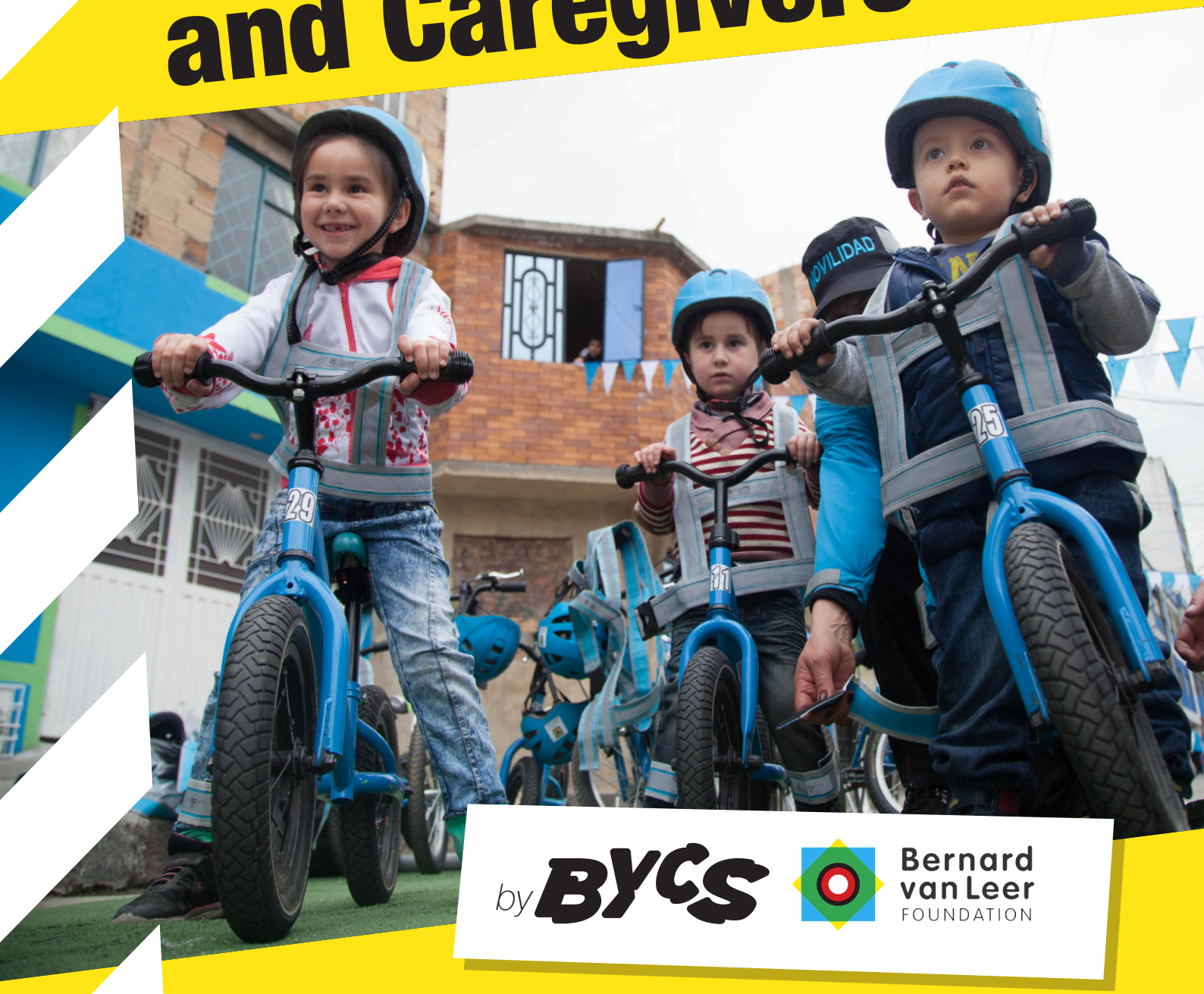
Cycling Cities for Infants, Toddlers, and Caregivers



by BYCS

Bernard van Leer FOUNDATION

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Introduction

The Bernard van Leer Foundation and BYCS have partnered on a project focused on the positive connection between cycling and early childhood (0-3 years old) development. To date, there has been limited research conducted in this area and cities are struggling to accommodate young children and families. The longer-term goals are to inspire policy and planning changes as well as further academic research that are advantageous to children ages 0-3, caregivers, families, cyclists, and city residents in general.

As part of the project, the team surveyed existing research and conducted interviews with caregivers and those working in the fields of early childhood development, education, mobility, city planning, government, and activism. Based on this work, we developed a series of guides for cities at different levels of cycling maturity. These guides are meant for a wide audience, including city officials, health and cycling advocacy groups, industry groups, and educational institutions.

The Bernard van Leer Foundation is an independent Dutch organisation working worldwide to ensure that all babies and toddlers have a good start in life. We inspire and inform large-scale action that improves the health and wellbeing of young children – especially the most vulnerable – and the people who care for them.

BYCS is an Amsterdam-based social enterprise driven by the belief that bicycles transform cities and cities transform the world. We work internationally with businesses, governments non-profits and civil society to initiate and scale breakthrough ideas around cycling. We are driven by a clear and powerful mission. We call this 50by30: half of all city trips by bike by 2030.


Credits: Courtesy of Oded Antman/Bernard van Leer Foundation

Phases of Becoming a Cycling City for Infants, Toddlers, and Caregivers

The framework in this report offers a roadmap for a city to transition from limited opportunities or openness to cycling to a cycling city for infants, toddlers, and caregivers. Because different cities are at different stages of cycling maturity, the report has been broken down into three phases in order to address the needs of each maturity level. The phases are fluid, so cities should not limit themselves to their current maturity level but should rather consider the following phases for future possibilities. The three phases are:

Inspiration and Motivation

Most cities begin in this phase and are characterised by an **absence of cycling infrastructure as well as a lack of recognition or prioritisation of cycling in budgets or policies**. Caregivers are unable to cycle due to a number of barriers related to basic safety.

The focus of this section is to help city decision makers understand the broad benefits for the city of prioritising cycling, especially for infants, toddlers, and caregivers, as well as the specific benefits of cycling for these groups. A selection of specific use cases are cited as examples.

Getting Started

A move into the second phase means that a city has **decided to begin to prioritise cycling and wants to ensure that infants, toddlers, and caregivers are taken into account but is unsure how to begin.**

The focus of this section is to help city decision makers get a better understanding of why people, especially caregivers, do not cycle, and how to take a few key steps to change this. The emphasis of this section is on gaining knowledge and perspectives, laying the groundwork, and establishing trust.

Scaling and Optimisation

Entering the third phase means a city has **begun to make it possible for infants, toddlers, and caregivers to cycle and now needs to ensure that it is safe, easy, comfortable, and fun.**

The focus of this section is on scaling strategies from piloting to neighbourhood or citywide and ensuring that the needs of cycling infants, toddlers, and caregivers are taken into account. There is also a strong focus on changing behaviours of those that needed an initial level of infrastructure and investment from the city to be convinced of the value and convenience of cycling.

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Why Prioritising Cycling, Especially for Caregivers and Children (0-3), is Beneficial for a City

This section outlines the benefits of cycling in connection with three key challenges that cities face: **increasing societal costs of declining physical health, the mounting effects of a changing environment, and the disproportionate burden placed on the poorest residents as a result of inequity.**

In general, incorporating infants, toddlers, and caregivers into a city's cycling strategy amplifies the associated benefits because of their more vulnerable nature as well as their significant share of the urban population. Furthermore, women are more likely to be undertaking caregiver journeys as a result of gendered division of household labor and care. Women are thus more likely to suffer from time poverty and a greater burden from transportation. Greater consideration of the needs of caregivers contributes to the work towards gender fair cities.

Declining Physical Health

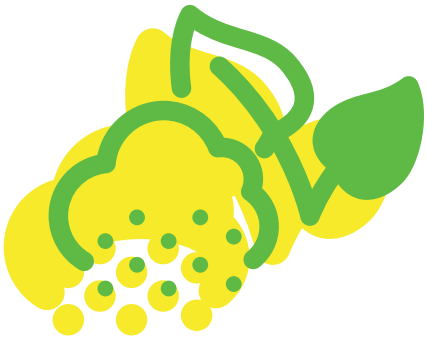
A city cannot function if its population is not healthy and an unhealthy population is a large burden to society. Local governments in the United States, the country with the highest health care spending per capita (over 30% higher than the next highest spender, Switzerland)[1], spend 10% of their annual budget on health.[2] This is the second largest expenditure category after primary and secondary education, which is 40% of local budgets.

Cycling provides a number of physical health benefits from reducing obesity to significantly lowering the risk of cardiovascular disease and cancer that can contribute to lowering health care costs for cities. Studies have shown that children who are obese at age 5 often continue to be obese into adolesence and adulthood.[3] Obesity is also on the rise in 2-5 year olds.[4] Part of the problem is inactivity. The World Health Organization estimates that over 80% of adolescents are insufficiently physically active[5] and this lack of physical activity starts at a young age.[6] Thus, the earlier cities address inactivity in children - by prioritising cycling for young children and caregivers - the more likely they are to receive the benefits of a healthy and thriving adult population.

The World Health Organization estimates that over 80% of adolescents are insufficiently physically active[5] and this lack of physical activity starts at a young age.[6]

A Changing Environment: Air Pollution

Switching from driving to cycling can also have a major impact on the amount of air pollution in a city, which has a significant economic and environmental impact, and is particularly harmful to infants and toddlers. The World Health Organization estimates that each year over 125,000 children under 5 die from outdoor air pollution. In terms of costs to society, an OECD study estimates that some developing countries spend over 10% of GDP on health care related to air pollution, equivalent to hundreds of billions of dollars per country (2015 USD).[7] The transport sector is the largest contributor to air pollution in many cities. For example, in São Paulo, transport contributes to 42% of particulate matter emissions, which is generally regarded as a key indicator because its effects on human health are significant, costly, well-documented, and controlling it is also costly.[8] The effect of switching to cycling on air pollution ranges, but studies have shown a reduction ranging from 11-22% of transport sector emissions.[9,10] The short- and long-term effects of air pollution on climate change are also putting major burdens on cities that are dealing with increased flooding, more extreme heat, and more frequent and higher intensity storms.[11] Making cycling the preferred mobility option for caregivers and young children - who make up a significant portion of the urban population - will thus have positive economical, environmental, and equity benefits for these groups and city residents in general.

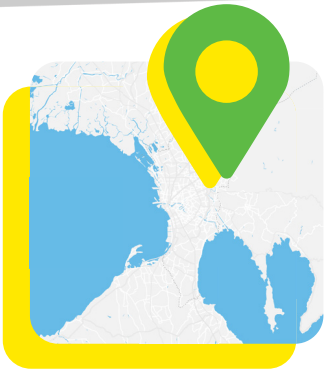


Inequity

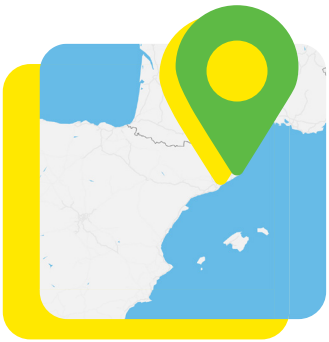
Many challenges cities face are connected with a widening gap between the rich and poor. Prioritising cycling for caregivers and young children, especially those with limited financial means, can contribute to shrinking this gap. Low-income caregivers often rely on walking and public transport to make multiple stops at off-peak times. As a result, their travel can be slow, unpredictable, stressful, and exhausting. This results in more time, energy, and money spent for those who have little to spare. When cycling is made safe, easy, comfortable, and fun for caregivers and young children, they become less stressed, happier, and more productive. This results in more frequent, longer, and positive interactions between caregivers and infants and toddlers which is crucial for cognitive development necessary for long-term success in life.[12] Additionally, low-income residents often live on or near noisy, polluted, and dangerous streets and are forced to travel along or cross them without safe infrastructure. As a result, they suffer the most from not prioritising cycling and have the most to gain.[13]

Case Studies: Benefits of Cycling

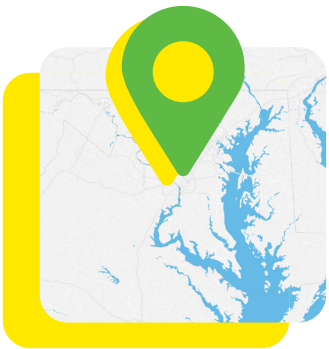
In addition to the benefits listed above, cycling also has a positive impact on a number of other challenges facing cities. Below are a few examples of how cycling has created direct benefits for cities in terms of **local economy, congestion, and health.**



First, the case of **Marikina, Philippines** can be used to help understand the impact of cycling measures on the emission of other air pollutants. In a study published in 2013, Vergel and Tiglao[14] found that the construction of bicycle lanes in Marikina would result in a 1.42% decrease in air pollution per day in the wider metropolitan region of Metro Manila when compared to the baseline scenario of no intervention, taking into account CO, HC, PM, NOx and SOx.



The case of **Barcelona, Spain** further displays the effects of cycling adoption on public health. In a 2011 study, it was estimated that the number of cycling journeys incurred by users of Barcelona's public bicycle sharing system would lead to the avoidance of 12 annual expected deaths due to gains in physical activity. Adding to that, approximately 9,000 metric tons of carbon dioxide emissions are averted annually.[15]



In **Washington DC, United States**, the presence of cycling infrastructure in the form of bicycle sharing stations was shown to reduce congestion by 4%. This effect was concentrated in areas of relatively high congestion, and translates to $182 million in private benefits, attributed to shorter travel times and the reduction of wasted fuel, as well as $1.28 million in public benefits in terms of reductions in congestion-induced carbon dioxide emissions.[16]

Finally, the case of **New York City, United States**: in a 2014 analysis conducted by the New York City Department of Transportation[17], it was found that installing protected bicycle lanes improved the viability of local businesses, congestion, and safety. Along Ninth Avenue, retail sales improved steadily up to 49% - a trend that was not seen beforehand and outpaced the borough by 46%. Across intervention areas there were also increases in traffic speeds for cars, on average by 35%, and reductions in crashes with injuries by 17%, even as cyclist volumes rose.

The Advantages of Cycling for Caregivers, Infants and Toddlers

Beyond the broad benefits described above, cycling also has a number of specific benefits for infants, toddlers, and caregivers. This section focuses on the themes of "connect" and "aware" and their relation to cycling for these groups.

Connect

The most common theme that arose from research and interviews was "connect". Nearly every interviewee spoke about how cycling creates connections at many different levels and the value that young children and caregivers derive from these connections. As a mode of transport, the bicycle provides a connection from place to place, often expanding the radius of access for people whose only option is to walk. Despite this, the interviewees focused more on deeper levels of connections - between the caregiver and child, the caregiver/child and the community, and the child with the natural and built environment. In addition, interviewees underscored how naturally these connections occurred. Rather than being forced, these connections arose organically, often without the deliberate intention of the caregiver.

Caregiver - Child

Cycling with a young child (up to 3 years old), whether on the same bicycle or on separate bicycles, provides a number of opportunities for the caregiver and child to connect.

Credit: Courtesy of Oded Antman/Bernard van Leer Foundation

Touch

Multiple caregivers interviewed described the connection they felt with the child as a result of being so physically close on the bicycle, particularly related to touch.[18,19,20] This includes holding hands, a comforting hand on the child's back, or the child holding on to the caregiver's back. Linda O'Donoghue, a Professor of Early Childhood Education and Development at Bow Valley College in Calgary, Canada, referred to this as the "intimacy of attachment", and emphasised the importance of this type of connection for a child's development.[21] This confirms the work of a number of scholars around the value of "social touch". Cascio, Moore, and McGlone summarise a number of the benefits of social touch for infants and toddlers, which include: reduced reaction to stress, increased familial attachment, and sustained expression of positive emotions.[22]

Conversation

This close proximity to each other also provides opportunities for children to develop their speaking and listening abilities through conversations with their caregiver. The caregivers interviewed described being able to easily converse with their child especially when they were sitting in a front-mounted seat, due to the physical proximity that the set up allows.[23,24] **These opportunities for constant conversation allow the young child to develop their vocabulary, an important part of their cognitive development,** as described by O'Donoghue.[25] This type of conversation is also linked to self-regulation, language acquisition, and socio-emotional adjustment.[26]

Shared Sensory Experiences

Cycling with a young child also allows for shared experiences. Anything that is observed during the ride, such as seeing a new kind of animal, is something the caregiver and child can discuss and learn about. Riding with his son in a front-mounted seat, Jacob Mason, the Director of Research and Impact at the Institute for Transportation and Development Policy in Washington, U.S.A., describes: "I could point out trees, stop signs, he learned shapes that way, he learned left and right that way...he could learn it because he was sitting inches away from me while I was pointing".[27] **This type of "serve and return" - when a gesture or sound from a child indicates interest and an adult responds with encouragement, a name, or explanation - helps develop a child's communication and social skills**.[28] Long-term studies have connected this practice - also known as "conversational turns" - to IQ, verbal comprehension, and language skills.[29]

Cycling allows caregivers to accomplish various tasks, such as commuting to work, running errands, exercising, or sightseeing, while still engaging in these positive connections with the child.[30]

Time Together

For many caregivers, having these shared experiences is difficult because they have a number of responsibilities and are constantly on the go. **Cycling allows caregivers to accomplish various tasks, such as commuting to work, running errands, exercising, or sightseeing, while still engaging in these positive connections with the child.[30]**

Be a Hero

As a child shifts to his or her own bicycle, the caregiver has the opportunity to be a positive role model in teaching the child a skill that they will use for the rest of his or her life. Juventino Quiroz, Bicycle Mayor of Panama City, Panama described how he often thinks about his own caregiver teaching him to cycle and how this created a lifelong positive connection.[31] He also hoped this positive association would continue for his children.


Credit: Ruben van Well


Credits: Bicitekas Archive

Community

Cycling also provides caregivers and children (0-3) with a number of opportunities to connect with their community.

Young children often start learning to cycle in shared yet controlled environments such as on the sidewalk, in an alley, on a quiet street, or in a local park. The public and prolonged nature of this process provides a number of opportunities for the caregiver and child to interact with members of the community, particularly other caregivers and children.[32]

Cycling in general is a public activity. In areas where bikes are stored in public or shared spaces, caregivers and children cycling will frequently make contact with other cyclists during the process of locking or unlocking the bike. In addition, cycling outside allows the caregiver and children to be recognisable faces in the community.

The idea that the cycling caregiver and child are “in the elements” and not traveling inside a car also means that they can hear and converse with those around them. As they cycle through the community, they can exchange greetings with neighbours and friends.[33]

Similarly, given the limited range of a bicycle as compared with a car or public transportation, cycling caregivers and children are more likely to shop, play, and make friends in a more confined neighbourhood, potentially deepening those relationships.

Finally, being a new parent can be quite isolating. Cycling provides opportunities to get out of the home with the child, explore the neighbourhood, take advantage of key services, and meet and interact with others.[34]

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Credits: Bicitekas Archive

Natural and Built Environment

The natural and built environments offer children a number of opportunities to grow and develop and cycling gives children the chance to strengthen these connections.

Children who cycle - first with their caregiver and then on their own - are exposed to a number of different weather conditions, such as high and low temperatures, as well as rain and wind. Jacob Mason, the Director of Research and Impact at the Institute for Transportation and Development Policy in Washington, U.S.A., reflected on how this impacted his son: “We are outside all the time and cycling is a big part of that… he wants to go outside all the time… in different weather, because he has a tolerance for it from cycling in all conditions”.[35] **Developing a comfort with being outdoors is the first step to enjoying and learning from nature. This is important because playing outside is beneficial for motor and visual development** and a lack of outdoor play can inhibit creative thinking and social skills.[36]

Jimena Perez Marchettta, the Bicycle Mayor of Salta, Argentina, described how riding with her son helped him become more connected with the built environment. On a particular street on which they regularly ride, her son noticed that the street had been resurfaced and wanted to feel what the fresh asphalt felt like.[37] In this way, he demonstrated a curiosity about his connection to the built world around him - in this case, the freshly-paved road - and wanted to know how it felt, further deepening that connection. In addition, he was willing to touch an unfamiliar surface and material, with no idea of how it would feel.

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Aware

Cycling with a caregiver creates an awareness in children of a number of different relationships which are valuable for their understanding of the world around them.

Spatial & Neighbourhood

When young children (0-3) cycle with a caregiver, either on the same bike or on their own bike, they gain a greater spatial understanding and awareness of their area. Their home, a friend's home, the local store - these landmarks do not exist as islands to which we magically teleport but are connected to each other via a network of routes.[38,39] Bruce Appleyard observed how children mapped their neighbourhood.[40] **Children who cycled were able to accurately map the neighbourhood landmarks and the connecting routes.** Children who were driven everywhere drew a series of unlinked paths. Similar studies have emphasised the importance of observational wayfinding skills gained through cycling and the benefits of this ability throughout life.[41]

Rules & Hierarchy

Similar to the way that landmarks within a child's life are connected by paths, objects in space, such as cars, bicycles, and pedestrians, are connected to each other by a series of rules. Infants and toddlers begin to learn these rules by cycling with their caregiver and this helps them establish a sense of order. Stopping and waiting at an intersection provides an opportunity for a young child to observe how rules allow vehicles and people to move through space smoothly and predictably. Children also begin to better understand the relative danger of certain objects such as large trucks or fast-moving vehicles and the greater level of caution they should exercise when cycling near these vehicles.

Visual & Auditory Cues

The street is filled with sights and sounds that begin to take on meaning for young children as they cycle more with their caregiver. Cycling on or near the street exposes children to a range of sounds that would otherwise be muted inside a car, bus, or train. Different types of vehicles have different sounds associated with them and this creates a connection for young children. A loud noise could mean a large or fast vehicle is near or approaching and the child should exercise caution. The relative location of a vehicle is another key aspect of developing an awareness and understanding of the sounds on the street. Hearing a vehicle approaching from behind and the sound growing louder helps the child to understand the spatial relationship between objects. Visual cues also help the child to derive meaning from the objects in the street. Watching the traffic light turn from red to green and then observing the resulting change in behaviour enhances a child's awareness of the street.

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Addressing Perceptions of the Bicycle

Despite the broad benefits that cycling provides to a city as well as the specific benefits for infants, toddlers, and caregivers, many city leaders remain reluctant to consider biking as an option for a number of reasons. This section addresses some of those hesitations and attempts to correctly frame the bicycle in the minds of city leaders as a key piece of the broader mobility puzzle.

"Providing Cycling Infrastructure is Expensive"

The provision of cycling infrastructure may involve a reallocation of and temporary rise in transportation budgets, but has been proven time and time again to cost considerably less per kilometer in construction compared to that of motorised transport. For example, in the UK[42], the average cost per kilometer of a bicycle highway, considered to be the most expensive form of cycling infrastructure, is £1.3 million. In comparison, expanding road capacity would cost approximately £50 million per kilometer, and railways £77 million per kilometer. In addition, cycling investments have significantly larger benefit to cost ratios, attributed to externalities like health benefits, returning around an additional £8 per pound spent. They also have lower maintenance costs.[43]

"The City is Too Hot and/or Too Hilly"

Difficult topography and extreme weather can make cycling difficult. An electric bicycle is one way that cities with unfavorable cycling conditions can make it possible to cycle. This will be discussed further in the next section.

"The City's Streets are Too Narrow for Cycling Infrastructure"

Some streets may seem too narrow to accommodate cycling infrastructure, but it is often the case that road space can be reallocated by removing car parking, making streets one-way, or reducing the width of motorised lanes. In the case that these measures cannot be employed or there is yet to remain enough width for cycling infrastructure, area-based measures to reduce motorised traffic volumes and speed can be utilised to assure cyclists will feel comfortable mixing.[44]

"Cyclists are Reckless"

While cyclists do break traffic laws, it has been widely found that drivers break the rules just as much as, if not more than, cyclists do. Cyclists' decisions to break the rules are usually rational, most often done to ensure personal safety rather than save time like drivers and pedestrians.[45] In addition, their decisions result in less incidences of injuries and fatalities, and are often a symptom of inadequate infrastructure that does little to protect.[46]

Credits: Bicitekas Archive

"Distances in the City are Too Long"

Studies have shown that bicycles are most suited to replace trips up to 7.5 kilometers.[47] This can vary as a result of a number of factors - physical ability, topography, and trip type - as well as the type of bicycle used (e.g. electric pedal-assist). Walking and public transit can be used for trips of greater than 7.5 kilometers or in connection with the factors above. This will be discussed further in the next section.

"Caregivers Need to Transport Children and Goods"

Bicycles can be used for trips involving the transporting of children or goods if the proper equipment is available, affordable, and incorporated into cycling infrastructure. This will be discussed further in the final section.

"Prioritising Car Access is Better for Business"

Reallocating road space in favour of cyclists often comes at the expense of car parking, which at first glimpse may be worrisome for commercial activity; drivers are usually more well off than cyclists and have higher capacity to transport bulk. Indeed, it has been found that cyclists do spend less per trip, but they tend to make trips more frequently, spending around the same amount on average, or more, than drivers do.[48] In addition, substituting car parking for bicycle parking means that there is capacity for around six more people to park and visit shops, which compensates for lower spending per hour.[49]

Getting Started

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The focus of this section is to help city decision makers get a better understanding of why people, especially caregivers, do not cycle, and how to take a few key steps to change this. The emphasis of this section is on gaining knowledge and perspectives, laying the groundwork, and establishing trust.

Understanding the Barriers to Cycling for Caregivers

Infants, toddlers, and caregivers face a number of barriers to cycling that are similar to cyclists in general but have specific differences. It is important to understand these barriers in order to begin to address them.

Personal Safety

One of the main barriers to caregivers cycling with infants and toddlers is a concern about personal safety in public space. In interviews with numerous caregivers, especially female caregivers, this was nearly always the main concern. **Harassment, whether verbal or physical, from cat-calling to direct attacks, is a regular threat to women in public spaces.** In Mexico City, in which the United Nations has launched the "Safe Cities and Safe Public Spaces for Women and Girls" program, a survey showed that over 60% of women interviewed had experienced street harassment in the last month.[50]

Other studies show that nine out of ten women have experienced violence on public transit.[51] In addition to avoiding cycling, the threat of harassment and violence causes many to avoid certain routes and spaces, or even leaving home altogether. Rather than being a means from getting from point A to point B, the act of mobility becomes a significant source of stress and anxiety that can have serious impacts on physical and mental health.

Traffic Safety

Another significant barrier to caregivers cycling with infants and toddlers is traffic safety and the threat of harm from motor vehicles. Cycling is often perceived as less safe than walking because cyclists operate closer to motor vehicles, have little to no separation or protection from motor vehicles, and many motor vehicle operators are not familiar with having cyclists operate in the same space and are thus not as cognizant of their presence. As compared to driving or riding in a motor vehicle, cycling is perceived as less safe as a result of a lack of exterior protection as well as the smaller size of the bicycle as compared to most motor vehicles which often results in motor vehicle operators not seeing cyclists in so-called "blind spots" of motor vehicles.

For these reasons, most caregivers would not consider putting themselves in such a situation of potential harm, much less the infant(s) and/or toddler(s) of which they have been tasked to care for. According to the World Health Organization, over half of all traffic deaths are pedestrians and cyclists and road traffic injuries are the leading cause of death for children and young adults aged 5-29 years.[52]

Socioeconomic Perception

For a number of reasons, cycling is seen by many as “not for me”. It is **often perceived as a vehicle for the poor** - those who cannot afford any other means of transport and are thus forced to endure the traffic safety risks described above.[53] The opposite is also true, especially in developed countries; there, cycling has become associated with wealthier, especially white, segments of the population who live close enough to work, shopping, or entertainment to cycle and are less likely to be targeted by police harassment.[54]

Distance

Long travel distance leads to a direct increase in the time and physical effort it takes to get to destinations, and is strongly associated with lower use of the bicycle. This has been found to be the case for parents, who frequently choose modes of shortest duration.[55] **As many cities are forced to sprawl away from city centres due to population growth, longer distances of travel become more recurring,** especially where there is low density and little mixtures of functions. This limits caregivers’ access to basic needs, and is especially critical for those who come from low-income households that can only find affordable housing well outside of city centers where many jobs are located.[56]

Weather & Topography

Extreme weather and topographical conditions in cities make it unpleasant or difficult for many to cycle. Heat and humidity can exacerbate the strain cyclists already feel.[57] Cities are becoming hotter not only because of climate change but also because of the “heat island” effect; building and road surfaces absorb and re-emit heat at a much greater rate than natural surfaces such as water or vegetation. Waste heat is also being generated at a greater rate with the increased use of air conditioning.[58] **Climate change is also causing an increase in precipitation in many cities which has been proven to reduce bicycle ridership.[59]**

Hills have also become a greater challenge for cyclists in cities. Throughout history, cities have mostly been founded near water on relatively flat terrain. As population expands beyond the carrying capacity of the original core though, new developments are forced into increasingly hillier areas on the periphery.[60]

The difficulty in extreme weather and terrain is made worse by the fact that caregivers have to transport one or more children as well as cargo such as groceries. With added weight, the bicycle, without proper design can become unstable on the up- or downhill portion of the ride threatening the safety of the caregiver and child(ren).


Credits: Josafat Martinez de Luna

Air Pollution

Air pollution, can lead to an increased risk of respiratory illnesses in adults and children alike.[61] In a German study examining the effects of perceived traffic risks on cycling behaviour, it was found that parents avoided cycling in fear of putting their small children at a health risk.[62] The fear is not unfounded either - the act of cycling does have the potential to increase exposure to air pollutants; cyclists respire at a higher rate which increases the volume of inhaled air and therefore pollutant absorption. This effect is especially harmful when riding around motorised traffic - during peak hours, for example. Coupled with the lack of a protective layer on bicycles, **air pollution may pose an additional risk that caregivers may not be willing to take.** It is important to note however that several studies have shown that the air quality is more often worse in cars.[63]

Equipment Costs & Availability

The initial investment of purchasing a traditional bicycle may pose a barrier for people that live paycheck to paycheck, as has been found to be the case in Western African cities such as Ouagadougou, Burkina Faso.[64] When it comes to the responsibilities caregivers have, like transporting toddlers and infants or goods, the cost of additional equipment comes into play as well - **detachable bicycle seats or bicycle bags, for example, may not only be unaffordable but difficult to find**, especially in cities with underdeveloped bicycle industries. The same argument goes for cargo bikes, which are often seen as a luxury.[65]

How to Begin Addressing these Barriers

Be Strategic with New Infrastructure, Starting with Pilots

Cycling infrastructure is one of the main ways of addressing concerns around traffic safety, but it is also where most cities get stuck. Infrastructure can be expensive, politically risky and often the debate about how much to spend, where to implement, and what type of treatment to use distracts from the main purpose: keeping people safe.[66]

Control the Narrative

Focus on how the change benefits all road users, not just cyclists. Reducing the speed of a road through traffic calming helps make it safer for pedestrians, cyclists, and motorists. Many road redesigns that eliminate or reduce the width of driving lanes - a technique of traffic calming - have actually been shown to reduce or have negligible effect on travel times through an area by simplifying travel patterns, despite the perception of motorists.[67]

Prioritise for Impact

Given the limited resources for road redesigns and protected bike lanes, it is important to focus first on changes that will have the greatest impact on increasing cycling. Using a system like Level of Traffic Stress (LTS)[68], which assigns streets and crossings a 1-4 rating based on speed, number of lanes, existing cycling infrastructure, as well as a connectivity analysis focusing on connecting cyclists to key destinations, create a priority list for new projects that have the highest potential to improve connectivity while improving Level of Traffic Stress. In the case of Rio de Janeiro[69], it was helpful to start in areas of high visibility to create cultural impact. In most cases, new infrastructure is best utilised when it alters a LTS Level 3, which most cyclists would not consider using, to an LTS Level 2, which most would consider using.


Credit: Joni Baboci

Use Demonstration Projects as Proof of Concept

A temporary project in most cases will receive approval far easier than a permanent project and they are often cheaper and quicker to implement. Allow users of the space the chance to experience a different configuration and measure the influence of the change. Hold events to bring people to the space and increase buy-in for the project. Survey different types of users about their perception and experience and measure factors like car speed, travel time, flow as well as mode share. These are keys figures that will be necessary for making the temporary change permanent.

Create Key Alliances

Cyclists and future cyclists aren't the only people who benefit from safer streets and from the ability to use the public space in different ways. Partner with groups that focus on access to public space, reducing traffic deaths, safe routes to school and other initiatives that have similar end goals[70]. The more widely applicable the message is and the greater the diversity of groups that are championing the cause, the more likely projects are to be approved and funding secured. In places where cycling has become associated with wealthier and more dominant groups, this also shifts the narrative to focusing on road users of all ages, income-levels, and backgrounds.

Utilise "Invisible" Infrastructure

Two of the key factors that play a major role in how safe a street feels to cycle on are the speed and volume of motor vehicle traffic. Separating and heavily protecting cyclists is necessary on arterial roads that remain higher speed and volume, but more local roads can be made to feel safer by reducing the speed and volume through traffic calming and without the need for additional cycling-specific infrastructure. Reduce traffic volume, especially through traffic, with bollards and diversions that "filter" traffic so that only local traffic travels on local roads. Reduce traffic speed by narrowing lanes and adding speed tables or other traffic calming devices. While these alterations improve conditions for cycling, they also make roads safer for all users, including motorists, and are thus more difficult to dispute the need for.[71]

Car-Free & Open-Street Events

Give people the chance to experience their city's streets in a whole new way and allow them to re-imagine what it could be like if they could get around with a bicycle. Car free and open street days have sent out strong waves of new discussions in Kampala[72], for example, and have enabled the public to appreciate their cities without cars.


Credit: Steve Hymon


Credits: Mariana Salvador

Stakeholder Engagement

In order to ensure the success of any initiative, it is important to communicate directly and often with caregivers. This will increase buy-in by providing caregivers a platform to express their challenges and give feedback on the solutions. Organise a diverse working group of caregivers (age, income, background, neighbourhood) and meet with them throughout the project in a setting and at a time that is convenient for them. Childcare should be provided. As part of this group, ask caregivers to indicate on a map the routes they currently use and the routes that feel unsafe (whether due to traffic or personal safety). In addition, listen to and record their daily/weekly behaviours, patterns, and needs. Outside of this core group, conduct awareness and promotion campaigns showing caregivers with children biking and emphasise that it is possible in adverse weather or air pollution, on hills, and over long distances.

Bicycle Lease-to-Own Programs

To overcome the high up-front costs associated with purchasing a bicycle as well as the necessary gear for transporting children and goods, partner with bicycle equipment manufacturers, bike shops, and community centers to offer lease-to-own or work-to-own programs. With lease-to-own, especially in low-income communities, the monthly payment should be no higher than a percentage of caregiver's monthly transit spending, as even with a bicycle for shorter trips, many caregivers will still need to use transit for long trips.

Credit: Josafat Martinez de Luna

Credits: Dhiraj Singh / Bernard van Leer Foundation

Trying Out Bicycles

In combination with the opening of a new bike parking facility or any other cycling promotion event, and in partnership with bike shops and manufacturers, offer people the chance to experience different styles of bikes, such as cargo bikes or electric bikes. Ensure there are bike specialists on hand, especially women, who are often underrepresented in this group, who can help adjust the bicycles to each rider's height and comfort-level and make recommendations for which bike best suits each rider's needs. When someone rides a bike that is properly fitted to their body type and needs, it can make a major difference in their perception of cycling and confidence in commanding the vehicle among traffic and safety concerns.

Electric Bicycles

With higher speeds and less effort required from the rider, especially on hills, the electric bike offers a solution to a number of the barriers identified above. In addition, for a caregiver transporting multiple children and groceries, the electric bike may be the only option in anything other than flat conditions. As a result though, of the high purchase cost relative to a traditional bicycle, cities will need to work with local groups to offer a lease-to-own program in order to make owning an electric bike financially feasible, especially for lower-income caregivers.

Incorporating Cycling into other Active Modes

Mobility is most optimised when cycling complements other modes. This gives the caregiver choice, flexibility, and adaptability which are important for their constantly changing, often chaotic, schedule. It also allows them to choose a mode which meets their needs in terms of the transport of children and/or goods.

Public Transit

Combining cycling and public transit provides the user with a number of benefits in terms of distance and speed. The bicycle allows a caregiver to potentially reach a wider range of public transport options - particularly valuable if some of the options are higher-frequency, higher-speed, and/or longer distance. The public transport portion of the trip allows the user to cover distances that would be impractical for walking or cycling.[73]

There are three conditions that are necessary, for this combination to be preferred:

- Cycling must be possible to and from a caregiver's local transport stop or station
- Secure, easy-to-use parking and an easy transition from the bicycle to the train, bus, or metro must exist
- Frequent (even at off-peak hours), high-speed, affordable, accessible, and safe transport must be available to make it worth cycling to


Credit: Dutch cycling embassy

The challenge for the bike-train combination is how the user reaches their final destination after departing from the bus, metro, or train (the "last mile problem")[74]. The three conditions presume that the user's final destination is close enough to the stop or station (for example a downtown or central station) to not require a second bike trip. This limits the number of users that can take advantage of the multi-modal trip.

Cities have tried to solve this problem with one or both of the following solutions: allow users to bring their bicycle on the bus, metro, or train, or some version of bike sharing. The first allows users to use their own bike for both ends of the trip but is limited in practice by space on the bus, metro, or train. Getting a bicycle - especially one made for the transport of children and/or goods - onto a transport vehicle is for many cyclists difficult or impossible without proper lifts, ramps, and sufficient maneuvering space. As discussed below, bike sharing, especially when connected to public transport, provides users with a far greater range of destinations after departing the public transport portion of their trip.[75]

Credit: Bernard van Leer Foundation

Walking

Walking is the simplest mode for local trips up to 2.5 kilometers[76], especially when suitable infrastructure is provided, such as sufficiently-wide, well-maintained sidewalks, safe and easy crosswalks, and useful wayfinding. Cycling can complement these trips by expanding the range of reachable destinations beyond 2.5 kilometers.[77] In addition, for trips with children and goods, a bicycle can make these trips less burdensome.

Bike Sharing

Bike sharing provides caregivers with a number of advantages. Caregivers generally make multiple stops (or "linked trips") as part of their journey from point A to B and often have different needs for each link of the trip. Bike sharing is a flexible option that, for example, allows the user to get to a destination such as a shopping area, complete their shopping, and then get on public transit without having to worry about the bicycle. A critique of most bike sharing systems is that because they do not have child seats or bikes small enough for young children they exclude caregivers traveling with infants and toddlers.[78]

Scaling and Optimisation

Entering the third phase means a city has begun to make it possible for infants, toddlers, and caregivers to cycle and now needs to ensure that it is safe, easy, comfortable, and fun.

The focus of this section is on scaling strategies from piloting to neighborhood or citywide and ensuring that the needs of cycling infants, toddlers, and caregivers are taken into account. There is also a strong focus on changing behaviours of those that needed an initial level of infrastructure and investment from the city to be convinced of the value and convenience of cycling.

Making Cycling Safe, Easy, Comfortable, and Fun

A city that has laid the groundwork for prioritizing cycling now needs to scale its efforts to ensure that the momentum is not lost and the number of cyclists continues to grow. Cycling needs to be more than possible; it must be safe, easy, comfortable, and fun or else most people, especially infants, toddlers, and caregivers, will choose other modes. These qualities - safe, easy, comfortable, and fun - have been used to organise the initiatives below to scale cycling. The different interventions are arranged from small to large in terms of the cost, time, scale, etc. so that cities can prioritise accordingly given limited resources. They encapsulate strategic and integrated urban and transport planning, infrastructure, services for cycling caregivers, as well as education and awareness.[79]

Things to Consider When Scaling & Optimising

Equitable Distribution of Projects

Projects that focus on central or downtown locations often disproportionately benefit wealthier, inner-core communities in cities where these neighbourhoods are largely high-income. As a result, in some regions, cycling infrastructure has become associated with gentrification and displacement[80]. It is important to distribute projects and funding equitably, even if cycling rates are currently lower in certain areas.

Data-Driven Decisions and a Need for More Data

There is a significant lack of data when it comes to cycling in general and for caregivers, infants, and toddlers in particular. In order to ensure that a city's limited resources are invested wisely, decisions should be made based on data in addition to stakeholder input. Cities should focus on collecting the following types of data in order to inform these decisions:

- Current mode-share split of caregivers (walking, biking, transit, car, etc.) - samples can be taken at childcare centers or at popular caregiver destinations (museums, parks, libraries)
- Travel patterns of caregivers including time of day, length of trip, and type of destination - travel diaries provide detailed records from a representative sample group
- Caregiver preferences, needs, and challenges related to mobility - work with the stakeholder group to distribute surveys to caregivers across different neighborhoods, income levels, backgrounds, etc.

Small Measures

SAFETY

- Facilitate groups of caregivers (especially women) that can cycle together and feel safer, either as part of weekly shopping, or to drop child(ren) off
- Conduct a temporary traffic calming and reduction pilot (paint, temporary bollards/planters) near a caregiver destination (playground, childcare facility, museum, library)
- Conduct a cycle lane pilot near caregiver destinations with separation from motorised traffic and pedestrians by a hedge/curb
- Provide information to caregivers regarding safe cycling with children (either on the bike with the caregiver or riding separately) (ie. age-specific considerations, equipment)

EASE

- Conduct a temporary bike parking pilot at a caregiver destination (playground, childcare facility, museum, library) using car parking space
- In existing bike parking areas, create more space between racks for cargo bicycles (and add signage to denote these areas)

COMFORT

- Provide information to bike shops about family- and female-friendly commuting / utility bicycling equipment (ie. bike seats, cargo bikes)
- Initiate women-led training programs for young women to learn bike maintenance. Connect program with internships and jobs.
- Develop and distribute neighbourhood-specific maps with child-friendly routes (lower air/noise pollution, lower speeds, more greenery, etc.)

FUN

- Partner with museums and educational institutions to provide educational signage or art (numbers, colours, pictures, shapes) along bike paths

Medium Measures

SAFETY

- Install permanent traffic calming and reduction fixtures (diversion, speed tables) connecting caregiver destinations
- Expand cycle lane network starting with neighbourhoods that are already largely safe to cycle in, connecting caregiver destinations
- Regular maintenance of streets to reduce litter and graffiti and reduce the perception of low neighbourhood safety

EASE

- Widen cycle lanes / tracks to allow for use of cargo bikes and reduce stress on slower riders (ie. caregiver riding with child(ren))
- At commercial hubs, provide short-term (1-2 hour) childcare so that caregivers can complete errands more efficiently
- Install bike-sharing stations near caregiver destinations and public transport hubs and ensure that some bicycles feature child seats
- Based on gaps in bike parking inventory, provide additional, well-lit, safe parking spaces
- Upgrade existing bike parking with racks that allow for stabilising bike while loading/unloading children/cargo
- Modify existing parking to ensure traffic is only on one side (as opposed to being located on a traffic island) and that there is a buffer or a barrier between the parking and the street
- Ensure all current and future bike parking areas provide enough space for cargo / longtail bicycles

COMFORT

- Add more street trees (for shade and traffic calming)
- Add more safe and clean public restrooms with changing tables, particularly near commercial / gathering areas
- Install drinking fountains near restrooms and caregiver destinations
- Provide flexible “play/pause” spaces with benches at frequent intervals for caregiver/child(ren) to take breaks en route (in lieu of formal playgrounds)
- Add lighting along bike routes

FUN

- Integrate existing or new green/natural spaces into bicycle network
- Build “Traffic Playgrounds” where young children can learn to cycle in simulated conditions

Large Measures

SAFETY

- Develop and implement a car circulation plan which creates hierarchy of streets (local, connector, arterial) with defined speeds, number of lanes, and appropriate cycling facilities
- Reconstruct streets to reduce and narrow lanes in order to calm traffic
- Create a network of cycle lanes and slow streets by connecting existing lanes and reducing speed of neighbourhood streets

EASE

- Focus new development and redevelopment around 15-minute neighbourhoods with a mix of housing, jobs, stores, and services
- At commercial and transportation hubs, add secure, well-lit bike parking facilities (above- or below-ground garages)
- Make secure, well-lit bike parking required for all new developments

COMFORT

- Develop policies that reduce and/or disincentivise the use of air and noise polluting vehicles

FUN

- Integrate cycling into pre-school and primary education curriculum
- Develop media (books, TV, movies) that normalise cycling as transportation, especially targeted to young children and caregivers
- Develop a Department of Children and Families that brings together representatives from other departments (health, business, education, transportation) that focuses on making cities more child- and family-friendly

Developing a Caregiver-Oriented Guide to Cycling with Infants and Toddlers

One of the challenges faced by caregivers who want to cycle with infants and toddlers is the lack of information on the subject. This can range from basic questions like “when is it OK to start cycling with a child?” to “what are the basic requirements for a safe child seat?” This information is often lacking especially in regions where cycling for transport is uncommon.

Why is a guide important?

Centralising information into an easy-to-understand guide helps busy caregivers make better-informed decisions quicker. Having to search through numerous websites and academic studies will cause even the most passionate cycling caregiver to give up, and most will not even take the time to look extensively. With photos and simple language, guides can also be more accessible to those with limited literacy or language skills. It is also important for the guide to take into account local conditions and context in order to increase its relevance and thus its adoption.

Developing the Guide

Before developing such a guide for caregivers, a city or region should assemble a diverse working group of caregivers (varying in age, income, background, neighbourhood, etc.). This group will help ensure the success of the project by identifying the needs of the guide in terms of what type of information should be included and in what form the guide would be most accessible. The working group can also help distribute it to relevant groups and individuals and increase uptake by being early adopters. Finally, the group can provide feedback on drafts of the guide. The project manager should meet with the working group throughout the project in a setting and at a time that is convenient for the members, with childcare provided.

An example of an activity that utilises the local knowledge of the working group is to create a family/child-friendly cycling route map. Working group members can indicate on a map the routes they currently use and the routes that feel unsafe (whether due to traffic or personal safety).

Credits: Cecilia Vaca Jones/Bernard van Leer Foundation

Types of Information Helpful for Caregivers for Cycling with Young Children (0-3)

Addressing Health Concerns

- The risks of air pollution while cycling and how they can be avoided
- The physical and mental impacts of a child's active lifestyle
- The impacts of outdoor playtime on a child's creative thinking and social skills

Equipment that makes cycling safe, comfortable, easy and fun

- What style of bicycle (longtail, longjohn, etc.) and fit (seat height and size) is most suitable for cycling and transporting items/children
- The types and features of bicycle attachments for caregivers (kickstands, baggage carriers, and skirt/mud/chain guards)
- The types and features of bicycle attachments and accessories for children (front- and back-mounted child seats and child helmets)
- Where items are sold and their price range

Age

- What age a child can begin to sit in a child seat
- When a child should shift from a front- to back-mounted seat

Length of Ride

- The maximum time recommended to spend in a child seat

Route Planning

- Which cycling routes are most family and child friendly given natural and built environments (green corridors, cycling infrastructure, topography, etc.)

Helpful Websites and Blogs

- "Cycling with a baby" Bicycle Dutch
- "Cycling with babies and toddlers," Bicycle Dutch
- "Toolkit – For measuring urban experiences of young children," Gehl & Bernard van Leer Foundation

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