

Children and Youth and Sustainable Urban Mobility

Tracy McMillan

Thematic study prepared for

Global Report on Human Settlements 2013

Available from <http://www.unhabitat.org/grhs/2013>

Tracy McMillan is an independent researcher and advisor on topics related to children's transportation and health, with specific expertise in non-motorized school transport. She is President of the PPH Partners, a consulting firm based in Flagstaff, Arizona, USA. Comments can be sent to the author at: tracy.mcmillan@pphpartners.com.

Disclaimer: This case study is published as submitted by the consultant, and it has not been edited by the United Nations.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning delimitation of its frontiers or boundaries, or regarding its economic system or degree of development.

The analysis, conclusions and recommendations of the report do not necessarily reflect the views of the United Nations Human Settlements Programme, the Governing Council of the United Nations Human Settlements Programme or its Member States.

Nairobi, 2011

Contents

- 1. The Crisis of Sustainability in Urban Transport for Children and Youth..... 1**
- 2. Non-Motorized Transport 3**
 - 2.1. Trends and conditions in non-motorized transport and related infrastructure from the perspective of children and youth 3
 - 2.2. Impacts/challenges of above trends from the perspective of children and youth..... 6
- 3. Public Transport 8**
 - 3.1. Trends and conditions in public transport and related infrastructure from the perspective of children and youth 8
 - 3.2. Impacts/challenges of above trends from the perspective of children and youth..... 9
- 4. Informal Motorized Transport 12**
 - 4.1. Trends and conditions in informal motorized transport and related infrastructure from the perspective of children and youth 12
 - 4.2. Impacts/challenges of above trends from the perspective of children and youth..... 13
- 5. Private Motorized Transport 15**
 - 5.1. Trends and conditions in private motorized transport and related infrastructure from the perspective of children and youth 15
 - 5.1.1. Serving young passengers..... 15
 - 5.1.2. Trips by young drivers..... 16
 - 5.2. Impacts/challenges of above trends from the perspective of children and youth..... 17
- 6. Commercial Goods Transport 19**
 - 6.1. Trends and conditions in commercial goods transport and related infrastructure from the perspective of children and youth 19
 - 6.2. Impacts/challenges of above trends from the perspective of children and youth..... 20
- 7. Land-Use and Transport Planning..... 21**
 - 7.1. Trends and conditions in land-use and transport planning from the perspective of children and youth..... 21
 - 7.1.1. Accessibility..... 21
 - 7.1.2. Mobility and affordability..... 21
 - 7.1.3. Safety 22
 - 7.2. Impacts/challenges of above trends from the perspective of children and youth..... 22
- 8. Children, Youth and Urban Transport: Policy Responses 24**
 - 8.1. Evidence of policy responses, specific practices/programmes/projects, etc., to address the impacts/challenges of urban transport trends from the perspective of children and youth..... 24
 - 8.1.1. Road safety 24
 - 8.1.2. Constraints and opportunities related to mobility and accessibility by various modes..... 28
 - 8.1.3. Air quality 30
 - 8.2. Challenges for future policy development 30
- 9. Towards Sustainable Urban Transport 32**
- List of References 35**

List of tables

Table 1. 2010 Mid-year population, by age	1
Table 2. 2010 Mid-year population aged 0–24, by region and sex	1

List of acronyms

CFA franc	Currency used in several countries in Western and Central Africa, currently with a fixed exchange rate to the euro: 1 euro = 655.957 CFA francs
FIA	<i>Fédération Internationale de l'Automobile</i>
GDL	graduated driver licensing
Rs.	Indian rupee
SSATPP	Sub-Saharan Africa Transport Policy Program
UK	United Kingdom of Great Britain and Northern Ireland
UITP	International Association of Public Transport
US	United States of America
US\$	US dollars

1. The Crisis of Sustainability in Urban Transport for Children and Youth

Despite the fact that children and youth are a growing proportion of the population in many urban areas around the world, in terms of urban transport they are an overlooked and vulnerable segment of the population. Children and youth under 24 represent 47 per cent of the total population in developing countries and 29 per cent of the population in developed countries, as listed in Table 1. Rates in some regions of the world are more contrasting: in Sub-Saharan Africa, children and youth age 0–24 represent 63 per cent of the population of the area (Table 2). It is estimated that by 2030, 60 per cent of the world’s population will live in cities¹ and that 37 per cent of the world’s population will be under the age of 20.²

Table 1. 2010 Mid-year population, by age

	World	Less-developed countries (UN-based)	More-developed countries (UN-based)
Total population:	6,853,019,414	5,621,913,725	1,231,105,689
0–4 years:	621,862,368	554,446,925	67,415,443
5–9 years:	601,126,842	533,977,161	67,149,681
10–14 years:	595,000,326	527,492,060	67,508,266
15–19 years:	597,568,265	523,312,780	74,255,485
20–24 years:	599,531,724	516,524,025	83,007,699
Total population, ages 0–24:	3,015,089,525	2,655,752,951	359,336,574
Per cent world population, ages 0–24:	44.0	47.2	29.1

Source: US Census Bureau, International Data Base, 2010.

Table 2. 2010 Mid-year population aged 0–24, by region and sex

Region	Population 0–24 years			% of total population aged 0–24
	Total	Male	Female	
Asia (excluding Near East)	1,648,580,809	861,121,557	787,459,252	42.9
Baltics	1,999,446	1,022,895	976,551	28.3
Commonwealth of Independent States	93,249,421	47,667,896	45,581,525	33.8
Eastern Europe	34,061,201	17,475,380	16,585,821	28.6
Latin America and the Caribbean	270,290,034	137,328,353	132,961,681	45.8
Near East	109,369,919	56,083,756	53,286,063	51.0
North Africa	80,442,789	41,024,969	39,417,820	49.0
Northern America	115,829,462	59,192,006	56,637,456	33.7
Oceania	13,335,349	6,820,769	6,514,580	38.1
Sub-Saharan Africa	534,964,340	269,409,521	265,554,819	63.0
Western Europe	112,722,812	57,751,156	54,971,656	27.4

Source: US Census Bureau, International Data Base, 2010.

1. United Nations, 2010b.

2. US Census Bureau, International Data Base, 2010.

Vulnerable road users are those that have high casualty rates and therefore should be given special attention in road safety policy. Vulnerability is further defined by the amount of protection in traffic and the task capacity of the road user. Children and youth, by virtue of some of their most common modes of transportation – walking, bicycling and travelling by two-wheeler – and their lower task capacity than an adult, are some of the most vulnerable road users.³ The underlying factors of the urban transport crisis manifest themselves in different ways in regions around the world. Important variations exist in the global conditions of urban transport by mode for children and youth in developed vs. developing countries. For example, as will be discussed in the chapters that follow, while children in urban areas of Sub-Saharan Africa travel almost exclusively by walking, policymakers in the US are desperately trying to get children out of their parent's cars and travelling on foot. However, many of the impacts are strikingly similar. Road traffic injuries are the leading cause of death globally for 15–19 year olds and the second leading cause of death for 10–14 and 20–24 year olds.⁴ It is estimated that by 2015, traffic accidents will surpass AIDS and malaria as the leading cause of death in children age 5–14 in Africa, which has the highest traffic fatality rate for children under 14 worldwide.⁵

This population has been largely neglected in transport planning around the world, however. It is surprising to note that even an organization such as the World Bank, does not discuss this large population group in its efforts related to Inclusive Transport by the Transport and Social Responsibility Thematic Group. As will be discussed in the chapters to follow, children and youth take trips each day by multiple modes; yet have constraints on mobility and accessibility based on their age, income, physical size and degree of personal freedom to travel. They are particularly vulnerable in terms of road safety and air quality. Relatively few urban transportation policies or plans (i.e. road or public transport) take any of this into account when planning infrastructure, routes, levels of service, or fare structures, or include children and youth in planning. A general indicator of this neglect is the lack of data from urban areas in both developed and developing countries on children and youth travel behaviour by travel mode, trip purpose, age and gender. However, the opportunity is ripe to shape the next generation of urban transport users by collecting data and developing policies/plans that are more inclusive to promote safe and sustainable travel behaviour and a diversified transport infrastructure that provide opportunities for employment, education, and equality; reduce conflicts; and promote health, leisure; globalization and participatory planning.

3. SWOV, 2009, p1.

4. Toroyan and Peden, 2007, p2–3.

5. Asia Injury Prevention Foundation, 2011.

2. Non-Motorized Transport

This chapter examines the global conditions and trends in non-motorized transport in urban areas from the perspective of children and youth.

2.1. Trends and conditions in non-motorized transport and related infrastructure from the perspective of children and youth

Non-motorized transport is an important transport mode for children and youth, promoting independent mobility, sustainable transport behaviours and increasing physical activity and other positive health behaviours and outcomes. The movement of people and commercial goods via non-motorized modes provides employment opportunities to youth who are under licensing age or cannot afford to obtain a license. Non-motorized transport also helps to minimize the environmental impacts of urban transport. The positive environmental, transport and health impacts of non-motorized transport are challenged however, by an inadequate non-motorized transport infrastructure in many locations around the world, making non-motorized transport a risky endeavour in terms of road safety. Investment in non-motorized transport falls far behind other transport modes, which may lead to further decline in numbers and safety of non-motorized transport road users.

In general, non-motorized travel data for children and youth in urban areas is difficult to locate for both developed and developing countries. While some developed countries have national data on children and youth travel behaviour, regional or urban-specific data is harder to find. Given that: 1) eligibility for driving does not begin until the mid-teen years in most countries; 2) the expense of auto travel; 3) the high rates of walking even for adults in urban areas in developing countries; and 4) that even public transport trips generally begin and end with a walk trip, one can assume that non-motorized travel is a common (though maybe not the primary) mode of transport for children and youth in urban areas across the globe. That said, the best available data at the urban level is on one particular trip: the school trip.

The school trip is a consistently taken trip by children and youth in most urban areas, up to early to mid-teen years. Non-motorized transport is often used for school trips, whether children and youth travel with an adult escort or on their own. Three studies from urban areas in Australia (Victoria, Perth and Melbourne) found walking rates to school ranging from 23–35 per cent.⁶ A study of two smaller urban areas in Switzerland (Bern and Biel/Bienne) found walking rates to school over 50 per cent.⁷ A study of Dutch urban children (216 boys and 232 girls) in ten disadvantaged neighbourhoods in six cities in the Netherlands found 53 per cent of children walked and 40 per cent cycled to school every day,⁸ while a study of three elementary schools in Taipei's Wenshan District found walking rates of approximately 40 per cent, though environmental conditions such as hilly terrain decreased walking and increased driving rates.⁹ Finally, a study of children's home to school mobility in Tehran (Iran) found almost 50 per cent of the sample of 3rd, 5th and 7th graders travelled by foot to school (either alone or with a parent), though 60 per cent of them indicated they would prefer to walk if given the choice. Distance was a significant factor in travel mode choice (walking or vehicular combined, i.e. public transport, school bus or parent's car). No children biked to school in this study, although almost all the children owned a bicycle. Traffic safety, secure bicycle parking and bicycle infrastructure were issues with cycling.¹⁰

6. McDonald, 2012, p4.

7. Bringolf-Isler et al, 2008, p71.

8. de Vries et al, 2010, p2314.

9. Lin and Chang 2010, p879.

10. Ahmadi and Taniguchi, 2007, p280.

National travel surveys from developed countries often find that once the distance from home to school exceeds one mile, the number of non-motorized trips decrease and the number of escorted trips by automobile (for primary school children) and public transport (for secondary school children) increase.¹¹ However, when looking at urban data in particular from these surveys, the sensitivity of the relationship between distance and travel mode becomes more inconclusive. In London and other urban areas in Great Britain (from large to small/medium urban) in 2005/2006, the percentage of children aged 5–10 walking to school was approximately 53.6 per cent with an average trip length of 1.3 miles, while the percentage of trips to school by walking by youth aged 11–16 was still 47.8 with an average trip length of 2.6 miles.¹² US data on school travel, collected as part of a national transportation survey conducted approximately every 5–7 years, found an increase in walking trips by urban schoolchildren, from 43.5 per cent in 1995 to 62.4 per cent in 2001.¹³ There is an overall trend in some developed countries, however, toward a reduction in non-motorized transport to school. Trend data from 1971 to 2003 from Sydney (Australia) shows that the prevalence of walking to school has decreased over time from approximately 58 per cent in 1971 to 26 per cent in the 1999–2003 sample for children aged 5–9. A similar trend was noted in youth aged 10–14.¹⁴ This trend can have a negative impact on air quality, local congestion, traffic safety, children’s sense of independent mobility and physical health. Some of the primary reasons given by parents for not allowing walking to school are distance, traffic safety and convenience, i.e. the school is on the way to the parent’s place of employment.¹⁵

In both developed and developing countries children and youth with lower-incomes have fewer or no other transportation options than walking, due to the cost of owning a car or riding public transport. A comparative study of school children age 7–18 in four different settlement types in South Africa, Ghana and Malawi found enrolment at urban schools was high for both genders but that school choice in urban areas increases travel distances and travel times for students to school. While other mode options were available (bus/minibus/combi/*bakki*), walking was the dominant mode for both boys and girls, and the majority of children in both Malawi and South Africa reported travel time to school in urban areas between 16–45 minutes (the majority children in Ghana reported travel times less than 15 minutes).¹⁶ While walking is beneficial in terms of the environmental aspects of sustainable transport, current conditions in urban areas indicate that it significantly limits opportunities for education and employment by youth due to long travel distances and road safety issues that exist in these urban areas, particularly as students reach secondary school age.¹⁷ Low-income youth in Nairobi (Kenya) are increasingly living on the urban periphery and walking significant distances to reach employment opportunities in the central city.¹⁸

Secondary schools in urban areas of both developing and developed countries are typically larger schools (or boarding schools, as is the case in many African countries) and therefore serve a larger population base (catchment area), which extends the distance between home and school (as noted above in the Great Britain data from 2005/2006) and travel time, along with time lost toward household responsibilities.¹⁹ In countries that culturally place a greater value in boys’ education than girls’, the educational opportunities of girls is most

11. McDonald, 2007, p511–512; Department of Transport, 2010c.

12. Department of Transport, 2008, p4.

13. Ham et al, 2005.

14. van der Ploeg et al, 2007.

15. McDonald, 2007; deBoer, 2008, p14–18; Mackett et al, 2002, p9; Bringolf-Isler et al, 2008, p71.

16. Porter et al, 2010, p59.

17. World Bank, 2006.

18. Pendakur, 2005, pp15–17.

19. Porter and Blaufuss, 2002, p4; Porter et al, 2010.

impacted.²⁰ In Dar es Salaam (Tanzania), transport options to secondary schools are further constrained because bicycles are not prevalent and it is deemed unsuitable for girls to ride one, if it were available. This fact, combined with the cost of public transport, may cause children from poor families to stop attending school.²¹

While the names vary (e.g. rickshaw, pedicab, *pousse-pousse*, cycle rickshaw), utilization of human-powered transport to move cargo and people is a popular occupation for youth in many urban locations.²² Human-pulled rickshaws are widely used in Dhaka, Bangladesh. It is estimated that urban rickshaws account for 30,000 passenger miles and almost 100 ton-miles of goods movement. Rickshaws in Dhaka are important transport modes for female passengers and children.²³ Rickshaws had been banned from major roads in Dhaka as a way to reduce roadway congestion; the World Bank had originally supported this policy but reversed its position based on the negative impact it had on disadvantaged persons (women, children, disabled, elderly, poor) in terms of transport and employment opportunities.²⁴

Infrastructure conditions are varied around the world for non-motorized transport. In many developed countries pedestrian infrastructure such as sidewalks are prevalent in urban areas. However, related infrastructure such as crossing aids, appropriate signage for road users, and pedestrian-oriented lighting for safety, may be lacking. European urban areas have better developed and integrated pedestrian infrastructure systems than urban areas in the US. Particularly in lower-income neighbourhoods in the US, the pedestrian infrastructure is discontinuous and creates unsafe environments where it integrates with the auto environment for persons travelling on foot of all ages, but especially for children.

There is clear disparity in the development and condition of pedestrian infrastructure in urban areas of developing countries, as compared to auto infrastructure. In Latin American and Asian cities, infrastructure investments have focused on the automobile, often to the detriment of non-motorized transport in many neighbourhoods.²⁵ Pedestrian infrastructure is lacking in many of these settings, as is also the case in many African cities (though auto infrastructure in African cities does not fare much better).²⁶ Neighbourhoods often lack designated areas for pedestrian traffic, and when it is present it is often occupied by parked automobile traffic, including cars, motorcycles, and commercial traffic.²⁷

Dedicated infrastructure for bicycles is even less developed, with many urban areas lacking on-street bicycle lanes, off-street bicycle paths and/or suggested bicycle routes and the appropriate signage for road users. Many European cities take non-motorized transport into consideration in terms of urban design and transport planning, whereas urban areas within the US are more auto-centric in design, though slowly improving.²⁸ As noted above, cycling is a predominant mode of transport in urban areas in China and the infrastructure is therefore well developed for it, including dedicated bicycle paths connecting travel destinations.²⁹ Infrastructure is a necessary component for safe travel by non-motorized modes, yet it is not the only factor. Several urban areas in California have well-developed infrastructure for bicycles, yet rates of cycling by children, youth and adults remain low. Cultural attitudes toward various transport modes are influential factors in travel mode choice.

20. Porter et al, 2010; World Bank, 2006, pp12–13.

21. Olvera et al, 2003, p296.

22. Efroymson and Rahman, 2005; Konings, 2006.

23. Efroymson, and Rahman 2005, p17.

24. Efroymson and Rahman, 2005 p3.

25. Pucher et al, 2007; World Bank, 2009 p48.

26. Pendakur, 2005.

27. Pendakur, 2005, p6.

28. de Vries et al, 2010, p2310.

29. Pucher et al, 2007, p391.

In many urban locations, particularly in lower-income sections of cities, bicycles and pedestrians mix precariously with motorized transport due to the lack of dedicated infrastructure for non-motorized transport and overall congestion. This is an unsafe situation for everyone, and particularly children and youth who are smaller in size and more difficult to see.³⁰

Of particular importance for children and youth is the infrastructure around the school zone. Several countries, such as the US and Austria, have special guidelines for the use of traffic control devices to highlight the presence of a school and school children travelling as pedestrians and bicyclists. Flashing beacons and signage indicating a school zone, enhanced crosswalk striping, reduced speed limits and traffic calming are some examples of measures used to increase safety and awareness.³¹

2.2. Impacts/challenges of above trends from the perspective of children and youth

No issue is more significant for children and youth travelling by non-motorized transport than road safety. The statistics regarding road safety for children across the globe are alarming. Poorly designed infrastructure and rapid motorization combine to make motorized transport – and increasingly private motorized transport – the dominant and dangerous ‘king of the road.’ This is an important challenge for sustainable transport in urban areas. In developed countries such as the US, while the overall trend has been a decline in pedestrian and bicycle fatalities, this does not take into account a complementary decline in exposure – fewer children are walking and bicycling.³² In urban areas in developing countries, where children and youth travel mode choice is more constrained, exposure of child pedestrians and cyclists on increasingly congested roadways continues to rise.

The majority of youth killed as pedestrians and cyclists in road traffic crashes live in developing countries. Pedestrians and cyclists are over-represented in these statistics because of high numbers of individuals who travel by walking and bicycling (therefore exposure is great) and their vulnerability when forced to share infrastructure with other road users – cars, buses, trucks and sometimes animals.³³ In a study of fatal injury in children aged 0–14 in six South African cities, pedestrian injuries represented the highest percentage of fatalities in all six.³⁴ A study of child injury in Karachi, Pakistan found child pedestrians were the most commonly involved mode in motor vehicle crashes.³⁵

Personal security is another challenge children and youth face when walking and bicycling and on public transport (to be discussed in chapter 3) in urban areas and may cause a mode change to private motorized transport, if available. In the research on children’s school travel, harassment, unwanted contact with strangers, and bullies are often mentioned as negative aspects of walking and bicycling in both developed and developing countries. Girls in urban locations in South Africa and Malawi report fear of rape and high levels of harassment/verbal abuse from drunkards, strangers, cannabis users and minibus conductors.³⁶ In a survey in the UK, approximately half of secondary school aged children said that bullying happens ‘in the street’ (i.e. while walking).³⁷

30. Toroyan and Peden, 2007, p10.

31. National Center for Safe Routes to School, 2007; Mailer and Schopf, 2002.

32. McMillan, 2005, p442.

33. Toroyan and Peden, 2007, p5.

34. Burrows et al, 2010, p3.

35. Razzak et al, 2004, p116.

36. Porter et al, 2010, pp65–67.

37. Department for Children, Families and Schools, 2009, p9.

Populations such as children, the elderly and persons with respiratory illnesses are especially vulnerable to air pollutants such as those associated with vehicle emissions – sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and particulate matter – as are road users with more direct exposure such as pedestrians and bicyclists (popular travel modes for children). Children are more susceptible to air pollution than adults because their respiratory systems are still developing in the first few years of life, and because they absorb and retain pollutants in their bodies more readily.³⁸ A recent report by the Centers for Disease Control and Prevention found that asthma in the US is more prevalent in children, the poor, females, the multiracial and Puerto Rican Hispanics.³⁹ Worldwide, it is the most common chronic disease among children.⁴⁰ Children and youth that are walking and bicycling are exposed to emissions from vehicles that can be high polluters in many locations because of their age, level of maintenance or engine or fuel type (as in the case of the 2-stroke engine on many 2-wheelers and those vehicles that still use leaded gasoline and higher polluting diesel fuels). Road dust also contributes to particulate matter. All of these conditions can contribute to respiratory conditions in children and youth.⁴¹

Over the past several years more attention has been paid to the positive impact of non-motorized transport on children's physical activity. It is perhaps obvious but so often ignored that walking and bicycling are human-powered transport modes that result in energy expenditure. While many children and youth are physically active in other ways such as free play, sports, etc., walking and bicycling provide an opportunity to accumulate more time being physically active, which may help to reduce the alarming trend in child overweight/obesity in many developed countries. As an example, a walk to and from school can typically contribute at least one third of the required time children should be active each day (the recommendation is 60 minutes of physical activity most days of the week). While this issue is most noticeable in developed countries such as the US, Australia and Great Britain, the trends of increased private motorized vehicle ownership and subsequent car trips to school in higher income areas of developing countries' urban areas indicate that this problem may not remain so isolated in the future.

38. World Resources Institute, 1999, pp5–6.

39. Centers for Disease Control and Prevention, 2011, p86.

40. WHO, 2008.

41. World Resources Institute, 1999.

3. Public Transport

This chapter examines the global conditions and trends in public transport in urban areas from the perspective of children and youth.

3.1. Trends and conditions in public transport and related infrastructure from the perspective of children and youth

Public transport is an important sustainable transport mode for children and youth, increasing mobility and promoting independent travel. Use of public transport by young people can reduce the number of trips made by private motorized vehicle with young people as passengers. In addition, children and youth utilizing public transport systems can decrease overall household transport expenses by reducing the cost of private vehicle travel, or reducing the necessity for a second vehicle.⁴² Public transport provides greater mobility and a means of travelling independently to youth while they are still under a legal driving age, and could delay their desire or need to drive.⁴³ The trend discussed in the private motorized transport chapter regarding reductions in the number of youth holding driver's licenses in several urban areas is in part possible due to good public transport systems.⁴⁴ Finally, moving youth from private motorized vehicles (either as passengers or as drivers) to public transport would have a positive impact on air quality due to reduced vehicle emissions.

Global trends in public transport indicate that it is a well-used transportation mode by children and youth in both developing countries and many European countries, along with non-motorized transport. Older youth (15–20) are a high user group, particularly on bus transport, which is less expensive than rail in cities that have both. In Great Britain, youth age 17–20 took the highest number of trips on buses in 2009, compared to all other age groups.⁴⁵ In medium and large urban areas in Great Britain, over 90 per cent of households live within a 13 minute walk of a bus stop with at least hourly bus service, making it a feasible and accessible transport option for those households with children and youth.⁴⁶ The London Area Transport Survey conducted in 1991 found that only 6 per cent of children age 8–11 took the public bus to school, yet 26 per cent of youth age 12–16 utilized the bus.⁴⁷ Public buses are more common for school travel in urban areas in the UK, as opposed to dedicated school bus service. However, the West Yorkshire Passenger Transport Executive, Metro, has introduced a youth-oriented public transport programme called 'generationM', which includes dedicated yellow school bus service within its public transport system.⁴⁸ Many urban areas in developed countries see bus use increase and car trips decrease as a mode of travel to school for secondary students, indicating that parents feel more comfortable allowing the children to travel independently and that the trip distance from home to school has likely increased for secondary school locations.⁴⁹ This trend generally continues, as youth become students at university. The cost of education and the generally good level of service to urban educational institutions may help to keep youth on public transport.⁵⁰ However, data also indicates that youth tend to become license holders when they finish school and/or work more and that their utilization of public transport then decreases.⁵¹

42. Bradshaw and Atkins, 1996, pp2,8.

43. Bradshaw and Atkins, 1996.

44. Noble, 2005; Ruud and Nordbakke, 2005; Guidez, 1996.

45. Department of Transport, 2010c, p2.

46. Department of Transport, 2010d, p2.

47. Bradshaw and Atkins, 1996.

48. West Yorkshire Passenger Transport Executive, 2011.

49. de Boer, 2008, pp16–17.

50. Noble, 2005.

51. Ruud, 2006, p3.

Youth ride public transport in larger, denser cities, such as New York and Boston, for access to school, employment, etc.; yet in other large yet less dense US cities such as Los Angeles, the automobile remains the dominant mode for trips by children and youth. Utilization rates by youth overall on US transit systems, however, are lower than in London. A study of US transit systems that carry the largest percentage of riders found that children and youth 14 years old and younger took 4.0 per cent of all trips, youth 15–19 years of age represented 8.5 per cent of all trips and youth 20–24 years of age took 11.5 per cent of all trips. School trips represented the second largest trip purpose of transit riders in the study.⁵² As is the case with other transport modes covered in this report, data on utilization rates of public transport by children and youth use in urban areas in developing countries is difficult to locate.

In many cities in developing countries, conventional public transport services such as large buses and rail generally make up a small percentage of public transport service provision (informal transport is more prevalent, as will be discussed in chapter 4). General data from Karachi (Pakistan) and Beijing (China) both show a decrease in public transport from the late 1970s–mid 1980s to the early 2000s and an increase in private motorized and informal/paratransit.⁵³

Children of poor settlements in Colombo (Sri Lanka) who attend less prominent schools do not have dedicated school bus services and are therefore dependent on the ordinary passenger bus service. Children report that operators of this service often refuse to pick them up because they travel on a reduced fare during peak hours and are therefore not as profitable a passenger.⁵⁴

Emergency medical services are a public transport that provides important pre-hospital care. The challenge for emergency medical services in any urban environment for all emergency patients is the ability to provide care quickly, whether travelling to the victim or transporting the individual to hospital care. Specific to children and youth, to increase their survival rate from road traffic collisions or other health issues, emergency vehicles should be outfitted with equipment that accommodates children's smaller stature and technicians should be trained in how to medically care for children and youth.⁵⁵

3.2. Impacts/challenges of above trends from the perspective of children and youth

Social exclusion is a process through which individuals; groups or communities are progressively prevented from participation in aspects of society such as education, employment, food shopping and health care.⁵⁶ Public transport systems that are expensive, poorly designed (e.g. no low-floor boarding for wheelchairs, strollers) poorly integrated with urban land uses, do not have good service coverage for the total population of an area, are in poor condition or are virtually non-existent constrain the transport options for children and youth. As an example, in Dar es Salaam (Tanzania), only primary schools and community dispensaries are prevalent in the unplanned (poorer) wards of the city. Therefore, to continue schooling and/or reach more extensive health services requires access via public transport to travel greater distances as well as the time and budget to do so.⁵⁷

52. APTA, 2007, pp8,19.

53. Ahmed et al, 2008, p132.

54. Sohail et al, 2006, p185.

55. Toroyan and Peden, 2007, p35

56. Transport and Urban Life Commission, 2007, p1.

57. Olvera et al, 2003, pp292–296.

Security issues such as bullying and harassment on public transport are other barriers to travelling by this mode for vulnerable populations such as children, youth, women and the elderly.⁵⁸ A study examining passengers' perceptions of personal security on public transport for the UK Department of Transport found that young people shared similar concerns as adults travelling on public transport – drunks on buses, intimidation by other people, dark stations and isolated bus stops. Teenage boys were intimidated and harassed by other groups of young men, while young women were uncomfortable with unwanted attention from other travellers, often young men. Younger children were also intimidated by the actions of the older youth, and had general concerns when travelling alone such as missing their stop, getting lost, strangers, and unfriendly bus drivers with little sensitivity towards the concerns of young travellers.⁵⁹ Minibus conductors were also listed as a harasser in a study of urban school children in South Africa, Ghana and Malawi.⁶⁰

Youth, however, are often perceived as the perpetrators of behaviour that makes other passengers insecure, such as gathering in large groups, loud talk and music, smoking and drinking on and around public transit, putting their feet on the seats, not paying for travel. Many transit systems around the world experience these issues with youth. In the UK Department of Transport study, a small minority of young people exhibited these negative behaviours and generally showed little awareness of their rule-breaking or their impact on other passengers.⁶¹

Overloading creates a significant safety risk for passengers and decreases the quality of service. Children and youth, being of smaller stature, are quite vulnerable in overloading situations. The Ministry of Transport in Nairobi (Kenya) has successfully enforced regulations related to overloading: all seats must be fitted with seatbelts and passengers must use them, and standing is not allowed on the larger Bus Track buses. However, the Bus Track operators reported a significant loss of revenue due to decreased capacity from the prohibition of standing, despite the buses being designed to accommodate standing passengers.⁶² Safety on and off public transport is also an issue. Children in case studies from Colombo (Sri Lanka), Faisalabad (Pakistan), and Dar es Salaam (Tanzania) reported aggressive driving by operators such as racing and sudden braking, and also that operators would not yield to the children when they attempt to cross the road at pedestrian crossings.⁶³

Aging public transport vehicle fleets in many cities can contribute to respiratory conditions in children and youth.⁶⁴

As was briefly mentioned earlier in the chapter, another important challenge for public transport with this young population group in many developed and developing countries is maintaining and/or increasing youth's interest in using this sustainable transport mode as they reach driving age. Public transport operators are challenged to promote their systems as cool, inter-modal (i.e. the ability to change transport modes during a trip, such as load a bike onto a bus), flexible, efficient and environmentally friendly, and as freedom giving as the private automobile.⁶⁵ Surveys of public transport operators in Great Britain and in Germany found variations in fare reductions for children and youth. The surveys also found restrictions may exist for bicycle transport, thereby constraining inter-modality, and that few involved youth in

58. Department for Children, Families and Schools, 2009, p9.

59. Turnstone Research, 2010, pp83–85.

60. Porter et al, 2010, p66.

61. Turnstone Research, 2010, p81–82.

62. Adam Smith International, 2005, pp21,50.

63. Sohail et al, 2006, p187.

64. World Resources Institute, 1999.

65. Ruud and Nordbakke, 2005, p6.

public transport planning (though some positive examples will be discussed in chapter 8).⁶⁶ Therefore, the overall challenge is to improve the quality and experience of public transport, in terms of cleanliness, frequency and reach of services, while keeping the cost of service down, in order to serve all.

66. Department for Transport, undated; Bäumer and Müller, 1999, p31.

4. Informal Motorized Transport

This chapter examines the global conditions and trends in informal motorized transport in urban areas from the perspective of children and youth.

4.1. Trends and conditions in informal motorized transport and related infrastructure from the perspective of children and youth

Informal transport systems such as minibuses, vans, taxis, three-wheelers, rickshaws and motorcycles often develop as a supplement or replacement to the formal public transport system where the system is deemed insufficient or unable to meet the needs of potential users (i.e. cost, inadequate infrastructure, inaccessibility, inconvenience).⁶⁷

Informal motorized transport is primarily important to children and youth in two ways: for mobility and employment. Children and youth mostly use this form of transport to travel for school and employment. Motorcycles and commercial vans are two primary informal transport modes in Bangkok (Thailand) that serve this population. A survey of motorcycle customers in 1992 found that 54 per cent were between the ages of 16 and 25, 60 per cent were female and 44.4 per cent had or were pursuing college educations. A 1997 survey in Bangkok of commercial van passengers revealed that 64 per cent were female and that students (college and grade-school) made up 46 per cent of the ridership.⁶⁸ In contrast, in Yola (Nigeria) males were the primary users of *okadas* (motorcycle taxis) (65 per cent), and 57 per cent of riders were aged 18–30.⁶⁹ *Peruas* in São Paulo (Brazil) also mainly serve young adults (50 per cent of riders are between ages 18 and 30).⁷⁰

Travel conditions on informal motorized transport are not always pleasant for children and youth. As was found in Sri Lanka with public transport, a study of access to services in Dar es Salaam found that operators of *dala dalas* (bus and minibus transport) are unfriendly to schoolchildren and often refuse to pick them up during rush hour because this population is viewed as unprofitable due to the concessionary fare that the authorities asked *dala dalas* to grant to schoolchildren.⁷¹

Informal motorized transport is seen as an entry point into the labour market for many youth, oftentimes low-skilled young men that have recently migrated to an urban area.⁷²

A comparison of the operator characteristics of hired-motorcycle operators in Yola (Nigeria), Bangkok (Thailand) and Jakarta (Indonesia) found virtually all of them to be male, just less than half were married, and the average age was 21.5, 27 and 32.4, respectively. Education levels also varied across the three locations, though were generally high: 37.6, 47.9 and 58 per cent had at least a secondary education, respectively. In Yola and Jakarta, approximately 53 per cent were born in the same region, while in Bangkok only 35.5 per cent were born in that region.⁷³ Informal motorized transport can also increase the mobility of youth to reach employment opportunities by reducing the time cost of travel (as compared to walking).⁷⁴

67. Cervero and Golub, 2007, p445.

68. Cervero and Golub, 2007, p451.

69. Cervero, 2000, p151.

70. Cervero, 2000, p135.

71. Olvera et al, 2003, p293–296.

72. Cervero, 2000, p28; Cervero and Golub, 2007, p446–453.

73. Cervero, 2000, p29.

74. Cervero and Golub, 2007, p456.

In Douala (Cameroon), '*bendskins*' (motorcycle taxis) have filled the gap left vacant by the public bus system, and are well-adapted to navigate the congested and poorly maintained road infrastructure throughout the city. Small capacity motorcycles are often used (less than 100cc), which do not require a driving license.⁷⁵ It is estimated that there are approximately 30,000 *bendskins* in Douala. Youth are often employed as drivers, providing them with gainful employment at a decent monthly income. A survey of one hundred male *bendskin* drivers and fifty male *pousseurs* (hand-cart operators) found the age range to be between 15 and 35, the majority were married and like the operators in Yola, Bangkok and Jakarta mentioned above, many were well educated (43 per cent had some secondary education).⁷⁶ Ownership of a *bendskin* is associated with income and experience so it is assumed that a minority of youth own their motorcycles. The growth of *bendskins* in Douala also created spin-off businesses to serve the needs of this section of the transport industry, such as parts and repair shops and the sale of used motorcycles imported from other countries.⁷⁷

While informal motorized transport is most dominant in developing countries, two travel modes associated with school trips in developed countries could be classified as informal motorized transport as well. First, the 'yellow school bus' (which might also be considered public transport by some) provides transport services to communities large and small across North America. In the US, 440,000 public school buses transport 23.5 million children to and from school and school-related activities each day. School children are eight times safer riding in a school bus than a passenger vehicle⁷⁸ and a school bus can remove up to 50 private vehicles from the roadways near schools, reducing traffic congestion and vehicle emissions. The school bus fleet in the US is becoming cleaner in its own emissions through newer buses and better fuel technologies, partially through support from the Diesel Emissions Reduction Act recently re-authorized through the US Congress and signed into law by President Obama.⁷⁹ The second mode is the 'school carpool,' which is important in areas where school bus service has been reduced or is not provided by the school and/or where schools are trying to promote sustainable transport modes and reduce single passenger private motorized travel to the school. In the US, many urban school districts no longer provide transportation by the 'yellow school bus' or have significantly reduced the number of students served based on travel distance due to transportation costs. This trend has contributed to an increase in the number of children being driven to school, either as a single passenger, or in a school carpool carrying multiple students. While this informal transport system still puts vehicles on the road, it is a more sustainable alternative to a single-passenger vehicle trip.

4.2. Impacts/challenges of above trends from the perspective of children and youth

The positive impacts of the informal motorized transport system are the increased employment opportunities and financial security that they can provide youth in many urban areas, and increased mobility options for children and youth (and other transport-constrained population groups) when formal public transport systems are lacking in service and/or are too expensive.

Negative aspects of the informal motorized transport system are the impact they have on already congested urban areas and the health issues they present, in terms of environmental air

75. Adam Smith International, 2005, pp.xiv–xv.

76. Konings, 2006, p42.

77. Adam Smith International, 2005.

78. McCray and Brewer, 2005.

79. School Bus Fleet, 2011.

quality, noise and road safety. Many of the motorcycles, scooters and auto rickshaws operated as taxis are 2-stroke engines, which give off significant emissions.⁸⁰ The noise from these engines is also a problem.⁸¹ Minibuses and regular buses are also often older and not utilizing the cleanest fuels. Operators of informal motorized transport are seen as reckless drivers in many cities (e.g. *bendskin* operators in Douala), ignoring the rules of the road, travelling at high speeds and endangering the health of their passengers, themselves and other individuals on the congested roadways.⁸² Since youth (especially males) are notorious risk-takers, this behaviour is not at all surprising. Also of note is the fact that if youth are operating a motorcycle under 100cc, a driving license is not required. Therefore, it is reasonable to assume that youth who are not only risk takers but also inexperienced at driving may be operating these vehicles on crowded city streets.⁸³ Overcrowding on informal motorized transport vehicles such as minibuses, motorcycle taxis, and auto rickshaws also increased the risk of injury or death.⁸⁴ An analysis of child injury in Karachi (Pakistan) between October 1993 and January 1996 found that child minibus passengers were the second most common trip mode involved in motor vehicle crashes (after children pedestrians, as victims). This analysis also found 62 children who were injured or killed falling from minibuses and buses during this period. Minibuses were also the most common vehicle involved in motor vehicle crashes overall (either striking a child pedestrian, or another motor vehicle).⁸⁵

80. Cervero and Golub, 2007, p456.

81. Pucher et al, 2007, p393.

82. Konings, 2006, p43.

83. Adam Smith International, 2005, pp.xiv–xv.

84. Pucher et al, 2007, p394.

85. Razzak et al, 2004, pp116–117.

5. Private Motorized Transport

This chapter examines the global conditions and trends in private motorized transport in urban areas from the perspective of children and youth.

5.1. Trends and conditions in private motorized transport and related infrastructure from the perspective of children and youth

Private motorized transport affects children and youth as users of the transport system in three different capacities: 1) passengers, 2) current and future drivers and 3) non-motorized users impacted by private motorized transport. Private motorized transport is the predominant mode of transport for children and youth in many developed countries,⁸⁶ whereas it is quite income-sensitive in developing countries.

5.1.1. Serving young passengers

The number of trips taken by children and youth as passengers in private motorized transport is increasing in most global urban locations, in concert with increased overall private motorized transport usage globally. Data from the Transportation Tomorrow Survey in the Toronto region of Canada indicates that the car travel was the main mode of travel for youth age 11–15 in 2006, with non-motorized and transit trips decreasing.⁸⁷ Car and motorized two-wheeler ownership has increased dramatically in cities in China, India and Pakistan in middle and higher-income populations.⁸⁸ While these statistics do not examine children and youth specifically, it is assumed that this trend is leading to an increase in private motorized vehicle trips as passengers in the younger population. Private motorized vehicle use is also largely income specific in urban areas in other developing countries.

In recent years, a large focus in developed countries has been put on the school trip for children and youth, because of the notable modes shifts that have occurred over time. Private motorized transport to school has increased dramatically, even in some urban settings, and walking and bus transport has decreased, most notably in the younger age groups. In the US, national data shows that only 17.1 per cent of students were driven to school by private motorized transport in 1969; by 2001, 55 per cent travelled to school by that mode (preliminary data analysis from the 2009 data set shows auto travel to school at 50 per cent).⁸⁹ Parents cite distance from home to school, convenience (e.g. school is on the way to work), traffic safety and personal security as the main reasons for providing private transport to children and youth as opposed to allowing them to travel independently.⁹⁰ Trend data from Sydney (Australia) shows a sharp increase in car travel to school, from 22.8 per cent in 1971 to 66.6 per cent for children aged 5–9 in the 1999–2003 dataset from the National Household Travel Surveys of the New South Wales Government Department of Planning. A similar rise was seen in youth aged 10–14, from 12.2 per cent in 1971 to 47.8 per cent in 1999–2003.⁹¹ Data specific to the London metropolitan area (UK) indicates that private cars make 29 per cent of trips to school.⁹² Older children appear to be a bit more independent in their school travel, with higher rates of public transport use, suggesting they are not escorted to school by private motorized vehicle as much as primary school children. A report on urban poverty and

86. Department for Transport, 2010c, p1; McDonald, 2005, p32; van der Ploeg, et al, 2007, p61.

87. O'Brien et al., 2009, p7.

88. Pucher et al, 2007, pp388–389; Ahmed et al, 2008, pp131–132.

89. McDonald, 2007, p511; McDonald, 2011 (under review).

90. McDonald, 2007, pp514–515; de Boer, 2008, pp14–18; Mackett et al, 2002, p9.

91. van der Ploeg et al, 2007, p.61.

92. Department for Transport, 2010d, p2.

transport in Mumbai (India) found very few children travelling to school via private motorized transport (auto or two-wheeler), even at the highest incomes class examined (>20,000 Rs. per month).⁹³

5.1.2. Trips by young drivers

The trends of increased urbanization, motorization and growing youth populations in many urban areas of the world suggest that the number of young drivers of both 4- and 2-wheel private motorized vehicles will continue to increase. Minimum licensing ages in both developed and developing countries is approximately mid-teens (14–18), though there are many youth that operate motorized transport at a younger age without the proper licensure (and at an older age as well). Several countries have provisional or graduated licensing programmes, where new drivers (particularly young drivers) are restricted to driving at certain times or for particular trip purposes, and must be accompanied by a licensed adult at certain hours for a probationary period or until they reach a certain age.⁹⁴

There is a trend in several developed countries such as Great Britain, the US, Norway, Sweden and Finland of a decreasing percentage of young people that are full car driving license holders.⁹⁵ In Great Britain, data from the National Travel Survey indicates that the number of males aged 17–20 that are full car driving license holders has ranged from a high of 58 per cent in 1991/1993 to a low of 30 per cent in 2004, with the last year of data (2009) finding 37 per cent. Female licensure rates were generally lower over the same time period, with the highest years being seen between 1992–1995 (42 per cent) and the lowest being in 2004 (24 per cent). Thirty-five per cent of females aged 17–20 were full license holders in 2009.⁹⁶ Full license holding fell more significantly in urban areas than rural, where fewer alternative forms of transport are available.⁹⁷ However, National Travel Survey data indicates that both full and provisional license rates of young people aged 17–24 fell in London between 1992/94 and 2002/04.⁹⁸ The cost of obtaining a license and owning a vehicle were the main reasons given by these young people, with family, friends and alternative transport options also being important reasons.⁹⁹ Data from license records in the US show a decline from 52 per cent in 1992 to 43 per cent in 2002, with cost also being a primary factor.¹⁰⁰ The reduction in license holding by youth in developed countries is an important trend to highlight and possibly capitalize on for promotion of sustainable urban transport.

As noted earlier, travelling by private motorized vehicle, whether as a child passenger or a teen driver, is associated with income in many developing countries. In one study of youth in Lusaka (Zambia), middle-income youth were found to travel more often by car or public transport for work and education than lower-income youth.¹⁰¹ Motorcycle or two-wheeler use is increasing exponentially in many parts of the world as a first entry into the motorized transport world for the driving-age population, because they are much cheaper to purchase and maintain and provide better fuel mileage. As an example, an estimate in 2005 indicated that over one-third of the population of Ha Noi, Viet Nam, currently own a motorcycle. Motorcycles made up 60 per cent of the mode share in that city.¹⁰² In South-Eastern Asia

93. Baker et al, 2005, p78.

94. NHTSA, 2010; Government of Western Australia, undated; OECD, 2006, p120–125.

95. Noble, 2005, p17.

96. Department for Transport 2010a, Table NTS0202.

97. Noble, 2005, p15.

98. Noble, 2005, p15.

99. Department for Transport, 2010b, Table NTS0203.

100. Noble, 2005, p18.

101. Gough, 2008.

102. Tuan and Shimizu, 2005, p1752.

cities like Ha Noi, the motorcycle is commonly considered to be the family vehicle and is used to transport children and youth, or youth are the operators themselves.¹⁰³

5.2. Impacts/challenges of above trends from the perspective of children and youth

Motorization has several impacts on children and youth, such as 1) constraints on and opportunities for mobility and accessibility; 2) changes in road safety; and 3) increased exposure to vehicle emissions.

As discussed above, parents in urban areas of developed countries often choose to transport younger children by car to places such as school or after-school activities because of traffic and personal security concerns. However, this escorted travel may inhibit a child's independence and development of decision-making skills in relation to traffic. It may also cause the child to develop a certain feeling of dependency on others for transport and other activities of life.¹⁰⁴ This is important particularly as children grow older and use of more sustainable transport modes such as public transport, walking and bicycling require more independence. The opposing side of this argument is that private motorized transport may also provide youth with more independent mobility as they reach licensing age.

Changing the desire of youth to drive is the major challenge in changing private motorized transport behaviour. The environmental impacts of private motorized vehicles do not seem to sway their attitudes towards driving as much as the cost of obtaining a license and owning a vehicle does.¹⁰⁵ A study of youth mobility in France in the 1990s found that the auto was the desired mode of transport even for those that travelled by public transport.¹⁰⁶ Youth participating in a study on travel behaviour in the context of climate change in the city of Bristol (UK) stated that car travel was faster, more comfortable and allowed more flexibility, freedom and control. Knowledge of climate change in and of itself would not influence their travel decisions (even if they decided to make a trip on foot).¹⁰⁷

The impact of increased motorization on road safety is significant. As introduced in chapter 1, road traffic crashes are a leading cause of death and injury in young people. Youth living in developing countries make up the majority of these deaths. In both developing and developed countries, children and youth are at risk as both passengers and drivers of private motorized transport, as well as users of 2-wheeled vehicles such as motorcycles and scooters.¹⁰⁸ Data from Thailand shows that motorcycles are involved in many accidents among Thai children and that children are just as often drivers of those motorcycles as they are passengers or pedestrians struck by a motorcycle.¹⁰⁹ In Karachi (Pakistan), children as motorcycle passengers was the third most common trip mode for children involved in motor vehicle crashes (9 per cent of crashes, as compared to 26 per cent for child pedestrians or 21 per cent as child minibus passengers).¹¹⁰

Young people have less experience driving and are more likely to be influenced by peers and be greater risk-takers, particularly young males.¹¹¹ In the US, traffic crashes are the

103. Toroyan and Peden, 2007, p20.

104. Hillman et al, 1990.

105. Noble, 2005, p10.

106. Guidez, 1996.

107. Line, et al, 2010.

108. Toroyan and Peden, 2007, p5.

109. WHO, 2008b, p4.

110. Razzak et al, 2004, p116.

111. Toroyan and Peden, 2007, pp8–11.

leading cause of death for teenagers; young drivers age 15–20 are involved in three times as many fatal crashes as all other drivers, mile for mile.¹¹² Within Organisation for Economic Cooperation and Development (OECD) countries, young drivers aged 15–24 represent between 18 and 30 per cent of all killed drivers, yet only make up 9 to 13 per cent of the total population in these countries.¹¹³ Young drivers not only put themselves at risk; they also increase the risk of injury and death of all other users of the road, regardless of age. Research from the US and the Netherlands found that for every young driver killed, more than 1.3 passengers or other road users die in the same crash.¹¹⁴ Death rate for male drivers are consistently higher than for females, even after adjusting for differences in driving rates.¹¹⁵

As noted earlier, road traffic fatalities in youth riding motorcycles (either both passengers or drivers) are very high in Eastern Asia, where utilization of this transport mode is increasing rapidly.¹¹⁶ Young driver behavioural factors are the same on a motorcycle as with a 4-wheeled vehicle, and the lack of physical protection around the operator increases the risk of injury and death even more.¹¹⁷

Reduced air quality and the health impact on children and youth due to private vehicle emissions is a challenge in this time of increased urbanization and motorization. The ‘school run’ is a significant contributor to vehicle emissions and traffic congestion in and around the school zone. In London, as much as 20 per cent of the traffic during peak school start times is due to parents driving children to school.¹¹⁸ A study conducted during the 1996 Summer Olympic Games in Atlanta, US, examined the impact of private vehicle travel restrictions and enhanced public transportation services put into place during the Games on peak traffic flow, one-hour peak ozone levels and asthma acute care events in children aged 1–16. Morning traffic reduced by 22 per cent and one-hour ozone decreased by 28 per cent. Asthma emergency care, urgent care and hospitalizations reduced approximately 42.9 per cent, based on medical claims to Medicaid and health maintenance organizations.¹¹⁹ This study indicates the direct and immediate impact that reducing the number of vehicles on the roadway can have on air quality and respiratory health in children.

112. NHTSA, 2010.

113. OECD, 2006, p13.

114. OECD, p13.

115. OECD, p14.

116. Toroyan and Peden, 2007, p5; WHO, 2008a.

117. Toroyan and Peden, 2007, pp20–22.

118. Mackett et al, 2002.

119. Friedman et al, 2001, p900.

6. Commercial Goods Transport

This chapter examines the global conditions and trends in commercial goods transport in urban areas from the perspective of children and youth.

6.1. Trends and conditions in commercial goods transport and related infrastructure from the perspective of children and youth

The delivery and collection of goods is a necessary component of urban living. The economic and social sustainability of an area is dependent on the effective, efficient, affordable and safe transport of goods to the population within the given urban area. Children and youth are increasingly active in commercial goods transport.

Given that youth represent a growing proportion of the populations in areas such as cities in Sub-Saharan Africa and Latin America, it is not surprising that they are both formally and informally employed in the industry of commercial goods movement. Human-powered modes such as bicycles, pedi-cycles, handcarts (e.g. *pousse-pousse*, rickshaws) provide a mechanism for youth to become employed before they reach driving age. In Douala, Cameroon, youth are resourceful operators of *pousse-pousse*, handcarts for hire or under contract that can carry 300–800 kg of merchandise (demographics for *pousseurs* discussed in informal motorized transport chapter as they were combined with *bendskin* driver demographics in this study). *Pousseurs* make between 30,000 and 75,000 CFA franc a month, which is well above the guaranteed minimum wage in the formal sector (25,000 CFA franc).¹²⁰ Hand-pulled and cycle rickshaws are used in cities in Bangladesh and India.¹²¹ Once driving age is reached (or before if concerns about enforcement of licensure are small), youth also operate motorized vehicles to move commercial goods.

As metropolitan areas become more motorized, the movement of commercial goods becomes more challenging, leading operators to search for a variety of means to distribute goods. A standard logistics solution is to set up sub-distribution areas outside of the central city and then utilize non-motorized or smaller, less polluting and congestion causing vehicles to make deliveries to areas within the city. This trend can lead to increased employment opportunities for youth, particularly if non-motorized transport modes such as handcarts are utilized as delivery options along with motorized vehicles. A bakery in Bogotá (Colombia) significantly reduced its distribution costs, increased employment and reduced its environmental impact in the urban area by executing this scheme.¹²²

Youth employment in commercial goods movement could also be negatively impacted by the infrastructure system. In many African cities, commercial goods movement is impeded by the very commercial goods they are delivering: a report on urban mobility issues by the Sub-Saharan Africa Transport Policy Program notes that street vendors occupy 25–35 per cent of road space,¹²³ significantly constraining the space for deliveries. Commercial activities also impede onto the non-motorized infrastructure system, further decreasing transport system capacity for all users.¹²⁴

120. Konings, 2006. At an exchange rate of 655.957 CFA franc per € (euro), this amounts to €46, €114 and €38 respectively.

121. Efrogmson and Rahman, 2005; Pucher et al, 2007.

122. Replogle, 1989.

123. Pendakur, 2005, p6.

124. Adam Smith International, 2005, p.xiv.

6.2. Impacts/challenges of above trends from the perspective of children and youth

Trends in commercial goods movement can have a significant impact on children and youth's mobility and health.

Caregivers of children and youth in urban areas in both developed and developing countries often cite traffic safety (including truck traffic) as a travel concern for this young age group, leading many caregivers to constrain trips and thereby the mobility of children and youth. This also relates to the issue of social exclusion, as discussed in Chapter 3, in terms of the infrastructure as a whole limiting the mobility of disadvantaged populations.¹²⁵

Overloaded infrastructure for the movement of people and commercial goods movement may also negatively impact children's road safety. As was discussed above, the infrastructure in many African cities is poorly designed to accommodate a mix of modes safely. Therefore, there is often significant congestion, road noise and mixing of trucks, private vehicles, various modes of public transport and non-motorized transport. This chaotic environment raises the risk of road traffic accidents, particularly for more vulnerable road users like small children. There are clear developmental differences that increase the risk of children: 1) given their size, children are much harder for vehicle traffic to see, particularly larger trucks; 2) noisy environments make it difficult for children to determine what direction traffic is coming from; and 3) young children have difficulty judging the size and speed of vehicles as well as the distances and complexities of road crossings.¹²⁶

Air quality is another significant challenge in children in relation to commercial goods movement. Both the volume of freight vehicles and their condition are factors that may contribute to high rates of air pollution in urban areas. Old and poorly maintained fleets of freight vehicles are significant polluters. Lead from leaded gasoline and particulate matter from diesel fuel and road dust are of particular concern for youth. Lead is a toxin that can have an impact on children's intellectual development.¹²⁷ Particulate matter from diesel fuels and road dust can irritate young children's still developing respiratory systems.¹²⁸ With children and youth travelling primarily by walking and bicycling in many urban areas in developing countries, and many roadways that carry commercial goods traffic unpaved or poorly paved, their exposure to toxic vehicle emissions is high.

125. Transport and Urban Life Commission, 2007.

126. Toroyan and Pedens, 2007, p10.

127. Canfield et al, 2003.

128. US Environmental Protection Agency, undated.

7. Land-Use and Transport Planning

This chapter examines the global trends and challenges of land-use and transport planning in urban areas from the perspective of children and youth.

7.1. Trends and conditions in land-use and transport planning from the perspective of children and youth

The relevance of land-use and transportation planning for sustainable transport for children and youth primarily centres around accessibility, mobility and affordability, and safety.

7.1.1. Accessibility

Ideally, land uses that important to children and youth would be easily reachable by the sustainable transport modes used by the majority of children around the world: walking and bicycling. The future of development is more megacities that by default are relatively sprawling. Development/redevelopment using a neighbourhood concept may increase access to basic services such as school, health care and employment opportunities for children and youth.

A trend that is occurring in many developed countries – which is a reflection of accessibility for children and youth – is the change in travel distance from home to school. National-level data from the US found that walking rates to school for children living within 1 mile of school declined from 85.9 per cent to 49.9 per cent. However, the per cent of students living close to school also decreased across this same time period. When the active travel to school data was standardized by distance, age and race, the change in the spatial distribution of students with respect to their schools accounted for 47 per cent of the decline in walking.¹²⁹ A study of sixteen elementary schools in California found that students living within one mile of school were three times more likely to walk than travel by private motorized vehicle.¹³⁰ Similar results were also found in studies from Oregon (US), England (UK) and Australia.¹³¹ The trend in home to school distance in developed urban areas is influenced by factors such as school choice; desegregation; school consolidation; politics; and land values, along with residential choice. In research on school travel in urban areas of South Africa, Ghana and Malawi, the percentage of children aged 9–18 that attended the school closest to home relevant to their educational level ranged from 57–72 per cent. In these countries, factors such as family history at a particular school; religion; proximity to a family business; or government allocation played a role in the relationship between home to school distance. Regardless of school location, walking was the dominant mode in these settings.¹³²

Therefore, while proximity of home to school can influence the use of sustainable forms of travel such as walking and bicycling, particularly in urban areas in developed countries, other factors come into play that highlight the importance of mobility in the land use-transportation relationship.

7.1.2. Mobility and affordability

In some cases services will not be accessible in close proximity to home or as in the school example above, a choice will be made to not utilize the closest service. In these situations,

129. McDonald, 2007, p512.

130. McMillan, 2007, p76.

131. McMillan, (2009), p2.

132. Porter et al, 2010, p56.

land-use and transportation systems that are well-planned can insure that these destinations are still reachable along a reasonable transportation route that is not time-consuming and is also affordable. In the example of urban school children in the three African countries described above (and elsewhere in this report), approximately half of students in South Africa and Malawi reported it took them between 16 and 45 minutes to travel to school (urban students in Ghana generally reported shorter travel times), and most of that travel was by walking, though a small percentage of informal transport use was reported in South Africa. Direct routes by foot or safe and affordable informal transport options are therefore important.

In many cities in the developing world, the urban poor live in unplanned settlements and slums on the periphery of cities, while employment densities are greatest within the central part of the cities. Transport systems (whether road infrastructure, formal or informal motorized transport or non-motorized transport) to these opportunities are often poor: congested, unreliable and often unsafe, which may constrain youth employment.

7.1.3. Safety

Safety is affected not only by the relationship between land-use and transportation systems but also the design of each element and may sometimes appear to be in conflict with goals for less sustainable modes of transport, such as private motorized transport. For example, locating schools along high volume, high speed roadways may make them more accessible for motorized transport but will increase the risk of pedestrian and bicycle injury and fatality, particularly if non-motorized infrastructure is not part of the overall design of the school's site design and transport system. In addition, transportation planning should take into account the land uses in a given area, and vice versa. In the study of child injuries in Karachi (Pakistan) discussed above, 6 out of 42 locations accounted for more than 71 per cent of all child pedestrian injuries. Lack of safe play spaces for children and number of children per acre were among the factors identified as contributors to injury rates in these residential neighbourhoods.¹³³

7.2. Impacts/challenges of above trends from the perspective of children and youth

Impacts related to constraints on accessibility, mobility, affordability and safety for children and youth include social exclusion, traffic safety, and exposure to air pollution.

As was discussed earlier, mobility constraints have relevance for youth entering the workforce. Social exclusion may be an outcome of poorly integrated land-use and transport systems in many urban locations around the world. When the burden of reaching destinations of opportunity such as education and employment is great, whether in terms of time invested, trade-offs in the investment of time or actual cost of transport, mobility is constrained and economic advancement is hindered.¹³⁴ In contrast, when a system is well-designed and connects residential areas and employment and education opportunities, social inclusion is enhanced.

Increased travel distance increase the level of exposure of children and youth to traffic crashes and air pollution. As was discussed in earlier chapters, most youth killed by road traffic injuries live in developing countries and are most likely to be vulnerable road users – pedestrians, cyclists, motorcyclists and passengers in private and public transport (though as

133. Razzak et al, 2004, pp.1.117–118.

134. Pendakur, 2005, p7.

youth become older, they are more at risk as drivers as well).¹³⁵ Poorly designed and poorly integrated land-use and transport systems are a significant factor in many of these fatalities. Urban areas with extensive land-use and transportation systems around the world contribute to increasing levels of air pollution from transport sources due to distances travelled and inducement of motorized transport. Data from the World Bank found that 76 per cent of the pollutant emissions in Mexico City in 1989 were from motor vehicles. 3.5 million tons of pollutants were measured in the Los Angeles area (US) in 1985, of which 63 per cent was attributed to motor vehicles.¹³⁶ High pollutant levels aggravate respiratory conditions in vulnerable populations such as children, youth and the elderly.

135. WHO, 2007.

136. Efroymsen and Rahman, 2005, p8.

8. Children, Youth and Urban Transport: Policy Responses

This chapter presents reviews of policy and programming responses from around the world concerning the relationship between children, youth and sustainable urban transport. The highlighted policies and programmes currently are or have the potential to address the urban transport challenges faced by this vulnerable population group as discussed in chapters 2–7. Policies and programmes that are relevant to both developed and developing countries will be examined.

8.1. Evidence of policy responses, specific practices/programmes/projects, etc., to address the impacts/challenges of urban transport trends from the perspective of children and youth

The primary issues faced by children and youth and challenges for policy makers when considering this population group are:

- Road safety;
- Challenges and opportunities related to mobility and accessibility by various modes; and
- Air quality.

Evidence of policy, practice and/or programme response examples in relation to the transport modes and trends covered in this report are examined below.

8.1.1. Road safety

In the area of road safety for young drivers, graduated driver licensing systems (GDL) are used in several countries around the world to help increase the safety of youth drivers and delay full license holding.¹³⁷ These programmes allow youth to gain more experience driving a private motor vehicle before they are afforded more privileges such as night-time driving and transporting other youth passengers. Research from the US and Canada on GDL systems found reductions in crashes involving teen drivers ranging from 9 to 31 per cent.¹³⁸ A recent national evaluation of GDL programmes in the US found that the most comprehensive programmes are associated with a 20 per cent reduction in fatal crash involvement rates in 16 year olds. A study from Ontario, Canada saw a 31 per cent reduction in crashes for all drivers age 15–19 years old. The programme now promoted by the US is a three-stage GDL system.¹³⁹ Driving privileges are increased gradually over time and with recorded hours of supervised driving, and after demonstration of responsible driving behaviour and driving proficiency at each stage. Forty-six states and the District of Columbia have implemented a three-stage GDL system.¹⁴⁰ The government of Ontario (Canada) has a two-stage programme with similar restrictions and time period for gaining experience.¹⁴¹ The Government of Western Australia also has a multi-step licensing process for young drivers to enable them to gain driving experience in more controlled settings before receiving their provisional license. Even after the issuance of this license, young drivers are subject to night-time driving restrictions for the first six months of the provisional period.¹⁴² Most of these programmes are

137. OECD, 2006, pp120–125.

138. NHTSA, 2008.

139. NHTSA, 2008.

140. NHTSA, 2010.

141. Government of Ontario, undated.

142. Government of Western Australia, 2010.

specific to operating a passenger vehicle; some locations also have provisional licensing for motorcycle operation. A recent expert group meeting on preventing motorcycle injuries in children was held in Thailand for cities and countries in South-Eastern Asia as a response to the increased use of motorcycles by children and youth, either as passengers or drivers, and the subsequent increase in injury and fatality in this population while travelling by this mode. One of the primary recommendations from the group was that the '*minimum age for award of motorcycle driving license be restricted to persons older than 18 years in all countries*'.¹⁴³

While broader issues such as operating vehicles without proper licensure exist in many countries around the world, there are opportunities to put GDL systems into place in developing countries where motorization by teen drivers is increasing. Systems such as GDL can increase road safety for all transport system users young and old, and it can provide some delay in the licensing experience for youth, allowing them to continue to travel by more sustainable modes of transport and to not contribute as quickly to the growing congestion on urban roadways.

Motorcycle helmet use by motorized two-wheelers, whether used for private motorized transport, commercial goods transport or informal motorized transport is critical for increased road safety of the vehicle operator. The likelihood of sustaining a severe head injury in a crash on a motorcycle, resulting in either death or permanent disability, is high if a helmet is not worn. Helmets significantly decrease the risk and severity of head injuries and the likelihood of death. Mandatory helmet laws are very effective when enforced at increasing helmet-wearing. Studies have shown use at over 90 per cent with enforcement. A study from New Zealand found that wearing a light-coloured helmet also reduced crash risk, presumably because of increased visibility. Other safety measures for two-wheelers include daytime running lights (decrease crash rates by up to 29 per cent) and reflective clothing.¹⁴⁴ Given the increasing number of motorcycles in urban areas, safety measures such as these are important for social and economic sustainability.

The Global Helmet Vaccine Initiative was launched in 2009 and is a partnership between the Asia Injury Prevention Foundation, the FIA (*Fédération Internationale de l'Automobile*) Foundation, the World Bank Global Road Safety Facility, the Centers for Disease Control and Prevention and the Inter-American Development Bank. The Global Helmet Vaccine Initiative currently works in four target countries (Cambodia, Nicaragua, Senegal and Viet Nam) to increase use of motorcycle helmet use and safety standards for children and adults through implementation of a '*five-pronged approach*':

- *Helmet provision - through establishing national helmet assembly plants or importing suitable helmets.*
- *Public awareness education - national mass media campaigns targeting at-risk road users.*
- *School-based programs - road safety education and helmet use training for teachers and students.*
- *Technical assistance, capacity building, and advocacy - working with government and non-government partners to ensure supportive road safety legislation, appropriate helmet standards, and adequate enforcement.*
- *Research, monitoring and evaluation - nationwide and program - based assessments to create best practice strategies.*¹⁴⁵

143. WHO, 2010, p2.

144. Toroyan and Peden, 2007, pp20–21.

145. Asia Injury Prevention Foundation, 2011; Global Helmet Vaccine Initiative, undated.

The successful helmet wearing campaign initially implemented by the Asia Injury Prevention Program in Viet Nam informed the Global Helmet Vaccine Initiative's helmet-wearing programme. This programme was involved in the development of certified climate-specific motorcycle helmets (tropical helmet) for both adults and children and has distributed 500,000 helmets at 140 schools in 7 countries since 2000.¹⁴⁶ The Asia Injury Prevention Foundation was also instrumental in the passage of 'Resolution 32', a mandatory helmet wearing law for adults 14 and older operating a motorbike. Helmet use has increased in this population from 10 per cent to 90 per cent since passage of this fine-based programme. The helmet law was expanded in 2010 to include children under 14 and an additional fine for adult drivers transporting helmet-less minors ('Decree 34').¹⁴⁷

Bicycle helmet use is a proven intervention to increase the safety of children and youth from severe injuries and death due to head trauma. Three-quarters of bicyclists' deaths are due to head injuries. However, research shows that wearing a bicycle helmet decreases the risk of head injury by 69 per cent.¹⁴⁸ Helmet laws have been enacted at various levels of government around the world. Compliance rates can be increased when helmet laws are accompanied by education on bicycle and road safety and effective enforcement of the laws,¹⁴⁹ such as the motorcycle helmet law in Viet Nam.¹⁵⁰

Traffic volumes and speeds are a deterrent to walking and bicycling for children and youth in many urban locations.¹⁵¹ Clear guidelines can be developed for traffic control management, using signage, traffic signals and traffic calming measures, along with enforcement, to reduce speeds and to shift volume off streets in urban areas where children frequently travel such as school zones and residential play areas. Transportation engineering can also be used to develop or enhance the non-motorized infrastructure in order to separate road users; in many urban areas in developing countries it is common for the roadway space to be shared between cars, motorcycles/scooters, public buses, informal transport modes, bicycles and pedestrians, creating congestion and conflict.

Safe Routes to School is a worldwide movement initially started in Odense (Denmark) in the 1970s, that promotes the idea of engineering, enforcement, education and encouragement of safe walking and bicycling to school for children and youth. A study of projects implemented along routes to school in Odense between 1986 and 1999 found an 18 per cent reduction in accidents (corresponding to 17.7 accidents a year) and a 20 per cent reduction in personal injuries (8.8 personal injuries per year). Traffic safety was improved for pedestrians, motorists and motor bikers; however, improvements were not seen for cyclists and moped users. The analysis also found that countermeasures such as traffic-calming, low-speed roadways, raised intersections and signalling systems were most effective at increasing traffic safety.¹⁵²

The state of California (US) began its own programme for Safe Routes to School in 1999, focusing most specifically on engineering changes along walking routes to school to improve road safety and encourage more walking and bicycling. A study conducted on urban schools participating in this programme found that sidewalks were critical for safety and promotion of walking at 3 out of 5 schools. While site-specific accident rates were too low to assess a statistically significant change, the data shows marked improvement in the reduction

146. Asia Injury Prevention Foundation, 2011.

147. Asia Injury Prevention Foundation, 2011.

148. Toroyan and Peden, 2007, pp22–23.

149. Watkins, 2010, p16.

150. Torre, 2009.

151. McMillan, 2009, p3.

152. Atkins, 2002, pp3–4.

of a potential safety hazard. Before sidewalks were constructed, 75 per cent of children walked in or alongside of the roadway; after sidewalks were installed, 95 per cent of children walked on the sidewalk rather than the roadway, creating a separation of users. Parents also reported that their children walked to school more often after the sidewalks were installed.¹⁵³ The California programme was a significant change in transportation policy in that transportation funding was specifically dedicated to pedestrian and bicycling infrastructure. The success of this programme helped in the creation of the Federal Safe Routes to School (SRTS) programme, passed in 2005 as part of the US Federal Transportation Bill (focusing on surface transportation). The programme provided US\$612 million in dedicated funding over 5 years to the 50 states and the District of Columbia for pedestrian and bicycle infrastructure and programming. While the amount was insignificant compared to the size of the total Federal Transportation Bill, it was monumental because it was dedicated funding to child and youth non-motorized transport issues. Efforts are underway to evaluate the federal SRTS programme. As of June 2008, 5,462 schools across the US were participating in the programme (either making infrastructure improvements or conducting education/encouragement and/or enforcement activities).¹⁵⁴

Safe Routes to School programmes exist worldwide. The Asia Injury Prevention Foundation is involved with a Safe Routes to School programme in Viet Nam. The programme provides interactive road traffic safety curriculum to teachers and students and provides funding to make infrastructure improvements for pedestrian and bicycle safety. Volunteers, local authorities and law enforcement work together to ensure traffic laws are followed.¹⁵⁵

The Sub-Saharan Africa Transport Policy Program (SSATPP), while not child/youth specific, implemented pilot projects targeting non-motorized transport in urban locations in Kenya and Tanzania between 1995–1999 (Nairobi, Eldoret, Dar es Salaam and Morogoro). The objective of these projects was not only to increase road safety for non-motorized transport but also to build local capacity to design and implement affordable urban mobility policies, particularly those that target the urban poor.¹⁵⁶ The project established project management structures, trained local staff in non-motorized transport matters, developed urban mobility plans for the pilot areas, involved local user groups in the planning of the non-motorized interventions, implemented awareness campaigns and explored financing schemes to increase ownership and promote use of bicycles. In relation to road safety, interventions were implemented that focused on: 1) separating road users (non-motorized from motorized); 2) calming traffic speeds and travel behaviours.

The most successful SSATPP projects in Kenya and Tanzania were those that were easy to maintain, where local staff and users effectively participated and where enforcement of the space was done. Training of local staff and linkage to other existing projects were also important to the success of projects. For the physical infrastructure projects, high-end vehicle speeds were reduced and traffic crashes noticeably decreased. When both bicycle and pedestrian facilities were designed, conflicts between these users were decreased. When only a bicycle path was built, pedestrians encroached on this space. Hawkers, vendors and minibus operators also encroached on the non-motorized infrastructure space, highlighting the importance of a multi-pronged intervention approach like found in Safe Routes to School that includes engineering, enforcement and education for behaviour change. While the report did

153. Boarnet et al, 2005.

154. National Center for Safe Routes to School, 2009.

155. Asia Injury Prevention Foundation, 2011.

156. Pendakur, 2005, p45.

not highlight children and youth in relation to these specific interventions, they were presumably users of the transport system and affected by these changes.

Personal security is another issue faced by children and youth when walking or bicycling.¹⁵⁷ Urban design features such as pedestrian-oriented lighting, good sight lines and safe connection/transfer points to public transport are important. Policies and programmes related to this address can address all four dimensions of sustainability through reduction in motorized vehicle use, increases in road safety and social inclusion, increased urban mobility and economic efficiency and innovative funding and financing schemes for implementation of non-motorized infrastructure improvements.

As discussed in chapter 4, overcrowding conditions on informal motorized can prove hazardous for children, increasing the risk of being crushed inside or falling off a vehicle.¹⁵⁸ A study from Karachi (Pakistan) stated that many drivers were paid per passenger they carry, so wage or incentive structures would be necessary to discourage overcrowding. The existence of such policies or regulations and their related impacts on children and youth were difficult to locate, however.¹⁵⁹

8.1.2. Constraints and opportunities related to mobility and accessibility by various modes

As discussed earlier, several studies of youth found that the desire to drive is great; therefore it is likely a mode shift would occur to private vehicle use if opportunities allowed. For this group, cost is a significant component that can help to keep young people from choosing private vehicle travel as their primary mode, and facilitate movement toward more sustainable transport practices. Therefore, policies and programmes that increase the cost of learning to drive and owning a motor vehicle (car or motorcycle) may be an effective deterrent to full licensure and vehicle ownership. GDL programmes effectively increase the cost of driving, at least in the sense of a greater commitment of time toward becoming licensed. However, increasing the other costs associated with owning a motor vehicle such as purchase price, license and registration fees, emissions testing fees and penalties, fuel, parking and roadway tolls can help to delay licensing and/or reduce the amount of driving that is done in urban areas.

Changes in travel behaviour can more easily occur if an attractive, equivalent alternative to private motorized transport is available. As discussed in the public transport chapter, making public transport expedient, efficient, and economical can increase its appeal to young people. West Yorkshire Passenger Transport Executive's 'generationM' programme is designed to do just that. The programme and its related website provides information on dedicated school transport, passes and permits available to school pupils 16 and over for public transport, and travel training teaching resources for schools. The website promotes the reduced fares available for youth under 22 (even if not a student), trip planning and real-time information on bus service available from a mobile phone.¹⁶⁰ As mobile phone usage in youth continues to increase across the globe, demand for real-time connections to service like this will increase.

Limitations to policies that attempt to deter licensure and vehicle ownership in youth should be recognized. While they can be effective tools to increase use of alternative transport modes, road safety and outdoor air quality, issues of social exclusion may still exist or

157. Sohail et al, 2006, p187.

158. Razzak et al, 2004, p117.

159. Razzak et al, 2004, p118.

160. West Yorkshire Passenger Transport Executive, 2011.

increase because of the constraints on travel that may be caused by limits in private vehicle travel. This may occur in places where public and/or informal transport is lacking, non-motorized transport is also unsafe, and/or security concerns exist.

Programmes also exist in cities in many developed countries that promote the idea of ‘walking school buses’ and ‘bicycle trains.’ Walking school buses and bicycle trains are meant to increase the number of children walking and bicycling to school by making it a fun and social activity that is supervised by adults. Adult escorts walk along a route to school, typically picking up children at designated locations along the way, just as a bus would at a bus stop. These programmes are generally most successful and sustaining when paired with other activities such as engineering improvements and enforcement of traffic laws, and when there is a dedicated volunteer base to provide an escort throughout the school year.¹⁶¹ A study conducted in Seattle (US) in three ethnically diverse low-income elementary schools found that the percentage of students walking increased from 20 to 25 per cent with the implementation of the walking school bus and was sustained 12 months after the start of the programme.¹⁶²

The SSATPP project described earlier also focused on increasing the supply side of bicycle transport through ownership opportunities and infrastructure for bicycles. Discounted bicycle sales for women and secondary school students, the target audience in this specific intervention, were very successful in Morogoro (Tanzania), as were the ‘bicycle for hire’ businesses that were already in existence in this city before the promotion of bicycling through this project. Innovative local financing such as micro-loans and savings societies offered mechanisms for bicycle purchases. Bicycle sales were successful in Eldoret (Kenya) but usage fell because road conditions were still largely unsafe for cyclists.¹⁶³

Youth are increasingly bringing their voices to the public discussion of urban transport issues around the globe. An example of this specifically related to institutional aspects of sustainable transport is the Youth for Public Transport (Y4PT) group.¹⁶⁴ Y4PT is part of the International Association of Public Transport’s (UITP) Youth Project¹⁶⁵ and is a ‘*group of young people from all over the world interested in urban issues related to mobility.*’¹⁶⁶ The group was formed to recognize innovative public transport projects that include youth and to start a dialogue between youth groups and government through more formal mechanisms so that young voices can be heard. Since 2005, Youth Parliaments have been held in cities such as Helsinki (Finland), Karlsruhe (Germany), Guadalajara (Mexico), Johannesburg (South Africa), Vancouver (Canada), Milan (Italy), Istanbul (Turkey), Taipei (China), Vienna (Austria) and Bogotá (Colombia). Youth aged 15–24 are invited to participate in these Parliaments, held in conjunction with UITP meetings. Youth sit in on UITP sessions, discuss issues amongst themselves and with UITP senior members and prepare and present a Final Report at the end of each Parliament and UITP meeting. This activity not only creates a document that contains youth opinion on public transport issues around the world, it also empowers them to participate and gives them confidence that their opinion matters. Issues identified by youth at the Parliaments as most important to them include: lack of routes and frequency of service serving areas of need by youth, disproportional pricing, lack of respect, cleanliness, security and transit fare overpricing.¹⁶⁷

161. Mackett, et al, 2003.

162. Mendoza et al, 2009, p4.

163. Pendakur, 2005, p45.

164. www.youthforpt.org.

165. UITP, 2010.

166. Youth for Public Transport, 2010.

167. Youth for Public Transport, 2010.

8.1.3. Air quality

Motorization is a clear trend in urban areas across the world, and children and youth will be a part of that either as a driver, passenger or non-motorized user impacted by motorized vehicles. Because of that, encouraging motorization is not the most effective option to improve air quality. Policies and programmes designed to eliminate lead from gasoline and remove or retrofit high-polluting vehicles are a high priority.¹⁶⁸ Policy makers also acknowledge the fact that while it is a priority to move forward in these areas, changes must be introduced gradually and with thought so as to not unduly burden the populations that most rely on the transport that is unfortunately the highest polluters (e.g. buses, taxis, mini-buses, motor rickshaws, motorcycles).

8.2. Challenges for future policy development

Two major challenges that exist for future policy development include ensuring the voice and needs of children and youth is heard in the creation of policies and programmes; and developing and maintaining the political will to make plans, investments and systems change that are important for vulnerable groups such as children and youth and the modes of transport they use most often.

Children and youth have been the focus of numerous local, regional, national and global initiatives by organizations across the world. But what has been the impact of these initiatives and how many have moved from anything more than words on paper and some mid-profile workshops? And how many have focused on transport issues for children and youth, urban or otherwise? As an example, August 2010–2011 was the United Nations ‘International Year of Youth’, giving voice to young people around the globe to address the issues they face and the impact they can have on policy.¹⁶⁹ Transport is not one of the fifteen priority areas outlined in the World Programme of Action for Youth; it should at least be implicit in each and every area.¹⁷⁰ In reviewing the fact sheets on the ‘International Year of Youth’ website,¹⁷¹ however, transport is not mentioned in relation to employment and education issues, and road safety is just one of many health issues outlined as impacting youth, despite the statistic presented in this document that 1,000 young people die each day due to road traffic injuries.¹⁷²

It is important to connect policies that cut across issues. Like adults, transportation is an inherent part of a child’s life. Whether it is trips to access health care, education, employment or for leisure, children and youth travel each day. As has been discussed in this report, transport issues such as safety and security can significantly restrict access to these activities. Transport should be an integral part of policy discussions on youth education, employment and health care.

As stated in chapter 1, it is estimated that by 2015, traffic accidents will surpass AIDS and malaria as the leading cause of death in children age 5–14 in Africa, which has the highest traffic fatality rate for children under 14 worldwide.¹⁷³ However, road safety is often left out as a performance measure in road infrastructure investments in developing countries. A recent report from the FIA Foundation¹⁷⁴ highlights the fact that the World Bank Northern Corridor Project in Kenya does not include any health risk assessment and that the Results

168. World Bank, 2011.

169. United Nations, 2010a.

170. United Nations, 2010a.

171. <http://social.un.org/youthyear/>.

172. United Nations, undated.

173. Asia Injury Prevention Foundation, 2011.

174. Watkins, 2010.

Monitoring Framework makes no reference to targets to cut road deaths and injuries as a result of this major project. Road safety is not identified as a factor in this project (either as a problem to address or an unintended outcome – positive or negative – that may result with the improvement of the roadway). The report points out that other major donors in the road sector are equally negligent and that the World Bank has made significant efforts through its Global Road Safety Facility to bring road safety into the spotlight of international development.¹⁷⁵

It is easy for agencies to put words down on paper and discuss issues at meetings; it is infinitely harder to take action, particularly when trying to address a complex global issue such as transportation that is impacted by factors such as socio-economics, culture, religion, land use, topography, geography, and human behaviour. The United Nations Decade of Action for Road Safety 2011–2020 is the newest global effort (on paper) to address road safety, *‘with a goal to stabilize and then reduce the forecast level of road traffic fatalities around the world by increasing activities conducted at the national, regional and global levels.’*¹⁷⁶ The rights of children and youth are mentioned in the description of the initiative released by the FIA Foundation in April 2010, yet the actual ‘Global plan for the decade of action for road safety 2011–2020’ from the United Nations does not contain the words ‘children,’ ‘youth,’ or ‘bicycle’ at all, and the word ‘pedestrian’ only appears three times.¹⁷⁷ Obviously, this initiative is just getting underway, so it is too soon to judge how it will impact children’s road safety and urban transportation. However, it is unfortunate to see no mention of these vulnerable road users in the initial plan.

175. Watkins, 2010, p19–21.

176. FIA Foundation, 2010.

177. WHO, 2011.

9. Towards Sustainable Urban Transport

Drawing on the material presented in earlier chapters, this chapter focuses on conclusions and lessons from policies, practices and strategies covered in the preceding chapters relevant to children, youth and urban transport that can be implemented by local authorities and national governments within the context of urban design, planning and governance. Broad policy recommendations for sustainable urban transport for children and youth in both developing and developed countries and for multiple modes of transportation are included, keeping in mind the four dimensions of sustainability.

As was presented in the earlier chapters, children and youth are vulnerable road users that are generally overlooked in today's urban transportation environment worldwide. It is important that their needs and voices become integrated into sustainable transport planning going forward. In many global locations, children and youth represent a significant proportion of the population. The development and implementation of policies and programmes that speak to their issues is critical.

The broad conditions and trends discussed in relation to youth are as follows:

- Chapter 2: *Non-motorized transportation* is one of the most common modes of transportation for children and youth in urban settings across the globe. While data for all trips is difficult to find, several studies conducted in cities in both developed and developing countries on travel to school highlight the importance of a safe and secure route to school to promote and maintain walking and bicycling in children and youth as a viable option. Walking is more prevalent than bicycling in most urban locations around the world. Safety, personal security, air quality and recognition of the positive impact of walking and bicycling on physical activity and health are the primary issues associated with non-motorized transport.
- Chapter 3: *Public transport* rates for youth are also difficult to find, particularly for developing countries, partly because formal public transportation rates in general are low in many urban areas in developing countries where the informal transport is more prevalent. In urban areas in developed countries where data is available, older children and youth can be active users of public transport. Social exclusion; personal security (with youth as both victims and perpetrators); air quality; safety from overloading conditions and reckless drivers; and encouraging utilization of public transport are the primary issues related to children and youth.
- Chapter 4: Children and youth are both users and operators of *informal motorized transport*. This transportation mode is an important form of mobility and an employment opportunity in many urban areas in developing countries. While it is less common in developed countries, school bus transportation and school carpools can be considered informal motorized transport with relevance to children and youth in these settings. Negative impacts of this mode include congestion, air quality, noise pollution and road safety.
- Chapter 5: *Private motorized transport* in children and youth is quite prevalent in urban areas of developed countries and is increasing rapidly in developing countries, particularly the use of 2-wheelers due to their lower cost of entry into the motorized transport market and operation. Children and youth are both passengers and young drivers of this mode. The impacts of motorization include constraints and opportunities for mobility and access; road safety; and vehicle emissions/air quality.
- Chapter 6: *Commercial goods movement* is most relevant for youth in terms of the employment opportunity it presents. Road safety due to truck congestion and

overloaded infrastructures and air quality are the primary issues related to commercial goods movement and children/youth.

- Chapter 7: The *land-use/transportation planning* relationship and its impact on children and youth was examined through the lenses of accessibility; mobility and affordability; and safety. Sustainable transport for children and youth can be impacted positively or negatively by the design of the land-use and transportation systems in terms of social inclusion or exclusion and exposure to traffic safety and air pollution.

Several lessons can be learned for the planning of sustainable transport for children and youth from the policies and programmes discussed in chapter 8. These lessons are not necessarily exclusive to children and youth but are certainly relevant.

- *Legislation without enforcement is less effective*: in the case of legislation like graduated license programmes, helmet usage and vehicle emissions/air quality programmes, passage of a law is not enough. The Global Helmet Vaccine Initiative's website highlights the legislative framework for road safety that is in place in each of their 4 target countries. It lists whether a law is in place, the population it applies to and the level of enforcement on a scale of 0–10, where 0 is not effective and 10 is highly effective. All four countries have some legislation in place for motorcycle helmets but only Viet Nam (where the helmet wearing programme began with the Asia Injury Prevention Foundation) rated above a 5 for enforcement, and the lowest rating was a 2 (Cambodia).¹⁷⁸
- *One size does not fit all*: policies and programmes must be considered and applied based on the local context. A policy or intervention implemented in one urban area or even one location within an urban area may not work in another. Also, effective policies and programmes from developed countries cannot necessarily be transplanted to urban areas in developing countries. In the case of the five California schools that installed sidewalks, only three saw improvements in safety conditions and walking rates. Aspects of the cost-effectiveness of a policy or intervention may also be considered. In urban areas of developing countries, it may be more cost-effective to focus on creating an infrastructure that separates users to reduce the risk of child pedestrian injury, or a helmet law and enforcement activity to reduce the injury risk of crashes with 2-wheelers than to implement a graduated license programme for 4-wheel vehicles or an emissions programme, as the impact of child injury is much greater in these areas.¹⁷⁹
- *Effective implementation of the 3 'E's*: in general, interventions are less effective when focused singularly on engineering, enforcement or education of users as a method of behaviour change. As was seen in the pilot projects implemented in cities in Kenya and Tanzania, the projects that were most effective were those where enforcement and staff participation were components of the overall intervention (creating a separate space for each user was also a factor).¹⁸⁰ The walking school bus programmes have also been found to be more effective when paired with engineering improvements and enforcement.¹⁸¹
- *Cost can be an effective intervention*: Policies and programmes that use cost to either encourage or deter behavior can be very effective. In the case of the helmet legislation in Viet Nam, adult helmet use went from 10 to 90 per cent with the passage of

178. Global Health Vaccine Initiative, undated.

179. Kobusingye, 2004, p2.

180. Pendakur, 2005, p45.

181. Mackett, et al, 2003.

legislation that instituted a fine for drivers and passengers over 14 using a motorbike without a helmet. Based on the success of this legislation, it has now been amended to include children under 14, and a fine for adults transporting helmet-less minors.¹⁸²

Data from several developed countries suggest that the cost of entry into the private motorized vehicle market for 4-wheelers (time and cost to obtain licensure; purchase insurance, vehicle, and registration and the regular operating costs of a vehicle) is effective at delaying entry (though this may be a negative if no other viable transport option is available), while the rapidly increasing rates of 2-wheeler ownership suggests that cost of entry with these vehicles is quite low (which can also be a negative if it leads or contributes to congestion and safety issues).

- *The importance of data:* including the needs of children and youth in planning for sustainable urban transport is infinitely easier if data were available to inform policymakers and planners about their urban current travel patterns, including mode of transport, trip purpose, and barriers to travel. Reliable and complete data on road traffic injuries is also critical, yet is currently lacking for many countries. Underreporting of injuries by poor and vulnerable road users in urban areas is likely.¹⁸³
- The comparability of such a dataset across global urban environments (developed and developing) would allow for greater lessons learned and understanding of applicability of interventions to a given setting.

The global population of children and youth is increasingly mobile and connected, and are already users of several sustainable transport modes. It is critically important we start considering and actively including them in the planning of urban transport systems.

182. Asia Injury Prevention Foundation, 2011.

183. Watkins, 2010, p15.

List of References

- Adam Smith International (2005) 'A study of institutional, financial and regulatory frameworks of urban transport in large sub-Saharan cities', *Sub-Saharan Africa Transport Policy Program (SSATP) working paper no. 82*, SSATP, World Bank, Washington, DC
- Ahmadi, E. and G. Taniguchi (2007) 'Influential factors on children's spatial knowledge and mobility in home-school travel: a case study in the city of Tehran', *Journal of Asian Architecture and Building Engineering* **6**(2): 275–282
- Ahmed, Q.I., H. Lu and S. Ye (2008) 'Urban transportation and equity: a case study of Beijing and Karachi', *Transportation Research Record Part A* **42**(1): 125–139
- APTA (American Public Transportation Association) (2007) 'A profile of public transportation passenger demographics and travel characteristics reported in on-board surveys' Washington, DC
- Asia Injury Prevention Foundation (2011) 'Making roads safe', <http://www.asiainjury.org/main/home.html>, last accessed 12 May 2011
- Atkins (2002) 'Evaluation of projects regarding routes to schools in the municipality of Odense', Road Traffic and Safety', <http://www.eu-target.net/WorkAreas/MobilityEducation/OdenseSaferoutesforchildren.htm>, last accessed February 2011
- Baker, J., R. Basu, M. Cropper, S. Lall and A. Takeuchi (2005) 'Urban poverty and transport: the case of Mumbai', World Bank Policy Research Working Paper 3693, <http://go.worldbank.org/9E4KP61FF0>, last accessed 12 May 2011
- Bäumer, D and G. Müller (1999) 'Systemhopping – a question of age? New mobility services for youth and adolescents', presented at the European Transport conference, Cambridge, January 1999, <http://www.etcproceedings.org/paper/systemhopping-a-question-of-age>, last accessed 12 May 2011
- Boarnet, M.G., K. Day, C. Anderson, T. McMillan and M. Alfonzo (2005) 'Can urban planning enhance walking to school? Evaluating California's safe routes to school program', *Journal of the American Planning Association* **71**(3): 301–317
- Bradshaw, R. and S. Atkins (1996) 'The use of public transport for school journeys in London', Paper from the Association for European Transport conference, Cambridge, October, <http://etcproceedings.org/conference/european-transport-conference-1996>, last accessed 12 May 2011
- Bringolf-Isler, B., L. Grize, U. Mäder, N. Ruch, F. Sennhauser and C. Braun-Fahrländer (2008) 'Personal and environmental factors associated with active commuting to school in Switzerland', *Preventive Medicine* **46**(1): 67–73
- Burrows, S., A. van Niekerk and L. Laflamme (2010) 'Fatal injuries among urban children in South Africa: risk distribution and the potential for reduction', *Bulletin of the World Health Organization* **88**: 267–272. doi:10.2471/BLT.09.068486
- Canfield, R., C. Henderson, D. Cory-Slechta, C. Cox, T. Jusko and B. Lanphear (2003) 'Intellectual Impairment in Children with Blood Lead Concentrations below 10 µg per Deciliter', *The New England Journal of Medicine* **348**: 1517–1526
- Centers for Disease Control and Prevention (2011) 'CDC health disparities and inequalities report – United States, 2011', *Morbidity and Mortality Weekly Report* **60**(Suppl): 1–109
- Cervero, R. (2000) 'Informal transport in the developing world', UN-Habitat, Nairobi, Kenya, <http://www.unhabitat.org/pmss/getElectronicVersion.aspx?nr=1534&alt=1>, last accessed March 2011

- Cervero, R. and A. Golub (2007) 'Informal transport: a global perspective', *Transport Policy* **14**: 445–457
- de Boer, E. (2008) 'School travel as a product of school system, school location and transport strategies: a comparative exploration of four Northwest European countries', presented at the European Transport conference, October 2008, Netherlands, <http://etcproceedings.org/conference/european-transport-conference-2008>, accessed December 2010
- Department for Transport (2008) 'Travel to school: personal travel factsheet – March 2008', *National Travel Survey 2006*, UK, <http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/factsheets/school.pdf>, last accessed 16 May 2011
- Department for Transport (undated) 'Children and young people', <http://www.dft.gov.uk/pgr/inclusion/childrenandyoungpeople/>, last accessed 12 May 2011
- Department for Transport (2010a) 'Full car driving license holders aged 17–20 by gender: Great Britain, 1989/91 to 2009', NTS0202, *National Travel Survey 2009*, UK, <http://www.dft.gov.uk/pgr/statistics/datatablespublications/nts/driving-licence/nts0202.xls>, last accessed 14 May 2011
- Department for Transport (2010b) 'Reasons for not driving by age: Great Britain, 2009', NTS0203, *National Travel Survey 2009*, UK, <http://www.dft.gov.uk/pgr/statistics/datatablespublications/nts/driving-licence/nts0203.xls>, accessed 14 May 2011
- Department for Transport (2010c) 'Travel by age and gender', *National Travel Survey 2009*, UK, <http://www.dft.gov.uk/pgr/statistics/datatablespublications/nts/latest/nts2009-06.pdf>, last accessed 16 May 2011
- Department for Transport (2010d) 'Travel in urban and rural areas: Personal travel factsheet-March 2010, *National Travel Survey 2008*, UK, <http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/statistics/datatablespublications/personal/ntsfactsheets/NTSTravelinUrbanRuralareas.pdf>, last accessed 16 May 2011
- Department of Children, Families and Schools (2009) 'Safe from bullying on journeys', DCSF ref: DCSF-00444-2009, Nottingham, UK, www.teachernet.gov.uk/publications, accessed March 2011
- de Vries, S.I., M. Hopman-Rock, I. Bakker, R. A. Hirasings and W. van Mechelen (2010) 'Built environment correlates of walking and cycling in Dutch urban children: results from the SPACES study' *International Journal of Environmental Research and Public Health* **7**: 2309–2324
- Efroymson, D and M. Rahman (2005) *Transportation policy for poverty reduction and social equity*, WBB Trus, Dhaka, Bangladesh
- FIA Foundation (2010) *UN Decade of action for road safety 2011–2020: Make Roads Safe*, The Campaign for Global Road Safety, <http://www.makeroadssafe.org/publications/Pages/homepage.aspx>, last accessed 12 May 2011
- Friedman, M.S., K.E. Powell, L. Hutwagner, L. M. Graham and W.G. Teague (2001) 'Impact of changes in transportation and commuting behaviors during the 1996 Summer Olympic Games in Atlanta on air quality and childhood asthma', *Journal of the American Medical Association* **285**: 897–905
- Frumkin, H., L. Frank and R. Jackson (2004) *Urban sprawl and public health: designing, planning and building for healthy communities*, Island Press, Washington, DC
- Global Helmet Vaccine Initiative (2011) 'Home' <http://www.helmetvaccine.org/index.html>, last accessed 12 May 2011
- Gough, K (2008) 'Moving around: the social and spatial mobility of youth in Lusaka', *Geografiska Annaler: Series B, Human Geography* **90**(3): 243–255

- Government of Ontario (undated) 'Graduated licensing', <http://www.mto.gov.on.ca/english/dandv/driver/gradu/index.shtml>, last accessed 18 May 2011
- Government of Western Australia (undated) 'Driver and vehicle services' Department of Transport, Perth, <http://www.transport.wa.gov.au/licensing/21662.asp>, last accessed 18 May 2011
- Guidez, J.M. (1996) 'The mobility of France's youth population within urban areas', presented at the European Transport conference, Association for European Transport and contributors, October, Cambridge, <http://etcproceedings.org/conference/european-transport-conference-1996>, last accessed 18 May 2011
- Ham, S.A., C.A. Macera and C. Lindley (2005) 'Trends in walking for transportation in the United States, 1995 and 2001', *Preventing Chronic Disease* **2**(4): 1–10
- Hillman, M., J. Adams and J. Whitelegg (1990) *One False Move: a Study of Children's Independent Mobility*, PSI press, London
- Kobusingye, O. (2004) 'Road safety – threats and opportunities for poor countries', *African Health Sciences* **4**(3): 199–201
- Konings, P. (2006) 'Solving transportation problems in African cities: innovative responses by the youth in Douala, Cameroon', *Africa Today* **53**(1): 35–50
- Lin, J-J. and H-T. Chang (2010) 'Built environment effects on children's school travel in Taipei: independence and travel mode', *Urban Studies* **47**(4): 867–889
- Line, T., K. Chatterjee and G. Lyons (2010) 'The travel behaviour intentions of young people in the context of climate change', *Journal of Transport Geography* **18**: 238–246
- Mackett, R., L. Lucas, J. Paskins and J. Turbin (2003) 'The effectiveness of initiatives to reduce children's car use' presented at the European Transport conference, October 2003, Strasbourg, France <http://www.etcproceedings.org/conference/european-transport-conference-2003>, last accessed October 2010
- Mackett, R., L. Lucas, J. Paskins and J. Turbin (2002) 'Children's car use: the implications for health and sustainability, presented at the European Transport conference, September 2002, Cambridge, <http://etcproceedings.org/conference/european-transport-conference-2002>, last accessed 18 May 2011
- Mailer, M., and J. Schopf (2002) 'A guideline for safer school travel and safer school environments in Austria', presented at the European Transport conference, September 2002, Cambridge, <http://etcproceedings.org/conference/european-transport-conference-2002>, last accessed 18 May 2011
- McCray, L. and J. Brewer (2005) 'Child safety research in school buses', Paper number 05–325; National Highway Traffic Safety Administration and Volpe National Transportation Systems Center, Washington, DC, <http://www-nrd.nhtsa.dot.gov/pdf/esv/esv19/05-0325-W.pdf>, last accessed 18 May 2011
- McDonald, N. (2005) 'Children's travel: Patterns and influences', Dissertation presented to the University of California, Berkeley
- McDonald, N. (2007) 'Active transportation to school: trends among U.S. schoolchildren, 1969–2001', *American Journal of Preventive Medicine* **32**(6): 509–516
- McDonald, N.C. (2012) 'Children and cycling' in Pucher, J. and R. Buehler (eds) *Cycling to Sustainable Transport: International Trends and Policies*, MIT Press, Cambridge, MA
- McDonald, N.C., A.L. Brown, L.M. Marchetti and M.S. Pedroso (2011) (under review) 'U.S. school travel 2009: an assessment of trends', *American Journal of Preventive Medicine*
- McMillan, T. (2005) 'Urban form and a child's trip to school: The current literature and a framework for future research', *Journal of Planning Literature* **19**(4): 440–456

- McMillan, T. (2007) 'The relative influence of urban form on a child's travel mode to school', *Transportation Research Part A* **41**: 69–79
- McMillan, T. (2009) 'Research brief: Walking and bicycling to school, physical activity and health outcomes' Active Living Research, Robert Wood Johnson Foundation, San Diego, CA
- Mendoza, J., D. Levinger and B. Johnston (2009) 'Pilot evaluation of a walking school bus program in a low-income, urban community', *BMC Public Health* **9**: 122–128
- National Center for Safe Routes to School (2007) 'Safe routes to school guide: engineering module', Chapel Hill, NC, <http://guide.saferoutesinfo.org/engineering/index.cfm>, last accessed 21 May 2011
- National Center for Safe Routes to School (2009) '2008–2009 Summary annual report', National Center for Safe Routes to School, Chapel Hill, NC, <http://www.saferoutesinfo.org/data-central/national-progress/federal-reports/2008-2009-summary-annual-report>, last accessed 18 May 2011
- NHTSA (National Highway Traffic Safety Administration) (2008) 'Traffic safety facts: laws. Graduated driver licensing system', DOT HS 810 888W, US Department of Transportation, Washington, DC, <http://www.nhtsa.gov/Laws+&+Regulations/Traffic+Safety+Legislative+Fact+Sheets>, last accessed 21 May 2011
- NHTSA (2010) 'Teen drivers – Graduated driver licensing' U.S. Department of Transportation, Washington, DC, <http://nhtsa.gov/Driving+Safety/Driver+Education/Teen+Drivers/Teen+Drivers+-+Graduated+Driver+Licensing>, last accessed 13 May 2011
- Noble, B. (2005) 'Why are some people choosing not to drive?' presented at the European Transport conference, October 2005, Strasbourg, France
- O'Brien, C., S. Ramanathan, R. Gilbert and A. Orsini (2009) 'Youth and sustainable transportation: a review of the literature', The Center for Sustainable Transportation, University of Winnipeg, Winnipeg, Canada
- OECD (Organization for Economic Cooperation and Development) (2006) 'Young drivers: the road to safety' OECD/ECMT, Transport Research Centre, Paris
- Olvera, L., D. Plat and P. Pochet (2003) 'Transportation conditions and access to services in a context of urban sprawl and deregulations: The case of Dar es Salaam' *Transport Policy* **10**: 287–298
- Pendakur, V (2005) 'Non-motorized transport in African cities: lessons from experience in Kenya and Tanzania' *SSATP working paper no. 80*, Sub-Saharan Africa Transport Policy Program, World Bank, Washington, DC
- Porter, G. and K. Blaufuss (2002) 'Children, transport and traffic in southern Ghana', Revised version of paper prepared for the international workshop on children and traffic, Copenhagen, 2–3 May, 2002, www.dur.ac.uk/childmobility, accessed March 2011
- Porter, G., K. Hampshire, A. Abane, A. Munthali, E. Robson, M. Mashiri and A. Tanle (2010) 'Youth transport, mobility and security in sub-Saharan Africa: the gendered journey to school', *World Transport Policy and Practice* **16**(1): 51–71
- Pucher, J., Z-R. Peng, N. Mittal, Y. Zhu and N. Korattyswaroopam (2007) 'Urban transport trends and policies in China and India: impacts of rapid economic growth', *Transport Reviews* **27**(4): 379–410
- Razzak, J., S. Luby, L. Laflamme and H. Chotani (2004) 'Injuries among children in Karachi, Pakistan – what, where and how' *Public Health* **118**: 114–120
- Replogle, M. (1989) 'Let them drive cars', *New Internationalist magazine* **195**, May, <http://www.newint.org/features/1989/05/05/drive/>, last accessed 16 May 2011

- Ruud, A. (2006) 'Consequences of obtaining a driving license for transport mode choice and attitudes towards public transport', presented at the European Transport conference, October 2006, Strasbourg, France
- Ruud, A. and S. Nordbakke (2005) 'Decreasing driving license rates among young people – consequences for local public transport', presented at the European Transport conference, October, Strasbourg, France
- School Bus Fleet (2011) 'Obama signs diesel emissions reduction act', 6 January 2011 <http://www.schoolbusfleet.com/Channel/Green-School-Bus/News/2011/01/06/Obama-signs-Diesel-Emissions-Reduction-Act.aspx>, last accessed 14 May 2011
- Sohail, M., D.A.C. Maunder and S. Cavill (2006) 'Effective regulation for sustainable public transport in developing countries,' *Transport Policy* **13**: 177–190
- SWOV (Institute for Road Safety Research) (2009) 'SWOV Fact sheet: Vulnerable road users', Netherlands, <http://www.swov.nl/UK/Research/publicaties/inhoud/factsheets.htm>, accessed February 2011
- Toroyan, T and M. Peden (eds) (2007) *Youth and road safety*, World Health Organization, Geneva
- Torre, E. (2009) 'How to reduce traffic fatalities among Vietnamese children: a performance assessment at Asia Injury Prevention Foundation' Asia Injury Prevention Foundation
- Transport and Urban Life Commission (2007) 'Tackling social exclusion: the role of public transport', the International Association of Public Transport (IUTP), Brussels, Belgium
- Transport for London (2010) 'Congestion charging', Transport for London, London, UK <http://www.tfl.gov.uk/roadusers/congestioncharging/default.aspx>, last accessed 18 May 2011
- Tuan, V. and T. Shimizu (2005) 'Modeling of household motorcycle ownership behaviour in Hanoi City', *Journal for Eastern Asia Society for Transportation Studies* **6**: 1751–1765
- Turnstone Research (2010) 'Passengers' perceptions of personal security on public transport – Qualitative research report' Department of Transport, UK, <http://www.dft.gov.uk/pgr/crime/personalsecurity/passengerperceptionssecurity/>, accessed November 2010
- UITP (International Association of Public Transport) (2010) 'UITP youth for public transport project', <http://www.uitp.org/knowledge/projects-details.cfm?id=440>, last accessed 12 May 2011
- United Nations (2010a) 'World programme of action for youth', United Nations Publications, New York, <http://www.un.org/esa/socdev/unyin/documents/wpay2010.pdf>, last accessed 16 May 2011
- United Nations (2010b) *World Urbanization Prospects: The 2009 Revision*, CD-ROM edition, data in digital form (POP/DB/WUP/Rev.2009), United Nations, Department of Economic and Social Affairs, Population Division, New York, NY
- United Nations (undated) 'Global launch of the international year of youth: Fact sheet, health of young people', <http://social.un.org/youthyear/launch.html#fact>, last accessed 13 May 2011
- UNFPA (United Nations Population Fund) (2007) *UNFPA global and regional programme, 2008–2011*, New York, DP/FPA/2007/19
- US Census Bureau (2010) *International Data Base*, Washington, DC, <http://www.census.gov/ipc/www/idb/informationGateway.php>, accessed August 2010
- US Environmental Protection Agency (undated) 'Particulate matter', <http://www.epa.gov/pm/index.html>, last accessed 12 May 2011

- Van der Ploeg, H., D. Merom, G. Corpuz and A. Bauman (2007) 'Trends in Australian children traveling to school 1971–2003: Burning petrol or carbohydrates?' *Preventive Medicine* **46**: 60–62
- Watkins, K (2010) *The Missing Link: Road traffic injuries and the Millennium Development Goals*, Make Roads Safe: the Campaign for Global Road Safety, <http://www.fiafoundation.org/publications/Documents/the-missing-link.pdf>, last accessed 13 May 2011
- West Yorkshire Passenger Transport Executive (2011) 'GenerationM', <http://www.generationm.co.uk/>, last accessed 13 May 2011
- WHO (World Health Organization) (2008a) 'Asthma Fact sheet No307', <http://www.who.int/mediacentre/factsheets/fs307/en/index.html>, last accessed 13 May 2011
- WHO (2008b) 'Disability, injury prevention and rehabilitation', New Delhi, India, <http://www.searo.who.int/en/Section1174/Section1461.htm>, last accessed 13 May 2011
- WHO (2010) 'Disability injury prevention and rehabilitation', Expert group meeting on preventing motorcycle injuries in children, 21–23 December 2010, Bangkok, Thailand, http://www.searo.who.int/en/Section1174/Section1461_15811.htm, last accessed 13 May 2011
- WHO (2011) 'Global plan for the decade of action for road safety 2011–2020', Geneva, Switzerland, http://www.who.int/roadsafety/decade_of_action/en/index.html, accessed March 2011
- Wikipedia (undated) 'List of bus rapid transit systems', http://en.wikipedia.org/wiki/List_of_bus_rapid_transit_systems, last accessed 18 May 2011
- World Bank (2006) 'Youth-responsive social analysis: a guidance note; Incorporating social dimensions into Bank-supported projects', Social Development Department, Washington, DC
- World Bank (2009) 'Brazil – Global Environment Facility (GEF) Sustainable Transport and Air Quality Project – Project Appraisal Document', Report No: 52135-BR, World Bank, Geneva, http://www-wds.worldbank.org/external/default/main?pagePK=64193027&piPK=64187937&theSitePK=523679&menuPK=64187510&searchMenuPK=64187283&siteName=WDS&entityID=000333037_20091214235743, last accessed 23 May 2011
- World Bank (2011) 'Energy and environment: Transport and the urban environment', <http://go.worldbank.org/HO8SIKM690>, last accessed 13 May 2011
- World Resources Institute (1999) 'Urban air pollution risks to children: ! global environmental health indicator', *Health Notes*: 1–20, Washington, DC
- Youth for Public Transport (2010) 'Who we are?', <http://www.youthforpt.org/?p=1570>, last accessed 13 May 2011