



Significance of school greenspaces in preventing childhood myopia

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Received: September 17, 2023; Accepted: December 1, 2023; Published Online: December 5, 2023; <https://doi.org/10.1016/j.xinn.2023.100551>

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Citation: Yang B.-Y. (2024). Significance of school greenspaces in preventing childhood myopia. *The Innovation* 5(1), 100551.

THE BURDEN OF MYOPIA IN CHINESE CHILDREN

Childhood myopia has emerged as a critical and underestimated public health issue globally, particularly in China and east Asian countries. The prevalence of myopia in Chinese children and adolescents is alarmingly high, with rates of 72% and 81% among middle school (ages 11–13 years) and high school (ages 14–17 years) students, respectively, resulting in an overall prevalence of approximately 54%.¹ It is projected that by 2023, the number of myopic children and adolescents in China will surpass 180.4 million.² Myopia not only causes various vision-threatening ocular complications such as cataracts, glaucoma, and blindness but also exerts detrimental effects on children's physical fitness, mental health, and academic performance. These adverse consequences can endure into adulthood, imposing substantial medical and economic burdens on individuals, families, and society. Consequently, there is an urgent need for effective intervention strategies to reduce the burden of myopia.

STRATEGIES USED BY CHINA TO ADDRESS CHILDHOOD MYOPIA: PROMOTING THE ROLE OF COMMUNITY GREENSPACE AS A APPROACH

In recent years, the Chinese government has initiated a series of measures to combat the rapidly growing issue of childhood myopia. A pivotal milestone in this endeavor was marked by the release of the *Technical Guideline on Comprehensive Public Health Intervention for Myopia Prevention and Control in Children and Adolescents* by the National Administration of Disease Control and Prevention of China on August 30, 2023.³ This guideline is designed to effectively tackle the increasing prevalence of childhood myopia in China and is based mainly on the national children and adolescents' myopia management plan initiated in 2018.⁴ This comprehensive plan was spearheaded by the State Council, coordinated by eight central government bodies, and strongly endorsed by President Xi Jinping.

Both the guideline and the plan recognize the complex nature of childhood myopia and propose a diverse array of prevention and control strategies. These strategies encompass interventions within families and schools, such as improving environmental conditions, increasing outdoor activities, reducing homework load, and limiting electronic device usage. In addition, the health sector plays a crucial role through early screening and treatment. The government is also expected to provide policy support and financial assistance, while concurrently encouraging children to heighten their health awareness and adopt healthier behaviors. Overall, these collective efforts underscore the holistic approach adopted by the Chinese government in combating childhood myopia, considering various influencing factors and engaging multiple stakeholders in the process.

We were particularly impressed by the recent guideline's incorporation of residential greenspaces, defined as community areas covered by tree canopy, grass, shrubs, and other forms of vegetation, as a crucial strategy for preventing childhood myopia. This marks the first instance in which the guideline acknowledges the importance of enhancing greenspace levels within communities or encouraging more frequent visits to such areas. This recommendation is supported by emerging epidemiological evidence that establishes a positive association between increased exposure to greenspaces and a decreased likelihood of childhood myopia. The underlying mechanisms explaining this association involve the promotion of physical activity and the reduction of screen time, both of which are well-documented protective factors against myopia.

THE SIGNIFICANCE OF SCHOOL GREENSPACE IN COMPARISON TO COMMUNITY GREENSPACE

Greenspace plays a pivotal role in our living environment, attracting attention from global researchers due to its potential impact on human health. Over the past decades, extensive evidence has consistently suggested that increased exposure to greenspaces can provide psychological and physiological health

benefits to human beings, including children and adolescents.⁵ We praise the recent guidelines for acknowledging the beneficial effects of greenspace on childhood myopia and advocating the inclusion of greenspace exposure as a supplementary intervention for myopia control and prevention. However, we identify a notable area for improvement—the guideline primarily emphasizes the importance of enhancing greenspaces within students' residential communities while overlooking the potential significance of greenspaces surrounding schools. In the context of preventing childhood myopia in China, we posit that school greenspaces may hold greater importance than those within residential communities, supported by the following four reasons.

First, the existing literature on greenspace and myopia focuses predominantly on greenspaces surrounding schools and consistently demonstrates the beneficial association between school greenspaces and myopia among students. Our systematic search of several international electronic databases revealed seven epidemiological studies related to greenspace and childhood myopia. Notably, four of these studies examining greenspaces surrounding schools consistently indicated that students residing in greener school environments had a lower likelihood of myopia. In contrast, only two studies clearly stated their assessment of greenspace based on residential addresses (one of the studies assessed both school and residential greenspaces). The remaining two studies evaluated greenspace using crude city/town-level greenness index and parks per capita, which were unable to differentiate between greenspaces located in residential communities and those surrounding schools. Collectively, these studies suggest that the existing epidemiological evidence supporting the beneficial impact of school greenspace on myopia is more robust, despite the relatively limited number of studies on both school and residential greenspace.

Second, in comparison to residential communities, increasing and enhancing greenspace levels and quality within schools is a more feasible endeavor. In Chinese cities, the development of new greenspaces or enhancement of existing ones within residential communities requires multiple approvals from several stakeholders, including homeowners, estate management managers, government departments, and others. Reaching a consensus across these stakeholders is often challenging and time-consuming. In contrast, schools possess a greater degree of autonomy, allowing school administrators to exercise self-governing rights in determining the improvement of greenspaces on their campuses. Furthermore, school campuses generally have smaller sizes when compared to residential communities. As a result, achieving optimal greenspace levels within schools requires fewer financial, human, and material resources than in residential communities. Therefore, implementing greening initiatives within school campuses is more practical and realistic.

Third, investing in the improvement of greenspaces within schools may be more cost-effective in terms of preventing childhood myopia than within residential communities. In urban areas of China, schools often accommodate a significantly larger student population, whereas each residential community tends to have a smaller number of students. Consequently, greenspaces on school campuses can cater to a greater number of students, allowing for maximum utilization of the antimyopic benefits of greenspaces.

Fourth, greenspaces within schools are more frequently used by students compared to greenspaces within residential communities. Chinese primary students and high school students typically spent approximately 9 h of their day at schools. Even after returning home, they have limited time to visit greenspaces in residential communities due to the heavy academic workload (with an average of 2.8 h spent on homework by primary and secondary school students in China). Moreover, boarding school students spend the majority of their time at school and only return home during limited holidays. Based on these schedules, school



Figure 1. Burden of childhood myopia in China and recommendations for enhancing school greenspaces

greenspaces are more likely to be actively accessed and used by students compared to greenspaces within residential communities.

CONCLUSION AND RECOMMENDATIONS

Although we recognize the significance of greenspaces in residential communities for improving the visual acuity of children and adolescents, we believe that it is crucial to prioritize greenspaces within schools. This preference stems from several factors: stronger existing evidence linking greenspaces in schools to students' myopia, greater ease of improvement for school greenspaces, more frequent utilization by students, and higher cost-effectiveness. Based on these conclusions, we recommend that when implementing greenspace-based interventions to mitigate myopia, it is essential not to overlook the importance of greenspaces in schools.

In addition, when enhancing greenspaces in schools, several aspects should be considered (Figure 1). First, native species should be preferentially selected to ensure that plants are adapted to local climates and require less maintenance. Doing so will not only support biodiversity but also improve greenspace quality. Second, it is imperative to refrain from using plants that produce excessive pollens, have thorns, or contain toxics within school premises because these can lead to allergic reactions, injuries, and poisoning among students. Third, in densely populated urban areas of China, school campuses are often constrained by limited space, making it challenging to incorporate extensive greenspaces. In such cases, the inclusion of vertical greenspaces, such as vertical gardening, green walls, and indoor plants, can help optimize the available greenspace. Fourth, school greening should be carried out with the help of forestry experts, landscapers, and healthcare professionals to maximize the aesthetic and health values of greenspace. Lastly, researchers can leverage school greening initiatives to increase the volume and quality of evidence on their beneficial effects through prospec-

tive or intervention studies, especially considering that the existing evidence on greenspace and childhood myopia is not very strong and comes mainly from cross-sectional studies. These collective efforts will strengthen our understanding of how and why to increase school greenspace while promoting multiple dimensions of health in the next generation of Chinese citizens.

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ACKNOWLEDGMENTS

This work is supported by the National Natural Science Foundation of China (no. 81972992) and the Guangzhou Science and Technology Project (no. 202201011545). I am very grateful to Prof. Matthew H.E.M. Browning (Clemson University, USA) and Dr. Nitika Singh (Jagiellonian University, Poland) for their helpful discussions and valuable comments and edits on the manuscript.

DECLARATION OF INTERESTS

The author declares no competing interests.