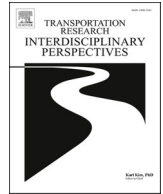


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Motorcycle three-wheelers in Pakistan: Low-cost rural transport services, crucial for women's mobility

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ABSTRACT

Rural women and men without their own means of transport depend on transport services. In low- and middle-income countries these are mainly provided by informal sector entrepreneurs. In Pakistan, motorcycle three-wheelers (designed as six-seater, route-based vehicles) provide most rural transport services. Research was undertaken in three districts of Punjab Province, with traffic counts and surveys of transport users. Motorcycles are increasing rapidly, and men's use of transport services is declining. The traffic counts showed motorcycles for personal and family use carry almost half of the people travelling. Women are increasingly passengers on motorcycles driven by male relatives, but these are seldom available for women's multipurpose trips during the daytime. On village-to-town roads, motorcycle three-wheelers are the only low-cost (two cents USD per passenger-km) public transport throughout the day. Point-to-point taxis are more costly. Most (55%) of women's public transport journeys are in three-wheelers. Women and men rate motorcycle three-wheelers highly, particularly their fares and frequency. Women have a greater willingness to pay more for less crowded, safer vehicles than men. It is concluded that the informal sector motorcycle three-wheeler services are optimising village-to-town transport connections, providing the only low-cost travel option for many rural women. Policies should avoid disrupting their vital services. With motorcycle growth undermining transport services, gender-aware strategies should be developed to facilitate frequent, uncrowded three-wheeler operations.

1. Introduction

Transport has a key part to play in connecting people to the resources they need in order to reach their full potential (Gonzalez et al., 2019). In rural areas where people and their activities are widely scattered, everyday travel can be associated with great distances and transport is a key element to access work, education, health care, shops and recreational facilities (Noack, 2011). Where people do not own their own means of transport, to travel they must walk or rely on transport services. The role and impact of transport services and mobility is particularly crucial in relation to rural settings, to women's access needs and to developing countries. Evidence suggests that rural women and school-age girls are disproportionately affected by poor access to transport (Fernando and Porter, 2002; Porter, 2013). Uteng (2012) pointed out that access is a gendered phenomenon in developing countries, including all the subsets of access, i.e. access to information, rights, land,

money, education, skills, political participation and voice. Policy makers and development practitioners need to understand how roads and transport services constrain or empower rural women, men and children, so that planning and regulatory frameworks can be adjusted to improve the lives of rural people.

This research has been undertaken to understand mobility issues in rural Pakistan with a gender perspective (Starkey et al., 2019). It has focussed on the role the informal sector is playing to meet people's travel needs. Informal sector transporters are particularly important, as in most low- and middle-income countries, the formal transport companies (including parastatals) only operate in urban and inter-urban contexts, leaving informal operators to serve the village-to-town roads (Hine et al., 2015). With little capital and barely profitable services, informal operators in low-income countries often provide poor quality, overcrowded and relatively expensive rural transport services, with little regulatory control (Starkey, 2016a). While governments build rural

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roads, and endeavour to maintain them, the provision of transport services is left to the private sector, and only informal sector entrepreneurs endeavour to serve the market demand of villagers. Hence, this paper is reporting investigations into the role of motorcycle three-wheeler transport services that are increasingly being used for public transport in countries in the global south (Starkey, Batool and Younis, 2019). The paper looks at the importance of motorcycle three-wheelers to rural people in Pakistan, considering the needs of women, men and children.

The research topic is particularly compelling from a socio-cultural perspective, as Pakistan is a conservative society, where the traditional gendered roles and responsibilities are highly differentiated and unequal. A recent study reported that Pakistan's female [acknowledged] labour force is only 25%, which is well below rates for countries of a similar income level (ADB, 2016). The same report argued that many more women would like to work, but they are constrained by various factors including lack of mobility. The type and quality of available transport services was one of the main factors limiting the ability of rural women to move outside of their village for work, and the ability of younger women to attend further education or vocational training to enhance their work opportunities (ADB, 2016).

1.1. Motorcycle three-wheelers in Pakistan

In 1994, the Jinan Qingqi Motorcycle Company of China established a joint Chinese-Pakistani venture to assemble and manufacture motorcycle-based three-wheelers, which are also known as motorcycle rickshaws or Qingqis. Motorcycles, without their rear wheel, were attached to an axle with two wheels, on which was mounted a body with a bench seat facing forward and another bench seat facing backwards. The 6-seater vehicles started to replace the 6-seater, horse-drawn 'tangas' used in the Punjab at this time (Hasan and Raza, 2015). Moving from animal power to a motorised three-wheeler was seen as a positive development that was welcomed by the authorities. At this time, public transport services were poor, and while double-decker buses operated on main roads in Lahore, crowded vans (particularly unpleasant for women) were common as transport services in urban, peri-urban and rural areas (Haider and Badami, 2004). The development of the motorcycle three-wheelers as route-based transport services that could cope with the narrow, rough roads proved popular. The fact that they were affordable, open and less crowded than vans, enabled women and men to travel in a timely way, with a greater sense of freedom and security than other public transport options. Fig. 1 shows a typical passenger motorcycle three-wheeler in Pakistan and women boarding one in a village. There are also motorcycle three-wheelers with flat-bed, pickup and enclosed configurations, all designed for freight (Fig. 2).



Fig. 1. Motorcycle three-wheeler in Pakistan, with women boarding.

1.2. Other forms of public transport in rural Pakistan

Motorcycle three-wheelers are generally the main route-based services on low-volume rural roads in rural Pakistan. On some roads, pickup trucks with sideways-facing seats operate passenger services as well as carrying small freight loads (Fig. 3). Some motorcycle three-wheelers have similar sideways-facing seats and these are often used to carry children to schools (Fig. 2). Other route-based services such as buses (over 50 seats), midi-buses (28–32 seats) and minibuses (16 seats) seldom operate on small roads, concentrating on the inter-urban routes where there is greater passenger demand. The main exceptions to this are some commuter services using midi-buses that leave villages in the early morning, returning from the towns in the late afternoons. Other rural services tend to be point-to-point services that are hired specially by a person or a group of people. These operate like urban taxis. They include autorickshaws (motor-scooter-based three-wheelers) with one bench seat for three passengers (Fig. 3). There are also 'rent-a-cars' which are car-based taxis and 'carry-vans', that are slightly larger, seven-seater taxis.

1.3. Gender issues in transport

1.3.1. Access to transport and its impacts

In developing countries, most rural people depend on walking or using public transport in their daily lives (Babinard and Scott, 2011). Rural mobility for women is important for access to basic services, including education, healthcare, markets and social networking (Porter, 2011). Ability to pay can be a problem, and women generally have less access to financial resources than men. This is one reason why the ownership of means of transport is highly skewed in favour of men, and this includes intermediate means of transport such as bicycles and motorcycles (Starkey et al., 2002). Furthermore, over the past decades we have increasingly realised the important influence of socio-cultural contexts on individual mobility (Bamberg et al., 2007; World Bank, 2012; Carrasco and Farber, 2014).

Mobility to and from work significantly impacts women's ability to gain economic independence via joining the labour force (ITF, 2018). In recent years, a growing body of academic literature has addressed the complex relations between transport, mobility and gender issues in developing countries (Hamilton et al., 1991; Jones, 1990; Turner and Fouracre, 1995; Fernando and Porter, 2002; Uteng, 2012; Porter, 2013; Tanzarn, 2018).

1.3.2. Harassment

In much of the world, women fear harassment while travelling, and this affects their travel choices and patterns (FIA, 2016). In Mexico 64% of women living in Mexico City have been assaulted while using public transportation and 95% of harassment victims on public transport are



Fig. 2. Freight 3-wheeler (a) and motorcycle three-wheelers with sideways seats (b and c).

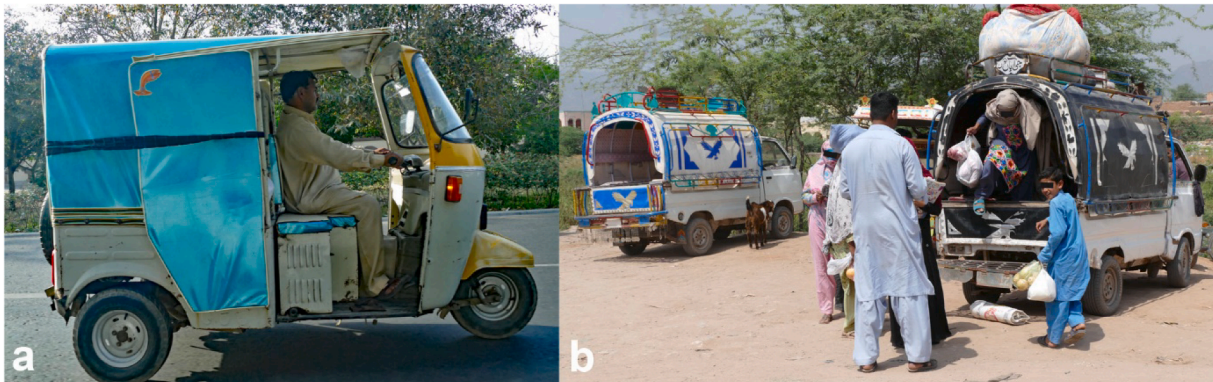


Fig. 3. Autorickshaw (a) and transport services pickups at a village terminal (b).

women (Lobo, 2015). In New York City, 63% of women surveyed reported experiencing sexual assault on the subway (Sur, 2015). In the Middle East, both women and men are concerned about verbal or physical harassment while travelling, but women are affected most; this results in them paying more for what they regard as safer forms of transport (World Bank, 2012). Women prefer enclosed, smaller vehicles, such as taxis, to larger vehicles that can be overcrowded and threatening. Women may confine their use of public transport to certain times of the day or use it only if accompanied by someone else (Mundial, 2010). While most research on harassment on public transport relates to urban transport, examples of comparable harassment in rural transport have also been cited (IFRTD, 2007; Tanzarn, 2018).

1.3.3. Affordability and travel patterns

Affordability can be a major challenge as transport costs can be a significant proportion of household expenditure and be a financial burden in poorer households. Women frequently spend less per month on transport than men, but more per journey. They travel less due to lack of resources and opportunities but pay higher rates because they select safer modes of transport (World Bank, 2010). Travel patterns play a significant role in the affordability of current transportation systems. Whereas men tend to undertake simple commuting journeys, due to the varied roles women play, women tend to make multiple stops to and from their destinations, for example to combine visits to markets, healthcare centres and schools. This causes them to pay for several tickets and results in greater financial burdens (World Bank, 2010). In one study in rural Yemen, it was found women paid 50% more than men to travel to schools because they needed to use more expensive, covered modes of transport.

1.3.4. Overcrowding and unavailability

In many countries, it is common for public transport vehicles to be overcrowded. They often exceed legal limits and sometimes have passengers hanging outside the vehicle or on the roof (Starkey, 2016a). Most people on the outside of vehicles are men, which can be because

women are more risk averse, and/or because men give them priority to inside seating (Starkey, 2007). Overcrowding leads to uncomfortable conditions, it may lead to harassment and, in some societies, it is contrary to social taboos that avoid close contact between sexes. In Pakistan, overcrowding is particularly pronounced in minibuses. These have two, uncrowded front seats reserved for women, but women routinely experience discomfort and harassment while travelling in the other seats. A survey of men conducted in Lahore district revealed 71% would discourage female family members from travelling in minibuses, but that 87% would strongly encourage female family members to travel on women-only vehicles. In peri-urban areas of Lahore, the lack of buses and small number of other public transport vehicles means that vehicles are infrequent as well as being overloaded, with waiting times often one to two hours (Sajjad et al, 2017).

1.4. Socio-cultural issues in Pakistan

One of the significant factors in Pakistani society is gender discrimination. In Pakistan, the status and responsibilities of women and men are very different. Although there are variations between regions, classes and the rural/urban divide, the overall patriarchy of society means women and men have distinct roles, with women having less independence than men. Rural areas are particularly conservative (ADB, 2000). Socio-cultural norms limit the mobility of girls, reducing their options for education and employment. The restricted mobility can limit their access to health facilities (Khan, 2010). Women generally have limited access to economic resources and depend on family members to provide transport or funds to pay for daily mobility (Adeel et al., 2017).

Rural women are generally only allowed to travel on a motorcycle if it is being driven by their husband, or a male relative. This is in contrast to the many countries where motorcycle taxis provide vital mobility for rural women: in one study in Liberia most women travelled to health centres (including maternity units) on a motorcycle taxis (Starkey et al., 2017).

Due to socio-cultural gender issues, there has been much rhetoric

about women's empowerment in Pakistan (Kabeer, 2003). Women's empowerment is a key concern within Pakistan for development-promoting organisations such as the Asian Development Bank, the World Bank and the United Nations agencies. The national transport strategy acknowledges that restricted mobility is a major barrier for women and the strategy aims to promote sustainable transport that can assist the empowerment of women, albeit without a detailed plan (Pakistan, 2018).

2. Research methodology

The purpose of this research study has been to understand, with a gender perspective, mobility issues in rural Pakistan and the role informal sector transport operators, including motorcycle three-wheelers, have in meeting the mobility needs of rural people, notably women.

2.1. Research locations

The research was carried out in Punjab Province. Three districts were selected for the surveys, providing a geographical spread with districts in the north, east-central and southern Punjab. Within each of the districts, villages were selected that appeared relatively representative of the local rural area. These were not on major highways and were not very close to large cities. They were connected by low-volume rural roads to their nearby market towns, which acted as small transport hubs for rural transport services, with onward connections to national services.

2.2. Research instruments and data collection

Traffic count and questionnaire-based surveys were carried out for the study. Twelve-hour traffic counts over two days were undertaken on eight rural roads in the second half of April 2019, recording all vehicle and pedestrian movements in each direction. On the rural roads, traffic was light, speeds were slow, most vehicles had few passengers, and the two local traffic count enumerators were known to most vehicle operators. This allowed accurate recording of disaggregated passenger loads, with those vehicles carrying many individuals willing to stop briefly to facilitate the counting. In addition to the main counts, in one district a two-day count was undertaken on a higher category road connecting two market towns, to provide some comparisons on traffic mix and volumes.

A questionnaire was developed and tested relating to people's family vehicle ownership, travel patterns, transport choices, journey times and distances, tariffs paid and experiences concerning safety and security. Purposive sampling was adopted to ensure the respondents included women, students, older persons and people with disabilities. Three hundred people were interviewed across the three rural areas studied (100 per research site) to understand their opinions on the different transport modes. These were village residents who were 'users' of transport services and/or personal means of transport. It was intended that about half of those interviewed would be women as the Population and Housing Census, conducted in 2017 suggested that females accounted for 48.8% of the population of Pakistan (Dawn, 2017). However, the final sample was 42% female, due to the reluctance of some women to participate. In addition, 150 owners of motorcycles (all men) were surveyed to understand their perspectives and the ways their vehicles were being used.

2.3. Data analysis

The survey data was entered into an SPSS software package. Initially the datasets were disaggregated by district to see if there were important differences between the three research areas. However, since the three situations proved quite similar, the data was aggregated, combining

responses from all three areas. This allowed a sample size of 300 (3×100) for single questions. However, some questions asked respondents to provide three different examples of travel experiences, so that up to 900 data points were available in some analyses. In the following sections, the N number cited is the sample size for the statistics produced. With user surveys on rural transport services, the median average is often more appropriate than the mean average, as extreme examples have less influence. The median may therefore be more in line with the experiences of most people. However, the median is not appropriate when dealing with bi-modal distributions, in which case the mean average may be more appropriate, or a graphical representation of the distribution. In the following sections, all three options have been used to present the data in ways that strengthen understanding of the issues raised. Where possible, Chi-squared significance tests have also been applied to compare statistical significances of differences in responses.

3. Results and discussion

3.1. Traffic counts, passengers carried and trip purposes

Table 1 summarises the numbers of travelling people counted on all surveyed roads, disaggregated by gender and age (children). This dataset is based on an aggregation of all traffic counts, to provide a picture of the various modes of transport used by the 61,000 people counted in the rural Punjab surveys. Most people travelling were men (57%), followed by women (23%) and children (20%).

As is shown in Table 1, the main mode of transport used by men was the motorcycle. This was also the main mode of transport for women, although, unlike men, women were invariably passengers, often sitting side-saddle. Although women represented only 18% of people travelling on motorcycles, this accounted for 38% of all travel by women. Similarly, children represented only 13% of people travelling on motorcycles, but this was their most common form of transport, accounting for 32% of the recorded movements of children.

From questionnaire responses, most of women's journeys on family motorcycles were for shopping (49%), multitasking trips (14%), work (11%), visiting relatives (11%), education (7%), clinic visits (4%) and banking (3%). The multi-tasking trips included visits to clinics, shops and relatives. The mean average journey by a woman passenger on a motorcycle was 18 km (median average 12 km) as women took both short trips to the nearby shopping centre and longer trips to facilities further away.

After journeys on family motorcycles, the next most important mode for women (and children as well) was the motorcycle three-wheeler, with women representing 35% of all motorcycle three-wheeler passengers and children accounting for a further 25% of passengers. Of the various motorised public transport options for women, motorcycle three-wheelers were by far the most important (55% of public transport journeys by women). This was followed by carry vans (20%) and cars/rent-a-car (13%) which are more expensive, point-to-point forms of transport that are not affordable for daily use by most rural women. Other forms of transport used by women were pickups (9% of women's journeys on transport services) and auto-rickshaws (2%), with buses (minibuses, midi-buses and large buses) accounting for only 1% of women's travel by transport services. Although only one fifth of passengers were children, they represented an important proportion of the travellers on buses (41%), pickups (35%) and carryvans (32%). This was partly due to specialised school runs using these vehicles.

The availability of low-cost motorcycle three-wheelers for public transport is particularly important for women. On many roads, motorcycle three-wheelers are currently indispensable for the less affluent, rural women for day-to-day transport, due to the lack of other affordable public transport options and the uncertain availability during the day of a male relative with a motorcycle.

Table 1
Men, women and children travelling during all traffic counts (trucks not included).

Passengers	Motor cycle	Walk	Bicycle	Cart	Pick-up	Carry-van	Car	Motorcycle3-wheeler	Freight 3-wheeler	Auto-rickshaw	Minibus/ Midibus/ Bus	Total	Sig-nificance
Men	20,227	1,321	597	1,171	1,030	1,887	2,264	4,600	1,289	220	353	34,959	0.000
% Men	68.5	39.1	68.6	74.7	40.1	38.4	58.9	40.2	65.8	39.7	47.7	57.0	
Women	5,376	844	58	141	638	1,445	974	4,047	438	169	86	14,216	0.000
% Women	18.2	25.0	6.7	9.0	24.9	29.4	25.3	35.4	22.3	30.5	11.6	23.2	
Children	3,922	1,217	215	255	898	1,581	608	2,799	233	165	301	12,194	0.000
% Children	13.3	36.0	24.7	16.3	35.0	32.2	15.8	24.5	11.9	29.8	40.7	19.9	
Total	29,525	3,382	870	1,567	2,566	4,913	3,846	11,446	1,960	554	740	61,369	

3.2. Passengers fares and the rural transport premium

People were asked about the fares they paid for public transport. Those taking long-distance buses paid 0.96 cents USD per passenger kilometre, while the commuters in midi-buses paid 1.07 cents USD per passenger-km. Motorcycle three-wheelers and pickups both charged 2.01 cents USD per passenger-km. The point-to-point services charged much more, with 3.96 cents USD per passenger-km for carry-vans and 9.16 cents USD per passenger-km for rent-a-car taxis. Compared to other countries, all the tariffs seem quite low, and the fares for three-wheelers are particularly low. To give some cost-of-living comparisons, at the time of the research sugar cost 24 cents USD per kg, and diesel cost 34 cents USD per litre.

Comparisons between countries can be difficult, but one way to overcome all the differences in fuel costs and exchange rates is to consider the 'Rural transport premium'. This is the ratio between the cost of per passenger-km of the available public transport services on low-volume, rural roads and the cost per passenger-km of long-distance bus services. Being a ratio, there are no units or exchange rate issues, and many idiosyncrasies due to local prices are cancelled out. There will always be a Rural Transport Premium. Rural transport services typically use smaller vehicles for shorter distances on poor roads, while long-distance buses benefit from two economies of scale (large loads and long distances) and are likely to run on better infrastructure. The Rural Transport Premium for motorcycle three-wheelers in Pakistan is just 2.1, meaning the cost per kilometre is about twice that of long-distance buses. This is a small figure for such low-capacity vehicles. Examples of the Rural Transport Premium in other countries include 10 for motorcycle taxis in Tanzania, 5 for minibuses in Kenya, 5 for motorcycle three-wheelers in Myanmar and 3 for 35-seater rural buses in Nepal (Starkey, 2016b).

3.3. User satisfaction and perceptions of transport services options

Users (disaggregated by gender) were asked their opinions of the various attributes of different public transport options including their availability, cost, safety and security, travel time and frequency and their comfort. An eleven-point scoring system was applied, weighted for extreme responses, with 0 being very poor, 3 poor, 5 OK, 7 good and 10 being very good. The responses were consolidated, and the average responses ranked.

Users' satisfaction with motorcycle three-wheelers is given in

Table 2
Users satisfaction on different attributes of motorcycle three-wheelers.

Indices	Male (N = 174)		Female (N = 126)	
	Score	Rank	Score	Rank
Cost	6.6	1	6.7	1
Availability	6.5	3	6.4	3
Safety and security	6.2	4	5.9	4
Travel time and frequency	6.6	1	6.5	2
Comfort	5.7	5	5.6	5

Table 2, with pickups in Table 3 and satisfaction with buses in Table 4. Responses generally suggested people were quite satisfied with all three types of transport services, with no overall rates below 'acceptable'. The opinions of men and women were broadly similar, with both having comparable overall satisfaction, with all three modes, although the satisfaction with motorcycle three-wheelers was lower than that of buses and pickups. Men and women agreed that vehicle comfort was the worst attribute of all forms of public transport and also, that buses were most safe and secure, but their availability was disappointing. The best thing about motorcycle three-wheelers was their low cost, with their availability and frequency also good. Both pickups and buses were regarded as being more safe and secure than motorcycle three-wheelers. There is a widespread perception that motorcycle three wheelers (and motorcycles themselves) are more likely to be involved in crashes than vehicles with four, or more, wheels. Women also reported that they felt more secure from inappropriate contact with males in pickups and buses. The key policy implication from the user satisfaction surveys, is that it is important to improve the comfort, safety and security of three-wheeler public transport, while trying to ensure they can still provide the low-cost transport services for which they are widely appreciated.

3.4. Willingness to pay for improvements and harassment issues

Transport users, disaggregated by gender, were asked about their willingness to pay extra for improvements to motorcycle three-wheelers and pickups used for transport services. Issues including loading levels, frequency of services and certain safety features that are legally required but are often absent. The results are presented in Table 5 and Fig. 4. The suggested possible increases were (in Pakistan Rupees) PKR 10, 20 or 30. To put this in context, the median average fare paid for motorcycle three-wheelers was PKR 25. Therefore, the three 'willingness to pay' options can be thought of as + 40%, +80% and + 120% (although percentages were never mentioned in the questions). The overall results are summarised in Table 5, along with statistical comparison of differences between the male and female responses. This shows that most respondents (61%) would be prepared to pay 40% extra for there to be only four people in a motorcycle three-wheeler. In general, about half the respondents were willing to pay a significant increase in fares (40%) for safer, less crowded and more frequent vehicles. However, this trailed off as price increases rose, with very few willing to pay double the current fare price for the suggested improvements. Willingness to pay extra for improved pickup services was slightly lower. It can be seen in

Table 3
Users satisfaction on different attributes of pickups.

Indices	Male (N = 174)		Female (N = 126)	
	Score	Rank	Score	Rank
Cost	7.4	1	7.1	3
Availability	6.8	4	6.6	4
Safety and security	7.2	2	7.3	2
Travel time and frequency	7.2	2	7.6	1
Comfort	6.5	5	6.5	5

Table 4
Users satisfaction on different attributes of bus services.

Indices	Male (N = 174)		Female (N = 174)	
	Score	Rank	Score	Rank
Cost	6.9	3	6.9	3
Availability	6.7	4	6.6	4
Safety and security	7.0	2	7.2	1
Travel time and frequency	7.1	1	7.1	2
Comfort	6.7	4	6.2	5

Table 5
'Willingness to pay' for possible improvements to motorcycle three-wheelers and pickups.

Possible improvements	Increase in fare (PKR)	Willingness to pay (%) responses	Men	Women	Sig.
			(N = 174)	(N = 126)	
Motorcycle three-wheelers					
Motorcycle three-wheelers have safety features:	10 (+40%)	52%	79	72	NS
	20 (+80%)	20%	29	32	NS
hand brake, indicator, lights and rear gate	30 (+120%)	4%	6	22	0.000
Motorcycle three-wheelers carry maximum of	10 (+40%)	61%	90	64	NS
	20 (+80%)	35%	52	25	0.01
4 passengers (2 people per bench seat)	30 (+120%)	1%	0	4	0.03
Motorcycle three-wheelers carry maximum of	10 (+40%)	41%	56	15	0.000
	20 (+80%)	13%	25	22	NS
6 passengers (3 people per bench seat)	30 (+120%)	1%	0	1	NS
Motorcycle three-wheelers travel after every	10 (+40%)	45%	71	64	NS
	20 (+80%)	14%	19	25	NS
15 min	30 (+120%)	3%	4	4	NS
Pickups					
Pickups carry maximum of 10 passenger	10 (+40%)	40%	58	63	NS
	20 (+80%)	10%	15	15	NS
	30 (+120%)	1%	0	2	NS
Pickups travel after every 15 min	10 (+40%)	30%	45	44	NS
	20 (+80%)	5%	5	8	NS
	30 (+120%)	3%	3	7	NS

Fig. 4, that overall women showed greater willingness to pay for improved services compared to men. From discussions with many stakeholders, the explanation of why women would be more willing than men to pay more, despite having less access to funds, appears embedded in the socio-cultural norms of the conservative society (unwillingness to travel close to male strangers) and the fear of harassment. This was confirmed through discussions and was borne out by the reports that some women pay for an extra empty seat on a three-wheeler, so they are not crowded. Some women pay for the expensive, but less-crowded, point to point services. This is in tune with the literature cited that provided examples of women paying more than men for transport, due to their choices (World Bank, 2010).

Despite the fear of harassment, which was expressed in discussions as well as through the questionnaires, this research showed that rural transport in the locations studied appeared relatively secure for passengers. The 300 users were asked if any of them or their families had experienced security incidents related to transport services in the past year. Security incidents included theft, physical assault and harassment. None of the 174 men nor the 126 women respondents reported any security incidents. In contrast half of respondents did report safety incidents (crashes of various severities), mainly involving motorcycles and motorcycle three-wheelers.

4. Conclusions and implications

Transport is a key gender issue in Pakistan and motorcycle three-wheelers are very important to rural women as there are few other options available to them. Women seldom travel on the early morning 'commuter' buses, unless they are in urban employment. This research showed that women use motorcycle three-wheelers for 55% of their public transport journeys. Other public transport options for women are carry-vans and rent-a-cars (expensive), pickups (unavailable on most roads) and autorickshaws (uncommon on rural roads). Motorcycle three-wheelers provide transport services throughout the day at very affordable fares and have therefore 'optimised' the rural transport services that link village women to market towns, medical facilities and transport links (buses to other towns and cities).

There continues to be a rapid adoption by men of motorcycles for personal and family transport. Women's main mode of rural transport is now as passengers on motorcycles operated by male relatives. However, women do not benefit from motorcycles as much as men because they cannot rely on male relatives to provide transport for their routine multipurpose journeys. Women may need to visit a school, a clinic and the shops in the nearby market town, and male relatives are not generally available in the daytime to act as chauffeurs for such travel patterns (survey data suggested that only 14% of women's journeys on motorcycles were for multipurpose journeys).

The shift to motorcycles is leading to an overall decline in the public transport market, with three-wheeler operators pessimistic about passenger numbers in the coming year. The current decline may well lead to a vicious circle of demand for rural transport services, with fewer passengers leading to longer waiting times and the consequence that fewer people make the effort to travel. The increased adoption by men of motorcycles appears to be undermining the main travel option that allows low-income rural women to undertake multipurpose journeys during the daytime.

This research has shown that non-affluent rural women depend on motorcycle three-wheelers for their mobility using public transport, as there are no other affordable and readily available options throughout the day. The survey results have provided evidence that this crucial gender issue is one of the most important aspects of motorcycle three-wheeler services in rural Pakistan. With the increasing adoption of motorcycles, three-wheelers services risk a downward spiral to oblivion, which would have devastating consequences for low-income rural women. Vicious circles of diminishing demand and transport frequency can be avoided by maintaining, or increasing, daytime frequencies, but informal sector operators are worried about any loss-making journeys. One solution would be for government transport authorities (or pilot projects implemented by local non-governmental organisations) to work with the operators to develop operational models that could generate an increase in ridership due to more attractive and more regular daytime services.

The current legal standards of four passengers per motorcycle rickshaw are widely ignored, but evidence from this research suggests that many people, including most women, would be willing to pay more for less-crowded journeys. Some women already chose to pay more, either by paying for empty seats or by using more expensive point-to-point services. Such willingness to pay would facilitate the suggested model



Fig. 4. Willingness to pay charts showing percentage responses disaggregated by gender.

of encouraging operators to run more frequent services that would also be less crowded. With the current 'bhatta' (bribe) environment undermining rural enforcement, it is recommended that motorcycle three-wheeler operators be facilitated to work together (through existing informal associations) and develop operational systems based on greater travel frequencies, slightly higher fares and uncrowded vehicles. Such participatory work could be initiated through local pilot projects.

The Government of Punjab has been proposing a clamp down on the informal-sector manufacture and operation of motorcycle three-wheelers, due to non-compliance with various regulations and standards. However, this research suggests that the gender issue for public transport in rural areas is so important that if there were a prohibition of existing rural motorcycle three-wheelers, it would be essential to ensure that appropriate alternative transport services were available to allow continued daytime mobility for rural women. If the threatened prohibition had serious negative consequences for women, the proposed regulatory action could be considered discriminatory against women. Such regulatory action might even be susceptible to legal challenges on the basis of rural women's rights, if no affordable transport alternative was readily available.

The great value of motorcycle three-wheelers to rural people, and women in particular, should be acknowledged in Pakistan. Policies and strategies relating to motorcycle three-wheelers, including enforcement of standards and the promotion of alternatives, should ensure that there are no adverse consequences (intended or unintended) that marginalise rural women by reducing their mobility and their access to markets, services and employment opportunities. Further in-depth studies of gendered transport issues in rural Pakistan should be undertaken to allow the development of realistic strategies for combining rural transport needs, including those of low-income women, the income-generating requirements of transport operators and the quality standards aspired to by government authorities.

CRedit authorship contribution statement

Paul Starkey: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Writing – original draft, Writing – review & editing. **Zahara**

Batool: Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Eng Muhammad Waqas Younis:** Data curation, Software, Supervision, Formal analysis, Visualization. **Atteq Ur Rehman:** Data curation. **Muhammad Sarmad Ali:** Data curation.

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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