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Patrick Rérat, Lucas Haldimann, Hannah Widmer

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Cycling in the era of Covid-19: The effects of the pandemic and pop-up bike lanes on cycling practices.

Patrick Rérat, Patrick.rerat@unil.ch, ORCID 0000-0001-6980-3336

Lucas Haldimann, lucas.haldimann@unil.ch, ORCID 0000-0003-0369-2287

Hannah Widmer, Hannah.widmer@unil.ch, ORCID 0000-0002-6568-3012

Observatory for Cycling and Active Mobilities and Institute of Geography and Sustainability,
University of Lausanne

Geopolis–Mouline, 1015 Lausanne, Switzerland

Abstract

This paper addresses the effects of the pandemic and of Covid pop-up cycle lanes on cycling. A questionnaire survey was carried out in Geneva and Lausanne, Switzerland. The pandemic has strengthened the attractiveness of cycling both as a mode of transport and as a recreational activity, showing its resilience in a time of crisis. Covid cycle lanes implemented after the first lockdown have improved traffic conditions for cycling in terms of safety, directness and the overall experience. Beyond the recruitment of new cyclists, an effect of consolidating existing practices is observed through, for example, their extension to additional routes and motives. These pop-up cycle lanes have, however, been politically contested, and their reception varies in the population, depending mainly on mobility habits and political position. As both cities aim to increase their modal share of cycling, the challenge is to capitalize on the recent development of cycling, to provide suitable infrastructures, but also to find ways to deal with the controversies and to legitimate cycling as a fully-fledged means of transport.

Keywords: Cycling, Covid-19, Corona, Mobility, Planning

Highlights

- The pandemic has strengthened the attractiveness of cycling as a mode of transport and a leisure activity
- Covid cycle lanes have improved safety, directness and the experience of cycling
- Covid cycle lanes have consolidated existing practices
- Their reception (and contestation) depends on mobility habits and political position

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1. Introduction

The coronavirus pandemic has had disruptive consequences on all aspects of life. As the virus does not move by itself but is disseminated by individuals, measures were taken to reduce mobility and social contact: border closures, limits on indoor gatherings, working from home, distance learning, etc. Social – or, more accurately, physical – distancing entered our lexicon. In the first stages of the pandemic, lockdowns led to a massive reduction in travel demand. People also turned to individual modes of transport as these, unlike collective modes of transport, guarantee physical distancing (Tirachini and Cats 2020; Basbas et al. 2021; Molloy et al. 2021).

Cycling soon came to be portrayed as “benefitting” from the pandemic, and it was debated in Spring 2020 whether COVID-19 would be “a turning point for active travel in cities” (Nurse and Dunning 2020). Sales of bicycles reached record high levels in several countries, and many cities took measures to foster cycling and to prevent a modal shift from public transport to the car (Combs and Pardo 2021).

The most emblematic measure is certainly the pop-up cycle lanes, termed provisional COVID-19 infrastructures by Kraus and Koch (2021) and COVID-19 cycling infrastructure by Lin, Chan, and Saxe (2021). In this paper we use the term ‘Covid cycle lanes’¹. These pop-up infrastructures were installed during or soon after the first lockdown (Spring/Summer 2020) and implemented very rapidly so that they differ from ‘classic’ cycle lanes in terms of the planning processes, materiality and duration. The quick and unbureaucratic manner in which the cities acted resonates with tactical urbanism (Lydon and Garcia 2015), a type of urban planning that usually involves temporary and low-cost interventions that aim to introduce rapid changes to urban spaces with a broader purpose in mind (ibid.)².

This paper addresses the effects of the pandemic and Covid cycle lanes on the practice of cycling in Geneva and Lausanne, Switzerland. While mobility practices often have their basis

¹ It refers to the French catchword “Coronapiste” (Corona & way) that has become part of the everyday language and entered the *Larousse* dictionary

² Even though tactical urbanism is often associated with grassroots initiatives, it can be applied by authorities. A famous example of top-down tactical urbanism is Ciclovía in Bogotá, Colombia, where streets are temporarily closed to cars on a regular basis.

in routines and are usually resistant to change, external events such as strikes and protests or natural hazards may disrupt them and represent a window of opportunity for change (Chatterjee, Sherwin, and Jain 2013). The pandemic, with its various travel restrictions, constitutes such a critical event and needs attention.

Methodologically, the paper differs from existing research that mainly uses aggregated data from bicycle counters to infer changes in cycling practice. We collected individual data through a questionnaire survey that was specifically designed to understand how and why cycling practices have changed with the pandemic. Theoretically, the paper draws on the concept of velomobility to address the multiple dimensions constituting cycling practices. This methodological and theoretical stance makes it possible not only to address the evolution of cycling with respect to the pandemic and the implementation of Covid cycle lanes, but also to understand the mechanisms behind it.

This paper is structured around three research questions:

1. How have cycling practices evolved with the pandemic?

This question identifies the various impacts of the pandemic on cycling (reasons for travelling, modal shift, equipment, etc.).

2. What are the effects of Covid cycle lanes on cycling practices as perceived by cyclists?

This specifically addresses the extent to which Covid cycle lanes have changed cycling as an embodied experience.

3. How were Covid cycle lanes received by cyclists and non-cyclists?

This third question addresses the political reception of these interventions. Although this part adopts a more explorative approach (due to the sample; see below), it addresses a crucial aspect of the politics of velomobility.

The next section presents the concept of velomobility and the literature on the effects of COVID-19 and Covid cycle lanes on cycling. The paper then explains the spatial context and the way the survey was designed. The empirical part is organized around the three research questions, and finally the conclusion outlines some lessons learned for cycling policies.

2. Theoretical discussion

2.1. The system of velomobility

Several authors have highlighted the need to consider a wide range of individual, social, political and material elements in studying cycling, and have coined the concept of the system of velomobility (see Behrendt 2018 and Cox 2019 for a discussion). The term ‘velomobility’ is often used in opposition to the concept of automobility, the latter of which was coined by Urry (2004) to highlight the fact that the car is much more than a vehicle but refers also to a socio-technic assemblage involving practices, infrastructures, social norms, images, rules, industries, etc.

Behrendt (2018) speaks of e-velomobility to refer to the “practices, systems and technologies of electrically assisted cycling where velomobility’s pedal-power combines with e-mobility’s battery/motor assistance to propel the rider”. Koglin and Rye (2014) draw on Cresswell’s ‘Politics of mobility’ (Cresswell 2010) to develop a theoretical framework for cycling in urban and transport planning that takes into account the physical movements of cyclists, their embodied experience, the representation of cycling and the power relations in urban traffic spaces (Koglin and Rye 2014). Velomobility can be regarded as an incomplete system that lacks dedicated infrastructures and social legitimacy in a context dominated by automobility, as both systems “compete for people’s time, for road space, for resources, and in discourse” (Watson 2013, 121). This last point is in line with the “omnimodal” approach (Héran 2014) that pushes for cycling to be addressed in relation to the other transportation modes.

To define velomobility, we draw on Kaufman’s conceptualization of mobility (Kaufmann, 2011) and adapt its three interlinked dimensions of cycling: movements (uses of the bike), the aptitude of movement or motility (the individual’s cycling potential), and the field of possibilities of a context (in this case its hosting potential for cycling, or its bikeability)³ (Rérat 2021b, 2021a). This approach shares principles with the other approaches of velomobility mentioned above, such as the need for a holistic view of cycling. It presents an advantage in that it enables the identification of the various changes affecting cycling at both an individual

³ We use bikeability by analogy with the more widespread term of walkability (attractiveness of a space for walking). It does not refer to individuals, unlike the British initiative of the same name that promotes training programmes.

and a contextual level. We use this framework to address the effects of the pandemic on cycling both in the literature review and in our fieldwork.

2.2. Bicycle use

This first dimension covers factual elements that transportation studies traditionally address: users' profile (socio-economic status, gender, age, etc.) and the characteristics of their journeys (frequency, reason, etc.).

This is the dimension that has attracted the most attention in the research on cycling in the Covid era. Data from automatic bicycle counters enables analysis of the evolution of traffic, usually highlighting the rapid recovery of cycling and a growth to higher level than before the pandemic. This was the case in Budapest where, after an initial period of decline at the beginning of the pandemic, the bicycle more than doubled its modal share (Bucsky 2020). Kraus and Koch (2021) identify an increase in cycling in European cities that implemented Covid cycle lanes (see below), and ridership data also shows the same trend of bicycle sharing schemes, whose use rebounded quickly after the first lockdowns (Bucsky 2020; Heydari, Konstantinoudis, and Behsoodi 2021; Teixeira, Silva, and Moura e Sá 2021).

A comparison of cycling traffic across time and space gives clues as to the factors behind this trend. Bicycle counters in 11 EU countries showed an 8% increase overall in cycling between 2019 and 2020 (Buehler and Pucher 2021); this was much larger on weekends (+23%) than on weekdays (+8%). A similar trend was observed in the USA (+29% on weekends, +10% on weekdays), but there was a decline in Canada of 3% on weekdays (+28% on weekends). The much smaller increase (or decline) in weekday cycling is due to the overall decline (all modes) in travel to work, university, school and shopping due to closures and travel restrictions. Many daily trips were replaced as people worked, learned and shopped from home. At the same time, there was an increase in cycling for exercise and recreation, as shown by weekend figures. This is also highlighted by changes according to the time of day – an increase in the afternoon and early evening, a smaller increase or decline during the morning on weekdays – and location – a larger increase on off-road recreational greenways and a (relative) decline within and to/from commercial areas and university campuses (ibid.).

In Switzerland, bicycle traffic increased by 10% between 2019 and 2020 on the Cycling in Switzerland network, which is mainly designed for leisure and sport (Schweizer and

Lindenmann 2021). The increase was higher in rural areas (+32%) than in urban regions (+4%). A larger inventory of bicycle counters in urban areas shows that 80% of the 134 counters recorded an increase, which was higher than 10% for 72 of them (Marincek and Rérat 2021). In Zurich and Basel, cycling declined during the lockdown and recovered rapidly. It reached the level before the pandemic but without a significant increase when controlling for seasons and weather (Büchel, Marra, and Corman 2022).

Aggregated data has several shortcomings. First, it may hide various trends in terms of reasons to cycle or population groups. Second, most year-to-year estimates understate the true increase of cycling, as many journeys by bike were not undertaken due to measures such as compulsory home working or online learning. Third, examining percentage changes in cycling only may be “misleading without accounting for changes in total travel by all modes over the same period” (Buehler and Pucher 2021).

Surveys among cyclists enable a better understanding of the variety of situations. Our paper, for example, considers the various cycling trajectories of individuals with the pandemic (decreasing, stable, increasing, restorative)⁴. In a survey in Australia on self-reported cycling activity, 63% of respondents increased their practice at the height of the pandemic restrictions, 15% reduced it (due to less working hours, working from home, restrictions, etc.) and 22% started again or were new to cycling (Fuller et al. 2021). Among the latter category, women were overrepresented (33%). Following the easing of national lockdown restrictions, about 85% of respondents either increased or maintained the level cycling that they had adopted during the national lockdown (ibid.).

Bicycle use can be interpreted as the meeting point between individual cycling potential and a context's hosting potential, both of which are discussed in the next sections.

2.3. Individual cycling potential

Individuals are characterized by their motility, or aptitude for movement, in a given physical, economic, and social context (Kaufmann, 2011, 37). The individual's cycling potential

⁴ In this paper, the cycling trajectory is restricted to the evolution of the use of a bike as a result of the pandemic. It is usually much wider and encompasses "a person's thoughts, feelings, capabilities and actions related to cycling [...] developed over the course of their lives and shaped by transitions (or life-change events) that they have made and the contexts that they encounter" (Chatterjee et al., 2012 : 5). However, a qualitative approach would have been required to address cycling trajectories in their complexity.

comprises three dimensions enabling an individual to use a bike: access (“can”), skills (“know”) and appropriation (“want”) (Rérat 2021a, 2021b).

The first dimension, access refers to the mobility options available to an individual (depending on price, time, etc.) and equipment, such as vehicles (cars, bikes, etc.), public transport passes or subscriptions to car-sharing schemes (Flamm and Kaufmann, 2006). The second dimension, skills involved in riding a bike are not restricted to the ability to balance while pedaling (Flamm 2004), but extend to the individual’s physical condition, their experience of traffic situations, their knowledge of the geographical context, their ability to estimate the duration of the journey, and their organizational knowledge (e.g. their ability to orient themselves, to plan activities or to do repairs). The third dimension, appropriation, refers to how individuals perceive and select mobility options according to their plans, aspirations and habits.

In terms of access, the rise in bike sales, the shortage of spare parts and the increased demand for repairs have often been portrayed in the media during and since the pandemic. Bicycle sales in the EU came to 22 million units in 2020, up from 20 million in 2019 (Statista 2021), and in 2020 in Switzerland, they reached a record level (500,000 bikes compared with 363,000 the previous year, an increase of 38%) (Velosuisse 2021). Between May 2020 and March 2021 in France, the ‘Coup de pouce vélo’ scheme offered individuals financial aid for repairs (more than 1.7 million bicycles) and training to “get back in the saddle” (6,000 people), as well as subsidizing the installation of bicycle parking facilities.

The ‘Coup de pouce vélo’ scheme raises the importance of skills for utility cycling. In our theoretical framework, skills must be considered relationally, as they depend highly on the bikeability of the context. Empty roads during the lockdowns due to the sharp decline in motorized traffic improved the experience of cycling (Nurse and Dunning 2020). This period may also have induced a learning effect, notably among women, who were more likely to state that their cycling skills and confidence improved during the pandemic (Fuller et al. 2021).

Appropriation refers to the reasons for which individuals change their cycling practices. A decline in cycling may result from a reduced need to travel due to home working and distance learning. An increase in cycling may stem from a variety of reasons. The first is the need for physical distancing and the fear of infection, which led to a strong decline in ridership on public transport (Tirachini and Cats 2020). In a survey among users of bicycle sharing schemes in Lisbon, maintaining social distancing and avoiding public transport were already present

before the pandemic, but are now among the main motivations (Teixeira, Silva, and Moura e Sá 2021).

A second range of reasons refers to the bike as a recreative and physical activity. Active mobilities were promoted as a means of staying fit and getting exercise when swimming pools, indoor gyms, and playgrounds were closed (Budd and Ison 2020), and offered a welcome break from the confines of lockdown (ibid.). Physical distancing may have resulted in more “undirected travels”, i.e. trips without a destination (De Vos 2020). The strongest increase was on weekends and in the afternoon (in comparison to weekdays and the morning rush hour), and this is in line with the rise of cycling as a leisure activity (Buehler and Pucher 2021). According to an Australian survey, key motivations for those who cycle for exercise are enjoying riding for fitness (82% say extremely important), riding as a social activity (39%) and having fewer cars on the roads (37%), while public transport restrictions were not important for 86% of them (Fuller et al. 2021).

2.4. Hosting potential for cycling

The hosting potential of a space refers to how receptive or suitable it is for certain modes of transportation (Kaufmann 2011). This receptiveness relates to the notion of affordance (Gibson 2014), which derives from the verb to afford, meaning both to provide and to be able to do something. Affordance is relational in that it links the suitability of a context with users’ intentions, capabilities and skills (the individual’s cycling potential). In the case of cycling, the hosting potential of a space, or its bikeability, has three main aspects (Rérat 2021a, 2021b): spatial context, infrastructures and rules and norms. The first of these, spatial context, refers to topography, climate and urban form (density, etc.). As this dimension is stable over the considered time frame, we do not investigate it further.

Separated and protected infrastructures are key affordances in the incentivization of cycling (e.g. Dill and McNeil 2013; Buehler and Dill 2016; Aldred et al. 2017). According to the Dutch CROW Bike Design Manual, five criteria have to be met to create a cycling environment suitable for a large proportion of the population: cohesion (connecting origins and destinations), directness (short and fast routes), safety, comfort (minimal stops or nuisances) and attractiveness of the route (Groot 2016).

A short-lived phenomenon that increased the bikeability of spaces was the reduction of car traffic during lockdowns. The most important measure, however, involved pop-up cycle lanes, which can be seen as a new affordance that is likely to change the embodied experience of cycling. Bogotá was the first city to expand its network and take back road space for the bike. It was followed by cities mainly in Europe (e.g. Barcelona (which increased its network by 21 km), Brussels (27 km), Milan (67 km), Paris (80 km) and London (100 km)) and North America (e.g. Chicago (48 km), Montreal (88 km) and New York City (102 km)) (Buehler and Pucher 2021). They reconfigured their built environment, at relatively low cost, to facilitate safer and more connected journeys for cycling as well as walking (pedestrianized streets, terrace expansions, etc.)⁵.

Kraus and Koch (2021) measured levels of cycling in 736 locations across 106 European cities and found that Covid cycle lanes had increased cycling from 11% to 48% on average between 2019 and 2020. This represents 1 to 7 billion dollars in health benefits per year if cycling habits stick. In Toronto (Lin, Chan, and Saxe 2021), the effect of pop-up bicycle lanes differs geographically, as accessibility gains are largest in areas where new infrastructure links with the preexisting network. The main barrier to cycling in much of Toronto remains the limited and disconnected cycling infrastructures. In Zurich and Basel, the lack of significant increase in cycling after the lockdown was attributed to the absence of policy measures such as Covid cycle lanes (Büchel, Marra, and Corman 2022).

The bikeability also has political and symbolic dimensions in spaces still dominated by automobility. The car has informally privatized public space so that other users do not feel legitimate anymore and feel that the road has become a dangerous place for them (Lee 2015). Many Covid cycle lanes faced political controversies. The rapidity of the implementation of these measures left little or no room for public consultation and followed a top-down decision-making (Combs and Pardo 2021). While the lack of public engagement may explain some controversies, it has to be noted that the hosting potential of a spatial context for the various transport modes is also the consequence of power relations seen in the allocation of

⁵ Combs and Pardo (2021) tracked 1109 measures regarding the use of streets in 60 countries between March and August 2020. This inventory is not exhaustive (Geneva and Lausanne are missing, notably) but quantifies the following types of measures: curb space reallocations (27%), full street closures (19%), legal, policy, enforcement or funding changes (16%), partial street closures (11%), automated walk signals (5%), reallocation of non-street space (3%) and other mobility-related strategies (bicycle parking, bicycle sharing and subsidies) (19%). On the whole, 43% of these measures expanded the street space for walking/cycling (Combs and Pardo 2021).

budget and space as well as in planning models that consecrated the hegemony of the car and led to the marginalization of active modes (Koglin and Rye 2014; Cox and Koglin 2019). Covid cycle lanes, like any infrastructures, “are not apolitical or neutral technologies. New space carved out for cyclists inevitably represents the disruption of real or imagined order within the existing streetscape” (Wild et al., 2018, 507). Cycling infrastructures may give rise to opposition as they re-allocate space, financial resources and political priority previously dedicated to automobility (Siemiatycki, Smith, and Walks 2016).

3. Research approach

3.1. Case studies

In Switzerland, 7% of all journeys were made by bicycle in 2015 (most recent figures), which is higher than in English-speaking and Latin countries but lower than in Northern European countries. Large differences are found between the German-speaking part of Switzerland (8.6%) and the French-/Italian-speaking parts (2.9%/2.7%), indicating varying levels of cycling infrastructures and traffic calming measures (Rérat 2021a).

Geneva and Lausanne are the 2nd and 4th most populated Swiss cities (200,000 and 140,000 inhabitants) and are located in the French-speaking part of the country. The modal share of cycling accounts for 7% in Geneva and 2% in Lausanne (a lower figure notably explained by its very hilly topography)⁶, which is much lower than in the other major Swiss cities (12% in Zurich, 15% in Bern and Winterthur, 17% in Basel). Traffic conditions in Geneva and Lausanne are rated negatively by cyclists: 22% of bike commuters in Geneva and 34% in Lausanne feel unsafe during their home–work journey (ibid.). These values are much higher than the national average (14%) and place them at the very bottom of a list of 24 cities. Bicycle sharing plays a minor role (as in most Swiss cities) due the small size of the sharing schemes.

In 2020, the length of cycling routes was about 130 km in Geneva and 111 km in Lausanne. However, these figures include a wide range of configurations: streets with a 30 or 20 km/h speed limit; pavements, pedestrian zones and bus lanes open to cyclists; cycling contraflows; cycle lanes (demarcated with paint) and cycle tracks (physically segregated from motorized

⁶ The rest of their modal split is as follows: walking 48% and 42% respectively, cars and motorized two-wheelers 26% and 35%, and public transport 20% and 21%.

traffic). Both cities have defined the increase in the number of kilometers of cycling routes as a political objective.

On 16 March 2020, the Swiss government decided to close down many economic and cultural activities, to make home working and online teaching compulsory, and to introduce a 'semi-lockdown' (residents were still allowed to go out without a curfew). The cantons of Geneva and Vaud (where Lausanne is located) were particularly affected by the first wave of the pandemic, and by the end of April 2020, the mortality rate per million people was twice as high as in the rest of Europe and almost three times higher than in the rest of Switzerland (Kuhn et al. 2021). Measures were progressively lifted before the summer, but some were implemented again with the second wave in the autumn.



Figure 1: Examples of Covid cycle laned in Geneva (above) and Lausanne (bottom) (source: Lucas Haldimann & City of Lausanne)

The pandemic accelerated existing cycling plans, and both Geneva and Lausanne created each 7.5 km of Covid cycle lanes in Spring 2020⁷ (Figure 1). In Geneva, the city targeted strategic points of interest, working towards a safe and legible cycling network. The authorities opted mainly to transform car lanes into bike lanes, so that the cycling network covers the whole of the city centre around the Old Town. The new developments were conceived jointly by the city authorities and the Canton of Geneva through a working group for active mobility that met over an intense period of ten days. All but one of the temporary bike lanes were made permanent in September 2020, although two have been taken to court by the main car lobby, and the process is still pending.

The strategy chosen by the City of Lausanne to gain space for cycling differs from that of Geneva: to implement the 7.5 km of Covid cycle lanes, the city mainly removed 600 parking spaces from the streets. The identification of suitable road sections was facilitated by already existing cycling plans, and the city concentrated its effort on the main axes entering the city centre. These have been made permanent with some adjustments (100 m were removed) and with a return to traditional planning and building processes.

The Covid cycle lanes provoked a lot of heated debate. Both proponents and critics used a broad range of means to advocate their cause: petitions, demonstrations, mobilization via social media, etc. In Geneva in particular, expressions of opinion were numerous. The debates resembled an arm wrestle between the opponents (car lobbies, right-wing parties and retailers) and proponents (cycling lobbies, environmental and health NGOs, and centre and left-wing parties). The block of opponents was divided, however. Some right-wing politicians supported the measure, while a car driver lobby attacked the Covid cycle lanes that removed space from cars on the main roads.

3.2. Methodology

The research relies on a questionnaire survey that addresses more dimensions than counter data but has the disadvantage of being self-reported (stated preferences) by individuals. The survey was available from 1 June to 4 August 2021, by which time the pandemic had reduced in intensity. This period allows for hindsight regarding the changes brought by the pandemic,

⁷ A couple of smaller towns in the French-speaking part of Switzerland implemented cycle lanes, but none of the German-speaking urban centers did. This is often explained by the higher quality and density of their infrastructures, although political factors also come into play.

as it was more than a year after “The Great Pause” (Nurse and Dunning 2020). The questionnaire was distributed online and not sent to a random sample. The primary target were cyclists, and a random population survey would not necessarily have led to a representative sample of them. A probabilistic method (postal survey or commissioning a polling company) was not within the budget.

Communication relied on social media and on the address database of the Observatory for cycling and active mobilities, University of Lausanne (contacts in associations, administrative authorities, etc.). The City of Lausanne published three paid posts on Facebook and mentioned the study in its monthly newspaper. The University of Lausanne retweeted the announcement, and several groups and associations relayed it among their members. The survey targeted cyclists primarily, but in order to reach non-cyclists too, it was presented as studying the influence of the pandemic "on your mobility, on your use of bicycles and on new cycling facilities". A total of 938 cyclists⁸ living in Lausanne and 463 in Geneva answered the survey, while the number of non-cyclist residents was much lower (352 and 89).

Relying on word of mouth can lead to biases. People active on social networks or those who are affected (experienced cyclists, members of cycling associations) or have a strong opinion (some opponents) are more likely to participate than others (new cyclists, indifferent people, etc.). We adopted several strategies to reduce possible biases: (1) We excluded non-residents who answered the questionnaire, even though it was clearly mentioned that respondents had to live in one of the cities (in addition to the total of respondents considered in the survey, 238 people in Lausanne and 552 in Geneva answered the survey despite living elsewhere (mainly in neighbouring municipalities). (2) We systematically compared the results obtained in Geneva and Lausanne. (3) We compared the results of the questionnaire with an intercept survey on Covid cycle lanes in Lausanne in May 2021 (n=162 cyclists) (Schmassmann and Rérat 2022). (4) We focused the analysis on cyclists, while recognizing that less committed or regular cyclists may be underrepresented. (5) We did not do frequency analysis of the usefulness of Covid cycle lanes among non-cyclists, as the sample is not representative of the whole population. Instead, we used a logistic regression to try to mitigate sampling bias and adopted a more exploratory approach to identify the varying reception of Covid cycle lanes and the

⁸ Respondents are defined as cyclists if they had cycled at least once in their city (but not on holiday or in another place) in the previous 12 months.

characteristics of respondents who support/oppose this measure. (6) We also used triangulation research to assess the results of this logistic regression and to avoid overinterpretation. We compared them with an analysis of the political debates on Covid cycle lanes in both cities (Widmer, Guinard, and Rérat forthcoming), as well as a discourse analysis on a national vote on cycling and a logistic regression on the outcome of the vote on a representative sample of Swiss citizens (Rérat and Ravalet 2022).

The survey was informed by our theoretical framework and was designed to collect information to address our three research questions. For the first one ("How have cycling practices evolved with the pandemic?"), questions were asked on mobility practices (frequency of use of the various modes; possession of vehicles and season tickets; changes since the pandemic) and cycling practices (frequency and evolution in general and for work/studies, shopping, to get to other activities, and for leisure/sport; equipment possessed; motivations and barriers). Four cycling trajectories are defined according to the evolution of cycling since the start of the pandemic: the decreasing trajectory (overall decline in bicycle use), the stable trajectory (overall stability), the increasing trajectory refers (people who cycle more than before the pandemic) and the restorative (people who have taken up cycling (again)). As learning to cycle is a rite of passage during childhood in Switzerland, and given the low bikeability of the two cities, we can assume that these individuals had previous cycling experience.

For the second question ("What are the effects of Covid cycle lanes on cycling practices?"), we asked cyclists to rate Covid cycle lanes (speed, user-friendliness, safety, markings)⁹, their effect on cycling (higher frequency, new routes), and their usefulness. For these two questions, we conducted frequency analysis and comparison between both cities.

For the third research question ("How were Covid cycle lanes received by cyclists and non-cyclists?"), we made the usefulness of the pop-up cycles lanes a dependent variable in a logistic regression. The question was general in scope and, like a vote that Swiss citizens are used to, tested the degree of approval and support for the measure¹⁰. The explanatory factors

⁹ These dimensions refer to the CROW criteria: respectively directness and cohesion, attractiveness, safety, comfort.

¹⁰ The question was "Do you think it [temporary cycle facilities] is a useful measure?". Possible answers were "yes" or "quite useful" on the one hand, and "no" and "not really" on the other hand.

were identified in the literature on the politics of cycling and in a previous survey among a representative sample of citizens on the vote for fostering cycling to be included in the Swiss Constitution (Rérat and Ravalet 2022). These factors refer to the sociodemographic profile (gender, age, household, education, income, employment status, place of work), mobility practices (access to a car¹¹ and frequency of bike use), political values (ranging from 0 (far left) to 10 (far right)) and the city of residence (in order to compare Geneva and Lausanne). The logistic regression measures the specific effect of the explanatory variables on the propensity to find the Covid cycle lanes useful in terms of odd ratios. If they are greater (or smaller) than 1, the modality increases (or decreases) the likelihood of finding Covid cycle lanes useful compared to the reference modality.

In the sample, men represent 56% of cyclists in Lausanne and 61% in Geneva. This overrepresentation is common where the modal share of cycling is rather low (Garrard, Handy, and Dill 2012; Aldred et al. 2017). This gender gap is usually explained by a higher sensitivity to women to a low level of infrastructure and perceived safety. Middle-aged people are most present (36% in Geneva and 34% in Lausanne are in their 30s, while 42% and 45% respectively are aged 40–60), while the youngest and oldest groups are less present. There is a high proportion of university graduates (75% and 76% respectively), which can be explained by a greater propensity (a) to cycle, (b) to have been aware of the survey (particularly through cycling, environmental, car associations) and (c) to participate in an academic survey. Most cyclists knew about the existence of Covid cycle lanes: 98% in Geneva, 88% in Lausanne. The media coverage and the political debates were not as lively in Lausanne. During the intercept survey in Lausanne though, those unaware were mainly new residents. Among respondents aware of the new infrastructures, almost all had at least one experience of the Covid cycle lanes (97% in Geneva, 92% in Lausanne).

4. Results

4.1. The evolution of cycling during the pandemic

Respondents cycle regularly, and they do so more in Geneva than in Lausanne (Table 1). Nearly half of respondents in Lausanne (45.5%) and more than two thirds in Geneva (67.5%) cycle

¹¹ This variable is the only one that was not used in the research we used to define this range of variables (Rérat and Ravalet 2022).

daily, and a quarter and a fifth respectively use their bike one or two days a week. Occasional cyclists (1–3 days per month or less) represent around 13% in Lausanne and just over 6.5% in Geneva; these figures could, however, be underestimated by the sampling method.

A comparison between transport modes shows that the bike is the most frequent (Tables 3 and 4): 72% and 86% of respondents in Lausanne and Geneva use their bike at least 3 days a week (a proportion higher than for the other modes). Cyclists are often multimodal as they use several modes depending on the day, journey and reason for travel (Tables 3 and 4)¹². In terms of frequency of use, the bike is followed (very closely in Lausanne) by walking, while only 10% of cyclists never use public transport (including the train) and almost one fifth never use a car (17% of cyclists in Lausanne and 19% in Geneva never drive a car). However, nearly half of the cyclists use a car several times a month (46% and 44% respectively). A more frequent use of the car (three days a week or more) is more common in Lausanne (13%) than in Geneva (6%), while the opposite is observed for motorized two-wheelers (2% vs 4%). The latter type of vehicle is never used by 83% and 89% of cyclists respectively.

Four cycling trajectories are defined according to the evolution of cycling since the start of the pandemic (Table 1). First is the decreasing trajectory, which represents an overall decline in individual bicycle use: about 10% travelled by bicycle less than before (9% in Lausanne, 11% in Geneva). Second is the stable trajectory, which is the most frequent (42% and 58%) and indicates an overall stability, although some respondents may have reduced cycling for one reason (e.g. work) but continued for another (e.g. leisure). Third, the increasing trajectory refers to people who cycle more; this is much more common in Lausanne (44%) than in Geneva (27%). These differences could be explained by the fact that cycling practices were already more developed in Geneva. Finally, the restorative trajectory represents 5% of cyclists in Lausanne and 3% in Geneva¹³.

¹² The smallest differences between cyclists and non-cyclists in Lausanne concern walking. Non-cyclists use the train less. A higher proportion of non-cyclists use urban public transport very frequently (33%) or never (16%) than cyclists (11% and 8% respectively). Cyclists use the car much less: 14% use it several times a week compared to 52% of non-cyclists.

¹³ The intercept survey of Covid cycle lanes in Lausanne showed that 13% of cyclists were on a decreasing trajectory, 53% were stable, 30% were increasing and 3% were restorative. These differences do not call into question the trends observed in the questionnaire and can be explained by the smaller sample (n=162), which is more subject to variation, and by the method (interviews conducted mainly during the week and in the afternoon).

Profile differences between trajectories are not very marked (which may be due in part to the size of the sample). Men and those with high incomes are slightly over-represented among those who have a decreasing trajectory; women are more likely to have a restorative trajectory; and the under-40s are more likely to have an increasing or a restorative trajectory. Other explanatory variables could not be tested, such as lifestyle (understood as the organization of activities in time and space) and its evolution with the pandemic.

In terms of access to bikes, most cyclists own a mechanical one (73% in Lausanne, 85% in Geneva). An important minority, however, have adopted the e-bike, particularly in hilly Lausanne (41%), indicating the growing importance of e-bikes as well as other kinds of bikes (folding, cargo, etc.) (9% in Lausanne, 12% in Geneva) and bike-sharing subscriptions (9% and 6% respectively)¹⁴. Many cyclists upgraded their equipment during the pandemic¹⁵: in Lausanne, 25% bought a new bike and 10% a second-hand bike, while 10% had their bike repaired (15%, 6% and 10% respectively in Geneva). Between 20% and 25% also purchased equipment such as clothing, protective gear, child seats, etc. The highest values concern those with restorative trajectories, followed by those with increasing trajectories. However, these purchases are not negligible for the other two trajectories, which suggests that these individuals are consolidating their cycling practices. Among those with an increasing or restorative trajectory, the electrically assisted bicycle occupies a prominent place (80% of those with an increasing trajectory and almost 50% of those with a restorative trajectory use an e-bike, compared to a third of those with a decreasing or stable trajectory).

Table 1: General use of the bike

		Lausanne (n=938)	Geneva (n=463)
Frequency of bike use	Less than one day a month	6.3%	2.2%
	1 to 3 day(s) a month	6.7%	4.3%
	1 to 2 day(s) a week	15.4%	7.2%
	3 to 4 days a week	26.1%	18.9%
	(Almost) everyday	45.5%	67.5%
Cycling trajectory	Decreasing trajectory	8.8%	11.2%
	Stable trajectory	41.5%	58.4%
	Increasing trajectory	44.3%	27.1%
	Restorative trajectory	5.4%	3.4%

¹⁴ Totals are higher than 100% as an individual may own more than one bike.

¹⁵ We don't have similar information from before the pandemic to measure to which extent these figures are specific to the recent period.

Future use after the pandemic	More cycling	17.9%	18.8%
	As much cycling	79.6%	79.7%
	Less cycling	2.5%	1.5%

An analysis of the various reasons for which individuals cycle (to go to their place of work/studies, to go shopping, to get to other activities, or for leisure/sport) uncovers three changes induced by the pandemic with regard to the appropriation of the bike (Table 2). The first is “demobility”, to use a French word that has become popular since the health crisis. Home working, distance learning and restrictions on economic, social and cultural activities have reduced the intensity of travel. This trend mainly concerns commuting trips (16% of cyclists in Lausanne and 22% of Geneva use their bike less to get to their place of work or education), but also journeys to other activities (6% and 12%).

The second impact is the modal shift towards cycling. People who cycle more than before for utilitarian reasons (going to work, education or shopping) outnumber those who cycle less (except for commuting in Geneva; 22% commute less by bike, 20% more) (Table 2). This modal shift can be explained by a refocusing of activities around the place of residence due to working from home and by less frequent use of public transport (Tables 3 and 4). Cyclists use urban public transport less than before the pandemic (-44% in Lausanne; -50% in Geneva), and take the train less too (-44% and -40%). Nearly a quarter of participants declared that they were cycling more in order to respect physical distancing rules and to avoid contamination. An increase in car use exists among cyclists but is smaller than for non-cyclists (11% vs 24% in Lausanne).

The third mechanism refers to the substitution of activities. Home working, distance learning, restrictions on leisure activities, and the rise of e-commerce have freed up time for other activities. Cycling as a leisure activity or sport has clearly increased: 40% of cyclists in Lausanne say that they have increased their recreational use and 4% have (re)started cycling (33% and 2% in Geneva). One tenth of the sample answered yes when asked whether they ride their bicycle more because of the ban on indoor and team sports.

The general trend towards increased bike use seems to be a long-term one, since very few respondents believe that they will cycle less once the health crisis is over (2.5% in Lausanne, 1.5% in Geneva, Table 1).

Table 2: Evolution of cycling according to purpose

	Lausanne (n=938)				Geneva (n=463)			
	Leisure	Work/study	Shopping	Other activities	Leisure	Work/study	Shopping	Other activities
Decrease	4.8%	15.9%	3%	6.2%	5.8%	22.2%	7%	12.1%
Stability	51.3%	51.3%	67.8%	58.2%	59.1%	57.3%	76%	63.8%
Increase	40%	25.7%	25.5%	31.3%	32.7%	17.4%	15.3%	22.3%
Start again	3.9%	5.0%	3.8%	4.2%	2.4%	3.1%	1.7%	1.7%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Table 3: Use of the modes of transport and evolution since the pandemic in Lausanne

	Current frequency of use				Evolution since the pandemic		
	Never	Less than one day a month	Several days a month	3 days a week or more	Decreased	Stable/not concerned	Increase
Walking	1.3%	2.0%	25.4%	71.3%	12.3%	55.5%	32.2%
Bike	–	6.3%	22.1%	71.6%	9.0%	41.6%	49.4%
Urban public transport	6.0%	13.9%	61.5%	18.6%	51.4%	44.5%	4.1%
Train	7.8%	29.4%	54.0%	8.7%	44.2%	51.1%	4.7%
Car	17.3%	23.2%	46.1%	13.5%	23.8%	64.9%	11.3%
Motorized two-wheelers	85.7%	2.3%	8.1%	3.9%	6.9%	87%	6.1%
Other (scooters, etc.)	83.1%	8.2%	7.1%	1.6%	2.5%	88.3%	9.2%

Table 4: Use of the modes of transport and evolution since the pandemic in Geneva

	Current frequency of use				Evolution since the pandemic		
	Never	Less than one day a month	Several days a month	3 days a week or more	Decreased	Stable/not concerned	Increased
Walking	1.3%	2.2%	24.1%	72.4%	6.2%	51.7%	42.2%
Bike	–	2.2%	11.5%	86.3%	11.2%	58.4%	30.4%
Urban public transport	8.1%	21.2%	59.3%	11.4%	50.1%	46.0%	3.8%
Train	9.8%	40.5%	45.3%	4.4%	40.4%	54.6%	5.0%
Car	19.3%	30.9%	44.0%	5.9%	17.6%	74.0%	8.4%

Motorized two-wheelers	88.8%	2.6%	4.8%	3.7%	9.2%	87.2%	3.6%
Other (scooters, etc.)	87.4%	6.2%	5.7%	0.7%	2.0%	93.2%	4.1%

4.2. The effects of Covid cycle lanes on cycling as perceived by cyclists

Traffic conditions are judged negatively in Lausanne and Geneva: 53% and 50% of cyclists respectively say that they do not feel safe during their daily journeys, and 48% and 34% state that their neighbourhood is not well planned for cycling. The low level of bikeability of both contexts explains the effects of Covid cycle lanes on cycling experiences (Table 5). As affordances, they improved the bikeability of the cities and consequently impacted on cyclists' practices.

The most positive effect is increased perceived safety, as agreed by 73% of the Lausanne respondents and 81% of those in Geneva. Covid cycle lanes are also considered more user-friendly than other facilities (67% and 77%). For a majority, journeys are also faster; this is more the case in Geneva (63%) than in Lausanne (53%). Most respondents (57% and 61%) also gave a positive assessment of the signage, a proportion that could increase further once the cycle lanes become permanent.

The quality of Covid cycle lanes compared to other routes (that may or may not have cycling infrastructures) prompted many cyclists (44% in Lausanne and 64% in Geneva) to modify some of their routes. A third of respondents claim that the new infrastructures have encouraged them to cycle more. The results do not differ between the cities on this last point, whereas the other effects are evaluated more positively in Geneva: +5 points for signposting, +10 points for safety, speed and user-friendliness, and +20 points for changing route.

Table 5: Effects of Covid cycle lanes on cycling

Covid cycle lanes...	Lausanne (% of cyclists who agree)	Geneva (% of cyclists who agree)
...make you feel safer	72.1%	80.5%
...are more user-friendly than those usually used	66.4%	76.1%
...have a satisfactory signage	56.3%	60.6%

...allow you to reach your destinations more quickly	52.6%	62.8%
...have prompted you to change some of your routes	44.2%	63.8%
...have encouraged you to cycle more	32.0%	32.2%

Evaluations of the importance of Covid cycle lanes as affordances vary significantly according to cycling trajectory and gender. People who cycle more than before are more positive than others on all variables. Differences between men and women appear in the case of Lausanne, but only when we consider respondents who strongly agree with the statements. This is the case, for instance, with regard to speed (27% of women strongly agree, 15% of men), safety (32% vs 27%) and user-friendliness (30% vs 21%). In Geneva, the difference is marked only for safety (47% vs 39%).

Covid cycle lanes make journeys more efficient, safe and enjoyable for a wider audience, particularly in terms of gender and frequency of use. In addition to the recruitment of new cyclists, they encourage the consolidation of cycling practices – and therefore of the system of velomobility. An enhanced experience (notably regarding safety) should increase the ‘loyalty’ of people travelling by bicycle. However, a significant minority of cyclists does not feel safe on the new routes (15% and 9%). This figure is likely to be higher for those who do not yet cycle but might like to.

4.3. The reception of Covid cycle lanes among cyclists and non-cyclists

The perception of Covid cycle lanes – and therefore their political reception – varies greatly within the sample of cyclists and non-cyclists. As the sample was not randomly selected, it is not reasonable to analyse the answers for each subgroup. We therefore opted for a logistic regression to measure the influence of various characteristics on the propensity to find Covid cycle lanes useful and to identify the differences between survey participants who support or oppose this measure.

Mobility practices have a very strong influence on the belief that Covid cycle lanes are useful (Table 6). There is a gradient according to the frequency of cycling. Respondents who cycle are more likely to find Covid cycle lanes useful than respondents who do not cycle. Among cyclists, those who cycle regularly are more positive than those who cycle occasionally (and recreationally). This result can be explained by the degree of familiarity with traffic conditions

for cyclists and the personal benefits derived from these measures. In addition, participants who always have access to a car in their household tend to be much more critical of Covid cycle lanes than those without a car. This opposition may be related to the reallocation of road space from automobility to velomobility.

The perception of Covid cycle lanes is also a matter of political values. The further to the right of the political spectrum the respondents of our survey are, the less persuaded they are of the utility. This sensitivity may relate to different beliefs (attachment to the private car, rejection of the bicycle as a carrier of alternative values, etc.).

Women are more convinced by the pop-up lanes than men, which seem coherent with a greater concern for road safety issues (see Garrard, Handy, and Dill 2012; Aldred et al. 2017) and could also relate to a weaker socialization to automobility. People with a tertiary level of education (university degree or equivalent) are also more likely to be in favour of the Covid cycle lanes, which could be interpreted as a greater awareness of environmental issues or the need to take cycling in cities more seriously. Finally, there were no significant effects of income, employment status or household type between Geneva and Lausanne.

Although this part of the research depends on the sampling of the survey, the results appear to be trustworthy based on other related studies. On the one hand, they are consistent with the political debates in both cities (where the opposition came mainly from right wing parties and car lobbies) (Widmer, Guinard, and R  rat 2023). On the other hand, they are in line with the results of a representative survey following a national vote on fostering cycling in Switzerland. The same explanatory variables – except for the level of education – were found statistically significant (R  rat and Ravalet 2022).

Table 6: Model explaining agreement with the usefulness of Covid cycle lanes (logistic regression)

		Odd ratios (B)	Significance	Standard error
Political values	From far left (0) to far right (10)	0.702	***	0.046
Gender	Women	1.849	**	0.226
	Men (ref)			
Age	Less than 30 years old	0.556	ns	0.339
	30 to 39 years old (ref)			
	40 to 59 years old	1.381	ns	0.262

	60 years old or more	1.288	ns	0.384
Education	Tertiary education	2.146	***	0.212
	Other level of education (ref)			
Monthly net income	Less than 4000 francs	0.924	ns	0.299
	4000 to 8000 francs	1.316	ns	0.25
	More than 8000 francs (ref)			
Access to a car in the household	Always available	0.348	***	0.266
	Available on request	0.446	*	0.42
	No car (ref)			
Workplace	UnNon-employed people	0.568	ns	0.371
	Other municipality	0.857	ns	0.321
	Urban region	1.671	ns	0.28
	City (ref)			
Household	With child(ren)	1.155	ns	0.219
	Childless (ref)			
Frequency of bike use	Never	0.056	***	0.292
	Less than one day a month	0.191	***	0.403
	One to three day(s) a month	0.289	**	0.423
	One to two day(s) a week	0.543	ns	0.357
	Three to four days a week	1.007	ns	0.34
	(Almost) everyday (ref)			
City	Lausanne	0.632	ns	0.246
	Geneva (ref)			

ns: non-significant; * $p < .05$; ** $p < .01$; *** $p < .001$

Model fit indicator–Nagelkerke R Square: 0.583; $n=1242$

5. Conclusion

This paper has addressed the effects of the pandemic and of Covid cycle lanes on cycling in Geneva and Lausanne through a questionnaire survey. We summarize the main results using the three dimensions of the system of velomobility – bicycle use, individual cycling potential and cities' hosting potential – before providing a general interpretation.

Bicycle use increased after the first stage of the pandemic in many cities, as shown by bicycle counter data (Bucsky 2020; Buehler and Pucher 2021; Kraus and Koch 2021). This is also the case among our survey respondents: 44% in Lausanne and 27% in Geneva cycle more, while 5% and 3% respectively have (re)started. The pandemic induced a small number of new cyclists and mainly consolidated the practice of people who already cycled but less frequently. However, our data do not make it possible to quantify the relative importance of the pandemic as such and the Covid cycle lanes specifically on changes in cycling patterns.

This increase took place despite a context of reduced need or possibility for travel (“demobility”) due to home working, distance learning and restrictions on economic, social and cultural activities. As far as cycling is concerned, the use of the bike decreased for commuting but increased for other reasons to travel, which may be explained by modal shift (from public transport) and by the substitution of activities (time freed to recreational cycling).

An individual’s cycling potential comprises three dimensions: access (“can”), skills (“know”), appropriation (“want”). In terms of access, many cyclists improved their equipment (repair, purchase (notably of e-bikes), etc.), and this improvement in equipment is likely to sustain future practices. Our data could not directly measure skills, but it can be argued that some individuals have developed their skills through cycling more. Finally, the appropriation of cycling has been extended. Many people have expanded their practice to leisure and sport – confirming the role of cycling for physical exercise and for mental health (Fuller et al. 2021) – while utilitarian reasons have also become more popular. The modal shift toward the bike can be explained by a less frequent use of public transport, by a refocusing of activities around the place of residence (due to home working) and by the time freed up by restrictions on some activities.

The changes in the hosting potential of Geneva and Lausanne refer in the first instance to the building of Covid cycle lanes. Given the low bikeability of these cities (respondents are very critical about the lack of infrastructures), Covid cycle lanes led to a better embodied experience of cycling in terms of safety, directness and comfort. As affordances, these pop-up cycle lanes are relational in that they link the suitability of a context with users’ intentions, capabilities and skills. The effect of these new affordances is also somewhat more marked among women and new cyclists. 44% of respondents in Lausanne, and 64% in Geneva, have

even changed some of their routes in order to benefit from this increased bikeability and segregation from cars.

In an immaterial sense, the hosting potential of a context also refers to the politics of mobility. Infrastructures are crucial affordances for cycling but may be contested politically (Koglin and Rye 2014; Wild et al. 2018; Cox and Koglin 2019), as has been the case in Geneva and Lausanne. The reception of Covid cycle lanes varied according to respondent's mobility practices and political positioning, which is consistent with other studies (e.g. Rérat and Ravalet 2022). The debates revealed opposition to the (re)allocation of road space from the long-dominant system of automobility to the system of velomobility, which is undergoing a process of expansion and redefinition.

On the whole, the pandemic represented an external shock for mobility systems that strengthened the system of velomobility, as shown by the increase in bicycle use, the development of equipment, the diversification of reasons for cycling, the implementation of Covid cycle lanes and the improvement of the embodied experience of cycling (particularly among women and cyclists who increased or restarted their practice). However, the system of velomobility is still fragile, as shown by the rather low modal share of cycling, the low level of safety experienced by cyclists and the struggles when road space must be shared or allocated to cycling.

Our study has some limitations as a survey collecting self-reported answers (stated preferences) at a specific moment in time. Further research could address the effects of the pandemic and of Covid cycle lanes over a longer period and in other contexts. First, biographical approaches could better reflect the various cycling trajectories in terms of use of the bicycle but also with regard to perceptions and experiences (Chatterjee et al. 2012; Chatterjee, Sherwin, and Jain 2013). Second, it will be necessary to monitor the evolution of cycling alongside the progressive return to work and the reopening of activities, in order to ascertain whether the increase in cycling is a durable trend. Third, the analysis of the effects of Covid cycle lanes could be better contextualized in order to consider the details of each intervention and for various types of cyclists. Fourth, the politics of velomobility and the controversies in relation to cycling infrastructures could be more thoroughly analysed. This point is important politically as many cities, including Geneva and Lausanne, aim to capitalize on the recent development and to further increase the modal share of cycling. The

development of cycling requires legitimization as a means of transport, and needs political approaches that integrate and respond to the oppositions that it arouses.

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Highlights

- The pandemic has strengthened the attractiveness of cycling as a mode of transport and a leisure activity
- Covid cycle lanes have improved perceived safety, directness and the experience of cycling
- Their reception (and contestation) depends on mobility habits and political position

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