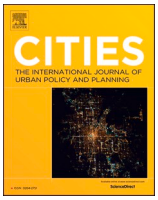
Cities 151 (2024) 105078

Contents lists available at ScienceDirect

Cities

journal homepage: www.elsevier.com/locate/cities



To move or not to move: A review of residential relocation trends after COVID-19

Mostafa Ayman Ilham [a,*], Achille Fonzone [a], Grigorios Fountas [b], Luca Mora [c]

[a] School of Computing Engineering & Built Environment, Edinburgh Napier University, Edinburgh, UK
[b] School of Rural & Surveying Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece
[c] Business School, Edinburgh Napier University, Edinburgh, UK

ARTICLE INFO

Keywords:
Residential location choice
Urban decentralisation
Travel behaviour
Activity behaviour
COVID-19
Post-pandemic
Teleworking

ABSTRACT

The restrictions imposed during the COVID-19 pandemic have led to significant changes in travel behaviour and public activities, and they might have contributed to changes in residential location choices. However, research examining the relationship between residential location choice and COVID-19 is very limited. To that end, this paper focuses on how pandemic-induced changes in work patterns, travel preferences and daily activity patterns have altered residential preferences and potentially, relocation trends. The main determinants of residential location choice have been established in the literature over the past 30 years: physical attributes of the dwelling; surrounding built environment; affordability; and accessibility to transportation, workplaces, and services. However, each of these determinants are prioritised differently depending on the circumstances. Therefore, exploring how these priorities have shifted after the pandemic can pave the way for understanding how preferences for residential location choice shift as a consequence. From the review, the key findings include the decreasing importance of transport and workplace accessibility in residential location choice after the pandemic. Firstly, teleworking is becoming more prevalent within office jobs than before the pandemic, leading to less frequent trips to conventional workplaces, reducing the need to live within a commutable distance to a workplace. Secondly, trips to other activities have likewise become less frequent due to either remote alternatives (e.g., online shopping) or shifting towards services closer to home, reducing the need to travel in general. Another consequence of the pandemic is people staying at home longer than before, thus increasing the need for more desirable dwelling attributes such as larger house size and wider surrounding green space. Since these attributes are generally more affordable in areas less accessible to transport and services, this may subsequently lead to migrations to areas of lower population density, potentially decentralising urban areas.

1. Introduction

With the recent COVID-19 pandemic, different levels of restrictions over time have led to drastic changes to numerous lifestyle choices, many of which potentially become irreversible. Such changes include significant mode shifts away from public transport (Downey et al., 2022; Vickerman, 2021) which are anticipated to continue for the medium- and possibly long-term, especially if car ownership increases (Das et al., 2021). There is also a considerable shift towards active modes of transport such as cycling (Burke et al., 2022) or walking (Semple et al., 2021), which more people started seeing as a desirable way of travelling. However, there is still uncertainty as to whether this can outweigh the shift to private cars from public transport (Ceccato et al., 2022). On top of this, demand for office space starts declining as many jobs adopt teleworking or "working from home" on a more permanent basis (Adobati & Debernardi, 2022). Furthermore, permanent closures of several high street retail units result from shifts towards online shopping, which consequently furthers the case for online shopping (Nanda et al., 2021; Parker et al., 2021). As a consequence, people may make long-term or even permanent changes to their lifestyle choices in light of these considerable travel-activity changes (Keeney et al., 2013).

One of the major effects of lifestyle choices is influencing where an individual or their collective household chooses to live, i.e., residential location choice. This is because aspects of lifestyle choices – such as needs of the family, work-related requirements, and household activity patterns – influence what the individual or their household desires from

* Corresponding author at: 10 Colinton Road, Edinburgh EH10 5DT, UK.
E-mail address: m.ilham@napier.ac.uk (M.A. Ilham).

https://doi.org/10.1016/j.cities.2024.105078
Received 24 November 2023; Received in revised form 22 April 2024; Accepted 29 April 2024
Available online 10 May 2024

the accommodation and location of their residence (Keeney et al., 2013; Masoumi et al., 2021). Given residential areas generally make up most of the urban space, residential location choice is an integral factor in the overall shape of the urban form. Traditional urban centres, where most non-residential activity (commercial and office) is concentrated at a definitive centre, normally have a higher population density living closer to this central area, with decreasing density further out. However, if more people choose to locate further away from the urban centre and adding density to the suburbs, it is likely that non-residential activities may start relocating accordingly to the population distribution (Rodrigue, 2020). This often contributes to generating more polycentricity in urban areas, where they no longer have a single definitive centre, but rather multiple different centres across the urbanity where residential and commercial land-uses are concentrated. As a consequence, the transport system would need to be very different in terms of type and density to accommodate these multiple centres.

Interestingly, there are a considerable lack of studies directly looking into residential location choice after the COVID-19 pandemic. Studies on residential location choice over the past 30 years (Borgers & Timmermans, 1993; Levine, 1998; Clark & Davies Withers, 1999; Kim, 2006; Chi & Boydstun, 2017; Masoumi et al., 2021) have considered many of its determinants, outside of the dwelling attributes, to be related to either travel or activity. Specifically, transport availability within the vicinity of the residence is seen as the most popular factor according to Masoumi et al. (2021). As for activity, workplace location of the household's main income earner has consistently been seen by studies (Chi & Boydstun, 2017; Clark & Davies Withers, 1999; Levine, 1998) to be a driving factor to induce relocation. These factors in particular play a significant role in residential location choice, while, at the same time, being among the most notably affected by the COVID-19 pandemic due to observed transport modal shifts and the uptake of teleworking (Semple et al., 2023). Likewise, changes in shopping behaviour due to online shopping and permanent closures of entire brands of retail stores (Parker et al., 2021) also have the potential to affect the urban structure and where people choose to live. Considering these well-established relationships between travel behaviour, activity patterns, and urban structure, the motivation of this study is to shed light into how the COVID-induced changes in key determinants of residential location choice affect relocation trends in the aftermath of the pandemic. As such, observing how these determinants (mainly, travel and activity behaviours) have been modified by COVID-19 can provide insights into how residential location choices may unfold in the long-term.

It can therefore be hypothesised that preferences for residential location have shifted away from ensuring accessibility to the workplace and other out-of-home activities (e.g. leisure, retail, employment, etc.) towards dwellings with more space to accommodate some of these activities in the home instead. This anticipated shift in priorities can result in patterns of relocation away from urban areas to more suburban or rural areas (Gallent & Madeddu, 2021). However, due to the heterogeneity underpinning the post-pandemic behaviour, it is necessary to

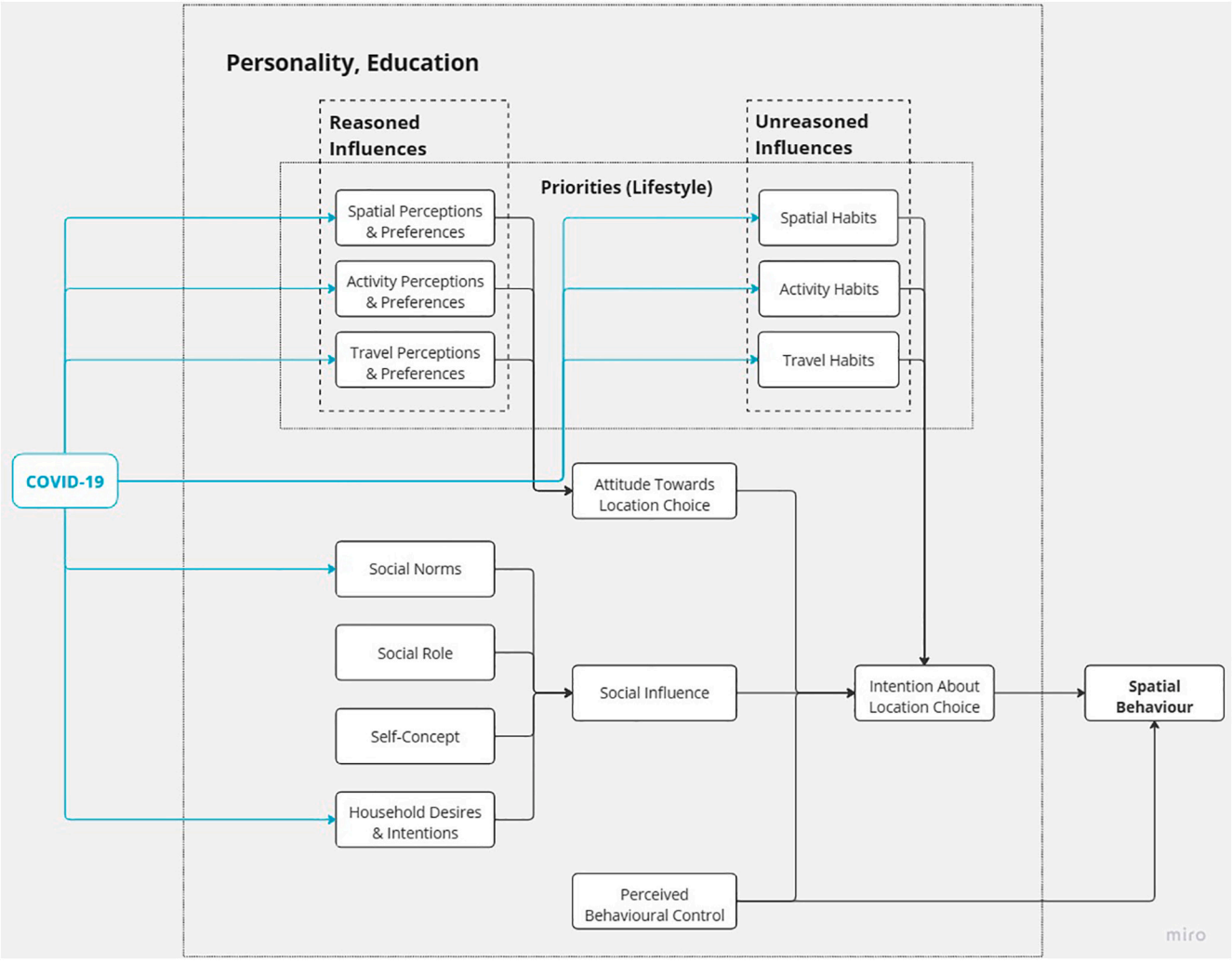


Fig. 2.1. Theoretical Framework for Residential Location Choice after COVID-19.

systematically investigate the recent literature about travel and activity behaviour in a post-pandemic setting. This would allow us to identify the impact of teleworking trends and changes in transport preferences on alterations in residential preferences.

This paper begins with Section 2, which provides a concise overview of the theoretical framework (Fig. 2.1) that was used to guide the literature search strategy and subsequent analysis of the articles. Section 3 follows with a discussion of the methodology adopted for both the search and analysis process. Section 4 presents the key findings, whose implications are discussed in Section 5 along with limitations of the study and future research agenda, and then summarised in Section 6.

2. Theoretical background and framework

According to Borgers and Timmermans (1993), three main categories of factors serve as key determinants of residential location of households when relocating:

- The residence itself: dwelling types, costs, type of neighbourhood;
- The transportation facilities in the residential neighbourhood: frequency of bus services, availability of railway station, accessibility to main road system, parking availability;
- The travel time from the residential location to the workplace: private car, public transport, walking, cycling.

On the other hand, Masoumi et al. (2021) categorises the reasons for relocation as either transport, spatial or socioeconomic, allowing for a broader scope compared to Borgers and Timmermans (1993) due to the addition of a socioeconomic element. In addition, socioeconomic factors (particularly affordability) are often seen as a trade-off with aspects of spatial and transport factors (Kim, 2006), be it on the accessibility side or attributes of the dwelling itself.

Kim (2006) identified a trade-off between spatial (dwelling attributes and proximity to services) and socioeconomic (affordability and job/education-related) factors, with the former found to be more important for higher income households while the latter was more important for lower income households. Levine (1998) and Chi and Boydstun (2017) stated how jobs of household members and proximity to their workplace locations remained dominant, or at least significant factors, in determining residential location choice. Clark and Davies Withers (1999) found that a change in job, and thus workplace, was a major 'trigger' for relocation to occur in the first place.

Despite its broader scope, the framework of Masoumi et al. (2021) does not address any potential link between land-use and transport. Van Acker and Witlox (2009), on the other hand, provides a much more comprehensive framework that has more versatility as far as the linkage between transport and land-use is concerned. This is because: (i) the framework of Van Acker and Witlox (2009) includes a spatial component related to urban density, proximity to services, surrounding green space and overall land-use arrangement, with transport availability falling under this category; (ii) it also includes a socioeconomic component related to social and financial aspects, such as income and education; and (iii) lastly, there is the socio-psychological component, which is related to the perceptions and attitudes of an individual. Due to the complex interdependencies between these three components, Van Acker and Witlox (2009) considered three different behaviours (spatial, activity and travel) within a hierarchy. This hierarchy stems from lifestyles of an individual or household as a result of the relationships between the three aforementioned components.

Influences of these behaviours (spatial, travel, activity) can be split into two categories: reasoned and unreasoned influences (Van Acker & Witlox, 2009). Reasoned influences are decisions consciously made based on the perceptions (expectations), attitudes (how one feels about a matter) and preferences (what one prefers to act upon). Unreasoned influences, on the other hand, are decisions made without thinking based on habits (repeated behaviour) and impulsiveness (one-off). However, habits are the focus for the purpose of this study with respect to unreasoned influences, due to the difficulty of gauging impulsiveness.

On top of this, Van Acker and Witlox (2009) examined this travel-activity relationship through three different perspectives: the individual, spatial and social contexts. The individual context is related to the thoughts and decisions of a single person or household. On the other hand, the spatial context is related to the built environment surrounding the household or residence. Thereafter, the social context involves relationships between a household and other people relevant to them. Alongside these contexts the theory of interpersonal behaviour, which originated from Triandis (1977) and was later simplified and implemented by Anable et al. (2006) and Domarchi et al. (2008), added the element of intention for behaviour stemming from habits and emotions. With this theory, behaviour is influenced by both habits (influenced by past frequency) and intentions, which are affected by three factors (Anable et al., 2006; Domarchi et al., 2008). Firstly, attitude, which is influenced by the expectancy (what an individual may expect about something) and value (how important something is to the individual). Secondly, the social factor, which is influenced by the individual's role in society. The social factor can also be influenced by the norms of the people relevant to them regarding any decision (such as residential location or transport mode choice) and the self-concept (how confident an individual feels about making their own decisions). Lastly, the affective factor is influenced by emotions, often provoked by a particular experience (either by the individual or someone relevant to them), which may lead an individual to act in a certain way according said experience.

However, on top of these frameworks (Domarchi et al., 2008; Van Acker & Witlox, 2009), there is another major factor that needs to be considered, which is the work-life balance of the household. This factor can also have a significant impact on decisions for travel-activity and thus location choice. To fill this gap, the concept of life priorities implemented by Keeney et al. (2013) needed to be introduced to the combined framework. This concept revolves around how an individual or household may balance work-related activities (anything that an individual engages in to generate income for their household) with other activities, defined as 'life domains'. Keeney et al. (2013) mentioned seven: health (both physical and mental); family; household management; friendships; education; romantic relationship(s); community involvement; and leisure.

The way a household prioritises each domain of activity (whether it be work-related or each life domain) can have significant impacts on their intentions and decisions for location choice. Firstly, greater priority to work-related activities will lead to a very strong dependence on job location, especially during career changes. This can be either for triggering relocation initially (Levine, 1998) or being the primary reason for choosing a specific location to live in (Chi & Boydstun, 2017). Secondly, higher priority for education and family will lead to a household preferring to live closer to good schools if they have children (Chi & Boydstun, 2017; Jiao & Harata, 2007). If the majority of activities from the household's prioritised domains occur outside the home, then they would be more inclined to accessible locations and better transport infrastructure (De Vos et al., 2012; Masoumi et al., 2021). On the other hand, if household management is a greater priority, attributes of the dwelling itself become more important (Rezaei & Patterson, 2018).

Thus, the concept of life priorities (Keeney et al., 2013) is added to the combined frameworks of interpersonal behaviour (Anable et al., 2006; Domarchi et al., 2008) and Van Acker and Witlox (2009). As a result, life priorities add a 'household desires and intentions' component to the determinants of social influence, as well as determining both reasoned and unreasoned influences. The overall framework for residential location choice that was composed on the basis of the aforementioned frameworks is shown in Fig. 2.1, which will be used to identify and categorise any possible links between findings of this systematic literature review.

Elaborating on Fig. 2.1, the base structure is taken from Harry

Triandis' theory (Triandis, 1977) of interpersonal behaviour based on simplified models used by Anable et al. (2006) and Domarchi et al. (2008). The reasoned and unreasoned influences that lead to spatial, activity and travel behaviour are derived from Van Acker and Witlox (2009) and plugged into the perceived consequences and habits of the base framework. This is especially relevant when spatial, travel and activity behaviour are all directly impacted by the consequences of the COVID-19 pandemic, which would have a knock-on effect on the factors that depend on them. The social role of individuals and the norms about travel and activity behaviour also have some influence in how such behaviour is affected after the pandemic. Along with the social factors taken from the base framework of interpersonal behaviour, the household desires and intentions were added based on Keeney et al. (2013) and their concept of life priorities. This is because each household will collectively have different lifestyles and will prioritise lifestyle choices based on their main goals in life, which is even more susceptible to affect how they may behave after the COVID-19 pandemic.

Based on the reasoned and unreasoned influences illustrated in Fig. 2.1 and existing studies on residential location choice (Chi & Boydstun, 2017; Masoumi et al., 2021), three analysis dimensions of the location choices are derived, which will be used to categorise findings from the review. These are: (i) travel; (ii) activity; and (iii) spatial elements. Within the context of this review, 'spatial' relates to location choice based on the built environment, such as attributes of the dwelling itself (e.g., the size and quality of the accommodation) or its proximity to shops, services and outdoor space. On the other hand, 'travel' focuses on the trip length and transport mode choice. As for 'activity', the term encompasses key activities that require travel to be accomplished as well as their digital counterparts, i.e., commuting vs teleworking and in-store vs online shopping.

3. Methodology

In order to provide a post-pandemic outlook for impacts of work and travel behaviour on residential location preferences and identify potential gaps in the existing state-of-knowledge, we conduct a systematic literature review. This involves analysis of recent literature on travel-activity behaviour within a post-pandemic setting in light of the framework outlined in Fig. 2.1, followed by a discussion on how this may potentially affect residential location choice in the long-term. However, to minimise bias during the review and reach more reliable conclusions, a step-by-step systematic methodology was implemented in line with previous literature (Mora et al., 2023). All the steps and processes taken throughout the systematic review have been summarised in Fig. 3.1 and will be elaborated on thereafter.

3.1. Initial database search

As the key components bridging the gap between residential location choice and the effects of the COVID-19 pandemic are 'travel' and 'activity', the literature search terms have been split into these categories. This is such that the articles from the literature search need to be related to a combination of a travel-related keyword and an activity-related keyword in light of the pandemic. Search terms used were tested and refined in a similar manner as in Nævestad et al. (2018), such that a reasonable range of articles could be identified. All three search elements have 'AND' operators between them, but keywords within each element are separated by the 'OR' operator. This is such that each article would consider COVID-19 and its contents would have at least one of the keywords from the 'travel' element and at least one from the 'activity' element.

Travel-related keywords have been comprehensively covered in Table 3.1. Firstly, there is travel behaviour as it relates to physical mobility patterns and choices, as well as trip purposes. Thereafter, keywords related to commuting are included here in order to complement teleworking. According to activity-travel patterns (Dianat et al., 2022; Irawan et al., 2022), trips to educational institutions are also common with distance learning being the digital alternative, hence any discussion related to these kinds of trips purposes specifically can be useful. On top of this, other spatial aspects related to accessibility whether through distance, time or cost are included within this element also. Terms related to public transport specifically or the transport infrastructure are additionally included, so more articles discussing the relevance of public transport and modal shifts can be included.

As for activity-related keywords, they are mainly based on work and shopping. This is because concept of life priorities (Keeney et al., 2013) and recent studies (Dianat et al., 2022; Irawan et al., 2022) show that work commutes and shopping trips are often the most frequent trips

Table 3.1
Search keywords.

Framework element	Keywords
COVID-19	covid OR coronavirus
Travel	"travel need" OR "travel demand" OR "travel behaviour" OR "travel behavior" OR "travel choice" OR "travel habit" OR "travel pattern" OR "travel purpose" OR "trip purpose" OR commuting OR "work trip" OR "trip to work" OR "travel to work" OR "journey to work" OR "travel to school" OR "travelling to school" OR "traveling to school" OR "trip to school" OR "journey to school" OR "travel to university" OR "travelling to university" OR "traveling to university" OR "trip to university" OR "journey to university" OR "travel to college" OR "travelling to college" OR "traveling to college" OR "trip to college" OR "journey to college" OR "travel time" OR "travel cost" OR "travel distance" OR "journey time" OR "journey cost" OR "journey distance" OR "accessibility" OR "transport service" OR "transport network" OR "public transport" OR "public transit"
Activity	business OR job OR "working from home" OR teleworking OR shopping OR e-shopping OR teleshopping OR leisure

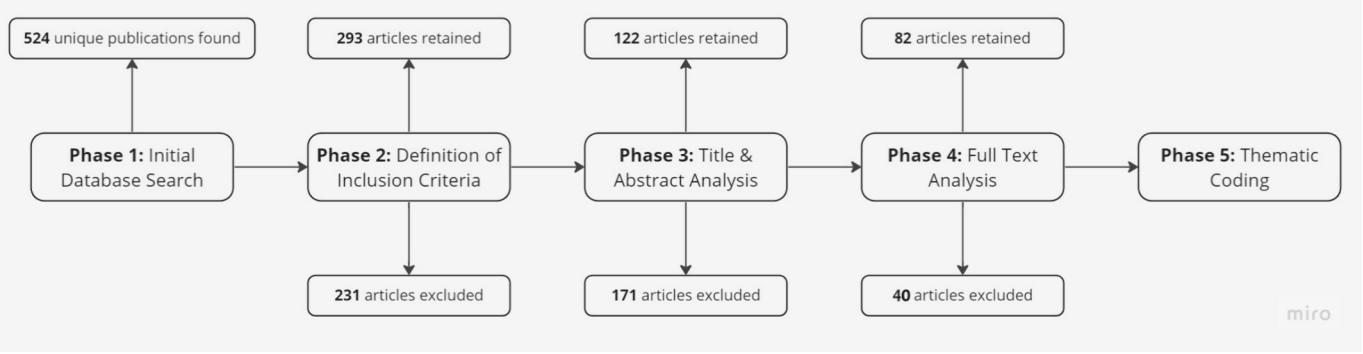


Fig. 3.1. Review Screening Process Overview.

made by individuals. Keywords based on the digital alternatives of these frequent activities (teleworking and online shopping) are included too. Generic terms such as 'business' and 'job' were included, as the former could encompass any work or non-work activity that could relate to a non-residential land-use (product of a business) against its digital alternative. Meanwhile, the latter is connected to careers (thus work and commuting) specifically. Leisure has also been added with the intent of encompassing leisure-related travel-activity patterns in general. This is because the increase or decrease of leisure trips and activities could influence or be influenced by changes in commuting or shopping trips.

Web of Science was the search engine used for the systematic review, because of its strict criteria in only including peer-reviewed journal articles. Fig. 3.2 shows the volume of research published over the past 30 years regarding the combination of travel-activity behaviour with residential location choice. The Figure shows the number of articles published per year, combining the search keywords related to 'Travel' and 'Activity' (as presented in Table 3.1) with 'Residential Location Choice'. Publications related to this topic have gradually increased, with a greater volume of research being evident as the decades progressed. There has been a more notable increase in research on this topic after 2016 and even more so after 2020, when the COVID-19 pandemic began.

The search was carried out on Web of Science in April 2023, which initially yielded 524 results. Before going through the analysis, a range of inclusion criteria needed to be applied in order to eliminate most articles irrelevant to the study.

3.2. Definition of inclusion criteria

In order to ensure the relevance of the identified articles, several inclusion criteria were defined based on the methodologies of previous systematic reviews (Brown et al., 2016; Mora et al., 2023; Nævestad et al., 2018) but tailored to the theoretical framework of Fig. 2.1:

(1) The paper must be a journal article published in the English Language.
(2) Its content should either focus on the period after the COVID-19 pandemic or, if the study took place during the pandemic, it must have some discussion related to what is anticipated post-pandemic.
(3) The findings discussed in the paper must show a link between the effects of COVID-19 and at least one of the following (based on Fig. 2.1):
    (a) Residential Location Choice;
    (b) Transport Mode Choice;
    (c) Commuting to Work vs Teleworking;
    (d) Shopping Trips vs Online Shopping;
    (e) Out-of-Home Activities in general.
(4) Findings must be based on the analysis of empirical data, regardless of whether the data is primary or secondary, so articles such as review papers would not be considered.

Firstly, we narrowed down the identified literature records via application of a category filter, such that only articles of that belong to any of the following 'Web of Science Categories' (the ten most relevant topics to searches surrounding 'residential location choice' were chosen) would be considered in the analysis: Economics; Environmental Studies; Transportation; Urban Studies; Geography; Public Environmental Occupational Health; Transportation Science Technology; Regional Urban Planning; Environmental Sciences; and Engineering Civil. Also, non-English articles were filtered out at this stage. This screening process eliminated a total of 231 records, leaving 293 articles to proceed to the next phase. The other three criteria concerning the content of the articles will be analysed in further detail over the next two phases.

3.3. Analysis of the articles

Applying the criteria established in Section 3.2, the titles and abstracts of the 293 articles were checked in relation to criteria 2–4 prior to a full-text assessment. Following this, further 171 articles were excluded due to not being compliant with all criteria (and, particularly, the second criterion regarding the post-pandemic focus), leaving 122 articles retained for further analysis.

Using similar criteria for the remaining articles, their full text has been scanned through to check whether the overall content of the 122 retained articles (with focus on the findings from empirical analysis) matches the criteria. Also, the methodology was examined briefly to check whether the main data is from pre-COVID (before March 2020), during COVID (2020–2021) or post-COVID (2022 onwards), as this would help in determining conformity to the inclusion criteria. Following this process, 40 more articles were excluded, leaving 82 articles retained for coding and review.

3.4. Thematic coding

Key findings from the 82 articles were assigned to either of three analysis dimensions, which were earlier defined. These findings were then grouped into micro-level 'components' based on what type of finding they correspond to, considering the specific details defined from the framework (Fig. 2.1). Thereafter, these components were then grouped into the meso-level 'themes' for each dimension, which would then shape this review throughout Section 4. A detailed list of review articles corresponding to each component and theme, along with the dimension they belong to, can be found in the Table within the

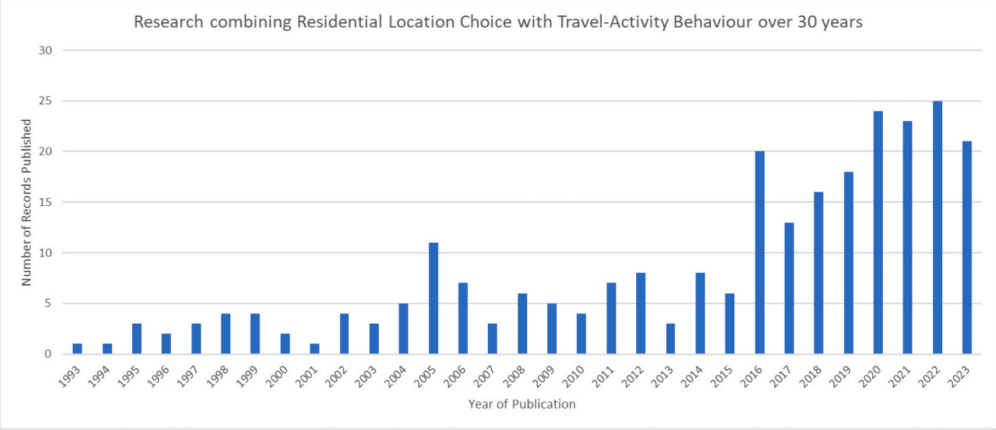


Fig. 3.2. Volume of research on the topic over the past 30 years.

Appendix.

4. Findings

The key findings of the thematic coding are summarised in the Appendix Table. In the latter, the findings from the literature were linked with the three analysis dimensions: travel behaviour, activity behaviour and residential location choice. The travel behaviour dimension (see Section 4.1 for a comprehensive discussion) is organised in two main themes reflecting post-pandemic trip pattern changes and modal shifts. The theme of post-pandemic trip pattern changes (Sub-section 4.1.1) encompasses the decrease in overall travel distance, continued reduction of trips in general, and interestingly, shifts from commuting to non-commuting trips. On the other hand, findings under the theme of modal shifts (Sub-section 4.1.2) extensively covered car dependency resulting from a decline in public transport and the uptake of active travel.

Under the activity behaviour dimension (see Section 4.2 for a comprehensive discussion), the findings of the thematic coding were classified in themes concerning the impacts of teleworking (Sub-section 4.2.1), the shifts towards the adoption of teleworking (Sub-section 4.2.2) and online shopping (Sub-section 4.2.3), along with their anticipated continuity. It should be noted that the theme about the adoption of teleworking points the discussion towards weighing the advantages and drawbacks of teleworking in order to determine its potential longevity; whereas, the theme about the impacts of teleworking provides insights into the COVID-driven changes in commuting patterns and the associated shifts to non-work activities.

Three distinct themes were formed initially for the dimension of residential location choice. The most notable theme stems from changes in the circumstances, which would influence relocation preferences and priorities, such as a greater tendency of people to spend more time at home than pre-pandemic. Prominent findings of the literature review were associated with the effects of teleworking on relocation choice, which also constitutes a separate theme. Thereafter, the anticipated changes in the urban structure resultant from any potential relocation shifts were explored. However, to focus the narrative, elements of the first and third themes were merged into a discussion about potential shifts away from urban centres (Sub-section 4.3.1). Likewise, the second theme has been merged with other elements of the first theme to discuss digital connectivity as a determinant of residential location choice (Sub-section 4.3.2).

4.1. Travel behaviour adjustments

4.1.1. Post-pandemic changes in trip patterns

From the most prominent of findings is the substitution of trips for digital alternatives performed remotely, especially with the significant increase in teleworking, which profoundly impacted commuting patterns. Specifically, it was found that even after the pandemic, people have generally reduced the number of days they commuted to work due to the benefits of teleworking. Studies also suggest that some commuting trips were substituted with non-commuting trips due to the time saved via teleworking (Hensher et al., 2022; Kroesen et al., 2023; Patwary & Khattak, 2022; Rafiq et al., 2022). This trend subsequently supports the shift towards off-peak travel, particularly on the weekends (Borowska-Stefanska et al., 2022). Conversely, a rise in popularity in online shopping through the pandemic has led to sustained reductions in shopping trips, which has led to more permanent changes in traditional shopping destinations (Ma et al., 2023). The relevance of these issues to the perspective of cities is that it relates to the centricity of the urban area and the viability of urban centres as a destination (Rodrigue, 2020).

With these substitutions of the two most common types of travel with digital alternatives, there has been much discussion about the longevity of these travel reductions as the pandemic restrictions gradually eased towards the post-pandemic period. Firstly, Beck and Hensher (2020) initially reported that despite a 50 % increase in overall travel (after the first easing of restrictions) within Melbourne, Australia, it was still less than 2/3 of pre-pandemic levels. Conway et al. (2020) anticipated some of the shifts to teleworking and online shopping to persist into the long-term, which implies that this overall reduction in travel from pre-pandemic levels would remain permanent to an extent. Thereafter, studies have proven that daily travel has either changed to an extent or remained at a reduced level overall due to changes in habits and perceptions (Ceccato et al., 2022; Christidis et al., 2022; Currie et al., 2021; Khan & Morency, 2023; Soria et al., 2023).

Another notable finding that has persisted after the pandemic is the shift to more localised travel from two different angles. Firstly, a decrease in the overall travel distance and secondly, an increased use of active (non-motorised) transport such as walking and cycling. As for the first point, Shemer et al. (2022) found that during the pandemic, total vehicle-miles travelled in Maryland (USA) has dropped by 16 % compared to pre-COVID and they estimated that by 2045, this reduction will remain to a degree (3–12 %). Also, Mohammadi et al. (2022) reported a positive correlation between commute trip length and frequency of teleworking, highlighting that the commutes longer than 30 min are more likely to be substituted by teleworking, which supports and possible explains the findings of Shemer et al. (2022) about the overall reduction of travel distance. Similarly in China, Mu et al. (2023) found that the average travel distance remained 20 % lower than pre-pandemic levels, with a decrease in trips over 500 km but at the same time, an increase in shorter trips under 100 km in length.

4.1.2. Modal shifts and their implications

The post-pandemic period has seen a significant shift in travel modalities, with public transport experiencing the most substantial reduction in usage compared to other modes. Studies indicate a dramatic decrease in public transport usage (Budnitz & Tranos, 2022; Currie et al., 2021), with some reporting reductions over 50 % (Christidis et al., 2022; Munawar et al., 2021; Sohrabi et al., 2023). This decline has led to decreased service levels, further reducing ridership — a phenomenon described as the “devil’s loop” (Christidis et al., 2022; El Zein et al., 2022). Although a recovery is possible, as suggested by Mashrur et al. (2022) and Ulahannan and Birrell (2022), public transport faces challenges in regaining its pre-pandemic patronage levels.

In contrast to public transport, private car usage has rebounded more quickly than other modes of transport (Beck & Hensher, 2022a). Bouzouina et al. (2022) and Budnitz and Tranos (2022) link this rise directly to the decline of public transport, which affirms the trends anticipated by Currie et al. (2021). Both Mogaji (2022) and Wang et al. (2023) highlight an inclination towards private vehicle ownership, with Ma et al. (2023) noting a 35 % increase in car use post-pandemic. The shift from public transport to private cars, as documented by Javadinasr et al. (2022), suggests an increasing reliance on cars for both commuting and leisure trips.

Despite a general shift towards car use, there has been a noticeable increase in active transport (walking and cycling) both during (Brezina et al., 2021; Currie et al., 2021; Semple et al., 2021; Shaer et al., 2021) and after the pandemic (Ma et al., 2023). Campisi et al. (2020) found that teleworkers are considerably more likely to engage in cycling, indicating a link between teleworking and active transport. Likewise, many of the extra non-commuting trips resultant from teleworking are conducted by walking and cycling (Kroesen et al., 2023; Stefaniec et al., 2022; Victoriano-Habit & El-Geneidy, 2023). However, this increase in active transport often coincides with a decline in public transport usage, as reported by El Zein et al. (2022) and Abdullah et al. (2021).

While the shift to teleworking and active transport appears environmentally beneficial, studies by Ceccato et al. (2022) and Currie et al. (2021) caution that the increase in car use may negate these benefits. This is especially when these studies suggest that both teleworking and active transport diverts people away from public transport more than from car use. Furthermore, Schaefer et al. (2021) raised concerns that the decrease in public transport use, combined with a potential increase

in car dependence, could lead to a rise in non-sustainable commuting practices in the future, particularly in suburban areas.

4.2. Pandemic-induced shifts in activity patterns

4.2.1. Influences of teleworking on activity shifts

The rise in teleworking has led to a marked decline in commuting trips. In the USA (nationwide), Javadinasr et al. (2022) noted a significant 17 % reduction in commuting trips post-pandemic. Similarly, Currie et al. (2021) observed a 6 % decline in Melbourne (Australia), with a more pronounced 20 % decrease towards the central business district. Other studies have also shown a similar trend to Currie et al. (2021), with some shifts towards suburban commuting in addition to teleworking (Burke et al., 2022; De-Toledo et al., 2023; Hensher et al., 2022; Jain et al., 2022; Li & Stoler, 2022; Loo & Huang, 2022). This trend towards reduced urban commuting overall suggests a re-evaluation of the necessity to live close to work. Prolonged teleworking practices have not only diminished the need for living within a commutable distance to work, but also prompted a shift away from peak-hour commuting. Studies by Huang et al. (2023), Loo and Huang (2022) and Stefaniec et al. (2022) corroborated a notable shift away from peak-hour travel.

An interesting finding from the literature is the emerging shift from commuting trips to non-work activities. While teleworking has led to a significant reduction in commuting trips, it has consequently led to an increase in non-commuting trips such as shopping (contrary to the effect of online shopping) and leisure trips. More specifically, Patwary and Khattak (2022) found that teleworking would increase the probability of making shopping trips by over 14 %, albeit more likely to be away from city centres or central business districts based on the findings of Currie et al. (2021). On the other hand, Ma et al. (2023) found a 46 % increase in outdoor leisure activities. This is due to the time saved due to teleworking being used for more leisure and shopping trips (Kroesen et al., 2023). Also, Hensher et al. (2022) reported a positive correlation between the frequency of teleworking and the frequency of non-commuting trips. Consequently, this leads to increased travel in off-peak times, particularly the weekend (Borowska-Stefanska et al., 2022), which agrees with observations that indicate shift away from peak-time commuting (Huang et al., 2023; Loo & Huang, 2022; Rafiq et al., 2022; Stefaniec et al., 2022).

4.2.2. Weighing the benefits & drawbacks of post-pandemic teleworking

Numerous benefits of teleworking have led to its sustenance after the pandemic. For example, Adobati and Debernardi (2022) have listed benefits for both employers, such as saving money in office rental and running costs, and for employees, such as a much better work-life balance due to time saved from commuting. The latter is especially favourable for those living further away from their workplace (Fabiani et al., 2021), which explains the correlation between commute length and likelihood or level of teleworking (Victoriano-Habit & El-Geneidy, 2023). Magrico et al. (2023) added that 78 % of pre-pandemic rail commuters in the UK saved lots of money in travel costs due to teleworking, which explains the abstraction from public transport cited by Currie et al. (2021) and Ceccato et al. (2022). Due to these benefits, Ton et al. (2022) reported 74 % of their survey participants expecting to telework more frequently post-pandemic compared to pre-pandemic.

On the other hand, many drawbacks have been reported that would hinder the full potential of teleworking. Firstly, the "loss of benefits of interactions between workers" mentioned by Adobati and Debernardi (2022) is a major factor that still puts a significant amount of people off teleworking. Also, some teleworkers experienced lower productivity (Delbosc et al., 2022) due to mental health issues or lack of motivation (Mohammadi et al., 2022) and for others, the risk of work invading family life (Adobati & Debernardi, 2022). Kong et al. (2022) found that those who are more likely to continue teleworking are usually those already possessing pre-pandemic experience to teleworking, which means those "forced" into teleworking involuntarily are much more likely to revert back to physical commuting (Ton et al., 2022). On top of this, there are cost constraints for the employee investing into workspace provision at home along with additional electrical running costs (Borowska-Stefanska et al., 2022) and availability of good internet connection. The latter factor has made digital connectivity a much more important factor to consider in urban planning and residential location choice, as areas with poor digital connectivity struggle to adopt teleworking (Balbontin et al., 2021; Budnitz & Tranos, 2022; Moser et al., 2022; Rafiq et al., 2022).

On top of the setbacks for those able to telework, only a limited selection of jobs are actually suitable for teleworking from the get-go (Soler et al., 2021). Krasilnikova and Levin-Keitel (2022) found that 87 % of teleworking jobs are in administration and Information Technology (IT). In contrast, jobs that involve more manual or semi-manual work and are usually common among lower education levels are usually unsuitable for teleworking (Huang et al., 2023; Krasilnikova & Levin-Keitel, 2022; Soler et al., 2021; Tahlyan et al., 2022). Huang et al. (2023) found that only about 40 % of full-time employees in their survey had the option to telework during the pandemic. This is supported by Krasilnikova and Levin-Keitel (2022), who reported 41 % of their respondents unable to telework due to the "nature of their job" and 20 % due to company culture. Thus, these findings collectively imply that teleworking is more common among higher-income households with higher levels of education. This implication is further supported by Ecke et al. (2022), who state that those with either lower economic status or educational levels are more likely to have a negative outlook on teleworking.

As a compromise between the benefits and drawbacks of teleworking, many studies have reported that the hybrid work model is more sustainable among those who are able to telework. For example, Beck and Hensher (2022b) stated that teleworking "is not and should not be seen as an all or nothing affair". The hybrid work model is where one commutes to work physically on some days and teleworks on other days. Balbontin et al. (2021) found that the number of days a week people generally prefer to telework varies by country, "with the highest average being 3.52 days in Peru and the lowest in Australia at 1.77 days". Overall, it is usually 1 or 2 days a week on average that is preferred, with the remainder of the workdays in the week (usually 3–4 days) involving commuting to the workplace as normal, which is also in agreement with Hensher et al. (2023), Javadinasr et al. (2022), Kogus et al. (2022) and Magrico et al. (2023). However, the overall decline of office usage in 2023 according to recent figures reported by Hensher et al. (2023) ranges between 20 and 28 % compared to pre-pandemic levels. Likewise, Javadinasr et al. (2022) reported an approximately 30 % increase in workers gaining the option to telework compared to pre-pandemic. Throughout the waves of COVID-19, it was found that the percentage of US workers who switched to teleworking increased gradually from 3 % to 5 % to 9 % between the first, second and third waves of the pandemic respectively (Salon et al., 2022), which implies further that teleworking will be more likely to continue post-pandemic.

4.2.3. Influence of online shopping on non-work activities

The adoption of online shopping, as highlighted by Ma et al. (2023), has resulted in a significant decrease in trips to shopping centres in a similar way that teleworking has reduced commuting trips, especially in urban areas. This change, mirrored in the findings by Patwary and Khattak (2022), suggests a reconfiguration of urban commercial spaces. However, Patwary and Khattak (2022) also reported an increased likelihood of making shopping trips for teleworkers, which appears to be contrary to the correlation with online shopping. However, understanding this in light of the findings of Currie et al. (2021) would suggest that these extra potential shopping trips would likely be away from urban centres. In other words, it is possible that trips to urban centres for shopping may also be replaced with shopping trips to more peripheral shopping destinations, such as retail parks, as well as online shopping.

Immediate effects of the pandemic have accelerated online shopping to record high levels, as Munawar et al. (2021) reported an increase in online shopping from 17 % in mid-2019 to 41 % in mid-2020 in Australia. Likewise, Shemer et al. (2022) reported online sales increasing worldwide by 32 % within the same timeframe. It has previously been discussed that the uptake of online shopping has a negative correlation with frequency of shopping trips (Patwary & Khattak, 2022). Therefore, the extent that online shopping is retained after the pandemic may also negatively affect the importance of physical shopping areas as destinations (Ma et al., 2023) and likewise, the purpose of shopping trips in general (Munawar et al., 2021). Based on their respective studies, Christidis et al. (2022) and Conway et al. (2020) both suggest that substituting pre-pandemic shopping trips with online shopping post-pandemic would persist to a moderate extent. This finding is supported by permanent closures of retail stores from entire businesses, who chose to operate solely online (Shemer et al., 2022). Furthermore, based on the strong negative correlation between post-pandemic trips to shopping centres and online shopping for home delivery (Ma et al., 2023), it can be implied that they will have the greatest risk of permanent closures.

4.3. Changes in residential location preferences in response to new activity patterns

Linking back to the theoretical framework (Fig. 2.1), intention for residential relocation is predominantly affected by travel, activity and spatial behaviour combined with attitudes. The latter is directly influenced by preferences and perceptions of spatial contexts, travel modes and activities. This means that, since the effects of the pandemic caused changes to these perceptions and preferences, as well as behaviours consequently, all these factors likewise play a role in influencing different intentions about residential location choice. Whether these intentions translate into actual behaviours depends upon the actual and perceived capabilities of the individual or household. Firstly, the actual capabilities are influenced by the socioeconomic status of the individual or household, such as their physical and financial capabilities. For example, a household may desire to relocate due to changes in preferences but may not be able to afford to do so. Secondly, the desires and intentions of the individual or household determine to what extent they value each factor. From this, it can be that even if a household can afford to relocate, they may not deem it worthwhile. Thereafter, the perceived behavioural control determines how much the individual or household feels they have control of their behaviour and capabilities.

4.3.1. From urban centres to suburbs: a shift in residential desirability

Four different studies (Melo, 2022; Mu et al., 2023; Salon et al., 2022; Stefaniec et al., 2022) have observed the link between adoption of long-term teleworking and relocation further away from the workplace. This indicates support for reduction in the need to live near the workplace, leading to the trend of relocating from urban centres to peripheral locations. Adobati and Debernardi (2022) stated that "a reduction of the spatial constraints related to the workplace" results in a "greater freedom of choice of localisation of one's main home". Supporting this, Salon et al. (2022) mentioned how those who decide to continue teleworking in the long-term "no longer need to commute regularly", which confirms the reduction in importance of living near the workplace. Stefaniec et al. (2022) found that 42.5 % of white-collar workers in their survey, whose ability to telework was established, would consider relocating due to teleworking eliminating the constraint of living near the workplace.

One of the notable impacts of sustained substitution of many out-of-home activities (such as working and shopping) with their online counterparts, is that people will generally spend more time at home than pre-pandemic (Campisi et al., 2020; Huang et al., 2023; Song et al., 2022). Consequently, people would begin to show more concern for the attributes of their dwelling than its location, which could affect centricity of cities, as residences in the city centre may not have these spaces available to accommodate desirable dwelling attributes. Melo (2022) specifically mentioned how "larger homes and areas with more greenery" become a greater importance in relocating. As such, households may shift away from urban centres to more suburban or rural areas, where they can find residences with dwelling characteristics up to their expectations more affordably. Combining this preferential shift with the reduced need of living near the workplace leads to a greater likelihood of relocating based on house over location.

4.3.2. Digital connectivity as a new dimension in residential location choice

The prevalence of teleworking and online shopping has led to digital connectivity becoming a significant factor in residential location choice. Budnitz and Tranos (2022) mentioned how "reliability of home broadband services deserves more consideration" in the long term. The implications derived from this is that upload speeds and availability of digital infrastructure are becoming more important in residential location choice than pre-pandemic. On top of this, Moser et al. (2022) found that broadband access has a strong positive correlation with the likelihood to adopt teleworking. Rafiq et al. (2022) also agrees with the link between teleworking and availability and strength of internet connection and digital infrastructure. However, since internet connectivity tends to be better in more urbanised areas, this would conflict on the tendency to relocate away from urban centres, which do not always have the space to accommodate the more desirable dwelling attributes that are more sought-after for relocation.

Contrary to the potential trend of shifting residential preferences away from urban areas, Soler et al. (2021) found that teleworkers and online shoppers were more likely to live in denser urban areas, which have better access to physical shops and workplaces. They explain this trend via three possible reasons: gentrification of the city centre, generally higher income of central urban dwellers and lower car ownership. However, linking this back to the findings of Moser et al. (2022) and Rafiq et al. (2022) from the perspective of considering the factors of digital connectivity, another possible explanation is faster internet connectivity. In other words, urban areas closer to the centre may have much better reception to support extensive teleworking or online shopping. Therefore, the requirement for better digital connectivity may outweigh the desirability of looking for more spacious dwellings away from urban areas in this case.

5. Discussion

5.1. Implications drawn from the findings

It is commonly known that the mobility of people living in lower density rural and suburban areas are much more car-dominant, compared to denser urban areas which have a significant amount of mobility on non-car modes (Brezina et al., 2021). Also, Hossain et al. (2022) highlights a negative correlation between distance from urban core and frequency of shopping trips. Combining these trends with the dominant overall shift to private cars (Sub-section 4.1.2), an overall decrease in commuting trips due to sustained teleworking (Sub-section 4.2.1) and the overall changes in relocation preferences (Sub-section 4.3.1), an overall decentralisation of the urban structure is anticipated. This is further supported by the reduction of commuting trips to central areas being greater than to suburban areas, combined with shifting from public transport to car outweighing the trips reduced by teleworking (Currie et al., 2021). Also, Li and Stoler (2022) have stated how employment is being decentralised to the suburbs in "post-pandemic US cities", leading to a shift from transit-oriented development to car-oriented development. Consequently, this would lead to more traffic congestion in peripheral areas despite the anticipated reduction of central congestion (Delventhal et al., 2022), especially when most of the new non-commuting trips discussed in sub-sections 4.2.1 are predominantly car-oriented due to the flexibility of destination (Huang et al.,

2023). This could thus lead to trip patterns across cities, which are less viable to serve with public transport, as less people would be travelling to a common destination such as the city centre. Such a potential outcome would exacerbate the challenges of restoring public transport services suspended during the COVID-19 pandemic and of overall recovering public transport usage.

Therefore, it is anticipated that residential location choice preferences would likely shift away from denser urban areas. This is mainly due to commuting trips being reduced overall as a result of sustained teleworking (Magrico et al., 2023), or at least a hybrid working model where some workdays involve commute to the conventional workplace, while other days are teleworked (usually through working-from-home). The hybrid work model offers a compromise between the benefits of teleworking with the benefits of a conventional workplace in order to mitigate the drawbacks of both (Adobati & Debernardi, 2022). Therefore, due to this lower demand in commuting overall, the importance of living near the workplace in residential location choice has decreased compared to pre-pandemic. As a result, people have been inclined to relocate further away from their workplaces due to their desire for more spacious housing and greener surroundings (Melo, 2022). This shows a major contrast to Levine (1998) and Chi and Boydstun (2017), who have previously highlighted the dominance of jobs and workplace location in residential location choice. However, other studies have also indicated that this impact on relocation may be marginal due to the relatively small proportion of people that can afford to relocate in the first place (Chen et al., 2023). On the other hand, future research needs to address which socio-economic strata are more likely to relocate, given that the relocation decision is not only subject to the working or income conditions of the household members but also on the composition and the life stage of a household. Considering also that the teleworking patterns may differ between developed and developing countries, future research should also look at the inter-relationship between teleworking and household relocation trends proportion between developed countries and developing countries.

Likewise, travel preferences are anticipated to shift more towards car dependency in general, especially given the nature of most non-commuting trips induced due to the time saved from teleworking. Also, the nature of the places that people may be inclined to relocate to, should they desire more spacious housing (for example), could be more car-dependent, especially if the relocation destinations are further away from the urban centres. Furthermore, jobs relocating away from urban centres as well as housing would lead to more orbital (suburb-to-suburb) commuting than radial (suburb-to-centre) commuting, which can be accommodated mostly by car and quite less by public transport. This is because public transport cannot viably serve places away from urban centres due to the lower density and, in turn, the lower demand. Subsection 4.1.2 has highlighted that despite the potential emissions and congestion reduced via shifts towards active transport (walking and cycling) and teleworking, any gains are likely to be offset by those shifting from public transport to car. In fact, both Ceccato et al. (2022) and Currie et al. (2021) highlighted that the latter shift to private cars outweighs the former shifts in travel behaviour, given the majority of those shifting to teleworking or active transport were public transport users originally. Thus, it can be implied that teleworking and active transport cannot be fully relied upon with regards to sustainability and reducing congestion and emissions.

What has been inferenced in this review has some agreement with Batty (2022), who made use of simulation to forecast post-pandemic travel and relocation patterns around London. The results of that study show an inclination towards recentralisation after some time. The simulation explored multiple scenarios, each with differing assumptions on what extent people return to the pre-pandemic normal (returning to work) or adapt towards a new normal (moving away from workplaces). In scenarios that lean more towards the latter case, there is more sub-urbanisation. However, there is quicker recentralisation in scenarios with more inclination towards the former case. In either case, what is implied from the study is that even with significant changes in relocation behaviours due to the post-pandemic impacts on travel-activity behaviour, the urban area would ultimately return to recentralisation in the long-term after a period of decentralisation.

A more recent study by Van Acker et al. (2024) further feeds into the finding that people have generally been spending more time at home post-pandemic than pre-pandemic. From this study, they found that these prolonged periods of being housebound have had a significant impact on residential attachment and satisfaction. For example, those who worked almost full-time at home (4+ days a week spent teleworking) found greater satisfaction and attachment to their residence compared to those who never teleworked. Due to this, it has led to a contrary result to the “urban exodus” (Van Acker et al., 2024) that was initially expected from prolonged teleworking due to less need to live near the office (Gallent & Madeddu, 2021). In other words, the findings of Van Acker et al. (2024) suggest that those who telework more often are less likely to relocate, due to increased residential attachment, and not due to shifting preferences towards dwelling attributes over accessibility or workplace proximity.

Going back to the hypothesis made in the Introduction based on relocation trends over the past 30 years combined with the study by Gallent and Madeddu (2021), the general indication from the findings proves it correct to an extent. In other words, due to the prevalence of teleworking, relocation towards more spacious dwellings – usually found away from urban centres – is anticipated to become more common post-pandemic. This would in-turn lead to a decentralisation of urban areas, as well as more support for car-dependent infrastructure, further supported by the shifts pointed out by Ceccato et al. (2022) and Currie et al. (2021). Urban centres spreading out can lead to clustering – the gathering together of employment and commercial land uses – in outer suburbs, where more people may decide to relocate their residence, potentially inducing further development in these areas. This can lead to urban areas having more polycentricity with clustering around satellite towns of cities (Batty, 2022), or potentially new urban areas forming in rural areas. In order to mitigate the issue of car dependency, it is recommended that infrastructure for public transport and walkability is improved for such places, which have new clusters forming due to relocations in employment and residences. Also, urban centres should be repurposed to accommodate the increase in leisure and recreational activities in order to maintain their viability as destinations. However, the extent of such changes greatly depends on how many of these people with new relocation preferences can actually afford to relocate in the first place. Also, Batty (2022) suggests that any decentralisation of the urban structure that occurs may eventually be reversed in the long-term.

5.2. *Future research agenda*

One major gap in findings across all the studies reviewed is the lack of consideration for residential consonance and dissonance. If someone is consonant to their residential location, it means the attributes of their location mostly conform with their personal preferences, while dissonance to residential locations is the opposite (De Vos et al., 2012). The dissonance factor can especially lead to heterogeneity with mode choice based on residential location, since urban dissonant residents will still continue to use the car whenever they can despite being easier to use alternatives such as public transport. On the contrary, rural, and suburban dissonant residents have an easier time adapting to their surroundings and making use of whatever car alternatives (walking, cycling and public transport) are available to them. Thus, attitude towards transport and habits are shown to be a much stronger factor in transport mode choice than the residential location itself. Considering the findings of this study, it would be expected that urban dissonant residents would be more likely to relocate to lower density rural or suburban areas to fit with their lifestyle choices better. However, future studies need to take this concept into consideration in order to verify to what extent this affects post-pandemic relocation.

Similarly, in light of the more recent study of Van Acker et al. (2024), it is recommended that future studies look further into the concept of residential attachment post-pandemic. This is because the findings from that study indicate a resistance to the findings from this review. In other words, while those who telework may be anticipated to relocate further from the workplace in favour of more desirable dwellings at affordable prices, at the same time they may develop more attachment to their residence and instead become less likely to relocate, Therefore, further studies need to be done to explore which of these factors are stronger and in-turn, which one outweighs the other. Also, in what ways would this relationship differ based on sociodemographic factors such as between different age groups, life stages, family status and region they live in.

Another gap that needs to be addressed in future research is the changes in lifestyle choices and life priorities. While recent evidence casts some light on how teleworking leads to shifts in life priorities from work-related to non-work (such as shopping and leisure) activities, lifestyle in general has much more complexities that are yet to be explored further. For example, how social influence from friends and family can play a part in post-pandemic relocation, as well as exploring further the importance of leisure. Thus, the lifestyle component, as shown in Fig. 2.1, and, particularly, its structural elements that are more critical to the household location choice, need to be further investigated by future studies that explore the inter-relationship between post-pandemic residential location choice and lifestyle.

On top of this, further studies should monitor the actual relocation patterns (surveys with origin and destination data) that occur in practice across various regions to compare with the theoretical findings of this review. Likewise, this would open up more studies to verify the findings of Batty (2022) and ascertain the particular spatial characteristics or activity patterns that may favour decentralisation or recentralisation. In addition, future studies should also examine whether possible decentralisation trends are also accompanied by potential gentrification of suburban or rural areas, which will further exacerbate the car dependency of the relocated households. However, it is important to point out that the adoption rate of teleworking may decrease in the future. Longitudinal observations in different urban contexts would thus be recommended to effectively monitor how commuting and relocation trends change in the long-term.

Future studies covering post-pandemic residential location choice should focus on addressing research needs and drawing new data on a variety of areas ranging from lifestyle trends and travel behaviour to the dynamics of the housing market. Indicatively, granular empirical evidence could be obtained in the future through:

- Surveys on Life Priorities;
- Household Surveys;
- Housing Market Surveys and Reviews;
- Teleworking Data;
- Data for the Origin & Destination of Relocation;
- Travel Diaries.

Surveys that cover attributes of different households (number of members, whether it is a family or shared accommodation, characteristics of each member, etc.) and their life priorities (Keeney et al., 2013) would help understand the context of the potential determinants of relocation. Likewise, further empirical evidence is required as to the level of teleworking and commuting (in the past vs present) among these households to support the findings of studies such as Adobati and Debernardi (2022). Along with this data, such surveys should also elicit information and compare the origin and destination of past and/or future relocation of each corresponding household. Travel diaries, which cover the mode choice, trip length and purpose of each trip – be it for work, shopping, or leisure – could also shed more light on the relationship between travel behaviour and relocation patterns in the post-pandemic era, especially across spatial settings with different housing market characteristics.

5.3. Limitations

Given that only Web of Science was used for the search in this review, it is possible there may be additional studies that were missed. This is because the Web of Science database is restricted to literature that has been published upon the application of high peer-review standards. Therefore, there is a possibility that exploring other search engines such as Scopus and Dimension may cover more relevant studies (especially grey literature), which have the potential to strengthen the findings of this review. Another limitation within this review is that it was limited to peer-reviewed journal articles. However, it is possible that further information could be derived from conference proceedings and reports. Thus, future reviews incorporating these types of literature would be recommended.

Regarding the search keyword combination, there is limited scope when it comes to leisure trips, as the word ‘leisure’ is simply mentioned as an activity keyword within Table 3.1. The reasoning for this is that this study put more focus on work-related trips (commuting to a workplace or educational institution) and shopping trips compared to their digital counterparts due to their more regular nature. Also, leisure trips constitute a very broad and complex topic, which could cover anything from a simple walk to a local park to going abroad for holidays. However, the results of this study suggested that leisure trips have generally been increasing post-pandemic while commuting trips reduced (Huang et al., 2023). As a result, future research could focus on a systematic review dedicated to the change in leisure travel post-pandemic and its correlation with work-related travel. This would be to explore further how these shifts in travel would affect transport infrastructure.

The findings in this review were based on generalised data from previous studies; as such, there has been a lack of an in-depth investigation into the different study areas covered, particularly regarding the varying nature of cities and the orientation of their infrastructure. This review has covered studies and case studies from numerous countries, mostly in Europe (which generally has a more walkable transit-oriented urban structure), North America (which is generally more car-oriented), Asia (featuring various urban structures but mostly transit-oriented) and Australia (largely car-oriented like North America). Thus, the absence of a focused examination of different study areas potentially led to an overlooking of area-specific, yet critical nuances of residential location preferences. For example, the determinants of relocation may differ in car-oriented cities compared to cities that are more transit-oriented. This is evident in the study of Buchel et al. (2022), which focuses on Zurich and Basel, both walkable, transit-oriented cities in Switzerland. Within this study, more people turned to cycling as a mode of transport, which was found to have the quickest recovery post-pandemic. However, for a city that is relatively more car-oriented like Melbourne in Australia, the shift to private cars outweighs any shifts to active transport (Currie et al., 2021). It is evident that the evolution of travel choices post-pandemic is subject to the orientation of the urban transportation systems, with discrepancies between car- and transit-oriented cities potentially exerting varying impacts on future household relocation patterns; as such, further investigation is warranted to understand the nuances of such impacts.

6. Conclusion

The main conclusion derived from the findings of this study is a likely shift in residential location preferences away from dense urban areas, driven by reduced commuting due to sustained teleworking or a hybrid work model (Adobati & Debernardi, 2022; Magrico et al., 2023). This shift marks a departure from previous studies emphasising workplace proximity in residential choices (Chi & Boydstun, 2017; Levine, 1998). People now are more inclined to relocate for more spacious and greener living environments, with the constraints now narrowed down to

affordability (Chen et al., 2023; Melo, 2022). Concurrently, travel preferences are shifting towards car dependency, influenced by the nature and location of non-commuting trips and potential residential relocation to less urbanised areas. This trend could lead to more orbital commuting, challenging the viability of public transport in lower-density areas (Ceccato et al., 2022; Currie et al., 2021). Overall, the findings support a post-pandemic move towards decentralised urban areas and car-dependent infrastructure, suggesting a need for improved public transport and walkability in emerging clusters and urban repurposing for leisure and recreation. Future research should examine the socio-economic and geographical variances in teleworking and relocation trends in order to account for any nuances in these trends.

CRediT authorship contribution statement

Mostafa Ayman Ilham: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Achille Fonzone:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. **Grigorios Fountas:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Luca Mora:** Supervision, Methodology, Conceptualization.

Declaration of competing interest

We have no conflicts of interest to disclose.

Data availability

This paper features a systematic literature review, so all the studies are available online.

Acknowledgments

The authors express their sincere gratitude for the financial contribution of HCI Skills Gateway in partnership with Edinburgh Napier University (WT2804449), who have been funding this research. Likewise, they are thankful to the anonymous reviewers for their valuable comments and constructive feedback, which substantially improved the quality of this manuscript.

Appendix A. Table of findings with references

Dimension	Theme	Component	References
Travel Behaviour	Post-Pandemic Trip Pattern Shifts	Decrease in Overall Trip Distance	Balbontin et al., 2021; Campisi et al., 2020; Fabiani et al., 2021; Hensher et al., 2022; Huang et al., 2023; Mohammadi et al., 2022; Mu et al., 2023; Rafiq et al., 2022; Salon et al., 2022; Shemer et al., 2022; Song et al., 2022; Tahlyan et al., 2022; Victoriano-Habit & El-Geneidy, 2023; Zhang et al., 2022
		Shift from Commuting to Non-Commuting Trips due to Teleworking	Abdullah et al., 2021; Beck & Hensher, 2022a; Borowska-Stefanska et al., 2022; Brezina et al., 2021; Ceccato et al., 2022; Christidis et al., 2022; Currie et al., 2021; Ecke et al., 2022; El Zein et al., 2022; Huang et al., 2023; Irawan et al., 2022; Javadinasr et al., 2022; Khan & Morency, 2023; Kogus et al., 2022; Krasilnikova & Levin-Keitel, 2022; Kroesen et al., 2023; Li & Stoler, 2022; Loo & Huang, 2022; Ma et al., 2023; Magrico et al., 2023; Mashrur et al., 2022; Melo, 2022; Mu et al., 2023; Munawar et al., 2021; Patwary & Khattak, 2022; Rafiq et al., 2022; Salon et al., 2022; Shemer et al., 2022; Soler et al., 2021; Stefaniec et al., 2022; Ton et al., 2022; Victoriano-Habit & El-Geneidy, 2023; Wang et al., 2023; Wilke et al., 2022; Zhang et al., 2022
		Travel Yet to Fully Recover to Pre-Pandemic Levels	Beck & Hensher, 2020; Ceccato et al., 2022; Christidis et al., 2022; Conway et al., 2020; Coppola & De Fabiis, 2020; Currie et al., 2021; Khan & Morency, 2023; Kolarova et al., 2021; Loa et al., 2021; Ma et al., 2023; Salon et al., 2022; Soria et al., 2023; Ulahannan & Birrell, 2022; Zhang et al., 2021
	Modal Shifts & Car Dependency Dynamics	Private Car Recovers Faster than Other Modes	Baghestani et al., 2023; Beck & Hensher, 2020; Beck & Hensher, 2022a; Borowska-Stefanska et al., 2022; Brezina et al., 2021; Budnitz & Tranos, 2022; Christidis et al., 2022; Currie et al., 2021; Javadinasr et al., 2022; Khan & Morency, 2023; Kolarova et al., 2021; Krasilnikova & Levin-Keitel, 2022; Li & Stoler, 2022; Loa et al., 2021; Ma et al., 2023; Melo, 2022; Mogaji, 2022; Salon et al., 2022; Schaefer et al., 2021; Soler et al., 2021; Song et al., 2022; Teixeira et al., 2022; Wang et al., 2023; Xiong et al., 2021
		Public Transport has Greatest Decline and Hardest Recovery	Beck & Hensher, 2020; Bouzouina et al., 2022; Ceccato et al., 2022; Christidis et al., 2022; Conway et al., 2020; Coppola & De Fabiis, 2020; Currie et al., 2021; Ecke et al., 2022; El Zein et al., 2022; Javadinasr et al., 2022; Jiao & Azimian, 2021; Khan & Morency, 2023; Kolarova et al., 2021; Krasilnikova & Levin-Keitel, 2022; Kroesen et al., 2023; Li & Stoler, 2022; Loa et al., 2021; Mashrur et al., 2022; Melo, 2022; Munawar et al., 2021; Salon et al., 2022; Schaefer et al., 2021; Sohrabi et al., 2023; Soria et al., 2023; Teixeira et al., 2022; Ton et al., 2022; Ulahannan & Birrell, 2022; Wang et al., 2023; Wilke et al., 2022; Xiong et al., 2021
		Increased Usage of Active Transport (Walking & Cycling)	Abdullah et al., 2021; Brezina et al., 2021; Buchel et al., 2022; Burke et al., 2022; Campisi et al., 2020; Ceccato et al., 2022; Currie et al., 2021; Hensher et al., 2023; Kamelifar et al., 2022; Ma et al., 2023; Mogaji, 2022; Munawar et al., 2021; Schaefer et al., 2021; Shaer & Haghshenas, 2021; Shaer et al., 2021 Sohrabi et al., 2023; Stefaniec et al., 2022; Teixeira et al., 2022; Victoriano-Habit & El-Geneidy, 2023; Xiong et al., 2021
		Teleworking & Active Transport Reduces Public Transport More than Car Trips	Balbontin et al., 2021; Campisi et al., 2020; Ceccato et al., 2022; Christidis et al., 2022; Conway et al., 2020; Currie et al., 2021; El Zein et al., 2022; Hensher et al., 2021; Hensher et al., 2023; Khan & Morency, 2023; Krasilnikova & Levin-Keitel, 2022; Kroesen et al., 2023; Li & Stoler, 2022; Loa et al., 2021; Loo & Huang, 2022; Magrico et al., 2023; Mashrur et al., 2022; Melo, 2022; Mohammadi et al., 2022; Rafiq et al., 2022; Schaefer et al., 2021;

(*continued on next page*)

(*continued*)

Dimension	Theme	Component	References
			Sohrabi et al., 2023; Soler et al., 2021; Soria et al., 2023; Tahlyan et al., 2022; Xiong et al., 2021
Activity Behaviour	Influences of Teleworking	Evolution of Non-Work Activities	Dingil & Esztergar-Kiss, 2021; Echaniz et al., 2021; Hossain et al., 2022; Ma et al., 2023; Shemer et al., 2022; Song et al., 2022; Wang et al., 2023; Xiong et al., 2021
		Permanent Job Changes	Chen et al., 2023; Christidis et al., 2022; Irawan et al., 2022; Jiao & Azimian, 2021; Magrico et al., 2023; Sohrabi et al., 2023; Soria et al., 2023; Xiong et al., 2021
		Shift from Work to Non-Work Activities	Abdullah et al., 2021; Buchel et al., 2022; Hensher et al., 2022; Huang et al., 2023; Irawan et al., 2022; Khan & Morency, 2023; Kroesen et al., 2023; Ma et al., 2023; Patwary & Khattak, 2022; Rafiq et al., 2022; Stefaniec et al., 2022; Wang et al., 2023
	Adoption of Teleworking	Benefits & Barriers to Teleworking	Adobati & Debernardi, 2022; Baghestani et al., 2023; Balbontin et al., 2021; Beck & Hensher, 2020; Beck & Hensher, 2022a; Beck & Hensher, 2022b; Borowska-Stefanska et al., 2022; Budnitz & Tranos, 2022; Delbosc et al., 2022; De-Toledo et al., 2022; Ecke et al., 2022; El Zein et al., 2022; Fabiani et al., 2021; Huang et al., 2023; Ikegami et al., 2022; Kong et al., 2022; Krasilnikova & Levin-Keitel, 2022; Kroesen et al., 2023; Ma et al., 2023; Magrico et al., 2023; Mogaji, 2022; Mohammadi et al., 2022; Moser et al., 2022; Rafiq et al., 2022; Salon et al., 2022; Soler et al., 2021; Stefaniec et al., 2022; Tahlyan et al., 2022; Ton et al., 2022; Wilke et al., 2022
		Continuity of Teleworking	Balbontin et al., 2021; Beck & Hensher, 2020; Beck & Hensher, 2022a; Beck & Hensher, 2022b; Bouzouina et al., 2022; Brezina et al., 2021; Burke et al., 2022; Christidis et al., 2022; Conway et al., 2020; Currie et al., 2021; Delventhal et al., 2022; De-Toledo et al., 2022; De-Toledo et al., 2023; Ecke et al., 2022; Hensher et al., 2021; Hensher et al., 2023; Jain et al., 2022; Javadinasr et al., 2022; Khan & Morency, 2023; Kogus et al., 2022; Kolarova et al., 2021; Kong et al., 2022; Kroesen et al., 2023; Ma et al., 2023; Magrico et al., 2023; Mogaji, 2022; Mohammadi et al., 2022; Munawar et al., 2021; Patwary & Khattak, 2022; Rafiq et al., 2022; Salon et al., 2022; Shemer et al., 2022; Sohrabi et al., 2023; Soler et al., 2021; Stefaniec et al., 2022; Tahlyan et al., 2022; Ton et al., 2022; Victoriano-Habit & El-Geneidy, 2023; Wilke et al., 2022
		Hybrid Work Model	Balbontin et al., 2021; Beck & Hensher, 2022a; Beck & Hensher, 2022b; De-Toledo et al., 2023; Hensher et al., 2023; Javadinasr et al., 2022; Kogus et al., 2022; Kong et al., 2022; Magrico et al., 2023; Patwary & Khattak, 2022; Stefaniec et al., 2022; Ton et al., 2022; Wilke et al., 2022
	Online Shopping Trends	Shifting to Online Shopping	Brezina et al., 2021; Conway et al., 2020; Echaniz et al., 2021; Ghodsi et al., 2021; Hossain et al., 2022; Irawan et al., 2022; Jiao & Azimian, 2021; Kolarova et al., 2021; Ma et al., 2023; Munawar et al., 2021; Patwary & Khattak, 2022; Shemer et al., 2022; Soler et al., 2021; Song et al., 2022; Xiong et al., 2021
		Continuity of Online Shopping	Bouzouina et al., 2022; Christidis et al., 2022; Conway et al., 2020; Ghodsi et al., 2021; Javadinasr et al., 2022; Khan & Morency, 2023; Ma et al., 2023; Mashrur et al., 2022; Munawar et al., 2021; Patwary & Khattak, 2022; Shemer et al., 2022; Soler et al., 2021
Residential Location Choice	Changes in Circumstances that Influence Relocation Priorities	More Time Spent at Home	Campisi et al., 2020; Huang et al., 2023; Song et al., 2022; Zhang et al., 2022
		Reasons Not to Relocate	Chen et al., 2023; Irawan et al., 2022; Mogaji, 2022; Victoriano-Habit & El-Geneidy, 2023
		Relocation Affected by Transport Modal Shifts	Khan & Morency, 2023; Li & Stoler, 2022; Melo, 2022; Moser et al., 2022; Soler et al., 2021; Victoriano-Habit & El-Geneidy, 2023; Wilke et al., 2022
		Shift from Accessibility to Dwelling Attributes	Batty, 2022; Melo, 2022; Mogaji, 2022; Mu et al., 2023; Salon et al., 2022; Stefaniec et al., 2022
	Effect of Teleworking on Relocation Preferences	Digital Connectivity Becoming a New Dimension in Relocation Choice	Budnitz & Tranos, 2022; Moser et al., 2022; Rafiq et al., 2022
		Reduction of Workplace-Related Spatial Constraints	Adobati & Debernardi, 2022; Balbontin et al., 2021; Chen et al., 2023; Delventhal et al., 2022; De-Toledo et al., 2023; Hensher et al., 2023; Mogaji, 2022; Mu et al., 2023; Salon et al., 2022; Soler et al., 2021; Stefaniec et al., 2022; Victoriano-Habit & El-Geneidy, 2023
	Urban Structure Changes	Urban Decentralisation	Batty, 2022; Chen et al., 2023; Delventhal et al., 2022; De-Toledo et al., 2023; Hensher et al., 2023; Hossain et al., 2022; Jain et al., 2022; Khan & Morency, 2023; Krasilnikova & Levin-Keitel, 2022; Li & Stoler, 2022; Loo & Huang, 2022; Melo, 2022; Mogaji, 2022; Moser et al., 2022; Mu et al., 2023; Soler et al., 2021; Song et al., 2022; Victoriano-Habit & El-Geneidy, 2023
		Travel Needs Differ with Spatial Setting	Brezina et al., 2021; Hossain et al., 2022; Khan & Morency, 2023; Li & Stoler, 2022; Loo & Huang, 2022; Moser et al., 2022; Soler et al., 2021; Victoriano-Habit & El-Geneidy, 2023

References

Review articles

Abdullah, M., Ali, N., Hussain, S. A., Aslam, A. B., & Javid, M. A. (2021). Measuring changes in travel behavior pattern due to COVID-19 in a developing country: A case study of Pakistan [article]. *Transport Policy, 108*, 21–33. https://doi.org/10.1016/j.tranpol.2021.04.023

Adobati, F., & Debernardi, A. (2022). The breath of the metropolis: Smart working and new urban geographies [article]. *Sustainability, 14(2), 34*, Article 1028. https://doi.org/10.3390/su14021028

Baghestani, A., Tayarani, M., Mamdoohi, A. R., Habibian, M., & Gao, O. L. V. (2023). Travel demand management implications during the COVID-19 pandemic: The case

study of Tehran [article]. *Sustainability, 15(2), 14*, Article 1209. https://doi.org/10.3390/su15021209
Balbontin, C., Hensher, D. A., Beck, M. J., Giesen, R., Basnak, P., Vallejo-Borda, J. A., & Venter, C. (2021). Impact of COVID-19 on the number of days working from home and commuting travel: A cross-cultural comparison between Australia, South America and South Africa [article]. *Journal of Transport Geography, 96, 13*, Article 103188. https://doi.org/10.1016/j.jtrangeo.2021.103188
Batty, M. (2022). The post-pandemic city: Speculation through simulation [article]. *Cities, 124, 18*, Article 103594. https://doi.org/10.1016/j.cities.2022.103594
Beck, M. J., & Hensher, D. A. (2020). Insights into the impact of COVID-19 on household travel and activities in Australia - The early days of easing restrictions [article]. *Transport Policy, 99*, 95–119. https://doi.org/10.1016/j.tranpol.2020.08.004
Beck, M. J., & Hensher, D. A. (2022a). Australia 6 months after COVID-19 restrictions part 2: The impact of working from home [article]. *Transport Policy, 128*, 274–285. https://doi.org/10.1016/j.tranpol.2021.06.005
Beck, M. J., & Hensher, D. A. (2022b). Working from home in Australia in 2020: Positives, negatives and the potential for future benefits to transport and society [article]. *Transportation Research Part A: Policy and Practice, 158*, 271–284. https://doi.org/10.1016/j.tra.2022.03.016
Borowska-Stefanska, M., Kowalski, M., Kurzyk, P., Sahebgharani, A., & Wisniewski, S. (2022). Spatiotemporal changeability of the load of the urban road transport system under permanent and short-term legal and administrative retail restrictions [article]. *Sustainability, 14(9), 30*, Article 5137. https://doi.org/10.3390/su14095137
Bouzouina, L., Kourtit, K., & Nijkamp, P. (2022). Impact of immobility and mobility activities on the spread of COVID-19: Evidence from European countries [article; early access]. *Regional Science Policy and Practice, 15*. https://doi.org/10.1111/rsp3.12565
Brezina, T., Tiran, J., Ogrin, M., & Laa, B. (2021). COVID-19 impact on daily mobility in Slovenia [article]. *Acta Geographica Slovenica-Geografski Zbornik, 61*(2), 91–107. https://doi.org/10.3986/ags.9390
Buchel, B., Marra, A. D., & Corman, F. (2022). COVID-19 as a window of opportunity for cycling: Evidence from the first wave [article]. *Transport Policy, 116*, 144–156. https://doi.org/10.1016/j.tranpol.2021.12.003
Budnitz, H., & Tranos, E. (2022). Working from home and digital divides: Resilience during the pandemic [article]. *Annals of the American Association of Geographers, 112*(4), 893–913. https://doi.org/10.1080/24694452.2021.1939647
Burke, M., Dissanayake, D., & Bell, M. (2022). Cluster analysis of daily cycling flow profiles during COVID-19 lockdown in the UK [article]. *Journal of Advanced Transportation, 2022, 16*, Article 4217431. https://doi.org/10.1155/2022/4217431
Campisi, T., Basbas, S., Skoufas, A., Akgun, N., Ticali, D., & Tesoriere, G. (2020). The impact of COVID-19 pandemic on the resilience of sustainable mobility in Sicily [article]. *Sustainability, 12(21), 24*, Article 8829. https://doi.org/10.3390/su12218829
Ceccato, R., Baldassa, A., Rossi, R., & Gastaldi, M. (2022). Potential long-term effects of Covid-19 on telecommuting and environment: An Italian case-study [article]. *Transportation Research Part D: Transport and Environment, 109, 24*, Article 103401. https://doi.org/10.1016/j.trd.2022.103401
Chen, R. Y., Zhang, M., & Zhou, J. P. (2023). Jobs-housing relationships before and amid COVID-19: An excess-commuting approach [article]. *Journal of Transport Geography, 106, 17*, Article 103507. https://doi.org/10.1016/j.jtrangeo.2022.103507
Christidis, P., Cawood, E. N., & Fiorello, D. (2022). Challenges for urban transport policy after the Covid-19 pandemic: Main findings from a survey in 20 European cities [article]. *Transport Policy, 129*, 105–116. https://doi.org/10.1016/j.tranpol.2022.10.007
Conway, M. W., Salon, D., da Silva, D. C., & Mirtich, L. (2020). How will the COVID-19 pandemic affect the future of urban life? Early evidence from highly-educated respondents in the United States [article]. *Urban Science, 4(4), 24*, Article 50. https://doi.org/10.3390/urbansci4040050
Coppola, P., & De Fabiis, F. (2020). Evolution of mobility sector during and beyond Covid-19: Viewpoint of industries, consultancies and public transport companies [article]. *Tema-Journal of Land Use Mobility and Environment, 81-90*. https://doi.org/10.6092/1970-9870/6900
Currie, G., Jain, T., & Aston, L. (2021). Evidence of a post-COVID change in travel behaviour - Self-reported expectations of commuting in Melbourne [article]. *Transportation Research Part A: Policy and Practice, 153*, 218–234. https://doi.org/10.1016/j.tra.2021.09.009
Delbosc, A., Currie, G., Jain, T., & Aston, L. (2022). The ?re-norming? of working from home during COVID-19: A transtheoretical behaviour change model of a major unplanned disruption [article]. *Transport Policy, 127*, 15–21. https://doi.org/10.1016/j.tranpol.2022.08.007
Delventhal, M. J., Kwon, E., & Parkhomenko, A. (2022). JUE insight: How do cities change when we work from home? [article]. *Journal of Urban Economics, 127, 20*, Article 103331. https://doi.org/10.1016/j.jue.2021.103331
De-Toledo, K. P., O'Hern, S., & Koppel, S. (2022). A social-ecological model of working from home during COVID-19 [article; early access]. *Transportation, 28*. https://doi.org/10.1007/s11116-022-10331-7
De-Toledo, K. P., O'Hern, S., & Koppel, S. (2023). A city-level transport vision for 2050: Reimagined since COVID-19 [article]. *Transport Policy, 132*, 144–153. https://doi.org/10.1016/j.tranpol.2022.12.022
Dianat, A., Hawkins, J., & Habib, K. N. (2022). Assessing the impacts of COVID-19 on activity-travel scheduling: A survey in the greater Toronto area [Article]. *Transportation Research Part a-Policy and Practice, 162*, 296–314. https://doi.org/10.1016/j.tra.2022.06.008
Dingil, A. E., & Esztergar-Kiss, D. (2021). The influence of the Covid-19 pandemic on mobility patterns: The first wave's results [article]. *Transportation Letters-the International Journal of Transportation Research, 13*(5–6), 434–446. https://doi.org/10.1080/19427867.2021.1901011
Echaniz, E., Rodriguez, A., Cordera, R., Benavente, J., Alonso, B., & Sanudo, R. (2021). Behavioural changes in transport and future repercussions of the COVID-19 outbreak in Spain [article]. *Transport Policy, 111*, 38–52. https://doi.org/10.1016/j.tranpol.2021.07.011
Ecke, L., Magdolen, M., Chlond, B., & Vortisch, P. (2022). How the COVID-19 pandemic changes daily commuting routines - insights from the German Mobility Panel [article]. *Case Studies on Transport Policy, 10*(4), 2175–2182. https://doi.org/10.1016/j.cstp.2022.10.001
El Zein, A., Beziat, A., Pochet, P., Klein, O., & Vincent, S. (2022). What drives the changes in public transport use in the context of the COVID-19 pandemic? Highlights from Lyon metropolitan area [article; early access]. *Regional Science Policy and Practice, 20*. https://doi.org/10.1111/rsp3.12519
Fabiani, C., Longo, S., Pisello, A. L., & Cellura, M. (2021). Sustainable production and consumption in remote working conditions due to COVID-19 lockdown in Italy: An environmental and user acceptance investigation [article]. *Sustainable Production and Consumption, 28*, 1757–1771. https://doi.org/10.1016/j.spc.2021.09.013
Ghodsi, M., Ardestani, A., Rasaizadi, A., Ghadamgahi, S., & Yang, H. (2021). How COVID-19 pandemic affected urban trips? Structural interpretive model of online shopping and passengers trips during the pandemic [article]. *Sustainability, 13(21), 15*, Article 11995. https://doi.org/10.3390/su132111995
Hensher, D. A., Balbontin, C., Beck, M. J., & Wei, E. (2022). The impact of working from home on modal commuting choice response during COVID-19: Implications for two metropolitan areas in Australia [article]. *Transportation Research Part A: Policy and Practice, 155*, 179–201. https://doi.org/10.1016/j.tra.2021.11.011
Hensher, D. A., Beck, M. J., & Wei, E. D. (2021). Working from home and its implications for strategic transport modelling based on the early days of the COVID-19 pandemic [article]. *Transportation Research Part A: Policy and Practice, 148*, 64–78. https://doi.org/10.1016/j.tra.2021.03.027
Hensher, D. A., Wei, E. D., & Beck, M. J. (2023). The impact of COVID-19 and working from home on the workspace retained at the main location office space and the future use of satellite offices [article]. *Transport Policy, 130*, 184–195. https://doi.org/10.1016/j.tranpol.2022.11.012
Hossain, M. S., Fatmi, M. R., & Thirkell, C. E. (2022). How will in-person and online grocery shopping and meal consumption activities evolve after COVID-19? [article; early access]. *Transportation Research Record, 12*. https://doi.org/10.1177/03611981221119183
Huang, Z. R., Loo, B. P. Y., & Axhausen, K. W. (2023). Travel behaviour changes under work-from-home (WFH) arrangements during COVID-19 [article]. *Travel Behaviour and Society, 30*, 202–211. https://doi.org/10.1016/j.tbs.2022.09.006
Ikegami, K., Baba, H., Ando, H., Hino, A., Tsuji, M., Tateishi, S., Nagata, T., Matsuda, S., & Fujino, Y. (2022). Job stress among workers who telecommute during the coronavirus disease (covid-19) pandemic in Japan: A cross-sectional study [article; early access]. *International Journal of Occupational Medicine and Environmental Health, 13*. https://doi.org/10.13075/ijomeh.1896.01865
Irawan, M. Z., Belgiawan, P. F., Joewono, T. B., Bastarianto, F. F., Rizki, M., & Ilahi, A. (2022). Exploring activity-travel behavior changes during the beginning of COVID-19 pandemic in Indonesia [article]. *Transportation, 49*(2), 529–553. https://doi.org/10.1007/s11116-021-10185-5
Jain, T., Currie, G., & Aston, L. (2022). COVID and working from home: Long-term impacts and psycho-social determinants [article]. *Transportation Research Part A: Policy and Practice, 156*, 52–68. https://doi.org/10.1016/j.tra.2021.12.007
Javadinasr, M., Maggasy, T., Mohammadi, M., Mohammadain, K., Rahimi, E., Salon, D., Conway, M. W., Pendyala, R., & Derrible, S. (2022). The long-term effects of COVID-19 on travel behavior in the United States: A panel study on work from home, mode choice, online shopping, and air travel [article]. *Transportation Research Part F: Traffic Psychology and Behaviour, 90*, 466–484. https://doi.org/10.1016/j.trf.2022.09.019
Jiao, J. F., & Azimian, A. (2021). Exploring the factors affecting travel behaviors during the second phase of the COVID-19 pandemic in the United States [article]. *Transportation Letters-the International Journal of Transportation Research, 13*(5–6), 331–343. https://doi.org/10.1080/19427867.2021.1904736
Kamelifar, M. J., Ranjbarnia, B., & Masoumi, H. (2022). The determinants of walking behavior before and during COVID-19 in Middle-East and North Africa: Evidence from Tabriz, Iran [article]. *Sustainability, 14(7), 20*, Article 3923. https://doi.org/10.3390/su14073923
Khan, N. A., & Morency, C. (2023). Investigating anticipated changes in post-pandemic travel behavior: Latent segmentation-based logit modeling approach using data from COVID-19 era [article; early access]. *Transportation Research Record, 21*. https://doi.org/10.1177/03611981221149730
Kogus, A., Foltynova, H. B., Gal-Tzur, A., Shiftan, Y., Vejchodska, E., & Shiftan, Y. (2022). Will COVID-19 accelerate telecommuting? A cross-country evaluation for Israel and Czechia [article]. *Transportation Research Part A: Policy and Practice, 164*, 291–309. https://doi.org/10.1016/j.tra.2022.08.011
Kolarova, V., Eisenmann, C., Nobis, C., Winkler, C., & Lenz, B. (2021). Analysing the impact of the COVID-19 outbreak on everyday travel behaviour in Germany and potential implications for future travel patterns [article]. *European Transport Research Review, 13(1), 11*, Article 27. https://doi.org/10.1186/s12544-021-00486-2
Kong, X. Q., Zhang, A., Xiao, X., Das, S., & Zhang, Y. L. (2022). Work from home in the post-COVID world [article]. *Case Studies on Transport Policy, 10*(2), 1118–1131. https://doi.org/10.1016/j.cstp.2022.04.002
Krasilnikova, N., & Levin-Keitel, M. (2022). Telework as a game-changer for sustainability? Transitions in work, workplace and socio-spatial arrangements

[article]. *Sustainability, 14(11), 13*, Article 6765. https://doi.org/10.3390/su14116765

Kroesen, M., De Vos, J., Le, H. T. K., & Ton, D. (2023). Exploring attitude-behaviour dynamics during COVID-19: How fear of infection and working from home influence train use and the attitude toward this mode [article]. *Transportation Research Part A: Policy and Practice, 167, 12*, Article 103560. https://doi.org/10.1016/j.tra.2022.103560

Li, H., & Stoler, J. (2022). COVID-19 and urban futures: Impacts on business closures in Miami-Dade County [article; early access]. *Annals of the American Association of Geographers, 23*. https://doi.org/10.1080/24694452.2022.2134839

Loa, P., Hossain, S., Mashrur, S. M., Liu, Y. C., Wang, K. L., Ong, F., & Habib, K. N. (2021). Exploring the impacts of the COVID-19 pandemic on modality profiles for non-mandatory trips in the Greater Toronto Area [article]. *Transport Policy, 110*, 71–85. https://doi.org/10.1016/j.tranpol.2021.05.028

Loo, B. P. Y., & Huang, Z. R. (2022). Spatio-temporal variations of traffic congestion under work from home (WFH) arrangements: Lessons learned from COVID-19 [article]. *Cities, 124, 12*, Article 103610. https://doi.org/10.1016/j.cities.2022.103610

Ma, W. N., Hoen, F. S., & Torset, T. (2023). No way back? A survey on changes in travel demand post-pandemic in Norway [article]. *Case Studies on Transport Policy, 11, 9*, Article 100942. https://doi.org/10.1016/j.cstp.2022.100942

Magrico, D., Sheehy, C., Siraut, J., & Fuller, T. (2023). Survey evidence on COVID-19 and its impact on rail commuting patterns in Great Britain [article]. *Case Studies on Transport Policy, 11, 14*, Article 100965. https://doi.org/10.1016/j.cstp.2023.100965

Mashrur, S. M., Wang, K. L., Loa, P., Hossain, S., & Habib, K. N. (2022). Application of protection motivation theory to quantify the impact of pandemic fear on anticipated postpandemic transit usage [article; early access]. *Transportation Research Record, 20*, Article 03611981211065439. https://doi.org/10.1177/03611981211065439

Melo, P. C. (2022). Will COVID-19 hinder or aid the transition to sustainable urban mobility? Spotlight on Portugal's largest urban agglomeration [article; early access]. *Regional Science Policy and Practice, 27*. https://doi.org/10.1111/rsp3.12518

Mogaji, E. (2022). Wishful thinking? Addressing the long-term implications of COVID-19 for transport in Nigeria [article]. *Transportation Research Part D: Transport and Environment, 105, 17*, Article 103206. https://doi.org/10.1016/j.trd.2022.103206

Mohammadi, M., Rahimi, E., Davatgari, A., Javadinasr, M., Mohammadian, A., Bhagat-Conway, M. W., Salon, D., Derrible, S., Pendyala, R. M., & Khoeini, S. (2022). Examining the persistence of telecommuting after the COVID-19 pandemic [article; early access]. *Transportation Letters-the International Journal of Transportation Research, 14*. https://doi.org/10.1080/19427867.2022.2077582

Moser, J., Wenner, F., & Thierstein, A. (2022). Working from home and Covid-19: Where could residents move to? [article]. *Urban Planning, 7*(3), 15–34. https://doi.org/10.17645/up.v7i3.5306

Mu, X. Y., Zhang, X. H., Yeh, A. G. O., Yu, Y., & Wang, J. J. (2023). Structural changes in human mobility under the zero-COVID strategy in China [article; early access]. *Environment and Planning B: Urban Analytics and City Science, 16*. https://doi.org/10.1177/23998083231159397

Munawar, H. S., Khan, S. I., Qadir, Z., Kiani, Y. S., Kouzani, A. Z., & Mahmud, M. A. P. (2021). Insights into the mobility pattern of Australians during COVID-19 [article]. *Sustainability, 13(17), 19*, Article 9611. https://doi.org/10.3390/su13179611

Patwary, A. L., & Khattak, A. J. (2022). Interaction between information and communication technologies and travel behavior: Using behavioral data to explore correlates of the COVID-19 pandemic [article; early access]. *Transportation Research Record, 14*. https://doi.org/10.1177/03611981221116626

Rafiq, R., McNally, M. G., Uddin, Y. S., & Ahmed, T. (2022). Impact of working from home on activity-travel behavior during the COVID-19 pandemic: An aggregate structural analysis [article]. *Transportation Research Part A: Policy and Practice, 159*, 35–54. https://doi.org/10.1016/j.tra.2022.03.003

Salon, D., Mirtich, L., Bhagat-Conway, M. W., Costello, A., Rahimi, E., Mohammadian, A., Chauhan, R. S., Derrible, S., Baker, D. D., & Pendyala, R. M. (2022). The COVID-19 pandemic and the future of telecommuting in the United States [article]. *Transportation Research Part D: Transport and Environment, 112, 24*, Article 103473. https://doi.org/10.1016/j.trd.2022.103473

Schaefer, K. J., Tuitjer, L., & Levin-Keitel, M. (2021). Transport disrupted-Substituting public transport by bike or car under Covid 19 [article]. *Transportation Research Part A: Policy and Practice, 153*, 202–217. https://doi.org/10.1016/j.tra.2021.09.002

Shaer, A., & Haghshenas, H. (2021). Evaluating the effects of the COVID-19 outbreak on the older adults' travel mode choices [article]. *Transport Policy, 112*, 162–172. https://doi.org/10.1016/j.tranpol.2021.08.016

Shaer, A., Rezaei, M., Rahimi, B. M., & Shaer, F. (2021). Examining the associations between perceived built environment and active travel, before and after the COVID-19 outbreak in Shiraz city, Iran [article]. *Cities, 115, 12*, Article 103255. https://doi.org/10.1016/j.cities.2021.103255

Shemer, L., Shayanfar, E., Avner, J., Miquel, R., Mishra, S., & Radovic, M. (2022). COVID-19 impacts on mobility and travel demand [article]. *Case Studies on Transport Policy, 10*(4), 2519–2529. https://doi.org/10.1016/j.cstp.2022.11.011

Sohrabi, S., Shu, F., Gupta, A., Sabbaghian, M. H., Molan, A. M., & Sajjadi, S. (2023). Health impacts of COVID-19 through the changes in mobility [review]. *Sustainability, 15(5), 20*, Article 4095. https://doi.org/10.3390/su15054095

Soler, J. R. L., Christidis, P., & Vassallo, J. M. (2021). Teleworking and online shopping: Socio-economic factors affecting their impact on transport demand [article]. *Sustainability, 13(13), 24*, Article 7211. https://doi.org/10.3390/su13137211

Song, Y., Lee, S., Park, A. H., & Lee, C. (2022). COVID-19 impacts on non-work travel patterns: A place-based investigation using smartphone mobility data [article; early access]. *Environment and Planning B: Urban Analytics and City Science, 18*. https://doi.org/10.1177/23998083221124930

Soria, J., Edward, D., & Stathopoulos, A. (2023). Requiem for transit ridership ? An examination of who abandoned, who will return, and who will ride more with mobility as a service [article]. *Transport Policy, 134*, 139–154. https://doi.org/10.1016/j.tranpol.2023.02.016

Stefaniec, A., Brazil, W., Whitney, W., & Caulfield, B. (2022). Desire to work from home: Results of an Irish study [article]. *Journal of Transport Geography, 104, 9*, Article 103416. https://doi.org/10.1016/j.jtrangeo.2022.103416

Tahlyan, D., Said, M., Mahmassani, H., Stathopoulos, A., Walker, J., & Shaheen, S. (2022). For whom did telework not work during the pandemic? Understanding the factors impacting telework satisfaction in the US using a multiple indicator multiple cause (MIMIC) model [article]. *Transportation Research Part A: Policy and Practice, 155*, 387–402. https://doi.org/10.1016/j.tra.2021.11.025

Teixeira, J. F., Silva, C., & Sa, F. M. E. (2022). The strengths and weaknesses of bike sharing as an alternative mode during disruptive public health crisis: A qualitative analysis on the users? Motivations during COVID-19 [article]. *Transport Policy, 129*, 24–37. https://doi.org/10.1016/j.tranpol.2022.09.026

Ton, D., Arendsen, K., De Bruyn, M., Severens, V., Van Hagen, M., Van Oort, N., & Duives, D. (2022). Teleworking during COVID-19 in the Netherlands: Understanding behaviour, attitudes, and future intentions of train travellers [article]. *Transportation Research Part A: Policy and Practice, 159*, 55–73. https://doi.org/10.1016/j.tra.2022.03.019

Ulahannan, A., & Birrell, S. (2022). Designing better public transport: Understanding mode choice preferences following the COVID-19 pandemic [article]. *Sustainability, 14(10), 15*, Article 5952. https://doi.org/10.3390/su14105952

Victoriano-Habit, R., & El-Geneidy, A. (2023). Studying the interrelationship between telecommuting during COVID-19, residential local accessibility, and active travel: A panel study in Montreal, Canada [article; early access]. *Transportation, 18*. https://doi.org/10.1007/s11116-022-10369-7

Wang, K., Ye, X., Shi, C., & Gan, H. C. (2023). Probit-based discrete-continuous choice model to explore the relationship between car ownership and commuters' non-work activity durations in Xiaoshan District of Hangzhou, China [article; early access]. *Transportation Research Record, 16*. https://doi.org/10.1177/03611981231152252

Wilke, D., Rau, H., & Hartling, J. W. (2022). Case study: Assessing the COVID-19 Pandemic's potential for a more climate-friendly work-related mobility [article]. *Sustainability, 14(19), 17*, Article 12708. https://doi.org/10.3390/su141912708

Xiong, J. M., Tang, Z. F., Zhu, Y. F., Xu, K. F., Yin, Y. H., & Xi, Y. (2021). Change of consumption behaviours in the pandemic of COVID-19: Examining residents' consumption expenditure and driving determinants [article]. *International Journal of Environmental Research and Public Health, 18(17), 15*, Article 9209. https://doi.org/10.3390/ijerph18179209

Zhang, H. R., Li, P. R., Zhang, Z. W., Li, W. J., Chen, J. Y., Song, X., Shibasaki, R., & Yan, J. Y. (2022). Epidemic versus economic performances of the COVID-19 lockdown: A big data driven analysis [article]. *Cities, 120, 11*, Article 103502. https://doi.org/10.1016/j.cities.2021.103502

Zhang, N., Jia, W., Wang, P. H., Dung, C. H., Zhao, P. C., Leung, K., Su, B. N., Cheng, R., & Li, Y. G. (2021). Changes in local travel behaviour before and during the COVID-19 pandemic in Hong Kong [article]. *Cities, 112, 9*, Article 103139. https://doi.org/10.1016/j.cities.2021.103139

Background material

Anable, J., Lane, B., & Kelay, T. (2006). *An evidence base review of public attitudes to climate change and transport behaviour*. London, UK: The Department.

Borgers, A., & Timmermans, H. (1993). Transport facilities and residential choice behavior: A model of multi-person choice processes. *Papers in Regional Science, 72*(1), 45-61.b.

Brown, V., Diomedi, B. Z., Moodie, M., Veerman, J. L., & Carter, R. (2016). A systematic review of economic analyses of active transport interventions that include physical activity benefits. *Transport Policy, 45*, 190–208.

Chi, G., & Boydstun, J. (2017). Are gasoline prices a factor in residential relocation decisions? Preliminary findings from the American housing survey, 1996–2008. *Journal of Planning Education and Research, 37*(3), 334–346.

Clark, W. A., & Davies Withers, S. (1999). Changing jobs and changing houses: Mobility outcomes of employment transitions. *Journal of Regional Science, 39*(4), 653–673.

Das, S., Boruah, A., Banerjee, A., Raoniar, R., Nama, S., & Maurya, A. K. (2021). Impact of COVID-19: A radical modal shift from public to private transport mode. *Transport Policy, 109*, 1–11.

De Vos, J., Derudder, B., Van Acker, V., & Witlox, F. (2012). Reducing car use: Changing attitudes or relocating? The influence of residential dissonance on travel behavior. *Journal of Transport Geography, 22*, 1–9.

Domarchi, C., Tudela, A., & González, A. (2008). Effect of attitudes, habit and affective appraisal on mode choice: An application to university workers. *Transportation, 35*, 585–599.

Downey, L., Fonzone, A., Fountas, G., & Semple, T. (2022). The impact of COVID-19 on future public transport use in Scotland. *Transportation Research Part A: Policy and Practice, 163*, 338–352.

Gallent, N., & Madeddu, M. (2021). Covid-19 and London's decentralising housing market–What are the planning implications? *Planning Practice and Research, 36*(5), 567–577.

Jiao, P., & Harata, N. (2007). Residential location choice behavior for different households: Methodology and case study. In *Proceedings of the Eastern Asia Society for Transportation Studies vol. 6 (the 7th international conference of Eastern Asia Society for Transportation Studies, 2007)* (p. 171). Eastern Asia Society for Transportation Studies.

Keeney, J., Boyd, E. M., Sinha, R., Westring, A. F., & Ryan, A. M. (2013). From "work–family" to "work–life": Broadening our conceptualization and measurement. *Journal of Vocational Behavior, 82*(3), 221–237.

Kim, J. H. (2006). Amenity valuing differentiation in residential location choice among income groups: A stated preference approach. *International Journal of Urban Sciences, 10*(1), 41–57.

Levine, J. (1998). Rethinking accessibility and jobs-housing balance. *Journal of the American Planning Association, 64*(2), 133–149.

Masoumi, H., Ibrahim, M. R., & Aslam, A. B. (2021, September). The relation between residential self-selection and urban mobility in middle eastern cities: The case of Alexandria, Egypt. In *, Vol. 32. Urban Forum* (pp. 261–287). Netherlands: Springer.

Mora, L., Gerli, P., Ardito, L., & Petruzzelli, A. M. (2023). Smart city governance from an innovation management perspective: Theoretical framing, review of current practices, and future research agenda. *Technovation, 123*, Article 102717.

Nævestad, T. O., Hesjevoll, I. S., & Phillips, R. O. (2018). How can we improve safety culture in transport organizations? A review of interventions, effects and influencing factors. *Transportation Research Part F: Traffic Psychology and Behaviour, 54*, 28–46.

Nanda, A., Xu, Y., & Zhang, F. (2021). How would the COVID-19 pandemic reshape retail real estate and high streets through acceleration of E-commerce and digitalization? *Journal of Urban Management, 10*(2), 110–124.

Parker, C., Millington, S., & Sonderland, R. (2021). Saving the high street: What to do with empty department stores and shopping centres. In *The conversation*.

Rezaei, A., & Patterson, Z. (2018). Preference stability in household location choice: Using cross-sectional data from three censuses. *Research in Transportation Economics, 67*, 44–53.

Rodrigue, J. P. (2020). *The geography of transport systems*. Routledge.

Semple, T., Fountas, G., & Fonzone, A. (2021). Trips for outdoor exercise at different stages of the COVID-19 pandemic in Scotland. *Journal of Transport & Health, 23*, Article 101280.

Semple, T., Fountas, G., & Fonzone, A. (2023). Who is more likely (not) to make home-based work trips during the COVID-19 pandemic? The case of Scotland. *Transportation Research Record, 2677*(4), 904–916.

Triandis, H. C. (1977). *Interpersonal behaviour*. Monterey, CA: Brooks/Cole Pub. Co.

Van Acker, V., Ho, L., & Mulley, C. (2024). "Home sweet home". How staying more at home impacted residential satisfaction and residential attachment during the COVID-19 pandemic in Sydney, Australia. *Travel Behaviour and Society, 34*, Article 100671.

Van Acker, V., & Witlox, F. (2009). Why land use patterns affect travel behaviour (or not). Toward a "state-of-the-art" conceptual framework and an appropriate modelling technique. *Belgeo. Revue belge de géographie, 1*, 5–26.

Vickerman, R. (2021). Will Covid-19 put the public back in public transport? A UK perspective. *Transport Policy, 103*, 95–102.