

Healthy and happy children: two-wheel focused cities and a golden opportunity for local governments

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Abstract

Urban environments profoundly shape the health and development of children and adolescents. As pediatricians and key advocates for child health, we must acknowledge car-centric urban design as a major yet underappreciated determinant of pediatric well-being. By 2050, 70% of the children worldwide will live in cities, many of which are designed primarily for car mobility. This paradigm contributes to environmental degradation, increased accidents, and a higher incidence of conditions such as asthma, respiratory infections, and hypertension. Exposure to air pollutants has also been linked to prematurity, impaired neurodevelopment, and allergic diseases. In contrast, active mobility, especially cycling, offers substantial benefits for children's physical, psychological, and social health, enhancing motor skills, autonomy, and self-esteem, while addressing the global rise in childhood obesity. Despite this, barriers such as unsafe infrastructure and poor urban planning hinder its adoption. Evidence from "bike-friendly" cities demonstrates that investing in active mobility yields health, environmental, and economic gains. Promoting child-centered, sustainable urban design requires coordinated action across individual, social, infrastructural, and public health levels. Pediatricians should leverage their unique position to advocate for policies that prioritize safe, accessible, and active mobility, helping ensure healthier, more sustainable cities for future generations.

Keywords: Public health. Bicycling. Urban Health. Environment Design. Exercise. Child health.

Crianças felizes e saudáveis: cidades amigas das bicicletas e uma oportunidade única para as autarquias

Resumo

O ambiente urbano condiciona profundamente a saúde e desenvolvimento dos jovens. Como pediatras e defensores-chave da saúde infantil precisamos de reconhecer a gestão centrada no automóvel como determinante, embora subvalorizada, do bem-estar pediátrico. Em 2050, 70% das crianças no mundo viverão em cidades, planeadas frequentemente para a mobilidade automóvel. Este paradigma contribui para maior degradação ambiental, risco de acidentes e de incidência de patologias como asma, infeções respiratórias e hipertensão. A associação entre exposição a poluentes atmosféricos e prematuridade, alterações do neurodesenvolvimento e doenças alérgicas foi também já demonstrada. Contudo, a mobilidade ativa, nomeadamente de bicicleta, beneficia substancialmente a saúde física, psicológica e social, potenciando as capacidades motoras, autonomia e auto-estima, atuando também na obesidade infantil, em agravamento mundialmente. Apesar destes benefícios, barreiras como infraestruturas e planeamento urbano deficitário limitam a adoção deste meio de transporte. Cidades "amigas da bicicleta" demonstraram que o investimento na mobilidade ativa traz ganhos em saúde, ambientais e económicos. Promover o

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Received: 19-11-2025

Accepted: 18-02-2026

<https://pjp.spp.pt>

Available online: 21-04-2026

Port J Pediatr. (Ahead of print)

DOI: 10.24875/PJP.25000090

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planeamento urbano sustentável e focado na criança requer intervenções coordenadas a nível individual, social, estrutural e nas políticas de saúde. Os pediatras devem usar a posição única para advogar pela priorização da mobilidade segura, acessível e ativa, garantindo cidades saudáveis e sustentáveis para gerações futuras.

Palavras-chave: Saúde pública. Ciclismo. Saúde da população urbana. Planeamento ambiental. Exercício físico. Saúde infantil.

As pediatricians and main advocates for the health of all children and adolescents — maybe second only to their parents and caregivers — we must not ignore one important factor for the health of this vulnerable population: car-centric cities.

The World Health Organization estimates that, by 2050, 70% of the worldwide children will live in cities.¹ Cities are often organized by adults and planned with a focus on how adults move through the city; thus, in many parts of the world, the main goal remains to shorten and accelerate private car trips. This paradigm continues to favor a mode of transportation that not only has local and global environmental impacts,² but also contributes to increased accidents³ and higher rates of obstetric complications⁴ and pediatric conditions, such as asthma, respiratory infections, and hypertension.^{5,6} Notably, transition toward electric vehicles, despite important benefits in reducing emissions and noise, does not address sedentarism, urban space overconsumption, or safety risks, reinforcing the need to prioritize active mobility.

Syed et al. observed that, compared to children living in areas with lower pollution, those exposed to higher levels of air pollutants had more severe asthma symptoms and lower levels of regulatory T cells.⁷ This negative environmental exposure has also been associated with an increased risk of infant death and adverse perinatal outcomes. Estimates suggest that, in 2019, prematurity could be attributed to exposure to environmental PM_{2.5}⁴ in about 2 million newborns worldwide. Prenatal exposure to several air pollutants may also contribute to lower cognitive levels, attention problems, ADHD, and ASD in children.^{8,9}

Notably, learning to ride a bicycle is itself a significant milestone in child neurodevelopment and is often a memorable family bonding experience. Cycling supports motor coordination, balance, social interaction, and self-image.¹⁰ Furthermore, initiatives that bring children together for group cycling lessons may serve as an alternative in certain urban or family contexts. School-based initiatives, such as incorporating cycling into Physical Education, could help teach bicycle riding to children whose families face logistical or financial barriers. Community initiatives such as supervised “bike trains” and municipal cycling programs have also already been piloted in several

Portuguese cities. Even for children with motor impairment due to neurodevelopmental disorders, group cycling activities have shown additional benefits and effectiveness in promoting self-esteem¹⁰. Beyond being a key motor skill, cycling enhances children’s independence and autonomy, while fostering social interactions with peers of a similar age.^{11,12}

Another major global issue that is impossible to ignore is overweight and obesity in children. The World Health Organization estimates that in 2024, 35 million children under 5 years of age presented with overweight, and, if we extend the age range to 5–19 years, there were 390 million cases of overweight and obesity in 2022, 160 million of which were obese.¹³ To make matters worse, the prevalence of this condition has been increasing, resulting in multiple health consequences.¹⁴ A milestone in this alarming trend was recently reported: the number of children with obesity worldwide surpassed the number of malnourished children.¹⁵ Obesity depends on hereditary, behavioral, environmental, and socioeconomic influences, so addressing it requires not only healthcare professionals but also public policy.¹⁴ Increasing physical activity and reducing sedentary behavior will be essential in this challenging process. Why not enable and encourage children (and adults) to include physical activity in their daily commutes, whose benefits have already been proven?¹⁶

If the benefits of this type of mobility are so clear and well-studied, why don’t we see children — and, again, adults — riding bicycles more frequently? From an urban planning perspective, there are several barriers in many parts of the world.^{17,18} Some key factors for positively perceiving and adopting cycling as a mode of transportation include street connectivity, distance and accessibility to destinations, and perceived safety.¹⁸ Portuguese legislation currently does not mandate helmet use for everyday urban cycling among minors, besides e-bike use and regulated sports. However, helmet promotion may influence parental risk perception and cycling adoption, highlighting the need for balanced safety messaging.

The perception of safety ultimately depends on existing infrastructure. In Portuguese cities, despite recent cycling networks expansions, challenges remain, including fragmented infrastructure, traffic density, and complex urban morphology - particularly in cities with

steep hills and narrow historical streets. Mitigation strategies such as traffic calming, safer school zones and access to e-bikes and protected bike lanes may improve feasibility and safety. Road traffic accidents remain one of the leading causes of pediatric mortality nationally and worldwide.^{19,20} It is estimated that, in the European Union, 13% of road traffic deaths among children aged 0–14 years are due to bicycle accidents.²¹ Although 2024 data show a modest reduction in road traffic fatalities and severity, Portugal continues to rank among the European countries with the highest road mortality rates, alongside a simultaneous increase in total accidents and in both serious and minor injuries.²² Reducing these numbers — even slightly — is possible and can save dozens of lives each year.²¹

Several scientifically studied global initiatives have been implemented to create “bike-friendly” cities.^{23–26} In France, urban planning efforts have been made in recent years, including in the capital.^{23,27} Paris has implemented the “15 minutes city” concept, which aims to make most necessities and services (workplace, public services and leisure), easily accessible within a 15-minute walk, bike ride, or public transit trip, with clear and demonstrated benefits.²⁷ Unlike Paris, other countries have implemented this philosophy in various cities for decades. A study by Delft University researchers in the Netherlands reported that the national bike-sharing program generates a return on investment of €1.50–€2.40 per euro invested. This is explained by increased accessibility, reduced road congestion, and improved health outcomes, which have been corroborated by other studies.^{28–31} Portuguese cities are at an earlier stage of transformation, with ongoing efforts to expand connected cycling networks and reduce car dependency, though important infrastructural and cultural gaps remain.³²

If our true ambition is to promote this type of mobility, we must act across several levels: individual (addressing biological and psychosocial factors), social (community, school, and family-based approaches), physical and infrastructural interventions (lowering urban speed limits, discouraging car use, and implementing segregated and connected bike lanes), and public health (legislation, financial incentives, and government priorities).¹⁸ Several organizations around the world, including the World Health Organization and non-governmental organizations such as BYCS (<https://bycs.org/>), have already published guidelines on how to implement such changes.

As pediatricians, our role is more evident at the individual level, through direct contact with children, and at the social level through family engagement. However,

we must not forget our influence and importance as professionals whose mission is to foster the healthy growth of future citizens. At this early stage of new municipal duties following local elections, now is the right time to collaborate with various organizations (e.g., Mubi, <https://mubi.pt/>), demanding a change in the urban paradigm for our children. Decisive and effective infrastructure legislation is required since long-term urban planning opportunities will always arise. Considering the future relocation of Lisbon's Humberto Delgado Airport, it may offer an opportunity to redesign large urban areas toward greener, child-friendly, and less car-dependent neighborhoods.

Author contributions

T. Ferrão: Conceptualization, data curation, formal analysis, writing – original draft; S. Rebimbas: Conceptualization, supervision, validation, writing – review & editing.

Funding

None.

Conflicts of interest

None.

Ethical considerations

Protection of human subjects and animals. The authors declare that no experiments on humans or animals were performed for this research.

Confidentiality, informed consent, and ethical approval. This study does not involve personal patient data, medical records, or biological samples, and does not require ethical approval. SAGER guidelines do not apply.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing or creation of the content of this manuscript.

References

1. Michail N, Ozbil Torun A, Parnell R. Towards child-friendly and walkable cities: Children's insights on neighbourhood design. *Cities Health*. 0(0):1-20.
2. Leroutier M, Quirion P. Tackling Car Emissions in Urban Areas: Shift, Avoid, Improve. *Ecol Econ*. 2023;213:107951.
3. Miner P, Smith BM, Jani A, McNeill G, Gathorne-Hardy A. Car harm: A global review of automobility's harm to people and the environment. *J Transp Geogr*. 2024;115:103817.
4. Bekkar B, Pacheco S, Basu R, DeNicola N. Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US: A Systematic Review. *JAMA Netw Open*. 2020;3(6):e208243.
5. Achakulwisut P, Brauer M, Hystad P, Anenberg SC. Global, national, and urban burdens of paediatric asthma incidence attributable to ambient NO₂ pollution: estimates from global datasets. *Lancet Planet Health*. 2019;3(4):e166-e178.
6. Perera F, Nadeau K. Climate Change, Fossil-Fuel Pollution, and Children's Health. *N Engl J Med*. 2022;386(24):2303-2314.

7. Syed A, Hew K, Kohli A, Knowlton G, Nadeau KC. Air Pollution and Epigenetics. *J Environ Prot.* 2013;04(08):114-122.
8. Perera F. Pollution from Fossil-Fuel Combustion is the Leading Environmental Threat to Global Pediatric Health and Equity: Solutions Exist. *Int J Environ Res Public Health.* 2017;15(1):16.
9. Lin LZ, Zhan XL, Jin CY, Liang JH, Jing J, Dong GH. The epidemiological evidence linking exposure to ambient particulate matter with neurodevelopmental disorders: A systematic review and meta-analysis. *Environ Res.* 2022;209:112876.
10. Schoen SA, Ferrari V, Valdez A. It's Not Just about Bicycle Riding: Sensory-Motor, Social and Emotional Benefits for Children with and without Developmental Disabilities. *Children.* 2022;9(8):1224.
11. Cordovil R, Mercê C, Branco M, Lopes F, Catela D, Hasanen E, et al. Learning to Cycle: A Cross-Cultural and Cross-Generational Comparison. *Front Public Health.* 2022;10:861390.
12. Ferreira IA, Fornara F, Pinna V, Manca A, Guicciardi M. Autonomy as key to healthy psychological well-being: A systematic literature review on children's independent mobility, cognitive and socio-emotional development. *J Transp Health.* 2024;38:101837.
13. Obesity and overweight. Accessed November 7, 2025. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>
14. Zhang X, Liu J, Ni Y, Yi C, Fang Y, Ning Q, et al. Global Prevalence of Overweight and Obesity in Children and Adolescents. *JAMA Pediatr.* 2024;178(8):800-813.
15. Obesity exceeds underweight for the first time among school-age children and adolescents globally – UNICEF. Accessed November 7, 2025. <https://www.unicef.org/press-releases/obesity-exceeds-underweight-first-time-among-school-age-children-and-adolescents>
16. Davison KK, Werder JL, Lawson CT. Children's Active Commuting to School: Current Knowledge and Future Directions. *Prev Chronic Dis.* 2008;5(3):A100.
17. Braun LM. Barriers to cycling, barriers to health equity: Disparities in perceived cycling environments in the U.S. *J Cycl Micromobility Res.* 2025;4:100066.
18. Logan G, Somers C, Baker G, Connell H, Gray S, Kelly P, et al. Benefits, risks, barriers, and facilitators to cycling: a narrative review. *Front Sports Act Living.* 2023;5:1168357.
19. Castelhão M, Lopes G, Vieira M. Epidemiology of major paediatric trauma in a European Country - trends of a decade. *BMC Pediatr.* 2023;23(1):194.
20. Gomes CJ, Heitor M, Albuquerque J, Inácio AR. External causes of death in younger than 18 years old in Portugal in the last 10 years - a retrospective analysis. *Forensic Sci Med Pathol.* 2025;21(3):1183-1190.
21. Thorsdottir SE, Lauritsen JM, Faergemann C. Trends in bicycle related injuries in children 0–9 years of age in an urban Danish population 1980-2023. *Injury.* 2025;56(6):112290.
22. Autoridade Nacional de Segurança Rodoviária. *Relatório Anual de Sinistralidade 24h e Fiscalização Rodoviária 2024.* ANSR; 2025.
23. Thaury MO, Genet S, Maurice L, Tubaro P, Berkemer SJ. City composition and accessibility statistics in and around Paris. *Front Big Data.* 2024;7:1354007.
24. Prince SA, Thomas T, Apparicio P, Rodrigue L, Jobson C, Walker KL, et al. Cycling infrastructure as a determinant of cycling for recreation and transportation in Montréal, Canada: a natural experiment using the longitudinal national population health survey. *Int J Behav Nutr Phys Act.* 2025;22:71.
25. Corr C, Murphy N, Lambe B. Beyond the big city: using a systems approach to cultivate a cycling culture in small cities and towns in Ireland. *Front Sports Act Living.* 2023;5:1127592.
26. Schwarz L, Keler A, Krisp JM. Improving urban bicycle infrastructure-an exploratory study based on the effects from the COVID-19 Lockdown. *J Urban Mobil.* 2022;2:100013.
27. Schwarz E, Leroutier M, Nazelle AD, Quirion P, Jean K. The untapped health and climate potential of cycling in France: a national assessment from individual travel data. *Lancet Reg Health – Eur.* 2024;39.
28. Millard-Ball A, Reginald M, Yusuf Y, Bian C. Global health and climate benefits from walking and cycling infrastructure. *Proc Natl Acad Sci.* 2025;122(24):e2422334122.
29. Bishop DT, Digaeva A. Bikeability cycle training: a route to increasing young people's subjective wellbeing? A retrospective cohort study. *BMC Public Health.* 2025;25(1):2826.
30. Berrie L, Feng Z, Rice D, Clemens T, Williamson L, Dibben C. Does cycle commuting reduce the risk of mental ill-health? An instrumental variable analysis using distance to nearest cycle path. *Int J Epidemiol.* 2024;53(1):dyad153.
31. Mbugua LW, Duives D, Annema JA, van Oort N. Societal costs and benefits analysis of integrating bike-sharing systems with public transport: A case study of the public transport bike ('OV-fiets') in the Netherlands. *Case Stud Transp Policy.* 2025;21:101513.
32. Renascença. Governo construiu apenas 300 dos 4.700 km de ciclovias previstas até 2023 - Renascença. Rádio Renascença. September 20, 2023. Accessed February 5, 2026. <https://rr.pt/noticia/pais/2023/09/20/governo-construiu-apanas-300-dos-4700-km-de-ciclovias-previstas-ate-2023/347426/>