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Transport Research Arena (TRA) Conference

# Public Transport Mobility and COVID-19 Health Crisis: What Changes in Students' Mobility Behaviors?

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## Abstract

Since 2020, the world has been affected by an important health crisis due to the COVID-19 virus, which has had significant impacts on the economic context of countries. This crisis particularly affects students in their daily lives: budget problems, loss of employment, deteriorated living conditions, disrupted teaching courses. Moreover, it also has strong consequences on the use of public transport in the world. This paper proposes an analysis of the disruptions in public transport mobility induced by the global health crisis among students. It shows that a preponderant proportion of students didn't changed their public transport mobility behavior. Amongst the students who have changed their behavior, some became users in 2021, others abandoned the use of public transport in 2021 and some oscillated between use and non-use. It also assesses if these are transitional or not.

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*Keywords:* students; mobility behaviors; public transport; health crisis

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## 1. Introduction and problematic

Students are in a pivotal period of their life cycle, at the interface between leaving secondary education and entering working life. Galland (1990) calls this transition "the new age of life", a life period between adolescence and adulthood. Access to higher education may lead them to obtain the driving license and/or to leave the family home. This profile of population would therefore be more inclined to modify their daily mobility behavior.

Literature on mobility of young people and students is rich. However, it mainly deals with analyses of daily mobility practices and is therefore the subject of writings in the professional press. Some research has focused on understanding mobility behaviors of students in certain geographical areas (Choplin et al. 2011), most of them deal with modelling approaches to understand their modal choices according to the main instrumental criteria of travel

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time and cost (Cattaneo et al. 2018, De Guzman et al. 2005, Toit 2013). This different work shows that the relationship between young people, students and the car has changed. While "students were considered as people concerned by car dependence" in the 1990s (Dupuy 1999), the situation has changed and we now talk about a break in the trends. Young people seem to take less the driving test, they do not have a car, they drive less. This phenomenon is not local but is noted in most OECD countries (Japan, United States, Sweden, Great Britain, Germany, United States, Australia, Canada, France, etc.) (Vincent et al. 2017). Therefore, today's students make greater use of public transport (PT), walking and cycling, even if there are strong inequalities in mobility (Choplin et al. 2011).

The world has been affected by a health crisis of considerable proportion since the beginning of 2020, which has had significant impacts on the economic context of countries. This crisis particularly affects students in their daily lives: budget problems, loss of employment, deteriorating living conditions, etc (Barthou et al. 2021, El Hadj et al. 2020). We more and more talk about the precariousness of students. Moreover, it also has strong consequences on PT use in the world, characterized by a significant drop in the PT. Several local studies (Beziat et al. 2021, Omnil 2021, Audab 2020) highlight the decline in PT mobility following the government measures of travels restrictions taken at the height of the epidemic waves.

This paper aims to focus on French students to evaluate the consequences of the crisis on their PT mobilities. How have students adapted their behavior in terms of PT mobility since the beginning of the crisis, particularly with a budget under severe constraints? How is the current relationship between young people and PT? Can we talk about a disaffection of PT among these students? Can the health crisis have a lasting effect on their PT mobility behavior? Could it trigger a new break in the trend in student mobility behavior? The contribution of this work consists in giving some elements of understanding about the behavioral reactions and perception of students with regard to the PT use. It also tries to measure if the potential changes may be lasting, leading them to favor active modes or even the car.

First, this paper presents the method used, especially the data collected and analyzed. Then, it discusses the PT mobility behaviors of students since the beginning of the health crisis. Finally, it concludes about the real impact of the epidemic factor on their PT mobility behaviors.

## 2. Methodology

The scope of the study concerns students living and studying in France. The analysis of the PT mobility of students is based on two data sources. On the one hand, we used the results of 13 household travel surveys (called EMC<sup>2</sup> surveys in France and based on the same methodology (Cerema 2020)), carried out in the main urban metropolises (except the Paris region), which concentrate 50% of French students (There are about 2.7 million students in France). These surveys were conducted during the 2010s. The household travel surveys are quantitative data collections on population travels on a given day, carried out within the perimeters of urban areas according to a standardized method. They allow us to draw up and estimate the characteristics of student mobility before the health crisis in France. The sample thus comprises almost 10,300 students surveyed. On the other hand, we carried out a quantitative on-line student survey during the period September 2021 to February 2022. It aimed to collect their PT mobility since the health crisis beginning and the perspectives of their use. The target group was young people who had experienced the health crisis as students from January 2020. Therefore, it corresponds to students with this status for the two academic years 2019/2020 and 2020/2021. They were asked about their PT use during three periods: January to March 2020 corresponding to a period prior to the first lockdown in France, January to March 2021 when the curfew was introduced and prior to the implementation of the 3rd lockdown and finally the period from April to June 2021 following the 3rd lockdown in France marked by the return of the curfew.

Mobilizing students is not easy in France as they do not lend themselves easily to surveys. Moreover, they were particularly solicited during the second semester of 2021 by multiple surveys related to the consequences of the health crisis. Following reminders sent out with the help of some universities and schools, 1,123 students completed the questionnaire in its entirety (it should be noted that this questionnaire was relatively long, at almost 5 pages). However, considering the target constraint mentioned above, the analysis sample is composed of 774 students (Fig. 1). We will not compare these data with the EMC<sup>2</sup> surveys' ones.

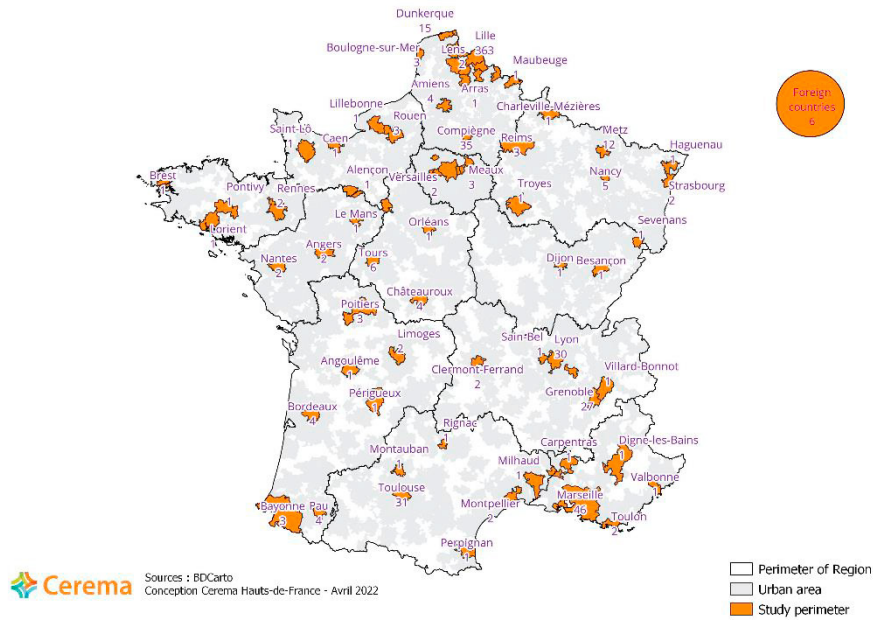


Fig. 1. Place of study of the students in the study sample of the online survey

### 3. Main results and discussion

#### 3.1. Public transport mobility of students before the COVID-19 epidemic

Before the start of the year 2020, which was marked by the appearance of the outbreak of the COVID-19 epidemic in France, students of the most student-centered conurbations made an average of 3.65 trips per day. About 7% of students didn't travel on the day before the survey.

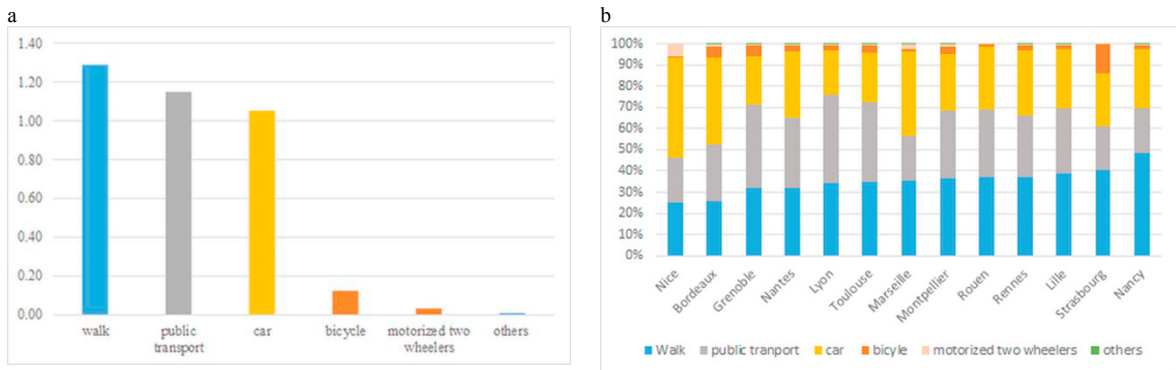


Fig. 2. (a) Number of daily trips by mode made by students; (b) Mobility by mode in the metropolitan areas studied – source: EMC<sup>2</sup>

Students were primarily walkers, with a proportion of 35.5% of their journeys made on foot. PT was their second most popular mode of transport, with a proportion of 31.5% of their journeys (Fig. 2a). The modal share of the car was 29%. However, there were some geographical disparities (Fig. 2b), which could be explained in particular by the geographical location of the campus facilities and the quality of the public transport services.

This hierarchy of the main modes used by French students is different according their age but not according the gender (Fig. 3a). Thus, the PT use decreases with age. The PT use for students under 25 years old is replaced by the use of the car. The car even becomes the primary mode of transport for students over 26 years old. These results are closely correlated with the possession of a driving license and the regular availability of a car. Thus, if the student has a driving license, the car becomes the first mode of travel, walking the second and PT the third, with a share of 26%. If the student has both a driving license and a car, the car is predominantly used, and the share of PT drops to 15%.

Almost one student in two uses PT to reach their place of study. However, the modal choice depends on the distance to be covered (Fig. 3b): walking is preferred for short trips (less than 1 km) but as soon as the distance between home and place of study is greater than 1 km, they chose public transport. In France, 1 in 5 students live in the immediate vicinity of their place of study (less than 1 km), 50% less than 3 km and 80% less than 10 km.

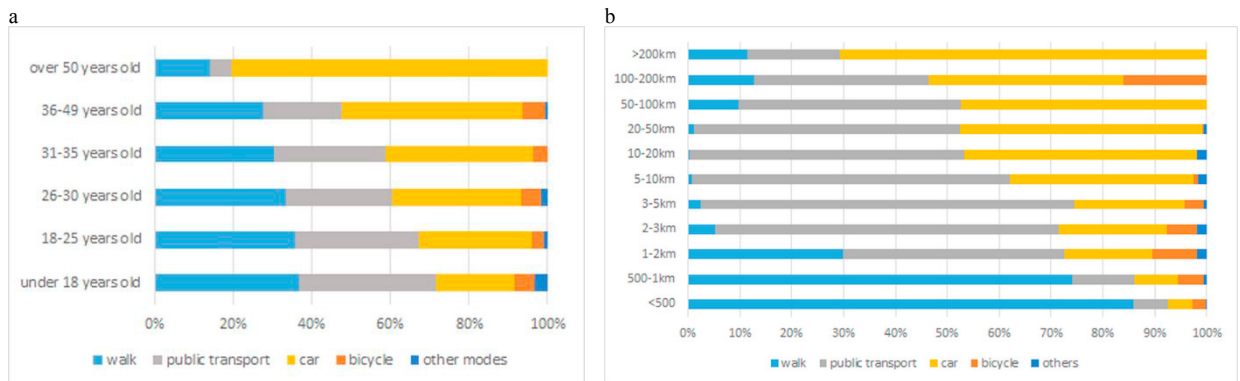


Fig. 3. (a) Mobility of students according their age; (b) Modes of transport according to the distance between place of residence and place of study

The number of daily trips made by PT by students was about 1.14, excluding students who never travel by PT (12% of the sample). Students used PT on a regular basis, with two-thirds of them using it several days a week. In particular, 77% of students who regularly used PT had a pass and 8% of them even had a free one. The main pattern for using PT was to get to the place of study (almost two-thirds of all PT journeys). Otherwise, students went shopping or to their leisure activities or to see friends on foot. More than one in two (57%) students who took PT had a driving license, but 68% of them didn't have a car. By definition, these were students in a situation of modal choice.

### 3.2. Has the health crisis changed Public Transport mobility practices of students?

#### 3.2.1. The mobility practices of students on the eve of the health crisis

The online survey allows us to analyze the PT mobility practices of students just before the onset of crisis. 68% of students actually used PT to travel, whether to get to their place of study or for any other reason during the period preceding the health crisis in France (January to March 2020). The frequency of use was regular for 68% of them. Knowledge of other mobility practices is not directly known from the specific survey conducted among students. However, we can estimate them by analyzing their declaration of the preferred modes of transport during this period. Two out of five students stated that they used only one transport mode: 41% of these students were exclusive PT users and 23% exclusive walkers. The others used several modes of transport, 75% of them using at least PT services. Overall, PT and walking were the two main modes of transport used in the period preceding the health crisis (Table 1), reflecting the main trends in student mobility practices in France in the years preceding the health crisis (see above).

Table 1. The modes preferred by students during the period January to March 2020

N=774	walk	public transport	car	bicycle	car-pooling	others
Proportion of occurrences	58.3%	61.2%	36.2%	16.7%	14.2%	2.6%

### 3.2.2. Less use of public transport from the beginning of 2021

83% of the students used PT at least once during the three periods analyzed. However, there is a change in the number of students travelling by PT in 2021, with the health crisis well underway. Thus, the proportion of students using PT goes from 68% to 63% during the period January to March 2021, which is characterized by a resumption of the epidemic in France, but it returns to its early 2020 level during the period April to June 2021 (Table 2).

This decline in the first months of 2021 is observed for both home-to-study trips and trips for other patterns. However, the volume of home-study trips remains below the level of early 2020.

Table 2. Proportion of students using public transport during the 3 periods analyzed

N=774	January/March 2020	January/March 2021	April/June 2021
Public transport users	67.7%	63.0%	67.0%
Home-study pattern	51.4%	43.0%	47.1%
Other patterns	51.3%	45.1%	53.6%

### 3.2.3. Almost 1 in 3 students have changed their public transport mobility practices since the health crisis

According to the survey, two out of three students report that they have not changed their PT use since the crisis began. On the one hand, there are students who didn't use PT at the beginning of 2020 (17%) and, on the other hand, those who used PT at the beginning of 2020 and have continued to use it since the health crisis beginning.

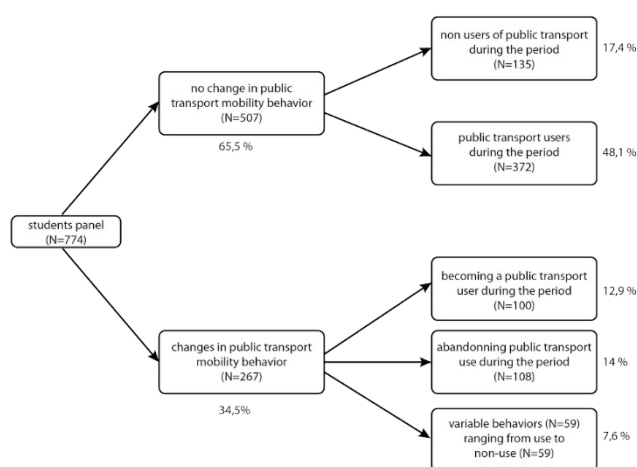


Fig. 4. Typology of public transport mobility behaviour of students since the beginning of the health crisis

Only 34.5% of students have changed their PT mobility behavior since 2020. Three profiles stand out (Fig. 4). The first profile corresponds to students who became PT users in 2021. The second one gathers students who abandoned PT use in 2021. Finally, the third group includes students who had varying behaviors over the periods, between using PT, abandoning and then returning to use, or between not use, use and no more use. In September 2021 corresponding to a new academic year, 25% of students using PT abandoned it (16% of the whole sample).

### 3.2.4. What changes in the use of public transport?

The survey makes it possible to assess whether there has been a change in the frequency of PT use for students who used it during at least one period studied. Overall, the frequency of PT use changed over the three periods studied (Table 3). Regular use decreased between the beginning of 2020 and the beginning of 2021, reflecting the impact of

the health crisis on mobility and in particular on the volume of travels. At the end of June 2021, we do not recover the level of regular users at the beginning of 2020. Changes in PT mobility behaviors are therefore emerging.

Considering the changes in the behavior of each student, 34% of the students who used PT at least during one period didn't change their use frequency: 42% of them continued to use PT regularly; the others used it occasionally. At the same time, 31% of the students who used PT decreased their intensity of use over the three periods, with almost one student in two having to abandon PT. Finally, almost one in five students stated that they increased their frequency. 63% of these students are students who didn't use PT in 2020 and who were led to travel by PT during the year 2021.

Table 3. Public transport frequency for the three periods analyzed

N=774	January/March 2020	January/March 2021	April/June 2021
Regular use	46.3%	27.0%	33.3%
Occasional use	27.9%	40.3%	38.8%
No-use	25.8%	32.7%	27.9%

The reasons for these changes may be analyzed from three specific questions in the survey. The first approach is based on the perception of modes of transport. The survey offers us to analyze the modes said to be preferred by students and the modes avoided. The overall analysis of the modes preferred by students in 2021 doesn't reflect the individual behavior of each of them, but it highlights the disaffection of certain modes during the hard times of the health crisis, such as January 2021, like PT and carpooling. Students therefore sought to some extent to avoid PT systems in favor of individual modes. This is confirmed by the results based on the declaration of the avoided modes. More than one in two students report that, despite the health crisis that was still raging in the country in 2021, they didn't seek to avoid certain modes of transport. For the others, the mode most often avoided is PT as a whole (Table 4). Car-pooling is the second most cited mode of transport avoided. This overall trend doesn't change with the profile of student behavior over the three periods. Similarly, the cross-tabulation between the preferred mode in 2021 and the mode avoided in 2021 doesn't show any significant difference by profile.

Table 4. Occurrences of avoided modes (proportion)

N=360	bicycle	urban public transport	regional trains	long-distance trains	car	car-pooling	others
Occurrence	3.3%	75.8%	23.6%	19.7%	9.4%	47.9%	14.2%

The second approach is based on their own assessment of the evolution of their PT use, whether they are users or not. It shows that one of the main reasons explaining the changes in PT use is that the crisis has led to fewer journeys to the place of study because of the switch to distance learning (Table 5). The possible fear of using PT linked to the virus is part of the panel of reasons underlined, but appears as the sixth reason cited, with 24% of students having mentioned it among their three major reasons.

The third approach focuses on students who stopped using PT during the year 2021, either during one or two of the periods relating to that year. One student could give several reasons, but in general, they gave at most two reasons. The most frequently cited reason relates to the use of other modes. Admittedly, this is a reason, but it doesn't directly explain why they didn't use public transport anymore. However, if we consider the second most frequently cited argument, we can say that the abandonment of PT is essentially the result of the consequences of the implementation of distance learning courses and examinations, which led to a significant reduction in the number of journeys between home and school. Fear of the health crisis was only cited by 15% of students who didn't use anymore PT.

Table 5. Main reasons declared by students to explain their change in use of public transport

N=774	Less travel to study place	No fear of contamination risk	Priority to walking	No alternative to PT use	PT price expensive	Fear of the health crisis	Modal change (personal choice)	Preference for cycling	Others
occurrences	52.8%	36.8%	36.7%	34.9%	26.1%	24.3%	18.0%	16.5%	17.2%



### 3.3. What perspective of public transport use in 2022?

Our survey asked students about their perspective on PT use during the new academic year starting in September 2021 in France. The results show that 55% of the students expressed their intention to use PT during the new academic year. This rate is lower than that observed during each of the three periods analyzed, which suggests significant changes in mobility behavior. However, among the sample, the weight of students who have reached the study level corresponding to 5 years of study after obtaining the baccalaureate is particularly high (29%). These students may correspond to individuals who will experience an important change in their life cycle by looking for or holding a job.

The cross-reference with our typology of public transport use (see Fig. 4) shows a variation in this average rate of intention to use PT. Thus, among the students who didn't change their PT mobility behavior during all the periods, 28% of the non-users declare to be ready to use PT (Table 6). Conversely, 67% of PT users who remained users throughout the period studied intend to continue using it. For students who changed their PT mobility practices, the situation is also different according to their profile. Those who became users in 2021 are 60% ready to continue this use. Conversely, 44% of those who gave up in 2021 said they would use PT again in 2022. Finally, more than one in two of those who oscillated between using PT and not using it during the three periods intend to use it.

Table 6. Number of students according to their intention of transport public use

N=774	No PT users in 2020 and 2021	PT Users in 2020 and 2021	Becoming PT users in 2021	Abandonment of PT in 2021	Between use and abandonment in 2020 and 2021	No opinion or no answer
Intention of use in 2022	38	248	60	48	33	44

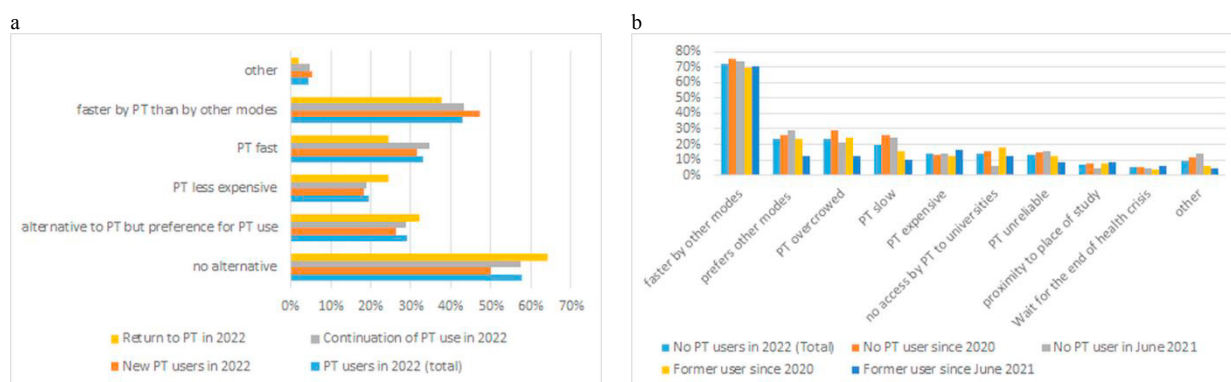


Fig. 5. (a) Main reasons explaining the intention of PT use in 2022; (b) Main reasons explaining the intention of no PT use in 2022

These declared intentions therefore underline that 63% of the sample students will not change their PT mobility practices (whether they use it or not). In June 2021, 65% of students using PT will continue to do so. 13% of students who will change their practices in 2022 after being no users in June 2021 declare they will use PT in 2022.

Whatever the profile of the students, the main reason for intending to use PT is the lack of an alternative to PT use (Fig. 5a). The performance offered by PT is highlighted as the second reason (speed, efficiency than other modes). Finally, the price criterion is cited by 20% of students who will use PT in 2022. This hierarchy of reasons remains similar according to the profile of users for 2022. For the 39% of students who declared their intention not to use PT in 2022, the main reason relates to their judgement of a lack of performance of PT (Fig. 5b): they consider that the other modes available to them will enable them to travel more quickly. Besides, they say that PT is overcrowded. The price criterion doesn't appear to be one of the reasons strongly cited. Finally, the health crisis is not a major criterion explaining their position, since it is cited by only 5% of students who do not plan to use PT.



#### 4. Conclusion

This paper proposes an analysis of the disruptions in PT mobility induced by the global health crisis among students after a two-year period. It shows that a preponderant proportion of students have not changed their mobility behavior by PT: 48% have continued to use them and 17% have continued not to use it. Amongst the students who have changed their behavior, three profiles have been identified: becoming users in 2021, abandoning the use of public transport in 2021 and a variable behavior over the three periods, oscillating between use and non-use. According to the students, the main reason explaining these behaviors relates to the management of the health measures of the crisis, especially the consequences of the switching of all courses and exams to distance learning, in particular during the main epidemic waves. The fear linked to the health crisis remains a less influential factor. The intentions of PT use show that almost one in two students intend to use PT, mainly because this is the only mobility service available to them to get to their place of study. The continuation of the health crisis has very little influence on their intentions.

It is currently difficult to conclude if these behaviors after two years of crisis are similar to the rest of the population. Indeed, most of scientific work is mainly carried out on the year 2020, corresponding to a major disruption in the lives of French people, as well as other nationalities. Based on the mobility behaviors revealed in the heat of the moment, confronted with the unknown nature of the virus, they highlight the intention of almost one in three public transport users to change modes after the first lockdown (UTP, 2020). In the Lyon region, the investigation has shown that the proportion of students who used public transport and stopped using it after June 2020 is similar to that observed for retired people but higher than the one of working people (Beziat et al. 2021).

This subject of the impact of the health crisis on public transport mobility is a central topic in the academic world. It aims to understand whether this crisis and its consequences (changes in lifestyle, in consumption pattern, teleworking) can be the cause of a break in the PT mobility behaviors observed. Moreover, it will help to draw the perspectives of the financial challenges related to public transport financing. It has already mobilized researchers on the very short-term effects, with an abundance of academic productions related to the first period of the crisis. However, considering that sustainable mobility changes are observed over the long term, a great deal of work should continue and explore the differences in behaviors adopted by people according to place, profiles or gender.

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