TRANSPORT-RELATED SOCIAL EXCLUSION AMONG SECONDARY SCHOOL STUDENTS IN DIFFERENT SUB-REGIONS OF LOWER SILESIA, POLAND: AN ACTIVITY-BASED APPROACH

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Abstract: While youth are generally considered to be at risk of transport-related social exclusion, only a few studies have focused on their experiences in Eastern European regions undergoing rapid neoliberal transformation of public services, including public transport systems. To address this gap, our study highlights the specific challenges faced by youth in three sub-regions of post-communist Poland, a country where neoliberalisation has led to the closure of 50% of public bus companies and around 30% of railway lines. Using an activity-based approach and the relational concept of transport-related social exclusion, we compared participation in different activities among 635 secondary school students who use different modes of transport. Our results, based on cross-tabulation analysis and ordinal regression, show that students who mainly use private cars participate in more activities than those who use other modes of transport. This effect is similar in all sub-regions, suggesting a common background of the exclusion. Simultaneously, the lowest level of activity was identified in peripheral areas. These areas were also characterised by a notable correlation between negative household economic assessments, reduced participation in activities, and lower car use. Further analysis also suggests that improvements in the frequency and routes of public transport could better meet the needs of non-car users and increase their opportunities for participation and social integration.

Keywords: secondary school students, transport-related social exclusion, social participation, activity, mobility, neoliberal policy

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Introduction

In recent years, numerous studies have examined the causes and consequences of the deterioration of public transport and the escalation of individual car use. Also, in the Eastern European context, the decline of transit has raised significant concerns about access to essential services, particularly in smaller towns and peripheral areas (Ciechański 2021, Smolarski, Suszczewicz 2021, Orchowska 2022). These fears are not unfounded. As many international studies show, physical mobility remains a major contributor to social and economic inequalities around the world (Kenyon et al. 2003, Lucas 2012). In particular, there are significant differences in travel patterns and access to desired destinations between car users and those using other modes, with the

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latter visiting fewer places and engaging in different activities less frequently (Social Exclusion Unit 2003, Currie et al. 2010, Hui, Habib 2017).

The challenges of transport-related social exclusion are particularly significant for secondary school students who are in adolescence – a critical period with long-term consequences for access to resources, networks and links to the community (Hatch, Wadsworth 2008). Engagement in out-of-school activities during this stage can promote physical, academic and psychosocial outcomes, including skills, habits and motivation for continued participation in adulthood (Simpkins et al. 2023). However, the social needs of adolescents are often unmet, as a significant proportion of secondary school students cannot use cars because of age restrictions. In parallel, adolescents are often exposed to poor access to public transport (Gašparović 2017). This problem also exists in Poland, where local authorities are not obliged to organise public transport to secondary schools. Moreover, the state-owned system of public buses and trains was disrupted by the implementation of radical neoliberal policies. As a result, more than 50% of public bus companies and around 30% of railway lines were closed in the first three decades of the post-communist transition – a decline not seen in most European countries (Šťastná et al. 2015, Taylor, Ciechański 2020).

To date, numerous studies have examined the impact of declining public transport accessibility and increasing car dependency on minors' participation in different activities (Shucksmith 2004, Gašparović 2017, Perez-Barbosa, Zhang 2017, Ralph, Iacobucci 2021, Haseeb, Mitra 2023). However, only a few analyses have specifically examined inequalities among secondary school students based on a quantitative activity-based approach that measures the total number of activities undertaken (Lucas et al. 2016b, Haseeb, Mitra 2023). Previous studies have also rarely used this perspective to analyse transport disadvantages among secondary school students in Eastern European regions, which are experiencing a decline in public services due to austerity policies and rapid neoliberalisation. In Poland, available analyses have been dominated by qualitative perspectives that do not measure the extent of transport-related social exclusion in detail. Furthermore, most analyses have focused on metropolitan or rural areas, often overlooking sub-regions with medium-sized urban centres. These areas are often struggling to meet the needs of their residents due to economic problems and loss of socioeconomic functions, and are not comparable to metropolitan areas in terms of spatial organisation, overall availability of services and distances required to reach key destinations (Dietz 2021).

Our paper partially addresses these gaps by analysing the level of participation in various activities among secondary school students using different modes of transport and representing three counties[1] in the Lower Silesia region of Poland. In that analysis, we use an activity-based approach to measure transport-related social exclusion. Activity-based measures involve counting the number of trips made by different modes, within a given time period, and by people with different socioeconomic profiles. They also include analysis of other trip characteristics, such as the type of destination, the frequency of visits and the number of destinations visited per trip (Kamruzzaman et al. 2016, Dietz 2021). To date, only a few analyses have used this approach to analyse the activities of secondary school students. Ralph and Iacobucci (2021) found that US adolescent drivers and passengers were more likely to be involved in extracurricular activities than those using other modes. This relationship was more pronounced in the study by Haseeb and Mitra (2023), which showed that public transport users participated in a lower number of activities than their motorised counterparts.

By comparing the activity levels, we apply the relational concept of transport-related social exclusion. This approach means that we do not use arbitrary thresholds of social exclusion. Instead, we assume that an individual's unfavourable situation can be defined by comparing it with the situation of other members of the population (Lucas 2012).

To develop a more comprehensive understanding of the challenges underlying transport-related social exclusion in the selected sub-regions, we also examine assessments of local public transport quality. This facilitates the identification of its shortcomings and the evaluation

[1] County or poviat, the second unit in Poland's three-tier local administration system.

of whether these deficiencies influence car usage as a means of mitigating accessibility constraints.

The first part of the study summarises the main directions of the debate on transport-related social exclusion in Poland and other European countries. The second part describes the methodology and justifies the use of data from Lower Silesian sub-regions. In the third part, we measure differences in the activities of users of different transport modes and consider the socio-spatial circumstances that favour the emergence of such differences. The next section includes a discussion of the available literature. The final part of the article presents the main conclusions of our study and highlights some limitations identified during the analysis.

Transport-related social exclusion of secondary students

Drawing attention to the consequences of the decline of public transport and the escalation of individual car use corresponds to a well-established debate on the unequal accessibility of key destinations and services across the population (Lucas 2012, van Wee 2016). Accessibility can be generally defined as "the extent to which land use and transport systems enable (groups of) individuals to reach activities or destinations by a (combination of) transport modes" (Geurs, van Eck 2001: 36). Deficits in access to transport can significantly reduce participation in activities and increase the risk of social exclusion (Church et al. 2000) defined as the lack or denial of resources, rights, goods and services, and the inability to participate in economic, social, cultural or political activities (Levitas et al. 2007).

According to Lucas (2019), the problem of transport-related social exclusion remains unresolved in European countries. For example, a significant proportion of young non-drivers in peripheral areas of the United Kingdom are deprived of a choice of schools within a 30-minute commute, affecting their ability to study, participate in social activities and enter the labour market (Preston, Rajé 2007, McDonald 2012, Somerset, Hoare 2018). Moreover, older adolescents without access to a private car are often unable to manage their daily schedules independently and rely on the support of family members (Emond, Handy 2012). They travel longer to activities and have more problems with evening outings and academic performance (Gašparović 2017). In addition, having no car has a negative impact on students' psychological autonomy and subjective well-being (Delbosc, Vella-Brodrick 2015).

In the Polish context, the economic stability of public transport systems was strongly affected by the post-communist transformation. It triggered a rapid shift from public transport to private cars, a decline in national employment opportunities and demographic changes (Książek 2016, Jaskulski et al. 2023). In addition, national policies focused on the implementation of market-based approaches, where profitability became a key criterion for assessing the efficiency of services. This trend often extended to other formerly public services, such as entertainment, health care and education (Książek 2014, Taylor, Ciechański 2017). It has reduced the spatial accessibility of these services in peripheral areas and exacerbated inequalities in the temporal accessibility of different destinations between car users and public transport passengers, including access to secondary education (Taylor 1999, Rosik et al. 2018, Komornicki 2019).

Polish studies confirm the findings of foreign researchers that the poor, the elderly and the young from peripheries experience the greatest difficulties in reaching different destinations (Gray et al. 2006). Particularly, significant barriers are faced by those who cannot replace public transport with a private car and who lack sufficient social capital to receive support from family or community members (Gitkiewicz 2019, Orchowska 2022).

With regard to secondary school students, Koliński (2021) and Ciechański (2023a, b) have found that inadequate bus timetables often limit the ability to get to school and influence the choice of higher education institutions. However, the relationship between students' access to a private car and the frequency of participation in other activities has not been quantitatively measured in detail. Only Fiedeń (2022) has found that motorised rural residents meet friends from other towns and villages more often than their counterparts without a car in the household.

Methodology

Study area and data

The analysis presented in this article is based on an audit survey of $N = 635$ students attending secondary schools in three Lower Silesian counties: Góra, Milicz and Oleśnica (their spatial location is shown in Fig. 1). The data were collected in 2022 based on a purposive selection of secondary schools and classes that were available during the researcher's visits. The survey was conducted in educational facilities where the relevant authorities had granted their consent. Consequently, the results are not necessarily representative of the general population.

In view of these circumstances and given that: (1) secondary education is not obligatory, and (2) some students may come from neighbouring counties, the sample structure deviates from the population structure. For instance, 55% of the respondents are female, whereas their proportion among residents aged 16–19 in the three surveyed counties was 48% in 2023, according to census data. The survey's findings also appear to overestimate the percentage of individuals representing commune centres, with a figure of 53% being reported, despite the 2023 census data showing that only 42% of 16–19-year-olds in the Góra, Milicz and Oleśnica counties resided in central parts of communes.

Notwithstanding the repercussions of these parameters on the study's limited representativeness, overrepresentation of respondents from commune centres may also imply that residing in such areas facilitates access to secondary education. Furthermore, the challenges in accessing certain services among youth from non-central areas of communes (discussed later in this study) may in reality be more substantial than the analysis indicates. However, it should be noted that these are merely hypotheses that, to a certain extent, exceed the scope of this study.

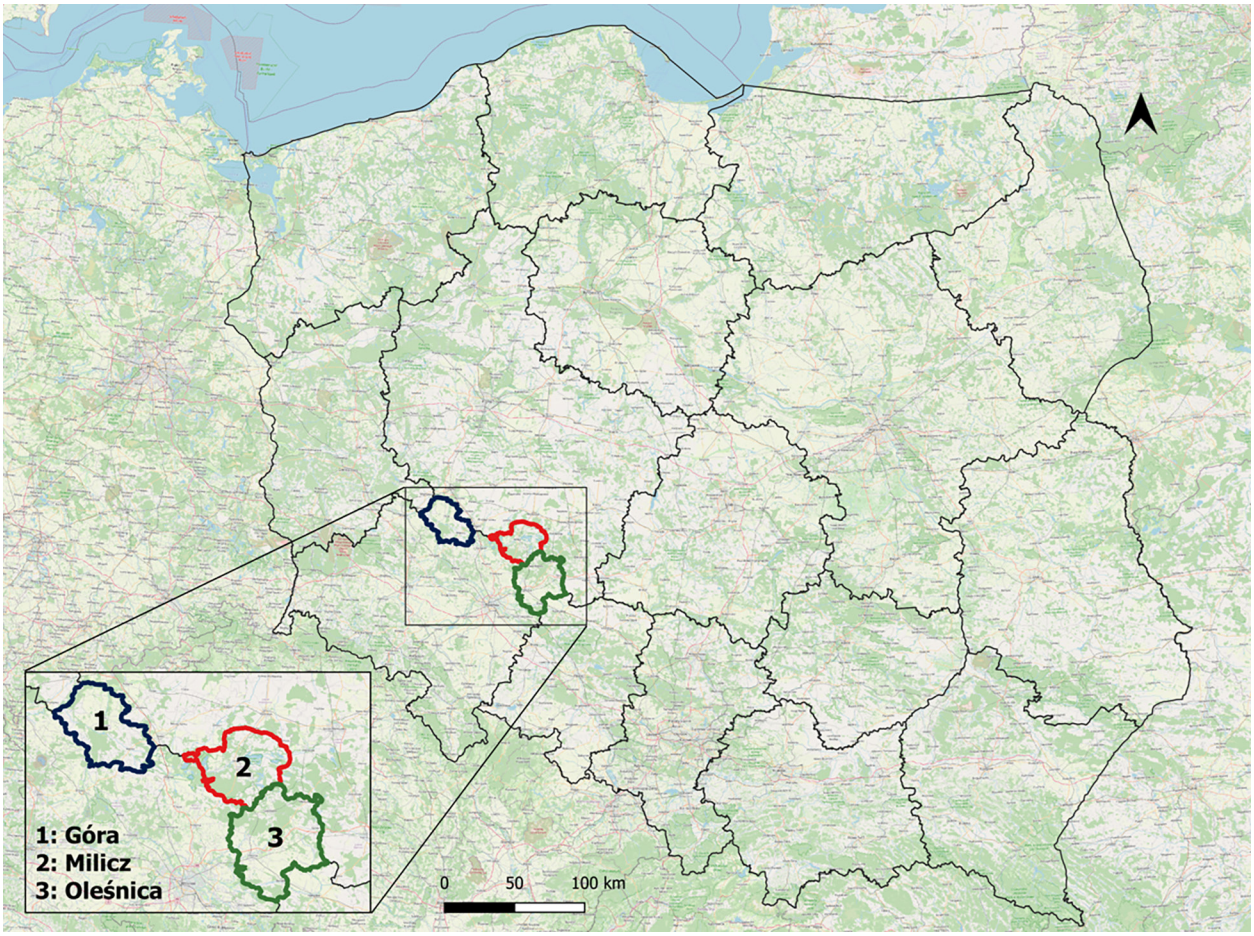

Fig. 1. Spatial location of the research area.

There are several reasons why these particular counties were selected for analysis. The city of Oleśnica is a county capital located 30 km from the core of the Wrocław agglomeration (Szczepański, Szczepańska 2023). This proximity means a relatively high provision of public transport connections to the surrounding areas, including good coverage of the county by a regional rail network and strong public transport performance on the route between Oleśnica and Wrocław (Jurkowski 2016).

In contrast, the town of Milicz is located on the periphery of the Wroclaw agglomeration, 60 km from its core, with very limited regional rail connections. Góra, a town which is not considered part of the agglomeration and is located 90 km from Wroclaw, has no rail access at all (Szczepański, Szczepańska 2023). In addition, Góra and Milicz are among the counties with the fewest public transport connections between the town and neighbouring communes. They also have an above-average number of registered cars per 1000 inhabitants compared to other Lower Silesian counties. These indicators suggest that Góra and Milicz have relatively poor public transport networks and are heavily dependent on private cars.

Methods

Our study uses activity-based approach in a four-step analytical procedure to test whether the use of different modes of transport affects the activity levels of Polish secondary school students. In the first step, the activity indicator was calculated for each respondent. The following questions were used for this purpose:

1. A question on participation in five extracurricular and social activities, including sports activities, tutoring/private lessons, interest clubs, courses and remedial classes (binary variables measuring whether respondents participate in each activity or not).
2. A question on respondents' independence, measuring whether students are able to carry out eight activities independently, such as shopping for books, cosmetics, clothes, technical equipment and other personal things, going to cinema, attending concerts and sports events (binary variables indicating whether these activities are usually carried out independently by the respondents or by other family members/no one in the family). Importantly, we do not ask whether these activities are carried out outside the home and assume that transport-related social exclusion does not occur if respondents participate in certain activities remotely (Geurs, van Wee 2013).

We then summarised the number of activities in which respondents participate or undertake independently and divided our sample into three separate categories based on quartiles: (1) respondents who participate in no more than 4 activities ('low level of activity' below the 1st quartile), (2) those who participate in 5–9 activities ('moderate level of activity' between the 1st and 3rd quartiles) and (3) respondents who participate in 10–13 activities ('high level of activity' above the 3rd quartile).

In the second step, a cross-analysis was carried out to examine the relationship between the activity index and the most commonly used mode of transport. This mode was identified on the basis of three different questions: typical mode of transport (1) to school, (2) to meet friends, and (3) for shopping (binary variables indicating whether the respondent usually uses a private car or other means such as public transport, bicycle, motorbike or carpooling). We used car usage as a reference point. Based on this, the study participants were categorised into three groups: no use of a private car/only other means of transport (0 destinations usually by car), moderate use of a private car (1–2 destinations usually by car) and high use of a private car (3 destinations usually by car).

In the third step, an ordinal regression analysis was conducted with the dependent variable based on the respondents' categorised level of activity index (as determined in step 1). The list of predictors used in the model included: (1) most frequently used mode of transport (from step 2), (2) gender (male/female), (3) subjective assessment of the economic situation of the respondent's household (poor, moderate, and good), (4) county represented by the respondent (Góra, Milicz, Oleśnica, and an 'other' category for students commuting from other counties), and (5) the distance between the place of residence and the centre of the commune (centre of the commune, up to 5 km from the centre and more than 5 km from the centre). This approach allowed us to examine the relationship between the level

of activity index and the most commonly used mode of transport in broader socioeconomic and spatial contexts.

The predictor relating to the county represented by each respondent was included due to the different provisions of public transport connections in the selected counties, as classified by Jurkowski (2016). The variable measuring the distance between the place of residence and the centre of the commune was introduced based on findings from other studies, which indicate that access to public transport is often more difficult in peripheral locations (importantly, each county consists of several communes).

In the fourth step, we investigated whether mobility choices correlate with the perception of transit quality. For this purpose, we conducted another ordinal regression analysis with the dependent variable based on the most frequently used mode of transport (as determined in step 2). The list of predictors used in the model included: (1) assessment of the frequency of public transport at the place of residence (poor, average, and good), (2) gender, (3) subjective assessment of the economic situation of the respondent's household, (4) county represented by the respondent, (5) distance between the place of residence and the centre of the commune, and (6) personal attitude towards public transport (negative, neutral, and positive).

The design of most of the predictors is consistent with the first regression model. The assessment of the frequency of public transport was derived from the mean responses to questions assessing the frequency of services at specific time intervals: 5–9 a.m., 10 a.m. to 2 p.m., 3–5 p.m., 6–8 p.m. and 9+ p.m. (rated on a scale of 1–5, with 1 indicating very poor and 5 indicating very good). After calculating the mean, the responses were categorised into quartiles and the sample was divided into three categories: poor rating (below the 1st quartile), medium rating (between the 1st and 3rd quartiles) and good rating (above the 3rd quartile).

Personal attitudes towards public transport were calculated as the mean of the responses to the following questions (rated on a scale of 1–5, where 1 means 'strongly disagree' and 5 means 'strongly agree'):

1. Nobody around me uses public transport.
2. Public transport has a negative image where I live.
3. Travel independence improves my image in the eyes of others.
4. If I have my own car, I will not use public transport.

We assumed that answers closer to 5 indicate a more negative attitude towards public transport. After calculating the mean based on the responses to the four questions, we established quartiles

Table 1. Distribution of the basic variables.

Variable	Category			Size	Share
Gender	Woman			349	55%
	Man			286	45%
Household location	Commune centre			338	53%
	Up to 5 km from commune centre			117	18%
	More than 5 km from commune centre			180	23%
County	Góra			52	8%
	Oleśnica			406	64%
	Milicz			135	21%
	Other			42	7%
Household economic condition	Bad			45	7%
	Moderate			114	18%
	Good			476	75%
Level of car utilisation	No utilisation			123	19%
	Some destinations			406	64%
	All destinations			106	17%
	Scale	Min	Max	M	SD
Level of activity (number of activities) – Sum	Low – High	0	12	6.58	2.43
Assessment of PT frequency – Mean	Bad – Good	1	5	2.20	0.88
Attitude towards public transport – Mean	Positive – Negative	1.50	5	3.22	0.59

and divided the sample into three categories: positive attitudes (below the 1st quartile), neutral attitudes (between the 1st and 3rd quartiles) and negative attitudes (above the 3rd quartile).

Following regression analysis, we examined respondents' views on expected improvements in public transport. This was based on the question: 'What would encourage you to use public transport more often?'. Respondents were given 10 possible answers (binary variables) and had the flexibility to choose any combination of these options.

The distributions of the variables used in the analysis are shown in Table 1. All calculations were performed using PS IMAGO PRO IBM SPSS Statistics, version 29.

Results

Relationship between car utilisation and the number of social activities

The cross-tabulation analysis (Table 2) shows that the lowest number of respondents with low activity levels was found among those who usually use a private car. These findings are confirmed by regression analysis (Model I in Table 3). The coefficients indicate that the activity index level is highest among those who commute by car on a regular basis, even after controlling for gender, economic situation, area of residence and distance from the commune centre. In contrast, respondents who rarely or occasionally use private cars are significantly less likely to fall into the highest activity category ($\beta = -0.775$ and $\beta = -0.784$, respectively).

Interestingly, the level of activity does not depend on the county in which the respondent lives. This may indicate that the location of the county in relation to the regional centre (Wrocław) and differences in local transport policies do not significantly influence the activity profiles of individuals. However, this result warrants further investigation.

Furthermore, Model I shows that a negative assessment of the household's material situation and living in peripheral areas (especially beyond 5 km from the centre of the commune) significantly contribute to a lower tendency to engage in various activities ($\beta = -1.052$ and $\beta = -0.540$, respectively). The additional correlations calculated also reveal that individuals with lower economic status living in peripheral areas are less likely to use private cars to participate in activities ($\rho = 0.19$, $N = 180$, $p < 0.05$), a trend not observed among respondents living in or near the centre of the commune. Both of these factors may together contribute to lower levels of activity among individuals from peripheral households, demonstrating that social exclusion in peripheral areas is often exacerbated by multiple reinforcing conditions.

We have also found that non-car users are disadvantaged not only in terms of the total number of activities they participate in, but also in terms of specific types of activities (Fig. 2). Compared to respondents who regularly use private cars, they are less likely to attend various leisure events, shop for equipment and, to a lesser extent, take private lessons. Although some of these differences were statistically significant, it is important to interpret the results of the χ^2 tests with caution because of small sample sizes in certain subcategories (Table 4).

The differences are particularly noticeable when comparing non-car users from peripheral areas (more than 5 km from the commune centre) with peripheral residents who regularly use private cars, as well as with residents in more central locations (Fig. 3). At the same time, there are no discernible differences between car users

Table 2. Level of activity vs. level of car utilisation.

	No utilisation of private car		Utilisation of private car – some destinations		Utilisation of private car – all destinations		In total	
	N	%	N	%	N	%	N	%
Low level of activity	26	21.10%	94	23.20%	7	6.60%	127	20.00%
Moderate level of activity	77	62.60%	238	58.60%	73	68.90%	388	61.10%
High level of activity	20	16.30%	74	18.20%	26	24.50%	120	18.90%
In total	123	100.00%	406	100.00%	106	100.00%	635	100.00%

$\chi^2(4, N = 635) = 15.437$, $p < .01$, $V = .11$.

Table 3. Ordinal regression coefficients for the level of respondents' activity (Model I) and the level of car utilisation (Model II) (higher coefficient = higher level of activity or car utilisation).

	Coefficients	
	Model I	Model II
Gender = woman	0.369*	−0.121
Gender = man	ref.	ref.
Economic condition = bad	−1.052***	−0.254
Economic condition = moderate	0.115	−0.578*
Economic condition = good	ref.	ref.
HH location = more than 5 km from commune centre	−0.540**	0.717**
HH location = up to 5 km from commune centre	0.107	1.026***
HH location = commune centre	ref.	ref.
County = other counties	−0.380	−1.016
County = Oleśnica	0.233	−0.98
County = Milicz	0.568	−0.512
County = Góra	ref.	ref.
Car utilisation = no	−0.775**	–
Car utilisation = some destinations	−0.784***	–
Car utilisation = all destinations	ref.	–
Frequency of PT = bad assessment	–	0.686**
Frequency of PT = moderate assessment	–	−0.114
Frequency of PT = good assessment	–	ref.
Attitudes towards public transport = positive	–	−0.465*
Attitudes towards public transport = neutral	–	0.149
Attitudes towards public transport = negative	–	ref.
Model fitting (χ^2)	48.081***	80.697***
Goodness of fit (Pearson χ^2)	232.438	421.882
Goodness of fit (Deviance χ^2)	262.101	387.406
Pseudo-R2 Nagelkerke	0.09	0.16
Test of parallel lines (χ^2)	16.116	17.436

* p < .05; ** p < .01; *** p < .001.

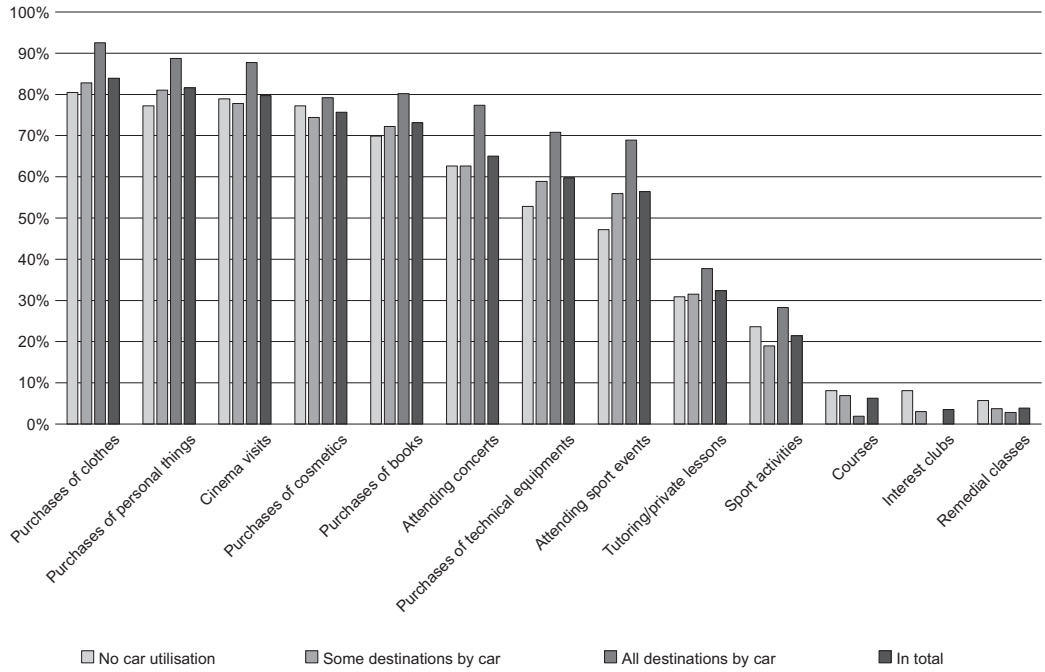

Fig. 2. (Independent) performance of particular activities by respondents with different levels of car use (independently) doing certain activities.

in peripheral areas and those living closer to the centre of the commune.

These findings are complemented by the results of the correlation analysis, which show that as the distance from the centre of the commune increases, the proportion of respondents who commute by car to participate in activities also increases ($\rho = 0.23$, $N = 635$, $p < 0.001$). This positive relationship highlights the crucial role of the private car in peripheral areas. However, such a strategy is not equally accessible to all peripheral residents. As mentioned earlier, less affluent residents in these areas are less likely to use cars than their more affluent counterparts.

Table 4. Results of χ^2 tests measuring differences in performance of particular activities by respondents with different levels of car use.

Name of activity	χ^2	*p*-value
Purchases of clothes	**7.193**	***p*=.027**
Purchases of personal things	5.171	*p=.075*
Cinema visits	5.148	*p=.076*
Purchases of cosmetics	1.263	*p=.532*
Purchases of books	3.513	*p=.173*
Attending concerts	**8.479**	***p*=.014**
Purchases of technical equipments	**7.89**	***p*=.019**
Attending sport events	**10.997**	***p*=.004**
Tutoring/private lessons	1.642	*p=.440*
Sport activities	4.769	*p=.092*
Courses	4.433	*p=.109*
Interest clubs	**12.105**	***p*=.002**
Remedial classes	1.405	*p=.495*

Differences between three categories of respondents: no car utilisation, some destinations by car, all destinations by car.

Table 5. Results of χ^2 tests measuring differences in performance of particular activities by respondents from peripheral locations.

Name of activity	χ^2	*p*-value
Purchases of clothes	**6.637**	***p*=.036**
Purchases of personal things	3.105	*p=.212*
Cinema visits	**9.329**	***p*=.009**
Purchases of cosmetics	6.218	*p=.045*
Purchases of books	5.263	*p=.072*
Attending concerts	**12.740**	***p*=.002**
Purchases of technical equipments	3.279	*p=.194*
Attending sport events	**9.219**	***p*=.010**
Tutoring/private lessons	5.412	*p=.067*
Sport activities	**10.134**	***p*=.006**
Courses	4.567	*p=.102*
Interest clubs	5.207	*p=.074*
Remedial classes	0.792	*p=.673*

Differences between three categories of respondents from peripheral locations: no car utilisation, some destinations by car, all destinations by car.

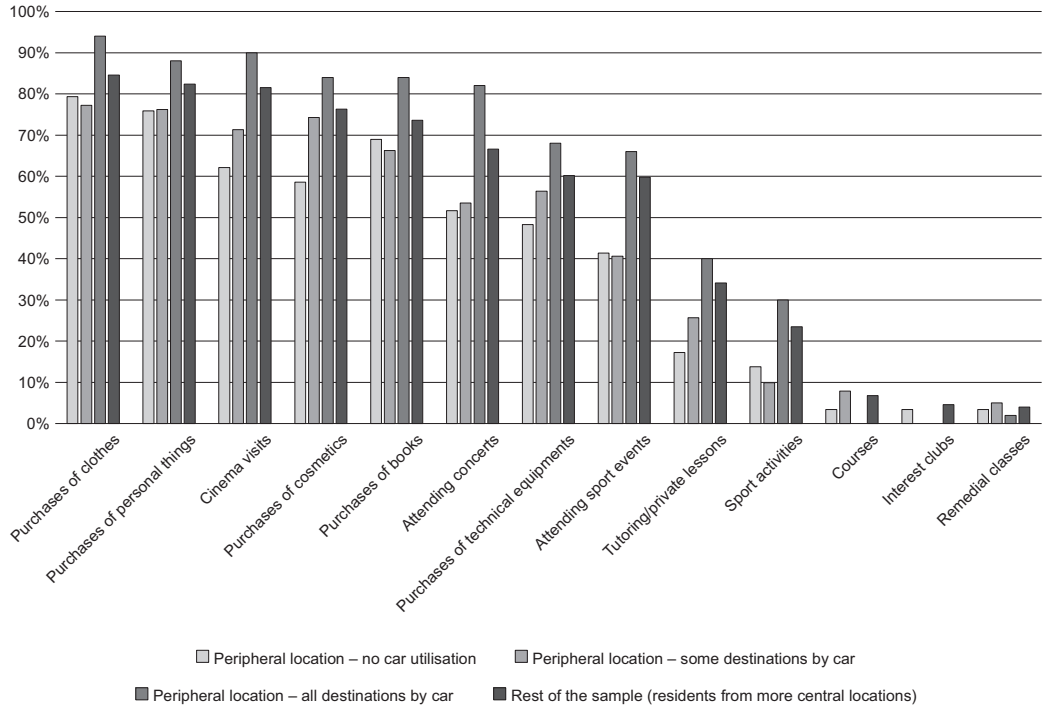

Fig. 3. (Independent) performance of particular activities by respondents from peripheral locations (more than 5 km from the centre of the commune) and with different levels of car use.

Relationship between car utilisation and the assessments of public transport

Model I shows a correlation between the number of activities undertaken and the frequency of car use. However, it was not explicitly investigated whether the higher car use was caused by inadequate public transport services. Establishing such a link would provide additional evidence on how the availability and quality of public transport affect car dependency and the accessibility challenges faced by people who do not own a private car.

Such evidence is supported by Model II (Table 3). The model shows that individuals who perceive public transport services as infrequent or poor ($\beta = 0.686$) and those who live outside the centre of the commune (within 5 km or >5 km away; $\beta = 1.026$ and $\beta = 0.717$, respectively) are much more likely to use a car than those who are satisfied with the frequency of public transport or live in the centre of the commune.

Conversely, lower car use was observed among individuals with positive cultural attitudes towards public transport ($\beta = -0.465$). Further analysis beyond the regression model also revealed a positive correlation between such attitudes and a more favourable evaluation of the quality of public transport, in particular its frequency ($\rho = 0.18$, $N = 635$, $p < 0.001$). These findings suggest that the quality of public transport influences mobility choices not only directly, but also through wider attitudinal factors.

It is also worth noting that car use is not consistently associated with economic status in our regression model. This implies that individuals may rely on cars regardless of their financial situation due to limited access to alternative means of transport.

Further analysis of the expected improvements to public transport (see Table 6) reveals that the current quality of transport services is unsatisfactory. The analysis highlights the need for more frequent connections, new lines and lower ticket prices.

Notably, these expectations remain prominent regardless of current participation in activities or the mode of transport used to attend them. Furthermore, the perceived shortcomings are equally important to both current and potential users of public transport (the differences between categories did not reach statistical significance).

Discussion

The findings of this study align with previous research conducted in Poland, which indicates that limited services and inadequate timetables are among the primary reasons for the low attractiveness of public transport and the social exclusion of individuals without access to a car (Koliński 2021, Ciechański 2023a, b). Existing Polish research further emphasises that this issue is exacerbated by transport companies' policies, which impose artificially inflated ticket prices to secure higher government subsidies for concessionary fares (Wolański 2019). Similarly, the presented study highlights participants' concerns about ticket prices, emphasising the need for their reduction.

Table 6. Expected improvements in public transport in the household location.

Expected improvement	Level of activity			Level of car utilisation			In total
	Low	Moderate	High	No utilisation	1–2 destinations	All destinations	
	% in column*						
Increased frequency of services	47%	56%	59%	63%	56%	51%	54%
New public transport connections	23%	31%	33%	33%	26%	31%	29%
Lower ticket prices	34%	28%	26%	30%	28%	30%	29%
Improved punctuality	15%	18%	13%	27%	19%	12%	16%
Increased comfort of journeys	8%	15%	18%	7%	15%	13%	13%
Upgraded bus stop infrastructure	5%	7%	5%	13%	5%	5%	6%
Increased feeling of security	3%	4%	3%	3%	5%	3%	4%
Upgraded fleet	3%	2%	0%	3%	1%	3%	2%
Other factors	3%	1%	3%	0%	2%	1%	1%
Nothing	23%	13%	13%	3%	14%	20%	16%

* percentages do not add up to 100, more than one answer possible.

Our analysis is also consistent with findings from different European studies. They show that the most economically disadvantaged groups often face mobility challenges owing to inadequate access to both private and public transport services (Titheridge et al. 2014, Lucas et al. 2016b). Empirical evidence from European contexts also shows that these groups tend to live in peripheral areas on the outskirts of cities, characterised by limited amenities, few local employment opportunities and inadequate access to basic services (Lucas et al. 2016a). Our study echoes similar findings, albeit focusing on peripheral areas located relatively far from urban centres, particularly on the fringes of the three study counties.

Moreover, the results presented are in line with those studies that analyse the consequences of the intersection of low income, lack of access to a car and living in peripheral areas. Exposure to these factors often correlates with lower participation in activities, creating a 'poverty trap' in which mobility problems are the result of poverty situations and at the same time exacerbate the economic disadvantage (Pereira, Schwanen 2013, Lucas et al. 2016a). Such a process also seems to affect the peripheral parts of the counties considered in our study. We have confirmed this by showing that non-car users from the periphery are less likely to participate in some educational and social activities, which may limit their life chances and perpetuate the social exclusion they experience (Stanley, Hensher 2021).

Both the respondents' assessment of public transport and the impact of car use on activity levels suggest the presence of structural car dependency in the counties surveyed. Structural car dependency occurs when "car use is a matter of necessity to support a particular pattern of employment or lifestyle due to patterns of transport service provision and land use location that make it impractical for people to use an alternative mode without experiencing undue hardship" (Lucas, Jones 2009: 122). Such circumstances – which are also found in the counties considered in our study – are exacerbated by a lack of competitive public transport services to different destinations, or a lack of service at the required time of day (Mattioli 2021).

The available literature also points to significant changes in the mobility lifestyles of households as one of the major challenges resulting from structural car dependency. In such households, car use becomes not only a protection against exclusion from relevant activities, but also a matter of habituation, automated choice and extended access to a wider range of destinations, both in terms of time of day and space (Mattioli et al. 2020). As a result, many households may be inadvertently locked into car use even if public transport services improve and these improvements are in line with individual expectations. This should be borne in mind when interpreting respondents' statements that improved frequency and new services would encourage them to use public transport. While some people might be expected to give up private car use, in many other cases there may be an 'attitude–behaviour gap', revealing a discrepancy between consumers' positive attitudes towards certain behaviours (e.g. returning to green transport) and the lack of these behaviours in actual choices (Paradowska 2020, Vieira et al. 2023).

Conclusions and study limitations

The main aim of this article was to determine whether the level of car use by young people affects the number of activities in which they participate. We have found that those who usually use a private car participate in significantly more activities than those who use other means of transport.

The analysis has also shown that there are statistically significant differences between users of different modes of transport at the level of some individual types of activity. Respondents who do not usually use private cars are less likely to attend sports and leisure events and private lessons. Another finding of our study is that transport-related social exclusion overlaps with economic disadvantage in most peripheral areas, as confirmed by a positive and statistically significant correlation between a negative assessment of the household's economic situation and both a lower number of activities undertaken and the use of private cars.

The study has also found a positive correlation between car use and negative perceptions of public transport quality. Among the most frequently requested improvements to public transport were increased service frequency and the

introduction of new routes. These requests were consistent across users of different modes and people with different levels of activity participation. This indicates that current public transport services do not meet young people's expectations, potentially limiting participation opportunities for those without access to a private car.

The analysis presented in this article has limitations that should be taken into account in future research on similar topics. First, the sample used in our study was not representative, whereas ensuring representativeness would have allowed a better capture of (sub)regional differences in transport-related social exclusion. This is important because although the decline of public transport is a widespread phenomenon in Poland, its extent may vary according to population density, the transport network and local government initiatives to address the social consequences of transport failure.

It is also worth noting that recent years have seen an increase in the number of initiatives undertaken by local authorities with the aim of enhancing the quality of non-urban public transport. Consequently, future research should focus on the assessment of how different approaches adopted by authorities influence the level of public transport provision and the disparities in access to various destinations.

Another limitation of our study is that we have not analysed subjective motivations for participating in certain activities. Future analyses should consider this factor, as non-participation in these activities may have non-transport reasons. Including subjective motivations could also help to develop explanatory models that better fit the data when predicting respondents' activity levels. On the other hand, the use of more objective measures of household income is recommended to improve the credibility and comparability of similar analyses, particularly when defining thresholds of deprivation in public policy.

In addition, our study focused on a relatively narrow range of activities, which may distort conclusions about the activity levels of people using different modes of transport. Furthermore, we used binary variables, which prevented us from accounting for the frequency of participation and led to more generalised conclusions. To address this gap, it would be beneficial to study a broader range of activities that correspond to relevant concepts of social needs (Cao, Hickman 2019). Using a more nuanced measure of participation for each activity, such as including frequency on a weekly or monthly basis, would also help to measure the extent of transport-related inequalities.

Building on the last suggestion, we also recommend that future studies incorporate more empirical measures of respondents' activity spaces (Kamruzzaman et al. 2016). Such approaches would better capture not only the frequency of travels but also the distances travelled, the number of destinations visited, their exteriority and polycentricity. This would provide detailed insights into the spatial opportunities offered by different transport modes (Hasanzadeh et al. 2019).

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Authors' contribution

DK: conceptualisation, methodology, software, validation, formal analysis, data curation, writing – original draft preparation, writing – review and editing, visualisation, supervision; JS: conceptualisation, methodology, investigation, resources, data curation, writing – review and editing, supervision.

Conflicts of interest

The authors declare no conflict of interests in this study. All authors have read and agreed to the published version of the manuscript.

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