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An application of Latent Class Analysis to explore the impact of sociodemographics on travel behaviour profiles – the importance of sociodemographics in transport policy

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Short abstract
Latent Class Analysis was used on the 2018/19 Dutch National Travel dataset to assess travel behaviour profiles and its connection with sociodemographic and spatial factors to grasp travel patterns in a more holistic context than previous research

Abstract
Understanding the relation between sociodemographics and travel behaviour is pivotal to devise policies that direct travellers towards more sustainable travel choices as well as to be aware of people's possibly restricted mobility for the sake of mobility justice. Although much research has been carried out in this regard, research taking a holistic perspective and utilising a data-driven method such as Latent Class Analysis (LCA) on a large population to identify specific travel patterns and potential triggers has not been carried out to this extent before. This method helps understand the interplay of different sociodemographic factors rather than assessing correlations isolated.
The main research question assessed was “To what extent are different travel behaviour patterns associated with specific sociodemographic profiles and what are implications for transport policy?”. To find underlying patterns and profiles, LCA was performed on the Dutch National Travel Survey combined datasets from 2018 and 2019. This analysis was conducted for non-avoidable, necessary travels, such as work and education and leisure travels. The trip characteristics to perform the clustering on were travel duration, distance and mode. The analysis resulted in 7 distinct classes (8 for necessary travels) of which 3 classes were associated with car use (4 for necessary travels) and 3 with active modes. Each car and active mode class covered different journey distances and durations, showing that specific modes are not inherently correlated to specific journey types. The smallest class was public transit trips that covered distances over 20 kilometres and travel times longer than 30 minutes. The results relate to sociodemographic axes of disadvantage previously identified in a literature study and were subsequently visualised and assessed with 7 experts from the PBL Netherlands Environmental Assessment Agency.
A mode-focused analysis of travel behaviour patterns confirmed previous research and found that people who conform to many disadvantaging factors travel with sustainable mode more often, possibly due to lack of car access. Against expectations, this holds even if their trip covers similar distance or travel time as it would take by car.
Next, we studied classes with similar journey duration and distance, yet different mode choice. The working hypothesis was that there is a certain substitutability of modes for similar journey types which is primarily motivated by sociodemographics. Specifically, three journey types, short, medium and long were identified and the modes to be substituted were car and active modes for short and medium journeys and car and public transit for long journeys. It was found that for active modes and public transit, a clear spatial

distribution along the Randstad area could be identified, showing that travellers are likely restricted by spatial accessibility. The car is much less influenced by that. Thus, while being outside of the Randstad works as a deterrent for active modes and public transit, that the short car class was present across urbanisation levels shows that travelling by car is warranted by other (sociodemographic) factors. On the other hand, for certain profiles, spatial accessibility of a mode is not sufficient to choose it. This was particularly the case for profiles who could be interpreted to need a car, such as travellers with young children. This seemed a clear deterrent to using active modes and public transit even if one was located in the Randstad area and technically had spatial accessibility to these modes. On top, car ownership triggered car use even if other, more sustainable modes were spatially accessible.
Recommendations concluded specifically from the substitution analysis include the need to detach car use from car ownership, by e.g. promoting car-sharing more as well as facilitating travelling with children on public transit. Moreover, a dialogue between employers and employees with regards to mode choice should be enhanced. Even if the same distances are covered, especially for work the choice for car is very dominant. While this might be related to comfort, offering e-bikes for employees could intercept the car choice.
Moreover, the possibility offered by the fact that young people still use more sustainable modes than older people should be assessed more in depth. As an extensive association of car use was found with characteristics of a more mature life, avoiding the need for young people to switch to a car (e.g. when deciding to have a family) seems a promising strategy to avoid arbitrary car use. The recommendations are likely applicable beyond the Netherlands.
This research contributes to the scientific field by analysing travel behaviour holistically and demonstrating that for different travel groups sociodemographic and spatial factors are of different relevance in their mode choice.

Programme committee

Planning for Sustainable Land Use and Transport

Topic

Cities and transport