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Older adults' experiences with app-based ride-hailing in Indonesia: At the intersection of health, gender, digital literacy, and affordability

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A R T I C L E I N F O

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A B S T R A C T

Introduction: App-based ride-hailing services—from car-based to motorbike-based—have significantly transformed urban mobility in Southeast Asia over the past decade. These services offer flexible, door-to-door transport essential for urban residents, particularly those who might experience reduced mobility, such as older adults.

Methods: This qualitative study examines older adults' experiences with app-based ride-hailing services, focusing on their experiences and perceptions of accessibility. The analysis is based on 28 semi-structured in-depth interviews with older adults (aged 60+) in Yogyakarta, Indonesia.

Results: The findings reveal that age-related physical challenges and declining health often motivate older adults to use ride-hailing services, especially for accessing healthcare facilities. Older women, in particular, face greater challenges in accessing private vehicles, and their mobility needs are often neglected within the household. Digital literacy strongly shapes older adults' perceived accessibility, influencing both their ability and confidence to use ride-hailing apps. Affordability also appears as a key concern, with frequent use of ride-hailing posing financial challenges for those on fixed or limited income.

Conclusions: Beyond examining perceived accessibility to ride-hailing services, this study provides a nuanced understanding of how these services are used. It highlights the dynamic intersections between gender, digital literacy, affordability, and health issues that affect older adults' engagement with using these services. These insights enhance our understanding of their mobility needs and inform the broader discourse on inclusive mobility.

1. Introduction

At 75, Cahyaning moves through her days with quiet resilience in the heart of a busy city. Once, when she was younger, she could weave effortlessly through the crowded streets on her motorbike to go wherever she needed. But an injury to her left hand changed her everyday life. Unable to ride anymore, her once-familiar routine slipped out of reach. She has no children to rely on and is living off a modest pension. In a neighborhood where public transport often fails to meet her needs, app-based ride-hailing services have become her lifeline, helping her to maintain her daily activities and participate in social life.

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Cahyaning's story exemplifies a larger picture of how aging affects mobility among older adults in Yogyakarta, Indonesia. Supporting mobility in later life is essential, as it facilitates social participation and plays a key role in preventing social exclusion (Lucas, 2012; Nordbakke and Schwanen, 2014). Webber et al. (2010) identify several dimensions shaping mobility in later life, including gender, cultural and biographical background, cognitive and physical abilities, environmental and psychosocial factors, and financial capacity. Among these, poor or declining health can act as a major limitation to older adults' mobility. For instance, common health-related issues, vision, and hearing impairments compel many older adults to cease driving (Hansen et al., 2020; Hauser et al., 2022; Kamal et al., 2022; Zhou et al., 2022).

These health challenges increase safety risks in the context of motorcycle use. In Southeast Asia (SEA), motorized two- and three-wheelers account for 46 % of all traffic-related fatalities (330,222), representing 28 % of the global burden (WHO, 2023). Older adults also face considerable risks as pedestrians, as they are particularly vulnerable to traffic accidents (Macioszek et al., 2023). While public transport may serve as an alternative to private vehicles, many older adults perceive it as unsafe due to concerns such as crime, overcrowding, and difficulty boarding, making it a less viable option for their mobility needs (Adler and Rottunda, 2006; Jahangir et al., 2022).

In Southeast Asian countries such as Vietnam, Indonesia, and the Philippines, limited public transportation has led to widespread reliance on flexible transport modes such as motorcycle taxis, auto-rickshaws, passenger vans, and other forms of local paratransit (Chalermpong et al., 2023). In recent years, many of these flexible transport options have transitioned into app-based ride-hailing services, transforming urban mobility by offering convenience through door-to-door mobility, no parking costs, short wait times, easy payments, and transparent fares (Rayle et al., 2016; Tirachini, 2020). Sikder (2019) found that the adoption and frequency of ride-hailing use suggest that ride-hailing may complement rather than replace public transportation. However, other studies argue that the nature of ride-hailing also has a substitution effect on public transport that is stronger than its complementarity effect in several cities (Tirachini, 2020).

Recently, several studies have explored the impact of ride-hailing services in urban settings from multiple perspectives (Chalermpong et al., 2023; Sikder, 2019). Research on the impact of these services on older adults has been conducted primarily in developed countries. For example, in the United States, Misra et al. (2022) and Shirgaokar et al. (2021) found that ride-hailing use among older adults varies widely based on technological familiarity, age, gender, and income, highlighting the influence of both digital and sociodemographic factors. Research on ride-hailing in Southeast Asia has predominantly focused on younger demographics (Irawan et al., 2022a; Nguyen-Phuoc et al., 2019). To the best of our knowledge, research on ride-hailing usage among older adults in Southeast Asia is limited, with a notable study from Yogyakarta, Indonesia, being one of the few. Irawan et al. (2022b) highlighted technology response as a significant barrier for older adults in accessing ride-hailing services, noting that health issues often lead these individuals to discontinue use.

Additionally, across Southeast Asia, including Indonesia, ride-hailing includes not only cars but also motorbikes, which are not commonly used for ride-hailing in developed countries (Belgiawan et al., 2022; Chalermpong et al., 2023; Rizki et al., 2021). Motorcycle-based ride-hailing services are favored in developing countries due to their affordability compared to car-based services, as well as their ability to offer faster speeds, more route flexibility, and more precise arrival times than public transport systems (Rizki et al., 2021; Irawan, 2023).

Despite the growing use of ride-hailing services, research on how older adults engage with these platforms in Southeast Asia thus remains limited. This article contributes to advancing these discussions by studying how ride-hailing services influence accessibility and mobility opportunities in later life. Based on a qualitative study in Yogyakarta, Indonesia, this article addresses the following questions: (a) How do older adults perceive the accessibility of ride-hailing services? and (b) What barriers and opportunities influence their use of these services?

2. Literature review

Extensive research highlights the strong connection between mobility and well-being, emphasizing the role of mobility in supporting health, social connections, and self-identity (Banister and Bowling, 2004; Spinney et al., 2009). Mobility fosters independence

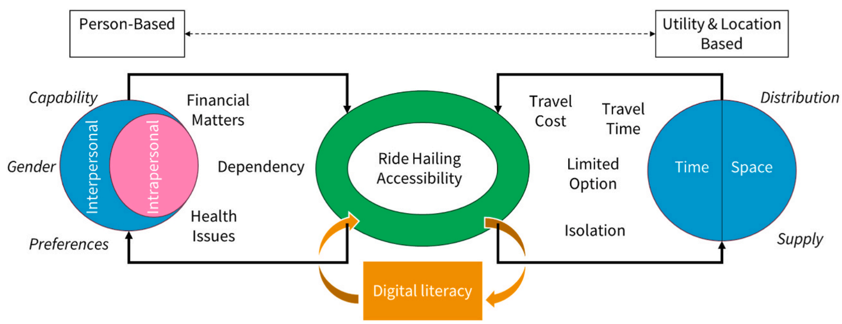

Fig. 1. Conceptual Framework of Accessibility in Ride-Hailing (Adapted from Geurs and Van Wee (2004); Pot et al. (2021); Tiznado-Aitken et al. (2021) and combined with the authors' interpretation of findings).

and social engagement, while restricted mobility negatively impacts mental health and quality of life, namely in older age (Banister and Bowling, 2004; Ziegler and Schwanen, 2011). With their flexible, on-demand nature, app-based ride-hailing services offer a promising solution to enhance mobility for older adults (Misra et al., 2022; Shirgaokar et al., 2021).

Understanding how older adults engage with ride-hailing services requires a multidimensional approach to accessibility. In this study, we adapt the accessibility framework (see Fig. 1) proposed by Geurs and van Wee (2004), which defines accessibility through four dimensions: location-based, individual-based, utility-based, and infrastructure-based. Location-based accessibility evaluates access to spatially distributed resources with travel time and explains variations in commuting, employment, and urban density (Geurs and Van Wee, 2004; Levinson and Wu, 2020).

Person-based accessibility encompasses spatial and temporal factors and individual attitudes are shaped by interpersonal and intrapersonal influences. Interpersonal factors, such as social roles and social expectations, shape preferences for transport options (de Bruijn et al., 2005; Heinen et al., 2011). For example, Loukaitou-Sideris (2016) found that women encounter specific cultural, economic, physical, and psychological barriers that significantly affect their travel patterns. Similarly, household roles and responsibilities influence access to shared vehicles, with priority often given to those with more frequent or time-sensitive mobility needs (Sikder, 2019). Intrapersonal factors such as health, personal preferences, and risk tolerance influence travel behavior and transport mode choices. Door-to-door and hands-on assistance provided by ride-hailing services has been shown to effectively support the mobility needs of older adults, particularly those experiencing health challenges (Bayne et al., 2021). Perceptions of accessibility extend beyond spatial and economic dimensions to include personal and social factors (Lättman et al., 2020; Scheepers et al., 2016).

In this paper, we take digital literacy as a form of "infrastructure" following the accessibility framework by Geurs and Van Wee (2004). Limited digital literacy can restrict older adults' access to ride-hailing options, exacerbating social exclusion (Durand et al., 2022). Studies show that older adults remain underrepresented among ride-hailing users (Vivoda et al., 2018), with these services generally appealing more to younger, educated, and urban populations (Alemi et al., 2018; Mitra et al., 2019). At the same time, the number of older adults using ride-hailing services is increasing and, as Inan et al. (2022) emphasize, there is a need to address factors such as technology anxiety to enhance economic benefits and inclusivity.

However, technological comfort is often context-dependent. For example, in a demonstration project, older women were more open to using Uber as a substitute for public transit, while older men showed higher familiarity and comfort with e-hailing services, often demonstrating greater technical knowledge (Leistner and Steiner, 2017). For older adults, confidence and enjoyment in using technology are pivotal for sustained internet use and engagement with digital services (Hsieh et al., 2011). Therefore, discomfort and inexperience can create significant barriers to exploring new options (Kim et al., 2016; Pangbourne, 2018), including ride-hailing services.

This study builds on existing accessibility frameworks by adding a digital dimension to the original person-based, utility-based, and location-based perspectives, deepening the understanding of older adults' access to ride-hailing services. Our approach highlights the importance of interpersonal, intrapersonal, and context-dependent factors and critical intersections between health, gender, digital literacy, and affordability. This approach advances the state of the art and offers insights into how older adults perceive accessibility and experience the use of ride-hailing services.

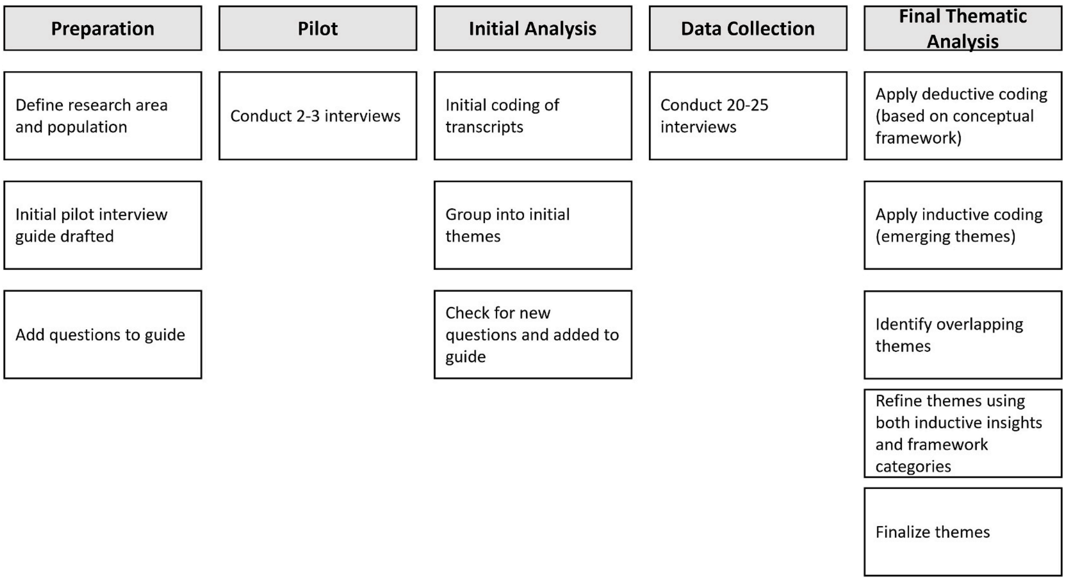

Fig. 2. Step-by-step study design.

3. Methods

3.1. Study design

Semi-structured in-depth interviews with older adults (aged 60 years and older) were conducted between June and July 2023 to explore older adults' daily activities and mobility, including the use of ride-hailing services, in Yogyakarta, Indonesia. The study employed a qualitative research design and followed five phases (Fig. 2). During the preparation phase, the study area and target population were defined, and a draft of the interview guide was developed. In the pilot phase, 3 interviews were conducted to refine the guide. These guides were translated from English to Bahasa and piloted beforehand to ensure clarity, flow, and comprehensibility.

The interview guide consisted of 20 open-ended questions. We developed the questions through an iterative process that began with a literature review and theoretical framework to identify relevant themes. An initial list of questions was compiled and then tested in a pilot interview to assess clarity and to explore the emergence of any additional themes. We refined the questions based on the pilot interview to ensure they aligned with the study objectives and captured a comprehensive range of relevant topics. The questions covered daily routines, transport mode choices, mobility barriers, use of ride-hailing services, perceptions of safety and affordability, family and community support, and aspects of urban mobility that required improvement. The full interview guide is provided in the Supplementary Material. Following data collection, interviews were transcribed, and transcripts were coded and grouped into themes combining deductive and inductive approaches. Final themes were refined by integrating framework-based categories with insights gathered from the data. Ethical approval for the study was obtained from the Ethics Committee at Utrecht University (ERB Review Geo S-23069).

3.2. Settings

Yogyakarta is one of the provinces in Indonesia undergoing significant demographic shifts due to a growing aging population. Compared to other provinces in Indonesia, Yogyakarta has the highest proportion of older adults in Indonesia, with approximately 16.8 % of its population aged 60 and above (Indonesia CSA, 2023; Yogyakarta CSA, 2024). The percentage of older adults in Indonesia increased by at least 4 % over the past decade (2010–2022), rising to 11.75 %. Life expectancy improved from 69.81 years in 2010 to 71.85 years in 2022. By 2023, all provinces in Indonesia had more than 6 % of their population aged 60 and above, with 18 provinces surpassing the 10 % threshold (Indonesia CSA, 2023).

The study was carried out in the Yogyakarta conurbation (see Fig. 3), including (1) Yogyakarta city, an urban area with high density, many intercity transit hubs, and an accessible public transport service; (2) the Sleman suburban area, a rapidly developing suburban area with a few intercity transit hubs; and (3) the Bantul suburban area, a suburban area without intercity transit hubs and

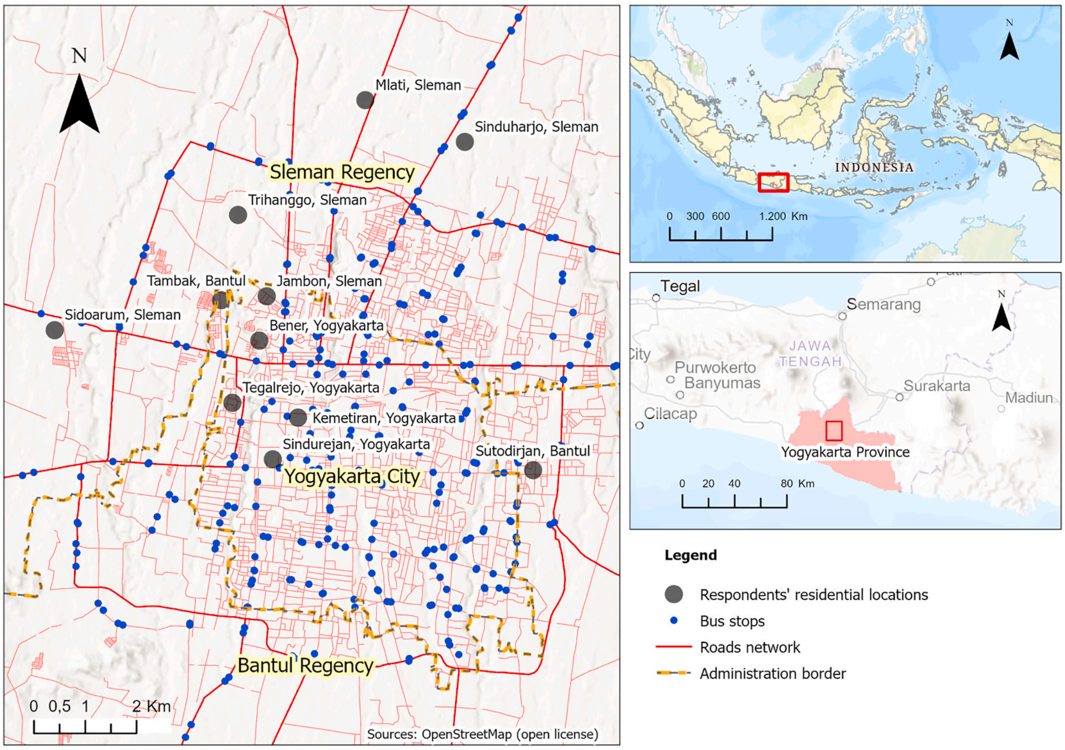

Fig. 3. Map of Yogyakarta indicating the study sites, bus stops, and roads (Source: Author's elaboration based on Open Street Maps, 2024).

poor public transport coverage (Yogyakarta CSA, 2024). Yogyakarta was chosen as the study site because it has the highest proportion of older adults in Indonesia and relatively poor coverage of public transport, especially in peri-urban areas. These characteristics create a context that motivates older adults to use app-based ride-hailing services.

3.3. Participant recruitment

Fieldwork was conducted in the urban area of Yogyakarta, using semi-structured in-depth interviews to capture the participants' perspectives. We focused on individuals aged 60 and above, following Indonesia's Old Age Welfare Law of 1998 (Law No. 13/1998), which defines older adults as those aged 60 and over. While the recent UN definition (2023) categorizes older adults as 65 and over, many studies from developing countries continue to use the earlier definition of 60 and above (UN, 2017). Therefore, we included participants aged 60 and above in this study. Initial recruitment drew on the first author's networks and was supplemented by snowball sampling. Sampling was carried out in a way that ensured the inclusion of various socioeconomic backgrounds and individual characteristics (e.g., gender). Each participant received a full explanation of the study, had the opportunity to ask questions, and provided both verbal and written consent before the commencement of data collection. The researchers redacted all identifying information and used pseudonyms to protect the identity of the participants.

3.4. Data collection

Twenty-eight semi-structured in-depth interviews (17 women and 11 men) were conducted in Bahasa Indonesian and Javanese, lasting 30–70 min (see Table 1). Data saturation was monitored throughout the process. Initial saturation was reached after 20 interviews. An additional 8 interviews were conducted to confirm the consistency of recurring themes, during which no new insights appeared. This approach aligns with established qualitative research practices, where saturation typically guides sample adequacy with 16–24 interviews (Hennink et al., 2020).

3.5. Data analysis

Grounded theory principles guided the inductive-deductive code and theme development using NVivo 12 software. The initial cycle involved open coding for deductive and inductive codes and axial coding to establish connections. Key interrelated themes, including person-based factors (e.g., gender, financial, health issues), aspects of digital literacy (e.g., adaptation, capability), and spatiality and utility, are discussed in the results section. Interviews were transcribed and translated into English and analyzed by the first author with input from the co-authors. A two-stage coding cycle was employed. Initially, deductive codes, based on the conceptual framework and covering key accessibility concepts (person-based, utility-based, location-based, and digital literacy), were developed. In the

Table 1
List of interviewees.

ID	Pseudonym	Age	Gender	Household Composition
1	Bakti	64	Male	Married, living with spouse and daughter
2	Ambar	65	Female	Married, living with a spouse
3	Arum	66	Female	Married, living with a spouse, younger children, extended family, and household staff.
4	Cahyaning	75	Female	Widowed, living alone
5	Bramantya	72	Male	Married, living with a spouse
6	Dyah	72	Female	Widowed, living with brother, son and granddaughter
7	Cakra	76	Male	Married, living with a spouse, and owning a boarding house with tenants
8	Dewi	71	Female	Married, living with a spouse
9	Dimas	68	Male	Married, living with spouse and grandchildren
10	Guntur	80	Male	Widowed, living alone
11	Gantari	60	Female	Married, living with a spouse and the youngest child
12	Hapsari	60	Female	Divorced, living with child and niece
13	Kartika	68	Female	Married, living with spouse and children
14	Indra	72	Male	Married, living with spouse and children
15	Ratih	70	Female	Single, living with sister
16	Utami	61	Female	Single, living alone
17	Ajeng	65	Female	Married, living with a spouse and a child
18	Ayuningtyas	68	Female	Married, living with a spouse
19	Indah	61	Female	Married, living with a spouse
20	Maulana	63	Male	Married, living with spouse and children
21	Mulyadi	63	Male	Married, living with spouse and children
22	Pambudi	60	Male	Married, living with spouse and children
23	Raditya	60	Male	Married, living with spouse and children
24	Rahardian	65	Male	Widowed, living with children
25	Lastri	72	Female	Widowed, living with grandchildren
26	Maharani	69	Female	Single, living with sister and niece
27	Maheswari	65	Female	Married, living with spouse and children
28	Nirmala	65	Female	Widowed, living alone, with children residing next door

second cycle, inductive codes emerged from the data (Hennink et al., 2020), capturing aspects such as health issues, gender, financial means, and digital barriers. Similar codes were then grouped into broader themes and code families. A subset of the codes used in formulating this paper is provided in Table 2.

4. Results

The following sections explore how older adults use ride-hailing services to support daily mobility, highlighting their role as a substitute or complement to previously employed transportation modes. The discussion examines opportunities and challenges, focusing on four interrelated themes – health-related limitations, gender norms, digital literacy, and affordability concerns – illustrating how older adults adapt to and engage with these services to meet their mobility needs.

4.1. Health

Health concerns are key in shaping mobility preferences among older adults. Participants noted that ride-hailing has become their preferred mobility option in later life due to its personalized and accessible features, which make it more suitable than public transport or private vehicles. Ride-hailing is particularly advantageous for individuals who lack access to private vehicles or those who have given up driving due to health issues such as vision impairments, poor reflexes, or post-fall limitations. Additionally, app-based ride-hailing bridges spatial gaps often neglected by public transportation by offering door-to-door connectivity—an essential feature for many older adults, which is often missing from traditional transport options.

For example, Bramantya, a 72-year-old retiree living with his wife on the urban periphery, initially chose Yogyakarta for its reputation as a popular retirement destination. Although he managed to live outside the city center when he could still drive, worsening health issues eventually affected his reflexes, forcing him to give up driving. As he adapts to the challenges of his declining health, he relies solely on app-based ride-hailing services.

> *Due to my age and sometimes having an unstable body condition, I'm no longer able to drive my car. For instance, when we need to go to the hospital, such as yesterday, I have regular check-ups because of my diabetes. The hospital is quite far, so my wife takes me there using Grab [app-based ride-hailing service]. Once we arrived, she helped me navigate to the doctor's office, often using the elevator. I always rely on my cane for support. (Bramantya, 72, Male)*

Besides the challenges of poor reflexes, for some older adults, previous traumatic experiences due to road incidents or road aggression significantly influenced and limited their mobility. Such traumatic experiences often led to anxiety or aversion to certain forms of transportation. Dewi (71), for example, was previously still active in riding a motorbike. However, the following incident left her anxious and hesitant to ride a motorbike again.

> *I don't dare to ride a motorbike anymore. … when I wanted to turn left, I slowed down, but it turned back and accelerated. Then it crashed, …, the fence, such a dangerous place, after that I decided I didn't have to ride a motorbike. …. We only have one car, so we have to split up when there are multiple events. He'll be at one event, and I'll be at another. Like next week, there are three events—someone's getting married, and my brother is hosting a party. If we both have to go somewhere, I'll use Grab, and he'll take the car. (Dewi, 71, Female)*

Consequently, she now relies more on her husband for transportation, especially since it is only the two of them since their retirement. On days when her husband cannot accompany her due to conflicting schedules, Dewi turns to ride-hailing services such as Grab for her mobility needs.

In contrast to Dewi, who stopped riding motorcycles after an incident, Cahyaning (75) adapted by transitioning to the more manageable option of an electric bike in addition to ride-hailing services. Following an incident that weakened her left hand and made handling her motorbike difficult—requiring both hands for braking and gear shifting—Cahyaning's mobility and daily routines underwent significant changes. Essential activities such as grocery shopping, collecting her pension, visiting the health center, and attending mass now depend on her ability to use these alternative modes of transport.

Table 2
List of codes.

Codes	Code family	Accessibility Determinant
Health challenges	Health	Person-Based
Post-fall trauma		
Women with limited skills in operating private vehicle	Gender	Person-Based
Limited access to private vehicles in the household		
Lack of digital literacy	Digital Literacy	Digital Literacy
Navigational challenges		Digital Literacy (Intersects with Interpersonal)
Dependency on assistance		Digital Literacy (Intersects with Interpersonal)
The financial burden of frequent use	Affordability	Person-based
Price surge issues		Utility-based (Intersects with Financial Capability and Preferences)
Service congestion during peak periods		Location-based, Person-based (Intrapersonal), Utility-based

I used to ride a motorbike, but the doctor advised me to stop after my fall, which affected my left hand. Now, the electric bike is light enough for me to manage. Without it, I would have to walk everywhere or rely on ride-hailing, which is more difficult and expensive. (Cahyaning, 75, Female).

This shift highlights how health challenges, such as physical impairments caused by fall incidents, significantly influence older adults' mobility decisions. By adapting to these limitations, older adults like Cahyaning find alternatives that balance their mobility needs with affordability and convenience, enabling them to maintain independence and access essential services despite health-related constraints.

4.2. Gender

Besides health, gender norms also appeared significant in how individuals navigate transportation options, including ride-sharing services. These dynamics are deeply embedded in the social and cultural meaning systems of Indonesia, where patriarchal structures are dominant. Men are typically prioritized as the primary drivers and decision-makers, limiting women's access to private vehicles and opportunities to develop riding or driving skills. Due to lower bargaining power and lower income, women are less likely to own a vehicle. Over time, this entrenched pattern places older women in secondary or even tertiary positions—after men and children—in accessing personal vehicles and other household resources. From a person-based lens, these gendered dynamics directly impact women's mobility preferences and opportunities, creating significant challenges for maintaining independence and accessing transportation options.

Take, for example, Ambar (65), a lifelong housewife who has always relied on her family, particularly her husband, for transportation. Having never learned to drive has significantly limited her options for mobility. For many women such as Ambar, the inability to drive or ride often forces them to depend on non-driving modes such as public transport, being co-passengers, or, more recently, app-based ride-hailing services. This reliance underscores how gender norms and the lack of development of driving skills, viewed from a person-based perspective, shape mobility preferences and constraints for older women.

Since my husband can no longer drive and I can't operate our vehicle, the Grab app has become our sole means of getting around. It's now the only option I have for mobility … When it comes to taking him to church or the hospital, and for my visits to church, I rely on Grab. (Ambar, 65, Female)

Over time, her husband's declining health has made him unable to drive, further complicating their mobility. While Ambar can still walk short distances, longer journeys are challenging, leaving app-based ride-hailing services as their only option. Significantly, Ambar's experience highlights the complexities older women face in managing mobility when their spouse's abilities decline. Ambar now relies heavily on app-based ride-hailing for essential trips, such as hospital visits and church, illustrating how gender norms and family dynamics can compound the challenges of aging to further restrict women's mobility options.

Like Ambar, Maheswari, 65, also faces mobility limitations due to a lack of access to personal transportation. In her household, the family motorbike is primarily reserved for her husband or daughter, leaving her with few options for independent travel. For a long time, she has relied on public transport, a necessity since her youth when she began working as a shop assistant at a construction materials store a few miles from her residence. Recently, however, access to app-based ride-hailing and a regular Ojek (motorbike taxi) driver has expanded her mobility choices.

I can't ride a motorbike. I don't even dare to ride a bicycle anymore. I used to ride both a bicycle and a motorbike, but I stopped cycling long ago. There are bicycles in our household, but I never use them. (Maheswari, 65, Female)

Maheswari's story reflects a similar situation to Ambar's, where household dynamics restrict access to transportation, often leaving older women reliant on alternative modes of travel. Unlike Ambar, Maheswari was once a confident bicycle and motorbike rider in her younger years; however, she now feels uncomfortable using these modes of transportation due to health concerns and the growing challenges of navigating the dense urban traffic.

These dynamics push many women toward alternative modes of transportation, underscoring the importance of accessible and reliable transport for individuals with limited driving or riding skills. Without such access, mobility options become restricted, especially in areas where alternatives are scarce. Vehicle ownership within a family significantly influences mobility options, with household dynamics—such as who has access to the vehicle—shaping daily routines. In households with one vehicle, priority often goes to the person, often men, who use it to access work.

4.3. Digital literacy

Digital skills are key to making reservations, managing trip changes, and navigating maps on app-based ride-hailing services. From an accessibility perspective, digital access poses a significant barrier for older adults using these services. When older adults do not have a smartphone, have visibility issues, or are unable to make online reservations and payments, they are heavily reliant on family members or acquaintances. Moreover, internet connectivity issues also act as a deterrent to the use of ride-hailing services. Many older adults discussed how the complexities of app interfaces and managing digital payments can be particularly overwhelming, limiting their access to these essential services.

So, (if my wife can't accompany me), my wife will use the Grab app to order a ride for me. Then, the cab arrives and takes me to the hospital. At the hospital, I have to use a cane to walk to the doctor's office myself. (Bramantya, 72, Male)

Bramantya's experience (Fig. 4) illustrates the intersection of physical limitations and a lack of digital literacy, underscoring the compound challenges older adults face in accessing app-based ride-hailing. Health issues have forced him to stop driving, making ride-hailing a necessary substitute. However, his limited digital literacy complicates this transition, leaving him reliant on his wife, who is also aging, to handle their mobility needs. She manages all aspects of their transportation, from booking rides with services such as Grab to coordinating logistics for hospital visits. This scenario highlights a dual dependency—on technology, which his wife navigates on his behalf, and on family support, which has become essential to his daily life.

The complexity of this reliance becomes even more pronounced when his wife is unavailable to assist him. Bramantya must rely on others, such as hospital security officers, to arrange transportation. Alternatively, he contacts his wife, who then books the ride remotely and sends him the driver's details. This approach, though necessary, turns a process design from straightforward into a complicated and time-consuming task. His experience highlights the additional layers of difficulty that older adults face when they must navigate digital services without direct access or fluency, making their reliance on external support central to their mobility and independence.

Digital barriers force older adults to adapt their mobility and compromise on activities they can participate. Maheswari, for example, uses the term 'lazy' to describe her inability to keep pace with technology and the digital demands of ride-hailing apps. Her experience highlights the complex nature of access to digital services and its non-recognition of the diverse needs of older adults with low (digital) literacy.

> *But I can't help myself; I'm too lazy to learn about it, …it's on my cellphone, but I haven't taken the time to figure it out. Honestly, it's not difficult, but I'm too lazy never to go anywhere. If I do go out, it's usually with my kids, and I don't feel comfortable going alone. (Maheswari, 65, Female)*

In addition to digital barriers, successfully using app-based ride-hailing services requires strong location awareness. Understanding maps and geography is essential; otherwise, making mistakes, such as ordering a ride to the wrong address, is easy.

> *I once ordered a Grab, but I unintentionally sent it to the hospital. I must have pressed the wrong button. When I tried to fix it, I couldn't, so I ended up having to walk about 1,5 km. (Cakra, 76, male)*

Cakra's experience illustrates this challenge: he mistakenly ordered a ride to an incorrect location and then struggled to correct the mistake. This highlights that a key issue with low digital literacy is the complexity of the user interface and the overall experience. For those not proficient in digital navigation, a simple mistake can lead to significant consequences, such as being unable to secure transportation or, as in Cakra's case, having to walk a considerable distance to reach the correct destination.

4.4. Affordability

Affordability also plays a critical role in shaping older adults' reliance on ride-hailing services. While health issues and household gender dynamics might lead to more frequent use of ride-hailing apps, cost remains an important concern. Ambar, for example, allocates a portion of her husband's pension to cover Grab rides. She lives with her husband, who has recently stopped driving, forcing

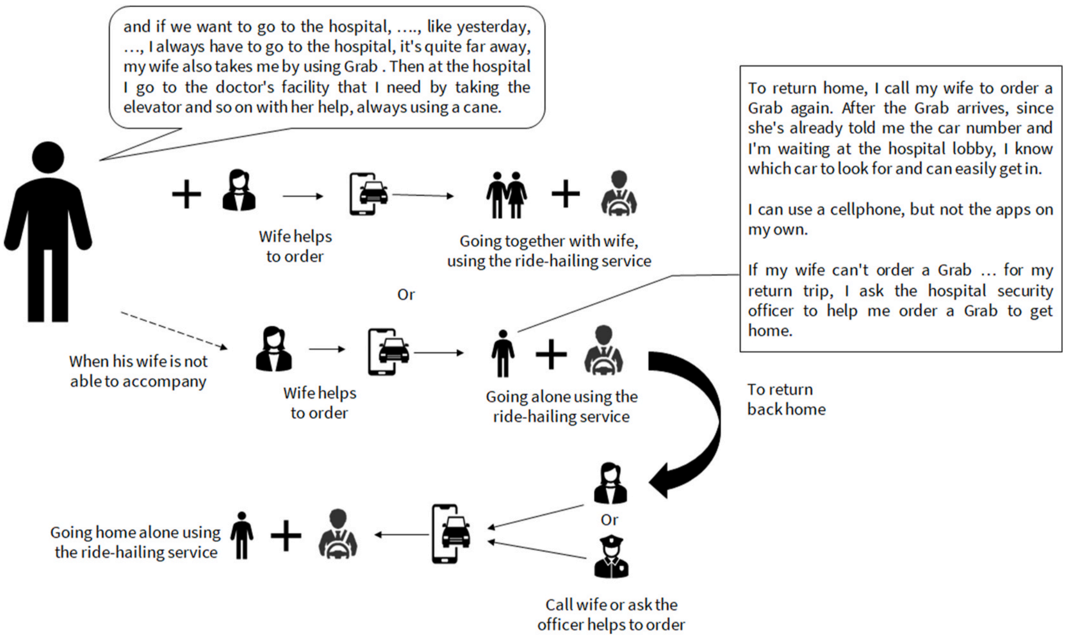

Fig. 4. Steps taken by an older adult with low digital literacy on app-based ride-hailing platforms. Source: Author's illustration.

them to rely on app-based ride-hailing services. Although neighborly help is sometimes offered, Ambar feels it is inappropriate to depend on the generosity of others frequently. Compared to two-wheeler taxis, car taxis are more expensive to afford these trips, and older adults ration for and forego other needs, highlighting the sacrifices necessary to maintain essential mobility.

I don't see any significant issues, except that Grab can be expensive. However, with no other transportation options available, I have to set aside part of my husband's pension for it. We must budget it separately because it's essential for our transportation needs. (Ambar, 65, Female)

Cahyaning similarly experiences the strain of relying on app-based ride-hailing services. As mentioned, living alone intensifies her reliance on herself for all mobility needs. Her daily routine, centered around attending church, incurs high costs due to the daily use of services such as Gojek. This reliance places a significant financial strain on her limited income, challenging essential mobility.

And if I have to use Gojek, it costs me a lot. Because I'm only a pensioner, I need to use 13,000 Rupiah (less than 1 USD) daily to get to church. So, I need to spend 26,000 Rupiah in total. (Cahyaning, 75, Female)

Cahyaning's situation illustrates how older adults often face trade-offs between maintaining their independence and managing financial constraints. For Cahyaning, attending church is a critical part of her social life, making it a non-negotiable expense. However, the cumulative cost of these trips leaves little room in her budget for other needs.

Moreover, the model of app-based ride-hailing services can pose additional challenges, particularly due to high competition, which impacts both affordability and availability. In Yogyakarta, for example, the influx of tourists during peak periods often increases demand, leading to dynamic pricing and reduced service availability. Bramantya, who resides in the urban periphery, often finds that rides become scarce and costly during peak times. App-based ride-hailing vehicles tend to concentrate around tourist hotspots during busy periods, leaving peripheral areas underserved. As a result, older adults in these areas frequently find themselves competing for limited rides or are forced to postpone their plans when prices surge or services become inaccessible. This can add to the frustration of relying on these services.

[Also] we find it difficult on that day [weekend or holiday], … because many local tourists also come to Yogya, so such tourists also order a lot of Grab. If that happens, we will have to order it far in advance; we will look for a vehicle we can contact. But if not, then on that day we don't go out. [Also] as lots of people are using it, the price is relatively high. … Since I'm retired and on a limited budget, we must postpone our plans when costs surge (Bramantya, 72, Male)

These disparities in ride-hailing availability and affordability, particularly between urban centers and peripheral areas, highlight significant location-based inequities. This geographical imbalance limits the ability to make spontaneous trips, reinforcing the need for more equitable service distribution to address the mobility needs of older adults in more peripheral locations.

5. Discussion

This paper provides a multi-perspective account of older adults' mobility, building on studies that link mobility with well-being (Banister and Bowling, 2004; Spinney et al., 2009; Ziegler and Schwanen, 2011). While accessibility is widely recognized as a core concept in transportation planning (Geurs and Van Wee, 2004; Kwan, 1998; Pereira et al., 2017; Pot et al., 2021; Tiznado-Aitken et al., 2021), most research focuses on public transportation. Here, we shift the focus to ride-hailing services to examine the specific needs of older adults for door-to-door mobility. Our study expands on existing frameworks by measuring accessibility at the individual level (e.g., personal capability), location-based level (e.g., ride-hailing availability), and utility-based measures (e.g., frequency of use) while also integrating digital literacy as a critical factor.

Our results indicate that app-based ride-hailing services provide valuable mobility alternatives for older adults, particularly those facing health challenges such as vision impairments, reduced reflexes, or post-fall trauma that limits their ability to drive or use public transportation. For some, these services have become a primary mode of mobility and a crucial alternative to driving and public transit. Participants valued ride-sharing for its personalized and accessible features, such as the ability to request vehicles at precise locations, select specific pick-up and drop-off points, and adjust schedules. Health conditions were frequently cited as the primary reason for relying on these services. This aligns with findings from Bayne et al. (2021) which highlighted how door-to-door and hands-on assistance in ride-sharing services effectively meet the mobility needs of older adults.

Importantly, we found that accessibility is also influenced by gender norms. Women, in particular, tend to have less access to household vehicles and may lack the skills to ride or drive, making app-based ride-hailing a crucial option. This supports Loukaitou-Sideris (2016) findings showing that women face specific cultural, economic, physical, and psychological barriers that significantly impact their travel patterns. In this context, ride-hailing services allow older women to maintain their independence and mobility by providing an accessible and flexible transportation option.

Despite the appeal and utility of app-based ride-hailing, substantial barriers remain, particularly regarding digital accessibility, which complicates use among older adults. Our findings align with those of Durand et al. (2022) emphasizing that limited digital literacy restricts older adults' access to ride-hailing options, exacerbating social exclusion. Many older adults in our study struggled with smartphone apps, often relying on family members to book rides. This dependence can lead to frustration, extended isolation at home, and added pressure on family members assisting with bookings. In contrast, those comfortable with technology are more likely to navigate apps independently and use ride-hailing services regularly. This aligns with findings from Leistner and Steiner (2017) and Vivoda et al. (2018), which showed that older adults with higher technical knowledge demonstrated greater familiarity and comfort with e-hailing services.

Our findings reveal that limited confidence in digital literacy significantly hinders the adoption of ride-hailing apps among older adults. This aligns with Kim et al. (2016) and Pangbourne (2018), who highlight that discomfort with technology creates significant barriers to adopting new mobility options. Similarly, Inan et al. (2022) identify digital anxiety as a critical factor limiting mobility for older adults. Confidence and ease in using technology are essential for sustained engagement with digital services, including internet use and ride-hailing (Hsieh et al., 2011).

Financial constraints also present a significant challenge, especially when app-based ride-hailing services are used frequently, underscoring issues of affordability and transport disadvantage among older adults. Participants in our study shared varied perspectives on ride-share affordability compared to self-driving, taxis, and public transport. Many reported using app-based ride-hailing services sparingly due to high costs, reserving them for essential trips such as medical appointments (Bayne et al., 2021).

The combination of these challenges can lead to the exclusion of older adults from essential mobility services. With limited resources, older adults often choose to prioritize spending on health-related trips and forego social gatherings; the latter, in the long term, contribute to social exclusion and loneliness. This supports previous research, emphasizing that ensuring access to a range of activities, as outlined in the basic accessibility principle, is vital for achieving social inclusion and participation in daily life (Lucas, 2012; Nordbakke and Schwanen, 2014).

6. Conclusions and further directions

This study has examined, through fine-grained qualitative analysis, the cumulative challenges faced by older adults in the use of app-based ride-hailing services in Indonesia. While some findings are consistent with previous studies, our study adds new insights by examining, in a combined way, how health-related limitations, alongside gender, digital literacy, and affordability, shape older adults' access to and use of ride-hailing services. Our study demonstrates how gender inequality acts as a pronounced issue with significant mobility impacts, especially for older women. This is an especially pressing issue in developing contexts, such as Indonesia, where gender disparities remain a significant factor in constraining everyday mobilities. In addition, health-related limitations compounded with reduced digital literacy skills amplify dependency on others (e.g., spouse, children, hospital officers), thus limiting one's mobility. Together, this shows that accessibility is influenced by a combination of both intrapersonal and interpersonal factors, and more studies should include combined approaches to these.

Nonetheless, there are several limitations to note and corresponding recommendations for future research. First, safety concerns were rarely mentioned by participants in Yogyakarta. However, this may not reflect the experiences of older adults, particularly women, in other regions. Future studies should investigate safety issues with specific attention to gender dynamics and variations across geographic and social contexts. Second, further research should explore how ride-hailing services facilitate access to other dimensions of mobility beyond healthcare access, including participation in social and religious activities, which are also important for the well-being of older adults.

Moreover, this study found that digital literacy remains a major constraint to accessing app-based ride-hailing services among older adults. Future efforts should consider the role of emerging technologies and the integration of ride-hailing services into broader mobility systems. This includes support services such as healthcare escorts and access to social participation. To address these challenges, it is important to involve multiple stakeholders in future initiatives and research. Policymakers, service providers, community organizations and older adults themselves can contribute to developing feasible and more inclusive mobility solutions.

CRediT authorship contribution statement

Octaviani Ariyanti: Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Dora Sampaio:** Writing – review & editing, Writing – original draft, Supervision, Methodology. **Ajay Bailey:** Writing – review & editing, Supervision, Methodology.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jth.2025.102134.

Data availability

Data will be made available on request.

References

Adler, G., Rottunda, S., 2006. Older adults' perspectives on driving cessation. J. Aging Stud. 20 (3), 227–235. https://doi.org/10.1016/j.jaging.2005.09.003.

Alemi, F., Circella, G., Handy, S., Mokhtarian, P., 2018. What influences travelers to use uber? Exploring the factors affecting the adoption of on-demand ride services in California. Travel Behaviour Soc. 13, 88–104. https://doi.org/10.1016/j.tbs.2018.06.002.

Banister, D., Bowling, A., 2004. Quality of life for the elderly: the transport dimension. Transp. Policy 11 (2), 105–115. https://doi.org/10.1016/S0967-070X(03)00052-0.

Bayne, A., Siegfried, A., Beck, L.F., Freund, K., 2021. Barriers and facilitators of older adults' use of ride share services. J. Transport Health 21, 101055. https://doi.org/10.1016/j.jth.2021.101055.

Belgiawan, P., Joewono, T., Irawan, M., 2022. Determinant factors of ride-sourcing usage: a case study of ride-sourcing in bandung, Indonesia. Transp. Policy 10 (2), 831–840. https://doi.org/10.1016/j.cstp.2022.02.010.

Chalermpong, S., Kato, H., Thaithatkul, P., Ratanawaraha, A., Fillone, A., Hoang-Tung, N., Jittrapirom, P., 2023. Ride-hailing applications in Southeast Asia: a literature review. Int. J. Sustain. Transp. 17 (3), 298–318. https://doi.org/10.1080/15568318.2022.2032885.

de Bruijn, G.-J., Kremers, S.P., Schaalma, H., Van Mechelen, W., Brug, J., 2005. Determinants of adolescent bicycle use for transportation and snacking behavior. Prev. Med. 40 (6), 658–667. https://doi.org/10.1016/j.ypmed.2004.09.003.

Durand, A., Zijlstra, T., van Oort, N., Hoogendoorn-Lanser, S., Hoogendoorn, S., 2022. Access denied? Digital inequality in transport services. Transp. Rev. 42 (1), 32–57. https://doi.org/10.1080/01441647.2021.1923584.

Geurs, K.T., Van Wee, B., 2004. Accessibility evaluation of land-use and transport strategies: review and research directions. J. Transport Geogr. 12 (2), 127–140. https://doi.org/10.1016/j.jtrangeo.2003.10.005.

Hansen, S., Newbold, K.B., Scott, D.M., Vrkljan, B., Grenier, A., 2020. To drive or not to drive: driving cessation amongst older adults in rural and small towns in Canada. J. Transport Geogr. 86, 102773. https://doi.org/10.1016/j.jtrangeo.2020.102773.

Hauser, E., Borgatto, A.F., Meneghini, V., Barbosa, A.R., 2022. Factors associated with driving status among Brazilian older adults. J. Appl. Gerontol. 41 (10), 2244–2252. https://doi.org/10.1177/07334648221106764.

Heinen, E., Maat, K., Van Wee, B., 2011. The role of attitudes toward characteristics of bicycle commuting on the choice to cycle to work over various distances. Transport. Res. Transport Environ. 16 (2), 102–109. https://doi.org/10.1016/j.trd.2010.08.010.

Hennink, M., Bailey, A., Hutter, I., 2020. Qualitative Research Methods. Sage Publications, USA, pp. 1–376.

Hsieh, J.J.P.-A., Rai, A., Keil, M., 2011. Addressing digital inequality for the socioeconomically disadvantaged through government initiatives: forms of capital that affect ICT utilization. Inf. Syst. Res. 22 (2), 233–253. https://doi.org/10.1287/isre.1090.0256.

Inan, D.I., Hidayanto, A.N., Juita, R., Andiyani, K., Hariyana, N., Tiffany, P., Pertiwi, T.P.T., Kurnia, S., 2022. Technology anxiety and social influence towards intention to use of ride-hailing service in Indonesia. Case Studies on Transport Policy 10 (3), 1591–1601. https://doi.org/10.1016/j.cstp.2022.05.017.

Indonesia CSA, I.C.S.A., 2023. Elderly population statistics 2023. https://www.bps.go.id/id/publication/2023/12/29/5d308763ac29278dd5860fad/statistik-penduduk-lanjut-usia-2023.html.

Irawan, M.Z., Joewono, T.B., Belgiawan, P.F., Chalermpong, S., Thaithatkul, P., 2022b. Examining the ride-hailing adoption behaviors among older adults in an Indonesian city: the case of Yogyakarta. Transp. Res. Interdiscip. Perspect. 16, 100729. https://doi.org/10.1016/j.trip.2022.100729.

Irawan, M.Z., Rizki, M., Chalermpong, S., Kato, H., 2022a. Mapping the motorcycle-based ride-hailing users in Yogyakarta: an analysis of socio-economic factors and preferences. Asian Transport Studies 8, 100073. https://doi.org/10.1016/j.eastsj.2022.100073.

Jahangir, S., Bailey, A., Hasan, M.U., Hossain, S., Helbich, M., Hyde, M., 2022. "When I need to travel, I feel feverish": everyday experiences of transport inequalities among older adults in Dhaka, Bangladesh. Gerontol. 62 (4), 493–503. https://doi.org/10.1093/geront/gnab103.

Kamal, M.S.H., Momtaz, A.Y., Basakha, M., Ahmadi, S., Karimi, S.E., Oskouei, O.A., Zanjari, N., Soleimanvandiazar, N., 2022. Barriers and facilitators of driving status among older persons. Ageing Int. 47 (3), 503–515. https://doi.org/10.1007/s12126-021-09431-z.

Kim, S., Gajos, K.Z., Muller, M., Grosz, B.J., 2016. Acceptance of mobile technology by older adults: a preliminary study. Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services. https://doi.org/10.1145/2935334.2935380. Florence, Italy.

Kwan, M.P., 1998. Space-time and integral measures of individual accessibility: a comparative analysis using a point-based framework. Geographical analysis 30 (3), 191–216. https://doi.org/10.1111/j.1538-4632.1998.tb00396.x.

Lättman, K., Friman, M., Olsson, L.E., 2020. Restricted car-use and perceived accessibility. Transport. Res. Transport Environ. 78, 102213. https://doi.org/10.1016/j.trd.2019.102213.

Leistner, D.L., Steiner, R.L., 2017. Uber for seniors?: exploring transportation options for the future. Transp. Res. Rec. 2660, 22–29. https://doi.org/10.3141/2660-0.

Levinson, D., Wu, H., 2020. Towards a general theory of access. Journal of Transport and Land Use 13 (1), 129–158. https://doi.org/10.5198/jtlu.2020.1660.

Loukaitou-Sideris, A., 2016. A gendered view of mobility and transport: next steps and future directions. Town Plan. Rev. 87 (5), 547–565. https://doi.org/10.3828/tpr.2016.38.

Lucas, K., 2012. Transport and social exclusion: where are we now? Transp. Policy 20, 105–113. https://doi.org/10.1016/j.tranpol.2012.01.013.

Macioszek, E., Granà, A., Krawiec, S., 2023. Identification of factors increasing the risk of pedestrian death in road accidents involving a pedestrian with a motor vehicle. Archives trans. 65 (1), 7–25. https://doi.org/10.5604/01.3001.0016.2474.

Misra, A., Shirgaokar, M., Agrawal, A.W., Dobbs, B., Wachs, M., 2022. How older adults use ride-hailing booking technology in California. Transport. Res. Pol. Pract. 155, 11–30. https://doi.org/10.1016/j.tra.2021.10.022.

Mitra, S.K., Bae, Y., Ritchie, S.G., 2019. Use of ride-hailing services among older adults in the United States. Transp. Res. Rec. 2673 (3), 700–710. https://doi.org/10.1177/0361198119835511.

Nguyen-Phuoc, D.Q., Nguyen, H.A., De Gruyter, C., Su, D.N., Nguyen, V.H., 2019. Exploring the prevalence and factors associated with self-reported traffic crashes among app-based motorcycle taxis in Vietnam. Transp. Policy 81, 68–74. https://doi.org/10.1016/j.tranpol.2019.06.006.

Nordbakke, S., Schwanen, T., 2014. Well-being and mobility: a theoretical framework and literature review focusing on older people. Mobilities 9 (1), 104–129. https://doi.org/10.1080/17450101.2013.784542.

Pangbourne, K., 2018. Mobility and ageing: a review of interactions between transport and technology from the perspective of older people. In: Curl, A., Musselwhite, C. (Eds.), Geographies of Transport and Ageing. Springer International Publishing, pp. 51–71. https://doi.org/10.1007/978-3-319-76360-6_3.

Pereira, R.H., Schwanen, T., Banister, D., 2017. Distributive justice and equity in transportation. Transp. Rev. 37 (2), 170–191. https://doi.org/10.1080/01441647.2016.1257660.

Pot, F.J., van Wee, B., Tillema, T., 2021. Perceived accessibility: what it is and why it differs from calculated accessibility measures based on spatial data. J. Transport Geogr. 94, 103090. https://doi.org/10.1016/j.jtrangeo.2021.103090.

Rayle, L., Dai, D., Chan, N., Cervero, R., Shaheen, S., 2016. Just a better taxi? A survey-based comparison of taxis, transit, and ridesourcing services in San Francisco. Transp. Policy 45, 168–178. https://doi.org/10.1016/j.tranpol.2015.10.004.

Rizki, M., Joewono, T.B., Belgiawan, P.F., Irawan, M.Z., 2021. The travel behaviour of ride-sourcing users, and their perception of the usefulness of ride-sourcing based on the users' previous modes of transport: a case study in Bandung City, Indonesia. IATSS Res. 45 (2), 267–276. https://doi.org/10.1016/j.iatssr.2020.11.005.

Scheepers, C., Wendel-Vos, G., Van Kempen, E., De Hollander, E., Van Wijnen, H., Maas, J., Den Hertog, F., Staatsen, B., Stipdonk, H., Panis, L.I., 2016. Perceived accessibility is an important factor in transport choice—Results from the AVENUE project. J. Transport Health 3 (1), 96–106. https://doi.org/10.1016/j.jth.2016.01.003.

Shirgaokar, M., Misra, A., Agrawal, A.W., Wachs, M., Dobbs, B., 2021. Differences in ride-hailing adoption by older californians among types of locations. Journal of Transport and Land Use 14 (1), 367–387. https://doi.org/10.5198/jtlu.2021.1827.

Sikder, S., 2019. Who uses ride-hailing services in the United States? Transp. Res. Rec. 2673 (12), 40–54. https://doi.org/10.1177/0361198119859302.

Spinney, J.E., Scott, D.M., Newbold, K.B., 2009. Transport mobility benefits and quality of life: a time-use perspective of elderly Canadians. Transp. Policy 16 (1), 1–11. https://doi.org/10.1016/j.tranpol.2009.01.002.

Tirachini, A., 2020. Ride-hailing, travel behaviour and sustainable mobility: an international review. Transportation 47 (4), 2011–2047. https://doi.org/10.1007/s11116-019-10070-2.

Tiznado-Aitken, I., Muñoz, J.C., Hurtubia, R., 2021. Public transport accessibility accounting for level of service and competition for urban opportunities: an equity analysis for education in Santiago de Chile. J. Transport Geogr. 90, 102919. https://doi.org/10.1016/j.jtrangeo.2020.102919.

UN, 2017. World population prospects the 2017 revision: key findings and advance tables. *Working Paper No. ESA/P/WP/248*. https://population.un.org/wpp/Publications/Files/WPP2017_KeyFindings.pdf. (Accessed 25 April 2022).

Vivoda, J.M., Harmon, A.C., Babulal, G.M., Zikmund-Fisher, B.J., 2018. E-hail (rideshare) knowledge, use, reliance, and future expectations among older adults. Transport. Res. F Traffic Psychol. Behav. 55, 426–434. https://doi.org/10.1016/j.trf.2018.03.020.

Webber, S.C., Porter, M.M., Menec, V.H., 2010. Mobility in older adults: a comprehensive framework. Gerontol. 50 (4), 443–450. https://doi.org/10.1093/geront/gnq013.

Yogyakarta CSA, Y.C.S.A., 2024. Provinsi Daerah Istimewa Yogyakarta Dalam Angka 2024. https://yogyakarta.bps.go.id/id/publication/2024/02/28/8bf08007fc346b9f836ca663/provinsi-daerah-istimewa-yogyakarta-dalam-angka-2024.html.

Zhou, Y., Yuan, Q., Ding, F., Chen, M., Yang, C., Guo, T., 2022. Demand, mobility, and constraints: exploring travel behaviors and mode choices of older adults using a facility-based framework. J. Transport Geogr. 102, 1–9. https://doi.org/10.1016/j.jtrangeo.2022.103368.

Ziegler, F., Schwanen, T., 2011. 'I like to go out to be energised by different people': an exploratory analysis of mobility and wellbeing in later life. Ageing Soc. 31 (5), 758–781. https://doi.org/10.1017/S0144686X10000498.