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Impact of the Covid-19 Pandemic on Changing Communication Behavior of Students

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Abstract: The goal of this article is to assess the views of university students on their mobility in the context of the COVID-19 pandemic. To achieve this goal, a survey was conducted to analyze changes in student mobility patterns before and during the pandemic. The research was conducted in March 2021, during the pandemic, and for its purpose, information was collected on various aspects of student mobility, including the form of study, destination, mode of transportation, and shopping location. The sample group consisted of university students from different backgrounds, and various features, including age, gender, residence, and driver's license status, were considered. In addition, the study examined the impact of COVID-19 on student mobility. The study found that the pandemic has significantly affected student mobility, with a shift towards remote or hybrid learning and preference for cars, bicycles, and walking over public transportation in bigger towns while in smaller towns and rural areas, student mobility behavior has remained relatively unchanged.

Keywords: Students mobility, Covid-19, pandemic, transportation

1. Introduction

The development of civilization and the accelerating rate of motorization (as shown in Fig. 1) have been increasing the number of individuals using their own vehicles to reach their destinations, primarily for work and school. Over the past decade, the number of cars has doubled. Rapid transportation is crucial for individuals to move quickly from one place to another. Efficient transportation depends on many various factors [1].

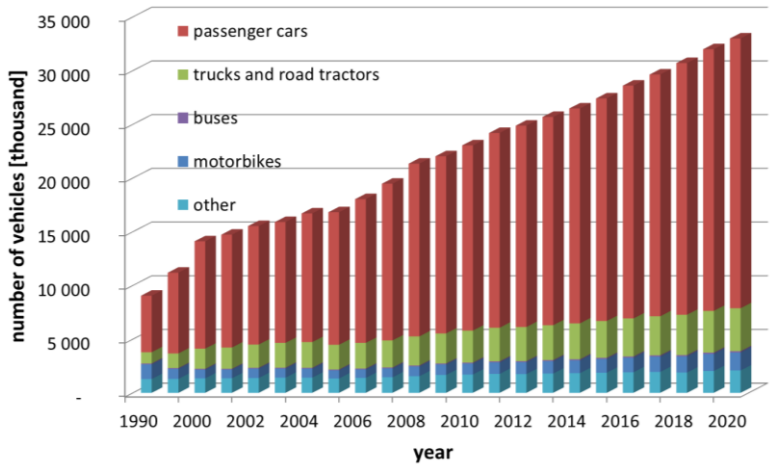


Fig. 1 Number of registered vehicles in Poland. Source: [2]

The effectiveness of users' transportation depends on their activity level, which includes their occupational, existential, social, physical, and other activities. The activity of urban residents is partly given by the size of the city. Urban residents engage in a variety of activities that affect their mobility patterns [3-7]. In Poland, the emergence of COVID-19 cases in March 2020, in addition to the activities mentioned above, has significantly changed the mobility of Polish residents. Currently, the number of COVID-19 cases is growing steadily, with nearly 1.2 million cases and about 26,000 deaths registered to date (as shown in Figure 2).

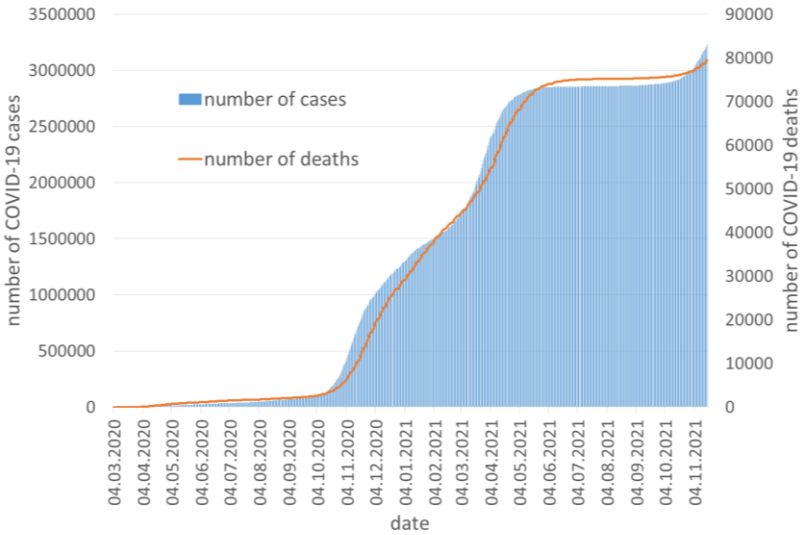


Fig. 2 Number of cases, deaths by COVID-19 in Poland. Source: [2]

According to [1], COVID-19 is an infectious disease, and was declared a global pandemic by the World Health Organization in 2020 [2]. The impacts of the pandemic, including social and economic impacts, are similar to the impacts of the Spanish Flu of 1918 and comparable to the Great Depression (1929-1933) [8]. COVID-19 has led to financial stability problems in many countries around the world, causing a decline in economic activity. To control the spread of COVID-19, unprecedented measures, including restrictions on movement, travel, and other

activities, were introduced worldwide [9,10], affecting about 90 % of the population. The introduced measures included working from home, restricted mobility, remote learning, closure of institutions, or restrictions imposed on public transport [11]. Various studies [12,13] have highlighted the relationship between people's mobility and government measures adopted to control the spread of the COVID-19 pandemic. Mobility restrictions have been implemented differently among country [14-17]. Schlosser et al [18] stated that travel restriction reduced the incidence of COVID-19. The definition of mobility varies among authors. According to Szoltysek [19], mobility refers to daily and routine movements and activities that result from the rearrangement of personal life, related to work and place of residence. These are all activities related to the use of means of transportation outside the place of residence [20]. The authors of the publication define mobility as the daily and routine movement of residents dependent on their livelihood. This definition is used throughout the article.

2. Data and Methods

The goal of the article is to analyze the impact of COVID-19 on student mobility and provide insight into potential future changes. To address the current pandemic situation, a survey was conducted among Polish university students in March 2021. The study was conducted as a survey preceded by a pilot study. The survey was then made available online. The questionnaire contained 23 close-ended questions and covered a variety of topics, such as gender, age, place of residence, study program, and mode of study. The questionnaire focused primarily on students' travel behavior before and during the pandemic, including destination, mode of transportation, travel distance, duration, and shopping habits. Respondents were asked to analyze how the pandemic affected their travel plans and whether they plan to change their behavior if the pandemic continues. At the end of the survey, participants could express their opinion on mobility during the pandemic. To ensure accuracy, only fully completed questionnaires were considered, and the results were analyzed using graphs and appropriate correlations. Finally, appropriate conclusions were drawn on the basis of the results obtained.

3. Results

The subject of the survey was Polish university students divided by gender, place of residence, estimated population of the area the students were living in, and mode of study (face-to-face, remote learning, hybrid. Out of the 3,585 students surveyed, only 1,009 questionnaires were deemed suitable for further analysis as they had been completed correctly. The survey thus considered the responses from 641 women (64 %) and 368 men. Most respondents (89 %) were under the age of 35. This is due to the specifics of the survey and the target group. Most

respondents lived in rural areas (52 %), compared to 48 % of the respondents living in urban areas. The participants in the survey were asked to provide an estimate of the population size of their community. According to the responses, the majority of the respondents (48 %) reported living in localities with a population of below 5,000 people. 23 % of respondents were living in localities with 5 - 25 thousand residents. The large percentage of respondents who reported living in the smallest localities is because the survey was made available through the portals of municipalities across the country. Nearly 92 % of the respondents, regardless of their gender, had a driver's license (Table 1).

Table 1 Structure of respondents. Source: authors

Category		number	%	Woman		Man	
				number	%	number	%
Gender	**Female**	**641**	63.53	-	-	-	-
	Male	**368**	36.47	-	-	-	-
Age	**under 20 years old**	**31**	3.07	**19**	2.96	**12**	3.26
	20 years	**169**	16.75	**115**	17.94	**54**	14.67
	21 years	**189**	18.73	**130**	20.28	**59**	16.03
	22 years	**152**	15.06	**99**	15.44	**53**	14.40
	23 years	**143**	14.17	**80**	12.48	**63**	17.12
	24 years	**86**	8.52	**56**	8.74	**30**	8.15
	25-35 years	**160**	15.86	**88**	13.73	**72**	19.57
	36-45 years	**51**	5.05	**36**	5.62	**15**	4.08
	46-55 years old	**23**	2.28	**16**	2.50	**7**	1.90
	over 55 years old	**5**	0.50	**2**	0.31	**3**	0.82
Place of residence	**urban area**	**481**	47.67	**281**	43.84	**200**	54.35
	rural area	**528**	52.33	**360**	56.16	**168**	45.65
Population	**up to 5000**	**487**	48.27	**318**	49.61	**169**	45.92
	5000-25000	**231**	22.89	**165**	25.74	**66**	17.93
	25001-50000	**97**	9.61	**66**	10.30	**31**	8.42
	50001-100000	**164**	16.25	**77**	12.01	**87**	23.64
	above 100,000	**30**	2.97	**15**	2.34	**15**	4.08
Driver´s license	**Yes**	**923**	91.48	**585**	91.26	**338**	91.85
	No	**86**	8.52	**56**	8.74	**30**	8.15

As for the fields of study, the survey included students with a broad range of majors with 43 fields. Philology and Nursing turned out to be the most popular majors, accounting for nearly 10 % of the respondents each. Conversely, there was only one respondent studying Forensic Science with Criminology, Midwifery, and Management and Command each. The survey showed that women were more likely to study Nursing and Finance and Accounting, while men preferred Computer Science and Mechanical Engineering and Mechanics.

The survey then delved into respondents' year of study, mode of study, and how they adapted to remote learning during the pandemic. The findings suggest that the majority of respondents were full-time undergraduate students in their first or second year, with remote classes becoming the standard during the pandemic. The percentage share of women and men stating this response was almost equal, with men mostly studying in their first and third year.

The questionnaire included 23 questions. In the first question of the questionnaire, the respondents were asked to identify the purpose of their daily trips before and after the pandemic. The respondents could choose from seven responses indicating the importance of the purpose of the trips. They were asked to rank their transportation choices from 1 to 6, with 1 being the most frequent and 6 being the rarest. Before the pandemic, the highest-rated purpose of travelling for students was school, followed by social gatherings, work and finally doctor´s visits. In contrast, a different pattern was recorded during the pandemic, with work being rated as the most common goal or purpose of travelling, followed by social gatherings and shopping, and finally doctor´s visits. These results are consistent with earlier questions about the mode of learning, where the pandemic changed the purpose of students' daily travel due to the preference or necessity of remote learning. As for gender, for women, the primary reason for travelling before the pandemic was school (61 %), while during the pandemic, it was family (32 %). In contrast, for men, the primary reason for travelling was school before the pandemic (48 %) and work during the pandemic (41%). This trend was supported by the fact that students had switched to remote learning.

The respondents were also questioned about the preferred mode of transportation. As in the previous question, they were asked to rate their selected means of transport on a scale from 1 to 6, with 1 being the most frequent and 6 being the least common. Prior to the pandemic, the preferred modes of transport by the respondents were primarily cars and walking; during the pandemic, this remained relatively unchanged, with even more respondents opting for cars and walking. However, it should be noted that whenever possible, the respondents opted for avoiding public transportation. These results mainly relate to basic human activities, such as school, work, and shopping.

Prior to the pandemic, cars were the primary mode of transportation for 72 % of both male and female respondents. During the pandemic, cars remained the top choice for women, with a slightly increased percentage of 76 %, while for men, it increased to 75 %. These findings support the notion that students tended to favor the use of private vehicles over public transportation.

In the next question, respondents were asked to specify the distance between their place of residence and their destination before and during the pandemic. Before the pandemic, the majority of respondents (45.39 % men and 38.75 % women) reported that the primary and secondary destinations were more than 20 kilometers away. After the outbreak of the pandemic, this situation did not change - the majority of the respondents continued to indicate a distance of more than 20 kilometers for both primary and secondary destinations.

In the next question, the respondents were asked to estimate the duration of their travel. The changes caused by the pandemic were small, as the students declared spending 15 to 30 minutes commuting before and during the pandemic, and only a tiny number of respondents reported travel times longer than 2 hours. This question follows on from the previous question.

Another question inquired about where respondents shopped before and during the pandemic. Before the pandemic, large stores such as supermarkets and hypermarkets were the most popular places to shop, followed by neighborhood stores. After the pandemic, the respondents mostly shopped at supermarkets, hypermarkets, and online. The pandemic thus led to an increase in online shopping to avoid physical contact with other people.

Before and amidst the pandemic, women primarily shopped in superstores and hypermarkets, but this percentage decreased from 59 % to 47 % during the pandemic. Conversely, the proportion of female students who preferred online shopping surged by nearly 20 % during the pandemic. The situation is comparable for men, who mostly shopped in superstores and hypermarkets, but this rate decreased by 10 % during the pandemic, in favor of online purchases. These trends confirm students' fears regarding the possibility of contracting COVID-19.

The survey also included questions on potential changes in communication habits in case the pandemic continues. Most respondents (nearly 77 %) stated that they would not change their habits, probably due to the convenience, safety, isolation from others travelling by car enables, or due to lack of public transport in rural areas. However, some respondents have already altered their mode of transportation due to health concerns, shifting from public transportation to cars, bicycles, or walking. This is particularly evident in large cities where parking is limited and public transportation is a necessity for many. Furthermore, about 9 % of the respondents stated that they would adjust their mobility behavior if the pandemic continues, depending on the situation. Gender did not appear to play a significant role in these responses (see Table 2).

Table 2 Changing habits of students. Source: authors

Category	Number	%	Woman		Man	
			Number	%	Number	%
Yes	**37**	3.67	**23**	3.59	**14**	3.80
rather yes	**55**	5.45	**33**	5.15	**22**	5.98
I do not know	**144**	14.27	**100**	15.60	**44**	11.96
probably not	**337**	33.40	**213**	33.23	**124**	33.70
no	**436**	43.21	**272**	42.43	**164**	44.57

4. Discussion

The survey also focused on the issue of the impact of the pandemic on their mobility. The majority of respondents reported a significant impact, with a noticeable decrease in the number of public transportation passengers. Many respondents had switched to using cars, bicycles or walking due to the increased concerns about passenger safety and due to the introduction of bus seat limits or closure of some lines. These observations are consistent with the authors' own observations on public transportation.

Due to remote work and study, closure of cultural institutions and restaurants, and limited social visits and travel, the respondents reduced their mobility to a minimum, with less frequent shopping trips. The initial phase of the pandemic saw a virtual halt in air travel around the world, resulting in a significant decline in tourism and business traffic worldwide.

The study also found that mobility was also influenced by the place of residence. In villages, where cars are the main mode of transport, the impact was minimal, while in cities, residents reported a more significant impact. The survey data also allowed for a correlation between respondents' gender and various demographic factors, including the size of the locality in which they reside, age range, year of study, form of study, type of study, and mode of study. In the case analyzed, variance was recorded in the following criteria: age range, place of residence, number of residents, year of study, form of study, type of study, and mode of study.

5. Conclusion

Student mobility, especially mobility of students from urban areas, changed during the COVID-19 pandemic. With the onset of the COVID-19 pandemic, student mobility decreased significantly. According to the data obtained through the questionnaire survey, most respondents preferred cars as their primary means of transportation, while others chose active lifestyle such as cycling or walking to avoid public transport for safety reasons. During the pandemic, students shifted their focus from university and studies to work and family, with many of them contributing to the household budget by studying remotely and working. Even during the pandemic, the car remained the primary means of transportation for most respondents. However, some of the respondents who had used public transportation before the pandemic then shifted to use bicycles or walk whenever possible [37]. In contrast, in the case of residents in smaller towns and rural areas, there were no significant changes in their transportation behavior since intercity public transportation is limited, and even in the past they mostly relied on their cars. These findings are supported by survey results indicating a preference for private transportation over public transportation. In the future, it would be beneficial to conduct further research on the relationship between students' transportation behavior and their financial situation, which is becoming a fundamental problem, especially for low-income groups, due to the ongoing global economic crisis.

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References

[1] Andersen, K., Rambaut, A., Lipkin, W.I., Holmes, E. & Garry, R. (2020). The proximal origin of SARS-CoV-2. Nature Medicine 26(4), 450-452. DOI: 10.1038/s41591-020-0820-9.

[2] Maier, B.F. & Brockmann, D. (2020). Effective Containment Explains Subexponential Growth in Recent Confirmed COVID-19 Cases in China. Science 368(6492), 742-746. DOI: 10.1126/science.abb4557.

[3] Möllers, A., Specht, S. & Wessel, J. (2022). The impact of the covid-19 pandemic and government intervention on active mobility. Transportation Research Part A: Policy and Practice 165, 356-375. DOI: 10.1016/j.tra.2022.09.007.

[4] Kurita, K., Katafuchi, Y. & Managi, S. (2023). COVID-19, stigma, and habituation: Evidence from mobility data. BMC Public Health 23(98). DOI: 10.1186/s12889-023-14980-w.

[5] Lara, D.V.R., Pfaffenbichler, P. & Rodrigues da Silva, A.N. (2023). Modeling the resilience of urban mobility when exposed to the COVID-19 pandemic: A qualitative system dynamics approach. Sustainable Cities and Society 91, 104411. DOI: 10.1016/j.scs.2023.104411.

[6] Hintermann, B., Schoeman, B., Molloy, J., Schatzmann, T., Tchervenkov, C. & Axhausen, K.W. (2023). The impact of COVID-19 on mobility choices in Switzerland. Transportation Research Part A: Policy and Practice 169,103582. DOI: 10.1016/j.tra.2023.103582.

[7] Wińska, M. & Gzik, A. (2019). Determining the level of satisfaction among users of public transport in Lublin. The Archives of Automotive Engineering – Archiwum Motoryzacji 85(3), 19-39. DOI: 10.14669/AM.VOL85.ART2.

[8] Jurkovic, M., Gorzelanczyk, P., Kalina, T., Jaros, J. & Mohanty, M. (2022). Impact of the COVID-19 pandemic on road traffic accident forecasting in Poland and Slovakia. Open Engineering 12(1), 578-589. DOI: 10.1515/eng-2022-0370.

[9] Warren, M.S. & Skillman, S.W. (2020). Mobility Changes in Response to COVID-19. Social and Information Networks. DOI: 10.48550/arXiv.2003.14228.

[10] De Vos, J. (2020). The Effect of COVID-19 and Subsequent Social Distancing on Travel Behavior. Transportation Research Interdisciplinary Perspectives 5, 100121. DOI: 10.1016/j.trip.2020.100121.

[11] Gössling, S., Scott, D. & Hall, C.M. (2020). Pandemics, tourism and global changes: A Rapid Assessment of COVID-19. Journal of Sustainable Tourism, 1-20. DOI: 10.1080/09669582.2020.1758708.

[12] Bonaccorsi, G., Pierri, F., Cinelli, M., Flori, A., Galeazzi, A., Porcelli, F., Schmidt, A.L., Valensise, C.M., Scala, A., Quattrociocchi, W. & Pammolli, F. (2020). Economic and Social Consequences of Human Mobility Restrictions under COVID-19. In Proceedings of the National Academy of Sciences of the United States of America 117(27), 15530-15535. DOI: 10.1073/pnas.2007658117.

[13] Pullano, G., Valdano, E., Scarpa, N., Rubrichi, S. & Colizza V. (2020). Evaluating the effect of demographic factors, socioeconomic factors, and risk aversion on mobility during the COVID-19 epidemic in France under lockdown: a population-based study. The Lancet Digital Health 2(12), e638 - e649. DOI: 10.1016/S2589-7500(20)30243-0.

[14] Galeazzi, A., Cinelli, M., Bonaccorsi, G., Pierri, F., Schmidt, A.L., Scala, A., Pammolli, F. & Quattrociocchi, W. (2020). Human mobility in response to COVID-19 in France, Italy and UK. Scientific Reports 11(1), 13141. DOI: 10.1038/s41598-021-92399-2.

[15] Yang, Y., Liu, Q. & Chang, Ch-H. (2023). China-Europe freight transportation under the first wave of COVID-19 pandemic and government restriction measures. Research in Transportation Economics 97, 101251. DOI: 10.1016/j.retrec.2022.101251.

[16] Ansari, S., Du, H., Naghdy, F. & Sattar, A. (2023). Impact of Post-Covid-19 on driver behaviour: A perspective towards pandemic-sustained transportation. Journal of Transport & Health 28, 101563. DOI: 10.1016/j.jth.2022.101563.

[17] Chang, H-H., Meyerhoefer, Ch-D. & Yang, F-A. (2021). COVID-19 prevention, air pollution and transportation patterns in the absence of a lockdown. Journal of Environmental Management 298, 113522. DOI: 10.1016/j.jenvman.2021.113522.

[18] Schlosser, F., Maier, B.F., Hinrichs, D., Zachariae, A. & Brockmann D. (2020). COVID-19 Lockdown Induces Structural Changes in Mobility Networks-Implication for Mitigating Disease Dynamics. Retrieved November 2, 2022, from https://www.semanticscholar.org/paper/COVID-19-lockdown-induces-structural-changes-in-for-Schlosser-Maier/e45405c41ee94b1e5d4507ea11b73150768380b7

[19] Szołtysek, J. (2011). Creating mobility of city residents. Wolters Kulwer, Warsaw.

[20] Załoga, E. & Dudek E. (2009). Selected problems of mobility of European society. Scientific Journals of the University of Szczecin, Problems of Transport and Logistics 9, 99-109. DOI: 10.18276/ptl.