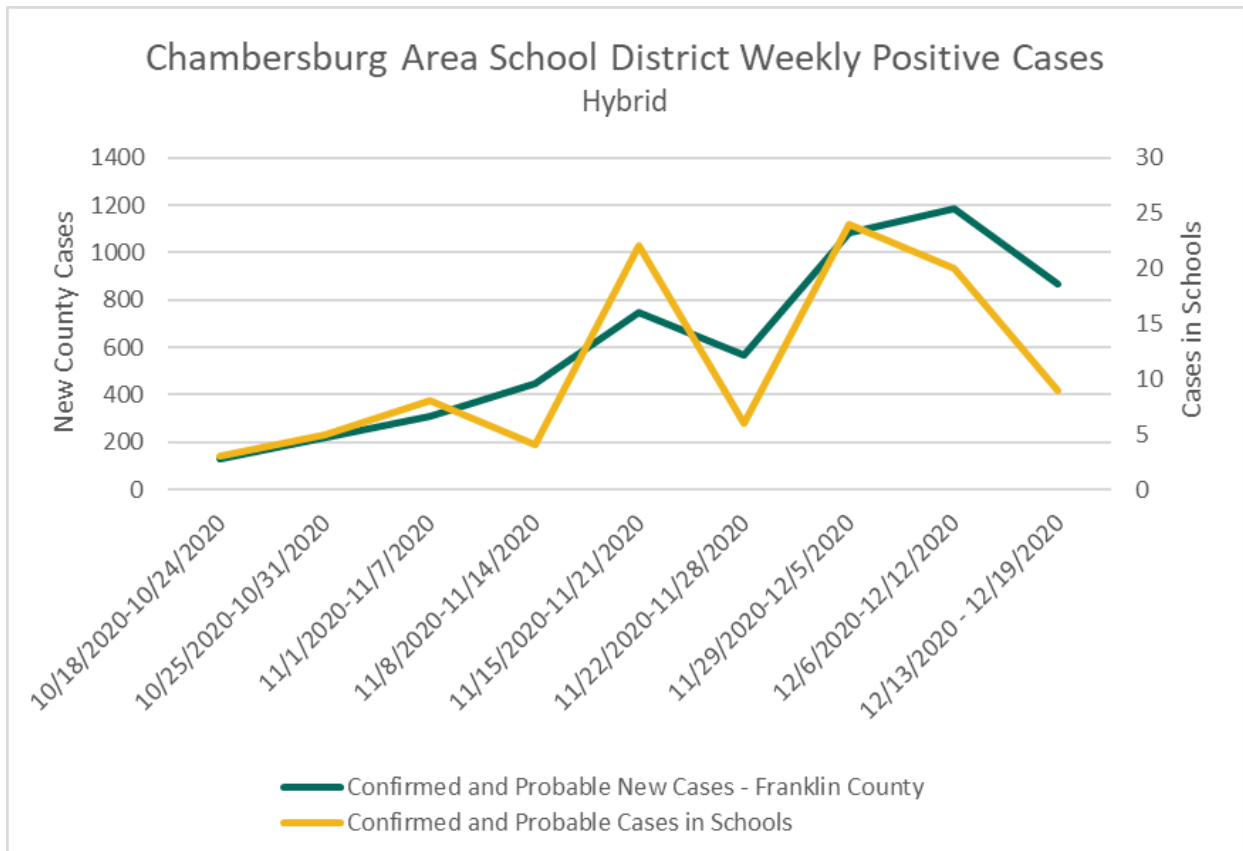
- Some districts reported cases for the school week (Monday-Friday) while others reported cases for a seven-day week (Sunday-Saturday). We assumed that cases identified during the five-day school week represent cases for the full seven-day week. We presume that a student or staff member who was diagnosed by a health care provider or identified as a case of COVID-19 by either the state or local health departments on the weekend would be captured in counts on the following Monday.
- Districts provided varying amounts of data from the beginning of the school year in late August through mid-December. Individual district graphs present all available data. The combined graph below aggregates available data from six of the seven districts from mid-October to mid-December to capture the timeframe when most districts reported data.
- For the graph that combines data across six districts, the county-wide rates needed to be weighted by district enrollment, implicitly estimating the number of the county’s cases in the district’s own community. For each district, we calculated the proportion of students enrolled in the district relative to the total number of students enrolled in the county. We applied the proportion to the number of

cases in the county each week to obtain a case count adjusted for enrollment and aggregated these counts across districts to generate an estimate of the total number of new cases in these communities.

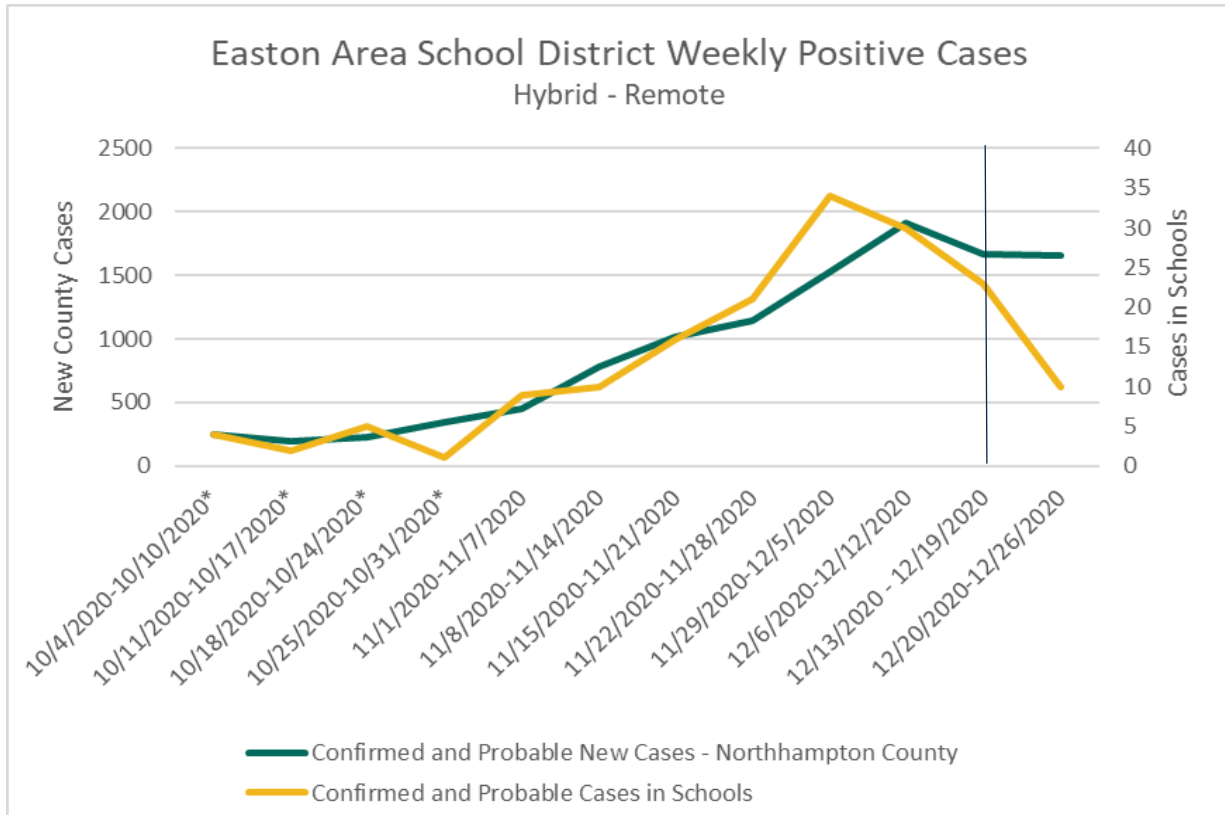
Findings on infection trends in individual districts

The graphs below represent weekly new cases of COVID-19 recorded in each school district compared to the weekly new case count in the county where the district is located. When applicable (as indicated in the subheading for each chart), a vertical line indicates a shift from remote to hybrid instruction and/or vice versa. Although the infection trends for individual school districts are not as smooth as those for the combined graph, owing to smaller data sets, the trends are generally consistent in showing infection trends among students and staff that follow larger trends in their counties.

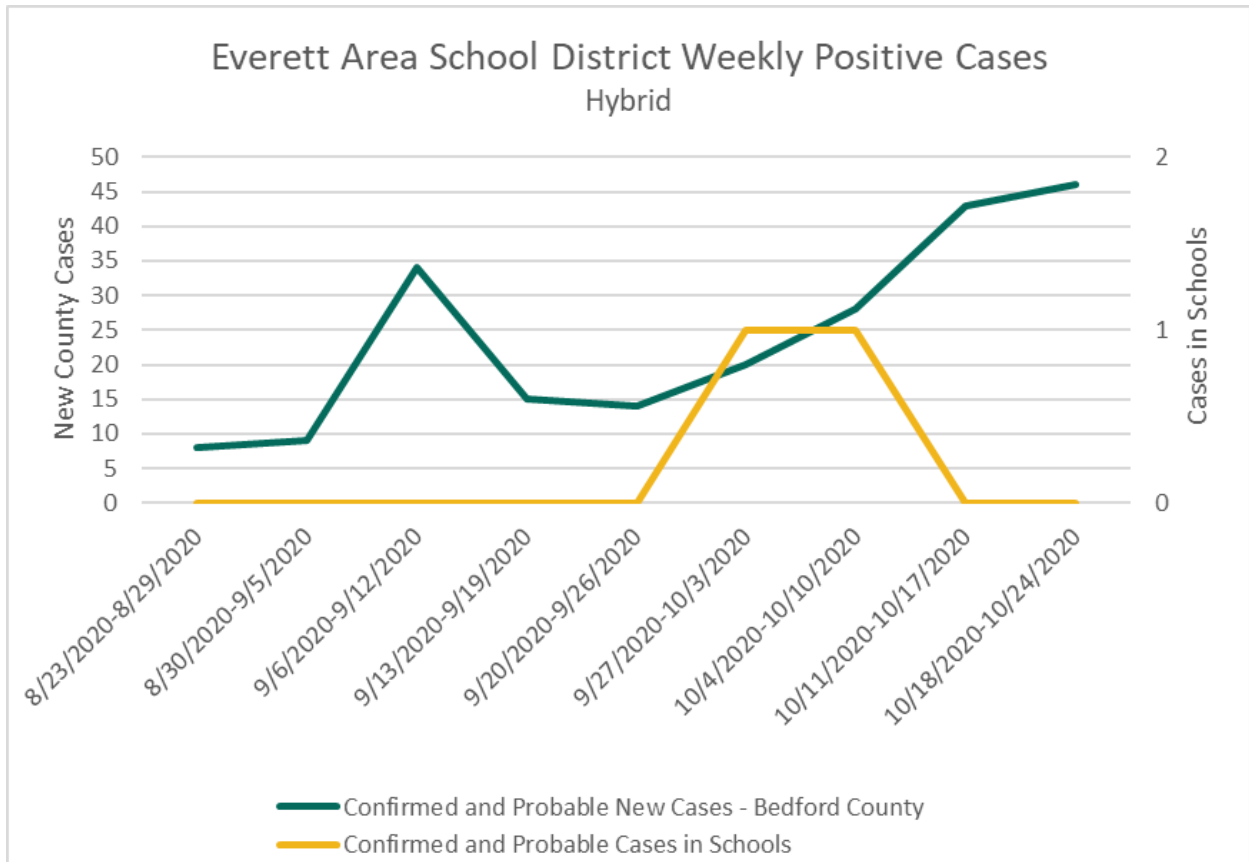
Chambersburg Area (Franklin County)



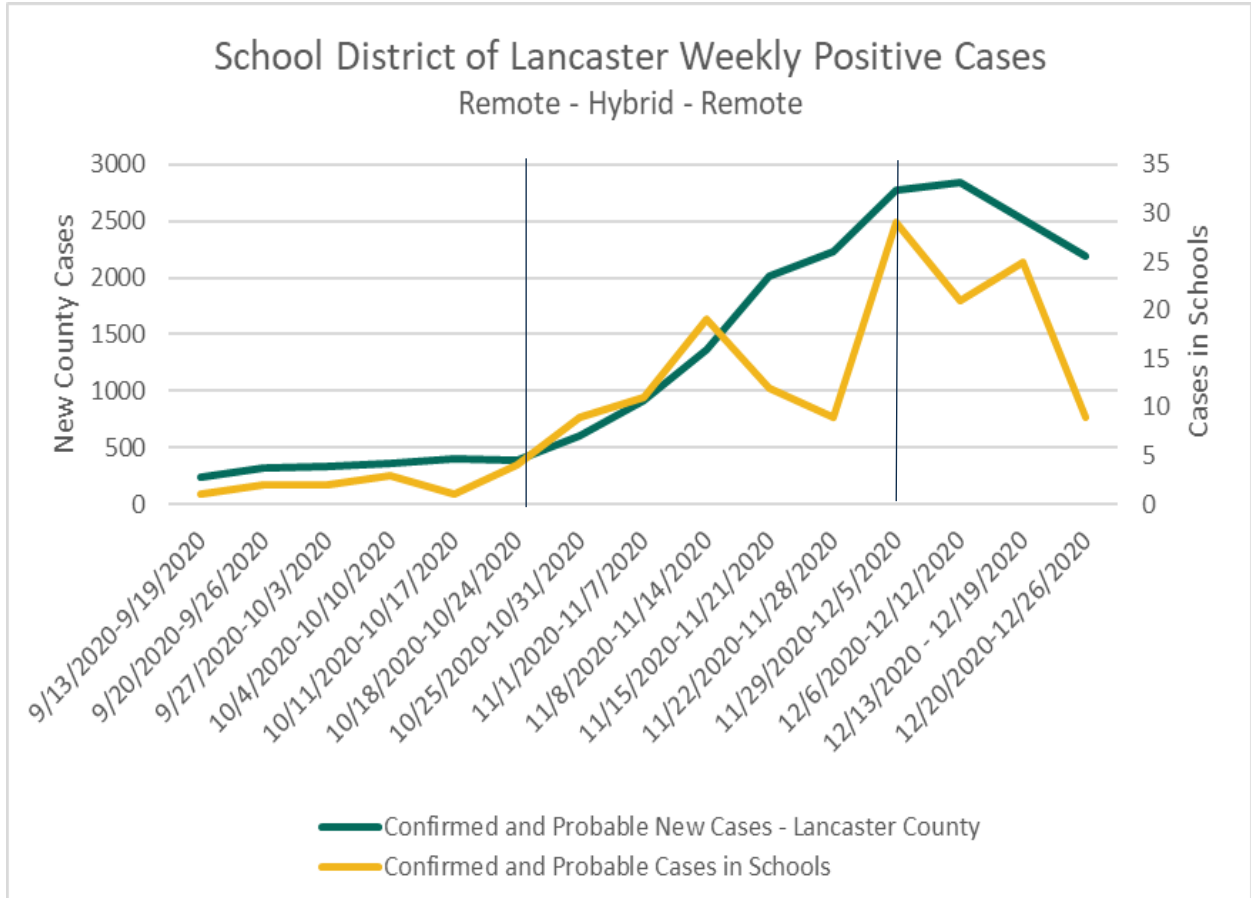
Easton Area (Northampton County)



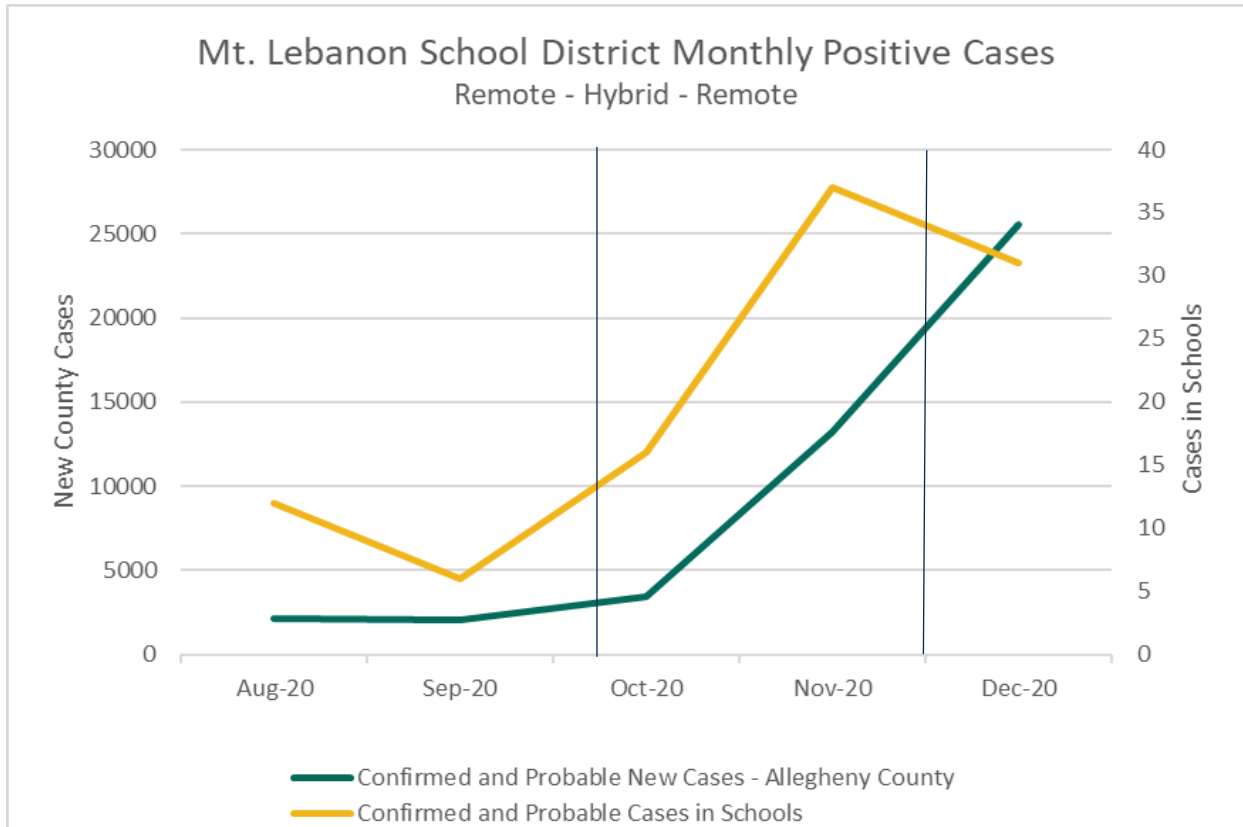
Everett Area (Bedford County)



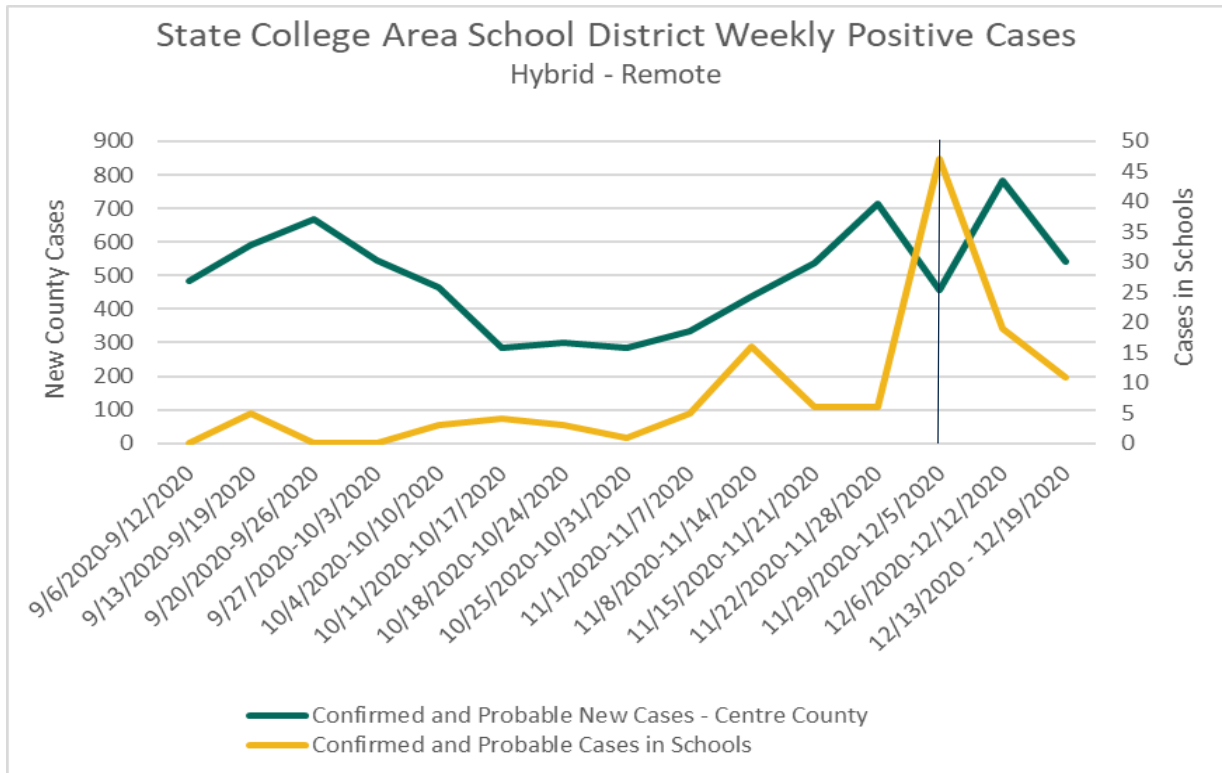
Lancaster (Lancaster County)



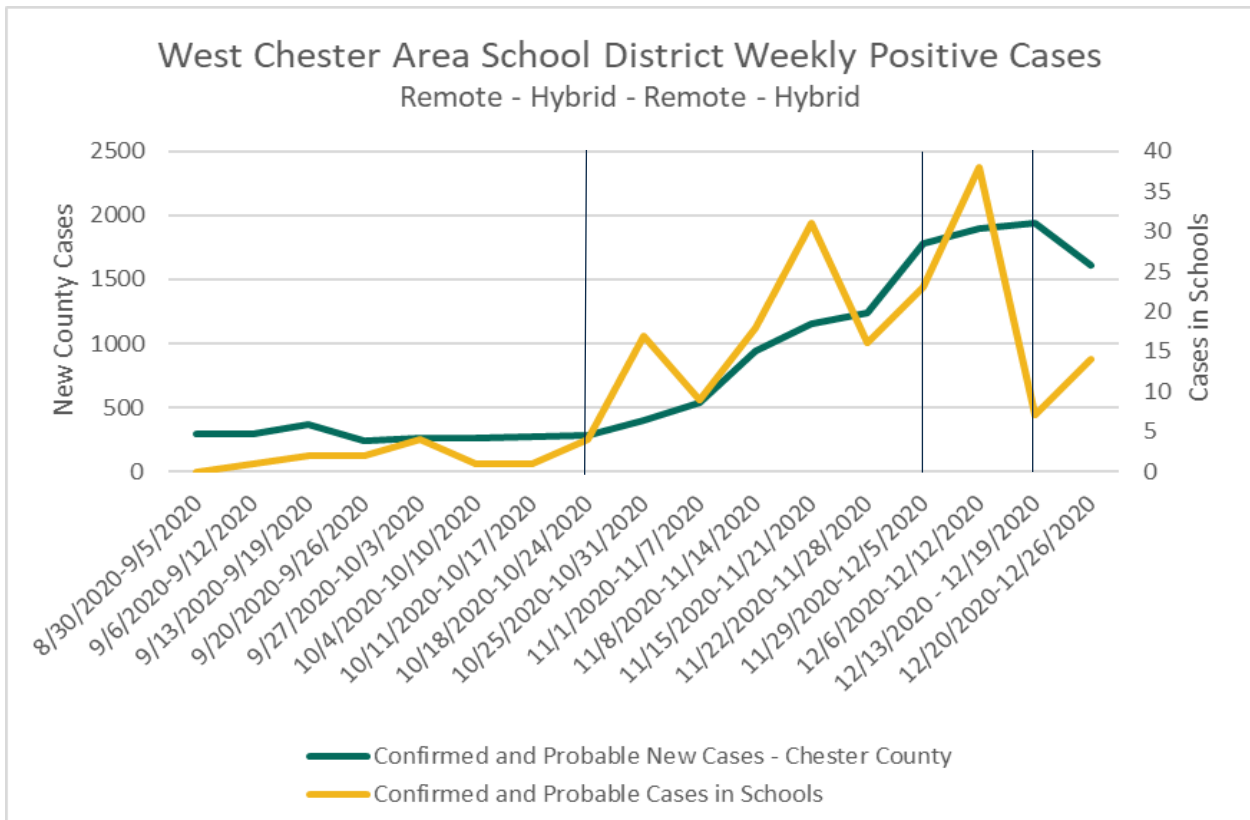
Mt. Lebanon (Allegheny County)



State College Area (Centre County)



West Chester Area (Chester and Delaware Counties)



References

- Gill, B., Goyal, R., Hartog, J., Hotchkiss, J., & DeLisle, D. (2020, June). *Considerations for Reopening Pennsylvania Schools*. Washington, DC: U.S. Department of Education, Regional Educational Laboratory Mid-Atlantic.
- Gill, B., Goyal, R., & Hotchkiss, J. (2020, September). *Operating Schools in a Pandemic: Predicted Effects of Opening, Quarantining, and Closing Strategies*. Princeton, NJ: Mathematica.

Data sources

- Chambersburg Area School District. Accessed December 31, 2020.
<https://www.casdonline.org/Page/18626>
- Easton Area School District. Accessed December 31, 2020.
<https://sites.google.com/eastonsd.org/covid-19-dashboard/home>
- Everett Area School District. Accessed December 31, 2020.
https://core-docs.s3.amazonaws.com/documents/asset/uploaded_file/981395/COVID_Data_Tracking_Week_8_10-19-2020_.pdf
- Mt. Lebanon School District. Accessed December 31, 2020.
<https://www.mtlsd.org/district/covid-19/covid-19-dashboard>
- Pennsylvania Department of Health. Accessed December 31, 2020.
<https://www.health.pa.gov/topics/disease/coronavirus/Pages/Cases.aspx>
- School District of Lancaster. Accessed December 31, 2020. <https://sdlancaster.org/back-to-school-plan/health-data-methodology/#dashboard>
- State College Area School District. Accessed December 31, 2020.
<https://www.scasd.org/Page/38689>
- West Chester Area School District. Accessed December 31, 2020.
<https://www.wcasd.net/Page/13104>