



Global Observatory of
**Healthy and
Sustainable Cities**

Taiyuan China 2024

Spatial indicators for healthy and sustainable cities
1000 Cities Challenge report

Yuying Chen, 2024



Full details of the data and methods are available at:

Global Observatory of Healthy & Sustainable Cities
<https://www.healthysustainablecities.org>

Population data: Schiavina, M; Freire, S; Carioli, A., MacManus, K (2023): GHS-POP R2023A - GHS population grid multitemporal (1975-2030). European Commission, Joint Research Centre (JRC) [Dataset] doi: 10.2905/D6D86A90-4351-4508-99C1-CB074B022C4A

Urban boundaries: Florczyk, A. et al. (2019): GHS Urban Centre Database 2015, multitemporal and multidimensional attributes, R2019A. European Commission, Joint Research Centre (JRC).
<https://data.jrc.ec.europa.eu/dataset/53473144-b88c-44bc-b4a3-4583ed1f547e>

Urban features: OpenStreetMap Contributors. OpenStreetMap.fr (2023).
<http://download.openstreetmap.fr/extracts/asia/china/shanxi.osm.pbf>

Colour scale: Crameri, F. (2018). Scientific colour-maps (3.0.4). Zenodo.
<https://doi.org/10.5281/zenodo.1287763>

Global Healthy & Sustainable City Indicators Collaboration

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Spatial indicators for healthy and sustainable cities

1000 Cities Challenge report

This report outlines how Taiyuan performs on a selection of spatial indicators of healthy and sustainable cities. As part of the 1000 Cities Challenge, we examined the spatial distribution of urban design and transport features that promote health and sustainability. The maps show the distribution of urban design and transport features across Taiyuan and identify areas that could benefit the most from interventions to create healthy and sustainable environments.

Taiyuan context

Taiyuan, the capital of Shanxi Province, is a major military and cultural hub in northern China. The city has an average elevation of 800 meters, with mountains to the north, east, and west, and the Fen River flowing through it from north to south.

Demographics and health equity

By the end of 2022, Taiyuan's GDP reached 557.117 billion RMB, with a permanent population of 5.435 million. The city faces challenges from cardiovascular diseases, chronic respiratory diseases, and other health issues. Chronic diseases remain the leading cause of death, with unhealthy lifestyles being the primary factor contributing to their occurrence.

Environmental disaster context

Taiyuan faces various environmental challenges, including heavy rainfall, thunderstorms, hailstorms, and geological disasters.

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Study region

The study region used to calculate spatial indicators for the population of Taiyuan presented in this report has been highlighted in the map below using parallel line shading.



Study region boundary (shaded region): GHSL - Global Human Settlement Layer under CC-BY-4.0; Global Human Settlements urban centres: 2015 (EU JRC, 2020; Taiyuan Center only) under CC BY 4.0 | Basemap: Sentinel-2 cloudless - <https://s2maps.eu> by EOX IT Services GmbH (Contains modified Copernicus Sentinel data 2021) released under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

Map legend



Administrative boundary
(GHSL - Global Human Settlement
Layer.<https://ghsl.jrc.ec.europa.eu/download.php?ds=pop.>)



Urban boundary
(Global Human Settlements
urban centres: 2015 (EU JRC,
2020; Taiyuan Center only)
(GHS:UC_NM_MN=='Taiyuan' and
CTR_MN_NM=='China'))

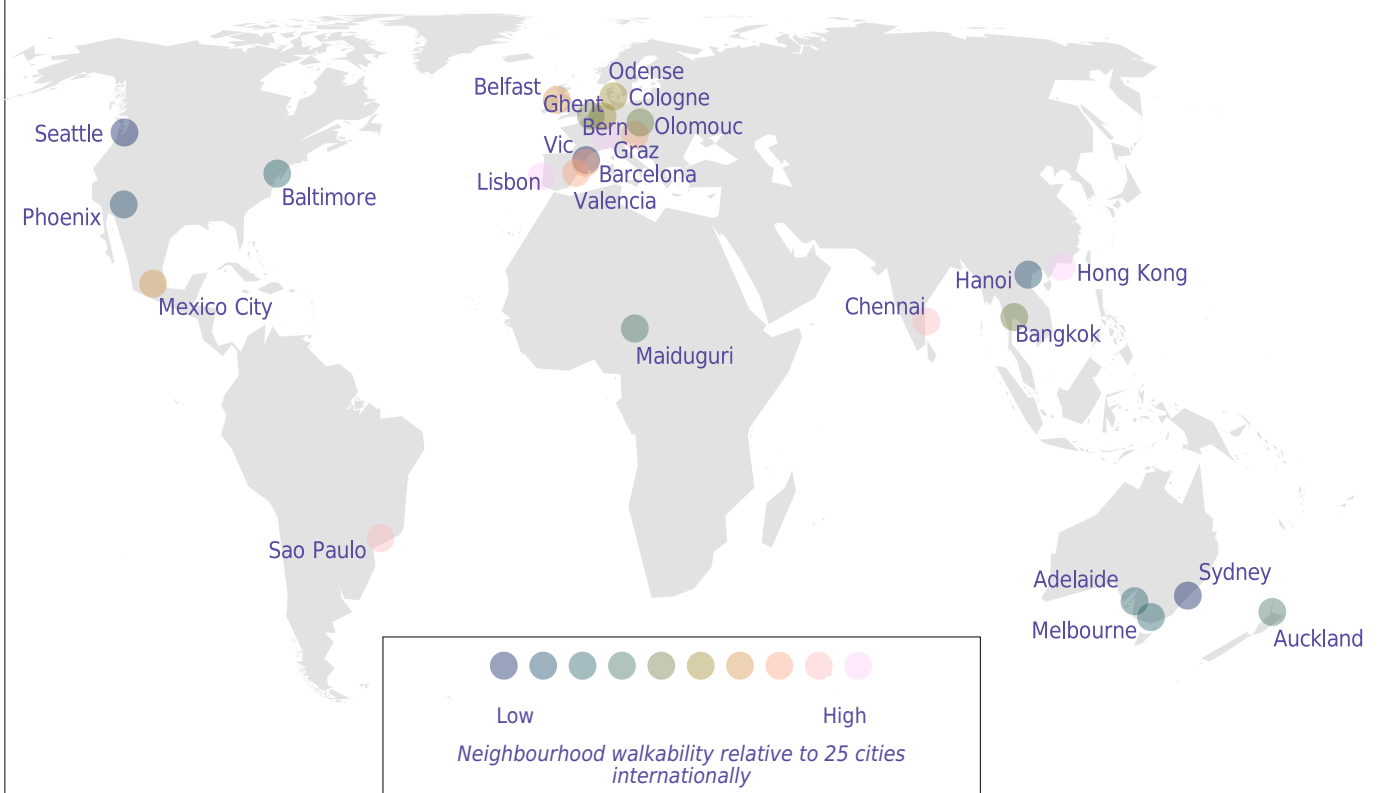


Study region boundary
(intersection of administrative
boundary and urban boundary)

Box 1: The Lancet Global Health Series study of 25 cities internationally

The 1000 Cities Challenge extends methods for assessing the health and sustainability of cities outlined in the 2022 Lancet Global Health Series on urban design, transport, and health. Policy and spatial indicators were calculated, analysed and reported in multiple languages for 25 diverse cities across 19 countries and 6 continents. These cities provide a useful reference for comparisons, but are not a representative sample of all cities internationally.

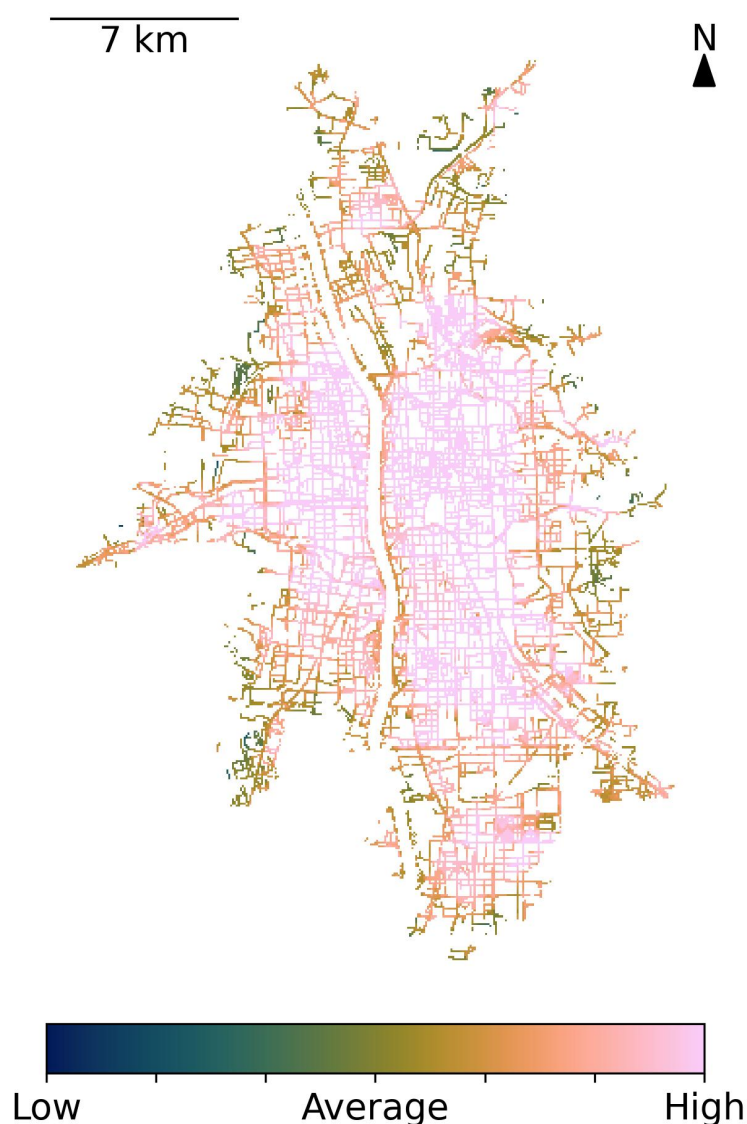
For more details, please see the 2022 The Lancet Global Health Series on Urban design, transport, and health (<https://www.thelancet.com/series/urban-design-2022>).



Walkability and destination access

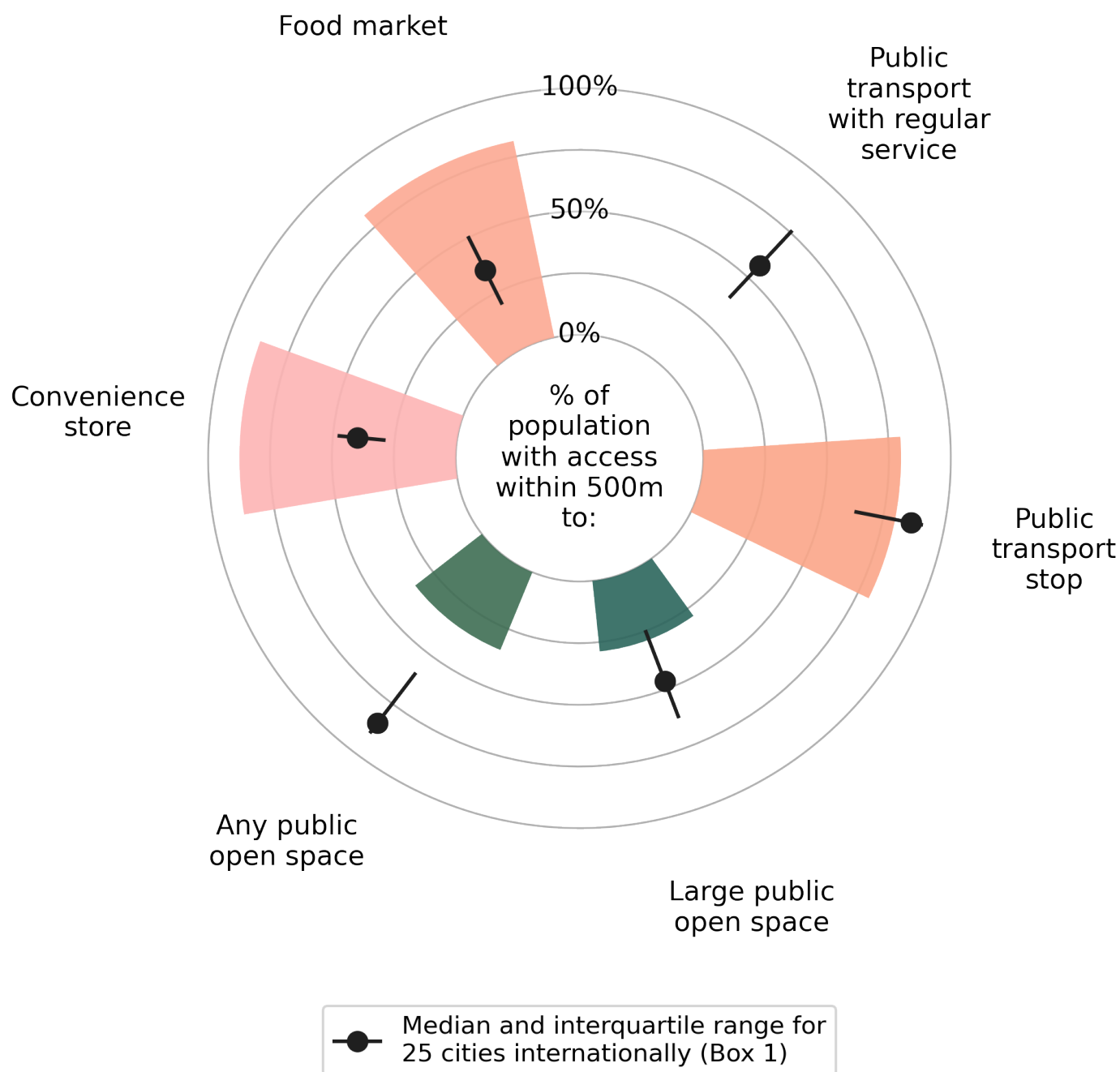
Walkable neighbourhoods provide opportunities for active, healthy, and sustainable lifestyles through having sufficient but not excessive population density to support adequate provision of local amenities, including public transport services. They also have mixed land uses and well-connected streets, to ensure proximate and convenient access to destinations. High-quality pedestrian infrastructure and reducing traffic through managing demand for car use can also encourage walking for transport.

Neighbourhood walkability relative to 25 cities internationally



99.8% of the population in Taiyuan live in neighbourhoods with walkability scoring above the median of 25 cities internationally (Box 1)

Percentage of population with access to amenities within 500 metres (m)

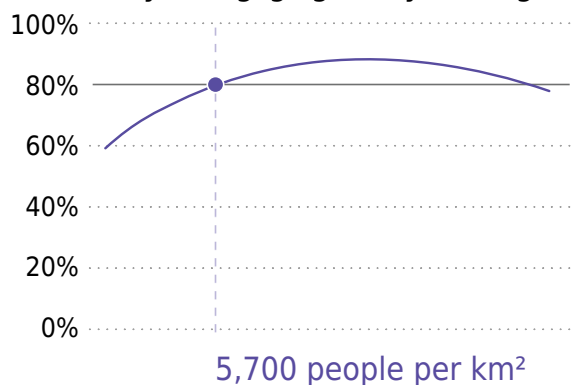


Urban design thresholds to promote walking

The 2022 Lancet Global Health Series found that to achieve at least 80% probability of engaging in any walking for transport, an average urban neighbourhood would need a population density of at least 5700 people km² and street connectivity of at least 100 intersections per km², approximately and depending on context. Preliminary evidence showed that street intersection density above 250 per km² and ultra-dense neighbourhoods (> 15,000 persons per km²) may have decreasing benefits for physical activity. This is an important topic for future research.

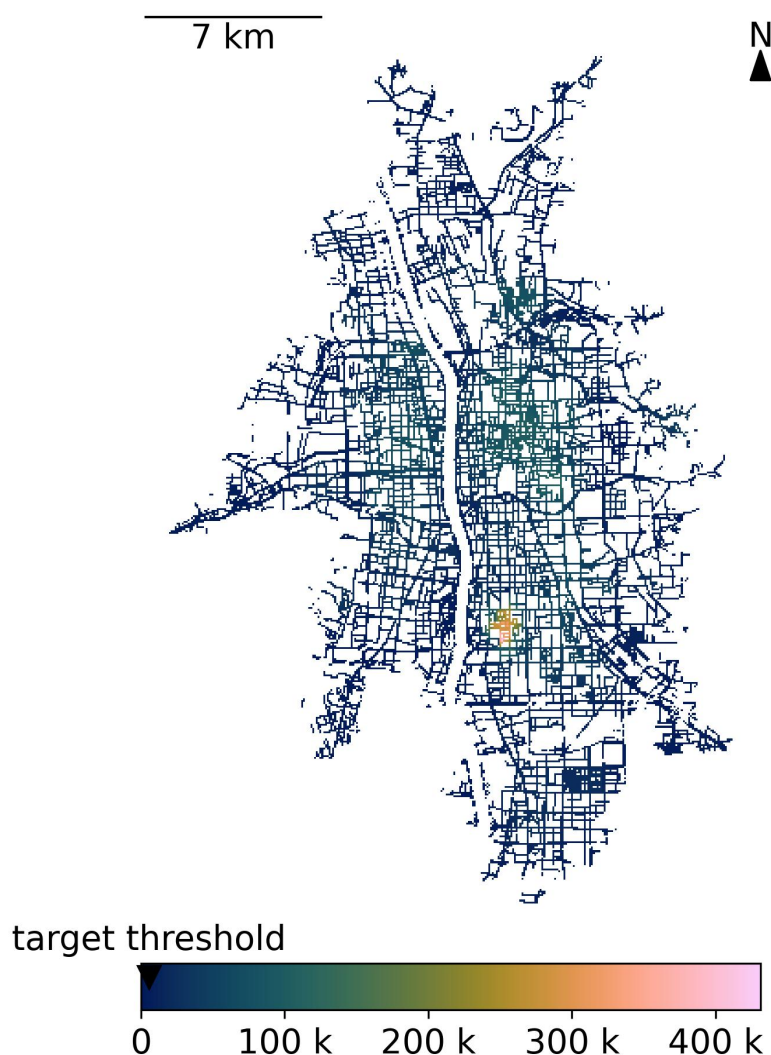
Neighbourhood population density (per km²)

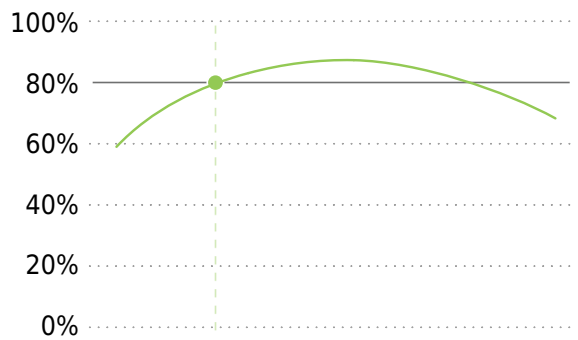
Probability of engaging in any walking for transport



Adapted from The Lancet Global Health (2022):
<https://www.thelancet.com/infographics-do/urban-design-2022>

97.4% of the population in Taiyuan live in neighbourhoods meeting the population density threshold for 80% probability of engaging in any walking for transport (5,700 people per km²)



Neighbourhood intersection density (per km²)**Probability of engaging in any walking for transport**

Adapted from The Lancet Global Health (2022):
<https://www.thelancet.com/infographics-do/urban-design-2022>

99.7% of the population in Taiyuan live in neighbourhoods meeting the street intersection density threshold for 80% probability of engaging in any walking for transport (100 intersections per km²)



Public transport access

Easy access to frequent public transport is a key determinant of healthy and sustainable transport systems. Public transport near housing and employment increases the mode share of public transport trips, thus encouraging transport-related walking; offering access to regional jobs and services; improving health, economic development, and social inclusiveness; and reducing pollution and carbon emissions. The frequency of services also encourages public transport use, in addition to the proximity of stations or stops.



79.9% of the population in Taiyuan live within 500m of public transport

Public open space access

Local access to high-quality public open space promotes recreational physical activity and mental health. Nearby public open space creates convivial, attractive environments, helps cool the city and protects biodiversity. As cities densify and private open space declines, providing more public open space is critical for population health. Having public open space within 400 m of homes can encourage walking. Access to larger parks may also be important.



28.8% of the population in Taiyuan live within 500m of public open space of at least 1.5 hectares in size

Summary

Spatially, Taiyuan's convenience store accessibility is comparable to the average levels of 25 benchmark cities, with about 87.4% of the population living within 500 meters of a convenience store. However, Taiyuan's public transport station accessibility is relatively low, with only 79.9% of the population living within 500 meters of a public transport station. The city's accessibility to public open spaces is poor, with only 34.1% of the population living within 500 meters of any open space, and only 28.8% living within 500 meters of public open spaces covering at least 1.5 hectares. Taiyuan shows high walkability within communities, with only 0.2% of the population living in neighborhoods with walkability scores below the average of other cities. Additionally, 97.4% of the population resides in areas meeting the population density threshold associated with an 80% likelihood of walking trips, and 99.7% live in areas meeting the street intersection density threshold for an 80% likelihood of walking trips.

Citation

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