AIRPORTS COUNCIL INTERNATIONAL
EUROPE

ASSESSING AIRPORT PASSENGER TRAFFIC AND COVID-19 TEST POSITIVITY RATES IN EUROPE SINCE JULY

November 2020

This paper summarises the results of a statistical analysis of weekly airport traffic data and information on the rate of positive confirmed results for COVID-19 tests (COVID-19 positivity rate).

The assessment shows that there is no statistically significant relationship between air passengers and COVID-19 positivity rates in European countries during the months of July, August and September. This period was identified for analysis because it saw the highest numbers of passengers in European airports since the onset of COVID-19.

These findings hold true even when controlling for the effect of the stringency of government measures and for changes in mobility patterns.

AIRPORT PASSENGER DATA REJECTS RELATIONSHIP BETWEEN AIR TRAVEL AND INCREASING COVID-19 TRANSMISSION RATES

ACI EUROPE analysis finds that an increase in air passengers in a country has no statistically significant relationship with the COVID-19 test positivity rate, based on aviation, public health and community data. ACI EUROPE assessed the change in the rate of positive confirmed results for COVID-19 tests (COVID-19 positivity rate), depending on changes in volumes of passengers at airports in the same country, for countries in Europe. The time period considered spans July, August and September (weeks 27 – 44), the dates with the highest daily levels of airport traffic in Europe since April 2020. This period is when COVID-19 was already present in the population.

The finding that changes in air passengers has no relationship with the COVID-19 test positivity rate remains consistent when further controls are included in the statistical model. The model accounts for the impacts of government measures as well as movement of people. The only variable that was consistently statistically significant was the COVID-19 test positivity rate in the country in the previous week. This relationship is demonstrated in the two charts below. Chart 1 demonstrates the clear trend in the data revealing that COVID-19 rates are highly influenced by the level of rates in the previous week. Chart 2 does not reveal any clear trend at all – pointing to the lack of any correlation between increasing airport passengers and changes in the COVID-19 rate. This is further confirmed by the multi-variate panel regression analysis. Both variables were transformed by taking the logs of the values, which allows better visual inspection of the data and normalisation for analysis.

Chart 1 – Clear linear relationship between the COVID-19 test positivity rate and the rate in prior week

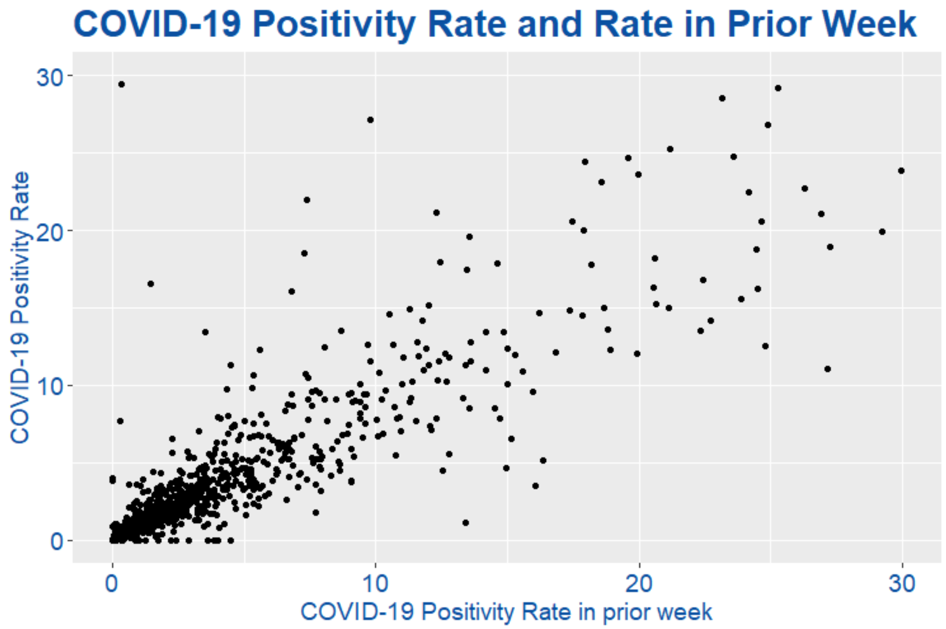
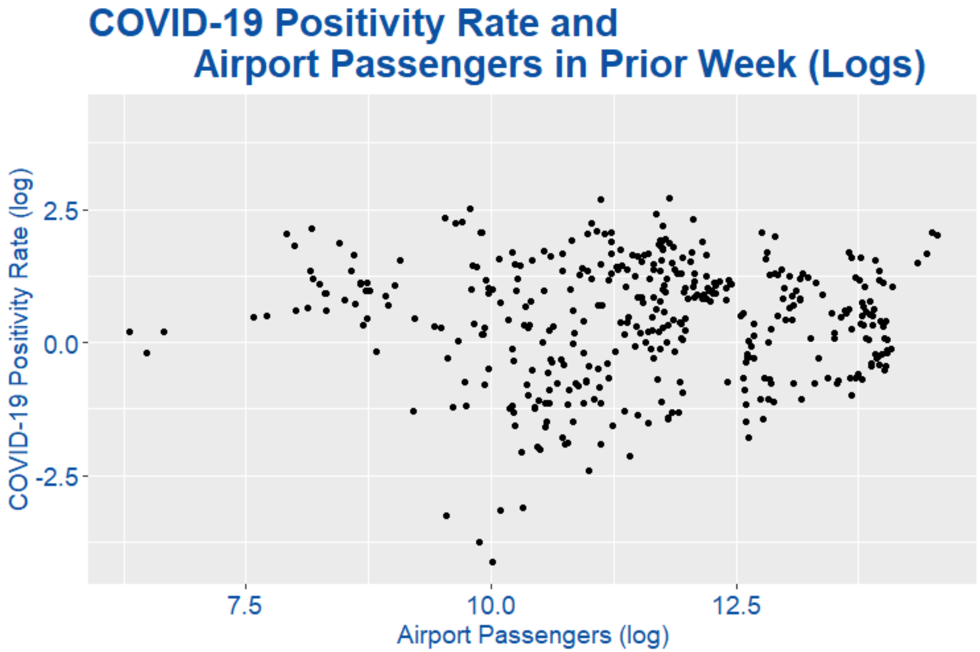


Chart 2 – No relationship between airport passengers a COVID-19 rate in a country



It is essential to note that this note does not suggest that aviation has no role in the transmission of viruses. Indeed, a substantial number of papers have documented how air travel at the initial stages of a novel virus have led to its transmission. This analysis aims to consider the role of air transport during a time period when the virus is already present in the population.

DISCUSSION OF THE MODELS AND VARIABLES

The most important variable correlated with changes in COVID-19 positivity rate is the positivity rate in the previous week. Every 10% increase in the positivity rate of COVID-19 tests in a country is correlated to an increase of approximately 7.1% to 9.5% in the COVID-19 test positivity rate in the following week, consistent across all the models. This is logical and in line with epidemiological information on virus transmission.

Model 1 ("Community-Rate") in the Annex which includes only the variable for the COVID-19 positive rate in the previous week shows that this variable is strongly significant.

An important factor in the conceptual framework is the level of government measures to restrict interaction and personal contact, as a way of limiting the transmission of the virus. The *University of Oxford Blavatnik School of Government* has put in place a sophisticated system to track the types of government measures put in place in a consistent manner for all countries over time.

Model 2 ("Stringency Measures") in the Annex results show that an increase in the overall Stringency Levels leads is related with a small decrease (-.4%) in positive tests the following week. It is unexpected to see that the level of the Stringency Index does not have a significant result in any of the models developed, indicating that government stringency measures on their own have little impact. This is an area for further research, beyond the scope of this analysis. One possibility is that the 'Stringency Index' could be seen as an ordinal variable, which is not conceptually related to actual impact on person-to-person interaction, while the next variable considered, from Google Mobility, provide a real measure of this.

Google has provided data on Community Mobility which measures time spent in a range of areas. The *Google Mobility data* covers the number of visitors at geographic locations identified as "Retail & Restaurants", "Grocery & Pharmacy", “Parks”, “Transit Stations”, “Workplaces”, and “Residential”. The first 4 indices account for presence at those geographic locations, while the second two measure time spent at the location. These variables, especially the first 4 indicators, have high levels of multi-collinearity, meaning that they influence the significance of the coefficients.

Therefore, the two variables with the lowest Variance inflation factor (VIF) were identified and retained for the model. These were the Retail Daily Index and the Workplaces Index. These variables have little collinearity and sufficiently capture the variance from the other mobility variables. Conceptually, they also capture two different types of person-to-person activities.

Model 3 (“Community Mobility”) includes these two variables and shows that adding these controls had no impact on the statistical significance of the Airport Passengers variable. The variable for time spent in workplaces is statistically significant with a positive coefficient, meaning that an increase in time spent in workplaces is associated with an increase in the positivity rate.

It is possible that the COVID-19 rate is impacted by airport passengers arriving 2 weeks before; as the incubation period can be 14 days. Therefore, **model 4** (“Airport Passengers 2-weeks before”) replace the independent variable of passengers at European airports 1 week before with passengers 2 weeks prior. This this has no noticeable change on the model.

Finally, the data was also assessed without controlling for time or country effects (“Pooled OLS”). The results of this model also support the overall analysis.

The results from these models show that air passengers are not a driver of COVID-19 positive test results. Other control variables, such as stringency measures or community mobility, are statistically associated with changes in the COVID-19 test positivity rate.

The regression results are presented in Annex 1. To ensure that outliers in the data did not overly influence the model results, the same regressions were performed with the outliers removed. This had a small impact on the coefficients and levels of statistical significance.

TRAVELLING SAFELY IS FIRST PRIORITY

COVID-19 has taken a toll on society with a great loss to many people. ACI EUROPE's members, our partners and the industry are committed to seeing renewal and revival of safe & healthy air travel. Public health measures have been put in place to limit, slow down or stop the spread of the virus. These measures have included restrictions on leaving home, closing of retail and commerce, closing of schools and workplaces, encouraging tele-work, and limiting travel. Some of the strongest restrictions have been place on air travel, with the implementation of quarantine measures for arriving air passengers serving as effective deterrents to travel.

ACI EUROPE considers that **any restriction should be based on a full consideration of the evidence available,** including the evidence submitted with this paper.

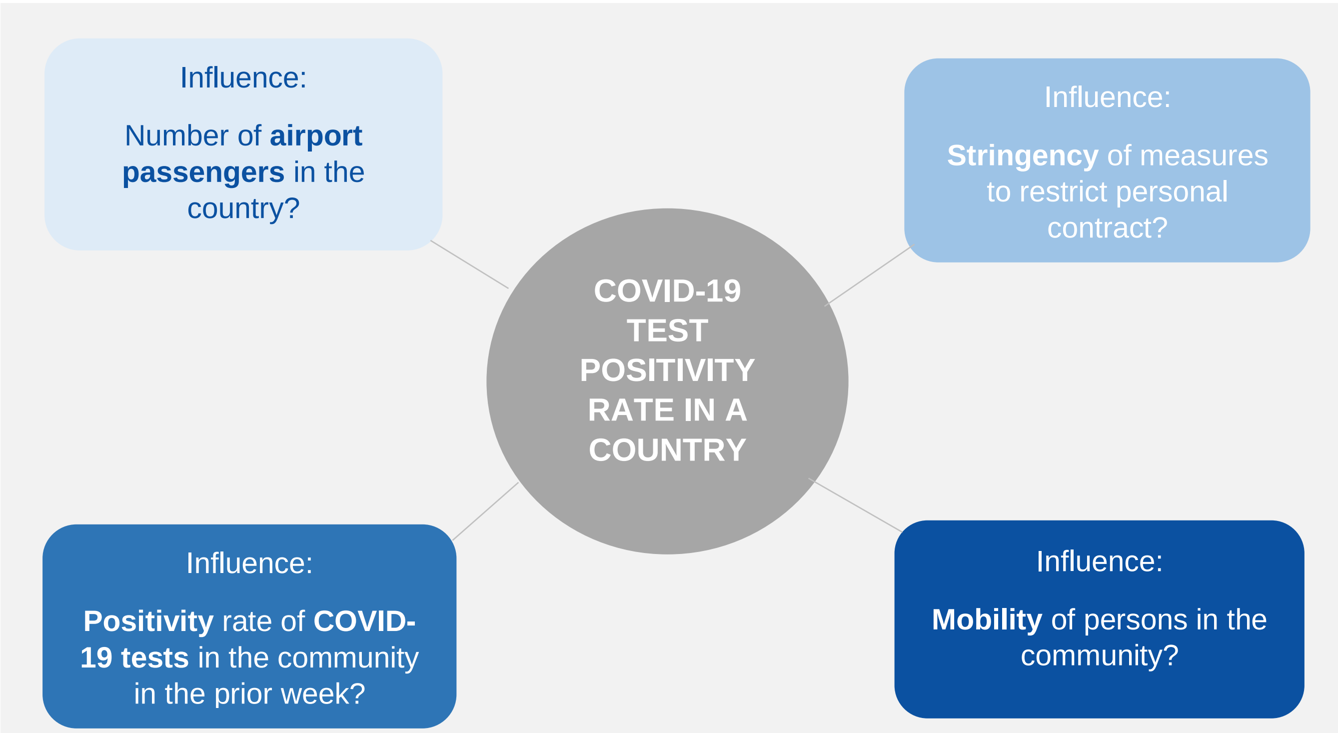
ACI EUROPE has argued that testing travellers can be considered as compatible and aligned with the common testing strategy proposed by the European Commission (EC) and endorsed by European Member States as regards asymptomatic people.

FURTHER INFORMATION ABOUT THE STATISTICAL MODEL AND DATA USED

The model depicted below aims to identify the relationship between air passengers and the COVID-19 test positivity rate in a country, during the summer months in Europe. In descriptive terms, the model assessed changes in the COVID-19 test positivity rate based on changes in air passengers in a *country* during a *certain week*, controlling for the COVID-19 test positivity rate in the prior week, the stringency of measures and changes in the movement of people, in the *same country* during the *same week*.

A fixed effects model regression was performed with a series of variables set out in the conceptual framework. The data for rate of positive COVID-19 tests and Airport Passengers were transformed by taking the natural logarithm, in order to normalise the skewed distribution resulting from the presence of large countries in the dataset.

Figure 1 – Variables Considered in the Model



Source: ACI EUROPE

The analysis shows that **an increase in passenger volumes at airports in a country is not correlated to any level of statistical significance with changes in the positivity rate of COVID-19 tests** in European countries. This result holds true for all controls applied in the model: rates of COVID-19 positive tests in the community during the prior week, stringency of government measures, and community mobility. Even if the variable for airport passengers had a statistically significant result, the influence on COVID-19 rates is very small. The coefficient for airport passengers in the prior week varies from -0.013 to 0.034 depending on the controls, again showing the lack of strong impact on the response variable (see Annex 1).

Data used

This assessment was greatly facilitated by valuable data sources made available publicly during the COVID-19 pandemic.

Response Variable

1. **COVID-19 situation**
   - **Weekly test positivity rates (%)**: Share of COVID-19 tests that have a positive result. As the results match the results of the rate variable, these are not presented. [Source: ECDC]

Explanatory variables

2. **Airport passengers at European Airports (ACI EUROPE)**
   - **Airport passengers**. Sum of arriving and departing passengers at an airport, aggregated at the country level. [Source: ACI EUROPE]

3. **COVID-19 positivity rate in prior week (ECDC)**
    - **This is the lagged (data from prior week) of the response variable, the weekly test positivity rates (%)**. A key part of the conceptual framework is that higher levels of confirmed COVID-19 cases in the community will lead to additional positive tests in the following week. Of course, auto-correlation of the variable with the response variable is a concern. This is addressed with the use of fixed effects to control for the week. The variance inflation factors for the lagged COVID-19 positivity rate variable is 7.67, below the level of 10 at which more investigation would be needed. [Source: ECDC COVID-19 data]

4. **Government public health measures (Oxford)**
    - The **level & changes** in the "stringency" of restrictions put in place by governments to control the transmission of the virus [Source: *Oxford COVID-19 Government Response Tracker*. The data is described on the University of Oxford Blavatnik School of Government site.]

5. **Community mobility (Google)**
    - Changes in mobility patterns [Source: Google Community Mobility data recording changes against a baseline over time of people in retail & recreation areas, grocery & pharmacy, transit, parks, and residential places and workplaces. The Google Mobility data is described in depth on the Google Community Mobility Reports site.]

Individual: The data above is available for 30 European countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

Time: The time period analysed spans weeks 27 to 44 (July to early October).

ANNEX 1 – REGRESSION RESULTS

The results below present the coefficients and the standard error for each model in the panel data regression. Based on diagnostics of the data, a fixed-effects regression model, controlling for effects of time and country, was used. The asterisk indicates if the variable is statistically significant, with the levels specified at the bottom of the table.

Table 1 - Impact of Airport Passengers on COVID-19 Test Positivity Rate

Dependent variable: COVID-19 Test Positivity Rate

	Community Rate (1)	Stringency Measures (2)	Community Mobility (3)	Airport passengers – 2 weeks before (4)	Pooled OLS (5)
Airport Pax prior week (log)	0.034 (0.060)	-0.013 (0.058)	0.048 (0.057)		-0.002 (0.010)
Airport Pax week-2 (log)				0.015 (0.051)	
COVID-19 positivity rate prior week (log)	0.718*** (0.030)	0.708*** (0.033)	0.939*** (0.022)	0.945*** (0.024)	0.952*** (0.014)
Retail-Mobility Index prior week			-0.004 (0.002)	-0.002 (0.002)	-0.003* (0.001)
Work Places - Mobility Index prior week			0.008***	0.008***	0.007***
Stringency Index prior week		-0.004 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.001 (0.001)
Constant					0.003 (0.197)
Fixed effects?	Yes	Yes	Yes	Yes	No
Observations	486	469	432	406	432
R2	0.575	0.556	0.881	0.886	0.936
Adjusted R2	0.530	0.508	0.872	0.877	0.935
F Statistic	296.619*** (df = 2; 439)	176.182*** (df = 3; 422)	595.344*** (df = 5; 401)	583.769*** (df = 5; 375)	1,247.411*** (df = 5; 426)
Note					*p<0.05; **p<0.01; ***p<0.001

Definitions and sources

Google LLC "Google COVID-19 Community Mobility Reports". https://www.google.com/covid19/mobility/ (Accessed: 11 November 2020)

Hale, Thomas, Noam Angrist, Emily Cameron-Blake, Laura Hallas, Beatriz Kira, Saptarshi Majumdar, Anna Petherick, Toby Phillips, Helen Tatlow, Samuel Webster (2020). Oxford COVID-19 Government Response Tracker, Blavatnik School of Government.

European Centre for Disease Prevention and Control. Data on 14-day notification rate of new COVID-19 cases and deaths & Data on testing for COVID-19 by week and country (Accessed: 11 November 2020).