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COMMENTARY AND DEBATE

COVID-19 and urban public transport services: emerging challenges and research agenda

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ABSTRACT

This article explores the implications of the COVID-19 pandemic for public transport. Three elements are explored. Firstly, the short-term effects, including perceptions of public transport as a vector of virus transmission and shifts towards less-sustainable modes of transport. Secondly, we discuss key challenges such as the new difficulties of providing safe and reliable public transport services, the consequent barriers for the promotion of sustainable and healthy urban mobilities and the potential exacerbation of inequalities. Finally, we assess future research directions focussing on how pandemics should be monitored and the need to construct sustainable and human-scale cities.

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Introduction

Promoting the use of public transport for urban mobility is not only key for decarbonization and mitigating climate change, but also offers direct benefits for public health: improving air quality in densely populated areas, promoting active modes of transport, and encouraging activities that are less stressful than driving.

The situation has been dramatically changed by COVID-19. In addition to restrictions on human mobility, the use of public transport has been limited, or discouraged (Tian *et al.* 2020), having been identified as a vector for the spread of infection in densely populated areas (Buja *et al.* 2020). As demonstrated by the previous SARS pandemic (Wang 2014), the fear of infection also discourages the use of public transport. Figure 1 shows changing tendencies in four large cities and a sharp fall in its use.

Barring the discovery, and availability, of an effective vaccine or treatment, physical distancing may be necessary until 2022 (Kissler *et al.* 2020). Cities must adjust to this situation and offset some of the more negative long-term effects of the pandemic.

Short-term effects of COVID-19 on public transport services

Unprecedented restrictions on the use of public space and mobility have been accompanied by some alarming, and often contradictory, political pronouncements. Since public transport has been associated with health risks, public authorities have advised limiting its use. This has produced a noticeable shift

towards the use of private vehicles (see Figure 1) and the introduction of micro-mobility measures including temporary pedestrianization, extensions to cycle networks, and road closures.

Social and health-related inequalities have been exacerbated between those able to do telework and those who must travel on a daily basis. Preliminary reports from cities such as Barcelona (ATM & GURB 2020) and New York (Sy *et al.* 2020) suggest COVID-19 has had its greatest impact in working-class neighbourhoods whose residents rarely do telework and whose journeys-to-work increase the potential for exposure to the virus.

New global challenges facing public transport services

Although there is great uncertainty and the debate is only just emerging, it is possible to forecast several medium- and long-term implications of the COVID-19 crisis for public transport services in cities (see Figure 1).

The provision of safe and reliable public transport services

Public transport operators must minimise the risk of contagion both on-board and during passenger waiting time. The use of masks will, no doubt, remain common for some time. Services must be flexible enough to satisfy user needs but (as and when required) limitations must also be placed on occupation rates to ensure physical distancing. New

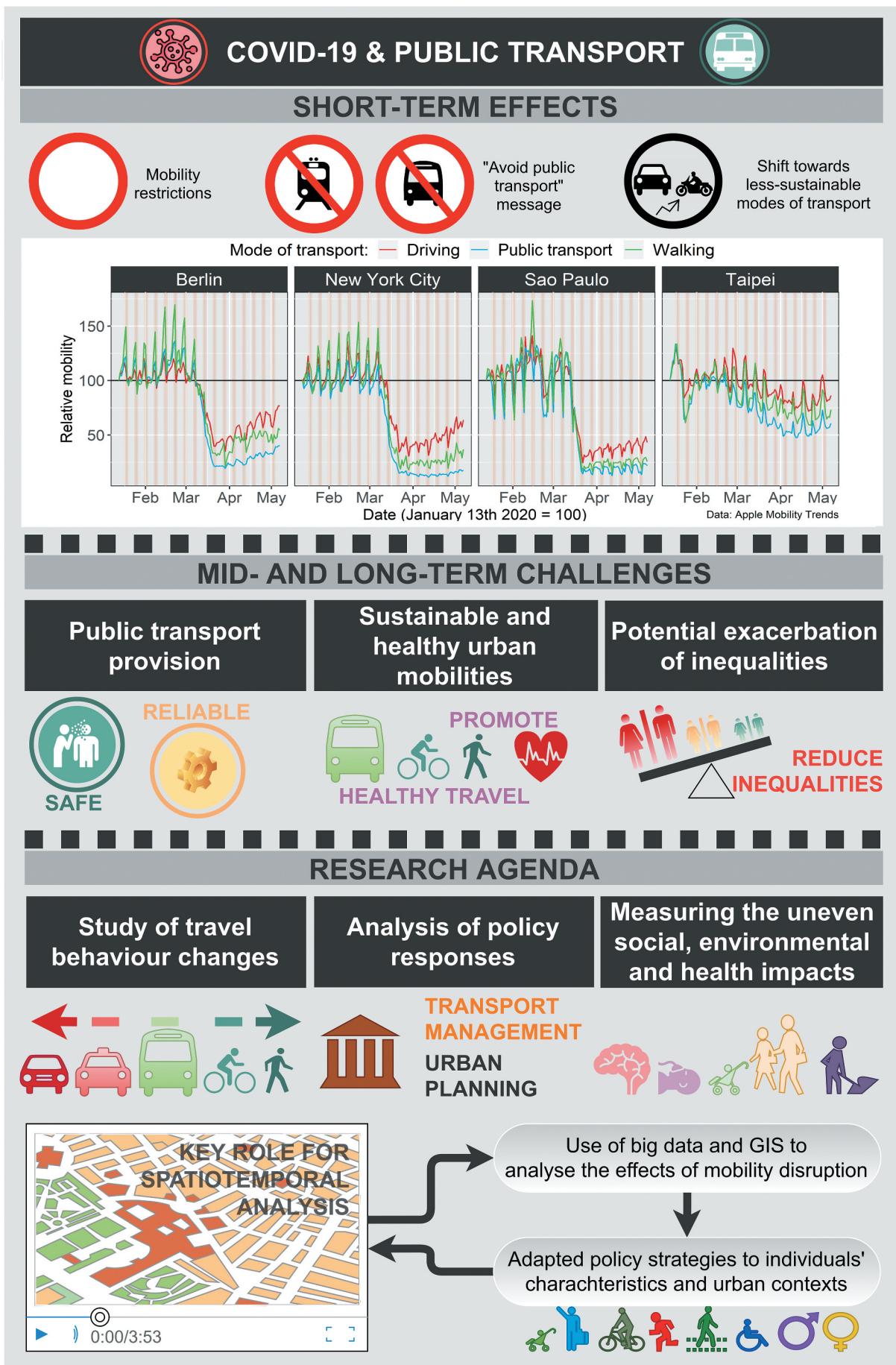


Figure 1. The effects, challenges and research agenda associated with COVID-19 and urban public transport.
Source: Own research

technological solutions will be important and include the introduction of contactless systems and investment in air renovation and filtering systems.

Fear of infection is real and associated stress could cause mental health problems. A shift in user preferences towards less crowded and more flexible transport solutions is highly likely. Transport operators will need to extend the provision of integrated multimodal systems, incorporating the latest technologies, and communicate more effectively with their users. Multimodality and co-modality will be important factors, with the most suitable transport combinations perhaps varying with real and perceived levels of risk.

It is unclear how these changes will be funded. In the short term, the public sector will probably assume the cost, while longer-term actions will probably require additional investment and a more efficient allocation of resources. Although, barring further serious outbreaks, occupation restrictions are unlikely to remain in force, the economic crisis and more telework will probably reduce commuting and cause a shift towards the greater use of private transport. Any temptation to increase fares and/or suppress services to counteract the effects of shrinking demand could have an additional negative impact on working-class neighbourhoods.

Public transport services recovery will be closely linked to how cities redistribute the use of their urban space. Although public transport would benefit from more space being reserved for bus lanes rather than private vehicles, in less densely populated cities it could be difficult to introduce more sustainable solutions.

More sustainable and healthy urban mobility

The disruption caused by the pandemic could be used to make cities healthier and more sustainable, with more space being made available to pedestrians and cyclists. This is not difficult when mobility plummets, as happened during the initial virus outbreak. Although it may not be easy to make such decisions permanent, there is a clear window of opportunity available and temporary action could subsequently inspire future policies.

The demand for public transport will be shaped by its interaction with other modes of transport. This is also a question of how public space is (re)distributed. Cities will have to decide which modes of transport they will promote. Ideally, the combined offer of active modes and public transport should favour more sustainable and healthier modal choices when the demand for mobility recovers.

The potential exacerbation of inequalities

The resilience capacity of different groups varies, with the most vulnerable social groups typically being the ones most affected. The pandemic could exacerbate existing negative externalities associated

with residential segregation and neighbourhood effects. Deprived neighbourhoods, besides being characterised by higher proportions of less qualified jobs, usually include more densely occupied urban spaces and are less permeable to physical distancing requirements and changes to transport systems.

Inequalities could be either reinforced or softened depending on how public space and transport services are managed. Cities which maintain, or increase, the amount of space devoted to private vehicles, and/or which reduce the provision of public transport, could prejudice and/or effectively exclude those without private cars.

Future research in the aftermath of COVID-19

The COVID-19 crisis and its medium- and long-term implications lead us to foresee an emerging research agenda based on sustainable and healthy urban mobility and with solid guidelines for future pandemics (see Figure 1).

Study of changes in travel behaviour

The reconfiguration of travel behaviour will be an emerging research field. It is important to understand how and why new constraints will affect different social groups and whether they will exacerbate existing social, gender, age, and spatial imbalances. Unequal access to, and availability of, transport could increase existing socioeconomic inequalities and segregation. Another key research topic could involve the reasons underlying the fear of contagion on public transport, their implications for human well-being and mental health, and their potential to change travel behaviour. Experience derived from previous SARS pandemics around the world (e.g. in South-East Asia) could perhaps help formulate best practices and recommended social responses. However, avoiding public transport could become a widespread trend and cause the exclusion of low-income workers and potentially affect their mental health. This could promote the purchase of private vehicles, resulting in greater financial burdens, exacerbating inequalities, and increasing the ecological footprint. This phenomenon should be studied worldwide, also in the Global South, where the supply of public transport is more limited.

Policy responses to the new context

Precise estimations are needed of the contribution of public transport to the spread of disease and of the effectiveness of the strategies implemented. The role of technology (contactless technologies, big data, and new means of communication) must also be analysed. The provision of public transport services, which depends on public funding and is often run at a loss,

requires a study of the efficiency of these services and their cost. Transport operators may need to remodel their service and financial structures to achieve greater efficiency without forgetting the social implications of such action.

Urban planning and transport management policies must also be critically reviewed. The first actions taken during the COVID-19 crisis sought to promote active modes and reduce the space given to private vehicles. However, the policies that will be implemented in the medium and long-term are uncertain, as are how these will affect pedestrians and public transport.

Measuring uneven social, environmental, and health impacts

The uneven impact of changes in travel behaviour is another critical research issue. Currently emerging lines of research include: the role of public transport in creating new social and health inequalities; the environmental impact of modal choices; the distance and frequency of daily, occasional and leisure travel; and the social and spatial reconfiguration of urban functions.

A more intense application of information technologies, big data, and Geographical Information Systems (GIS) offers an unprecedented opportunity to dynamically monitor human mobility at multiple spatio-temporal scales. Its combination with qualitative information will allow a detailed longitudinal analysis of the different effects of the pandemic. This therefore offers a promising direction for research, with the potential development of complex, yet reliable, data-driven systems that should permit rapid knowledge acquisition and the formulation of adapted-to-reality policies (Zhou *et al.* 2020).

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