Urban Density and Equity of Access to Social Services

October 16, 2025

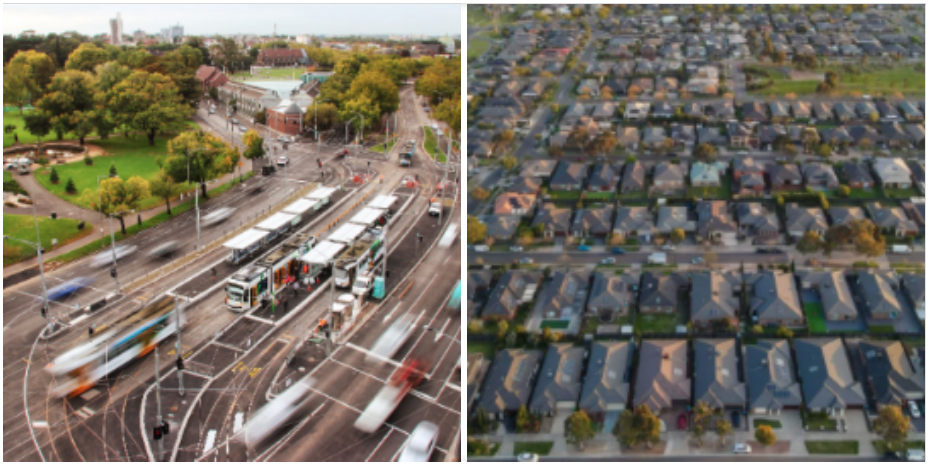
Growing Cities, Inequitable Access

As Australian cities urbanise, challenges associated with rapid urbanisation are coming to the fore particularly the need to deliver equitable access to services; government and non-government agencies have become increasingly aware of this need. To respond to the increasing challenge, it is necessary to observe rapid changes across the built environment, the socio-demographics of locations and other relevant factors.

Access to services in urban areas is unevenly distributed throughout cities resulting in considerable inequality. In Australian cities for example, the inequality in service provision is exhibited between residents in the peri-urban areas and residents in inner city areas (Nice et al. 2024). Whether the spatial inequality in service provision is exhibited in health outcomes is not clear despite the prevalence of health risks such as obesity being 2.3 times higher in outer-urban and regional areas of Australia (AIHW 2018). These spatial inequalities in health for example, are not

solely observed in Australian cities. Inequalities have recently changed from an inner-city to a suburban challenge in the United States (Allard 2017) and China is also seeing spatially segregated urban poor (Yang and South 2018).

> The considerable inequality observed across cities is a consequence of social inequalities and poverty (Harpham and Boateng 1997), and no doubt related to restricted access to services.



Left: Suburb with good public transport connectivity and access to services.
Right: Newly developed suburb without public transport or access to services.

According to the City-level Gini Annual Dynamic dataset, which provides annual Gini index values for 1,028 global cities from 2000 to 2018, cities like Johannesburg (South Africa), Fortaleza (Brazil), and Lusaka (Zambia) exhibit some of the highest urban Gini coefficients globally, reaching up to 0.70–0.75, indicating extreme income disparities within the urban population.

Understanding the role of urbanisation particularly urban density, and the interaction of various urban systems in exacerbating inequalities, is needed.

The role of urban density is key to understanding how to deliver equitable access to key social services such as primary health care, education and public transport. This StoryMap explores the considerable variation in access to services across Australia's capital cities and the opportunities arising from urban

densification with respect to accessibility to social services along with the associated co-benefits of increased urban density or the often referred to, compact city approach.

Can compact cities reduce social inequalities?

What is a compact city?

Despite the popularity of the compact city concept, there are many definitions and no consensus on what comprises a compact city (Breheny 1992; Burton 2000, 2002; Daneshpour and Shakibamanesh 2011; Elkin 1991; Newman and Kenworthy 1989). Most of the definitions, however, agree on key dimensions namely, a compact city is a city:

- With high density (both population and infrastructure density)
- Of mixed land use which facilitates a city in which amenities such as schools, shops and workplaces are within a short distance such that you could walk, cycle or use public transport to reach your destination (Stevenson et al. 2016).

The power of urban design in the compact city | Dr. Árpád Szabó | TEDxBME

The concept of a compact city was first described in the 1930's and it arose as a response to urban expansion and the urgent need to maintain arable lands that were being lost to city developers. However, it was not until the 1960s, when urban planning

reformers such as Jane Jacobs introduced models for increased urban density (Jacobs 1961) that the concept was embraced. The work by Dantzig and colleagues (1973) extended the compact city models in the mid 1970s with a focus on the role of efficient resource use by delivering compact cities. By the 1990s the compact city concept was touted as a key proponent for sustainability as it addressed land use efficiency, transportation, energy consumption and social equity. By 1994, the United Nations Framework Convention on Climate Change recognised compact cities as a strategy for reducing greenhouse gas emissions and delivering energy efficiency (Bodansky 1993). Today, the compact city concept is as important as it was in the 1930s with an emphasis on addressing challenges previously faced namely, social inequalities across cities and increasing environmental concerns.

Over the past decade there is an increasing reference to compact cities, specifically urban plans that describe 15- or 20-minute cities. Quarter of an hour or 15-minute cities deliver not only sustainable outcomes in cities particularly in relation to reduced air pollution, but importantly can ensure access to essential services (Bruno et al. 2024).

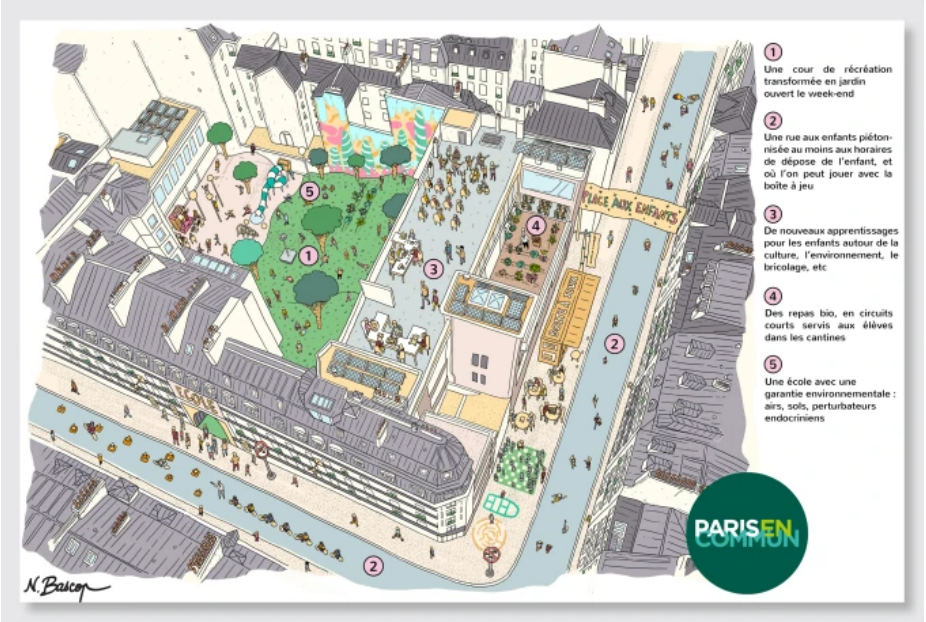
Global applications of compact cities

The 15-minute city concept grew in prominence during the COVID-19 pandemic with numerous cities advocating a 15-minute city and developing plans to fulfil the ambition. Several cities led the ambition including:

- Paris, France
- Barcelona, Spain
- Portland, United States
- Melbourne, Australia (Pozoukidou and Chatziyiannaki 2021).

Paris embraced the compact city approach by instituting *Paris en Commun.* Based on the Paris Climate Action Plan, *Paris en Commun* focuses on reducing barriers between neighbourhoods, thereby ensuring neighbourhood development delivers across key social services, namely, housing, employment, shopping, health care, education and entertainment (Willsher 2020).

A tangible example of Paris en Commun is the implementation of the 15-minute city concept, by restructuring land use to bring essential services within walking or cycling distance of residents. This included repurposing road space for bike lanes and local amenities, and promoting mixed-use zoning to integrate residential, commercial, and social infrastructure within neighbourhoods.



Courtesy Paris en Commun (Paris's mayor has a dream of 'the 15-minute city')

The Portland Plan (City of Portland 2012) and Plan Melbourne 2017–2050 (Victoria State Government n.d.) espouse similar ideals, with Plan Melbourne promoting social mobility to enhance social cohesion ensuring neighbourhoods are inclusive, safe and diverse and importantly, designing for local living within a 20-minute neighbourhood (Victoria State Government n.d.).

A recent assessment of a city's potential to implement a 15-minute urban plan was undertaken by Bruno et al. (2024), who estimated access times to resources and services for most cities across the globe. To explore which cities are classified as 15-minute cities, see the 15min-City platform. The interesting finding arising from this online platform is that no Australian city is a 15-minute city. Melbourne and Sydney perform best, with a walking trip to access services estimated at 17 minutes and 19 minutes respectively. This suggests that access to essential services such as health care and mental health support is suboptimal and this is particularly the

case for populations without access to private transport.

Similarly, recent research by our Lab (Thompson, Stevenson, Wijnands et al, 2021) explored the urban design of almost 1700 cities across the globe with a focus on urban features such as the density of infrastructure like road networks and public transport, along with green and blue space. The study described 9 city typologies based on transport networks and green and blue space highlighting for the first time cities that would fall into the criteria deemed a compact city, namely cities with urban density and intense, extensive, and highly organised transport networks. These features are strongly associated with better physical access to distributed health care and welfare infrastructure. Thompson et al. (2020) named these city types as 'high transit' city typologies; such cities comprised 10% of all cities, globally, and included London, Paris, and Amsterdam.

No Australian city was categorised as a high transit city; rather, Australian cities were classified as 'motor cities', cities of medium to low density with grid-based road networks and median levels of public transport, a city type mostly located in the United States. This typology implies greater spatial inequality in accessing decentralised health and social services, potentially exacerbating disparities for vulnerable populations such as the elderly, the disabled, or low-income residents.

This is not to say efforts to develop and plan for compact cities in Australia have not been made. Regulatory planning decisions by local governments in the City of Brisbane, for example, have supported compact city policy for many years (Limb et al. 2020). The challenge lies in the fact that local governments are making regulatory decisions that support compact city policy yet are not achieving planned outcomes through the approach. To date, there are no empirical explanations for these outcomes (Limb et al. 2020). However, efforts are also constrained by hundreds of years of urban planning decisions promoting low density outward growth (Troy 2004).

Co-benefits of compact cities

A large challenge associated with growing urbanisation is the loss

of arable land leading to food insecurity. In China alone, 4 million hectares of arable land has been converted to urban use in the past 10 years (Tan et al. 2005). Similarly, there are increasing references in Australia to food insecurity due to urban sprawl (Millar and Roots 2012). In response to the growing threat of food insecurity, much evidence supports a compact city model (UN Habitat 2011, 2014a, 2014b, 2014c, 2015). It highlights the overriding co-benefit of resource efficiency as a consequence of preserving valuable land resources by preventing the conversion of agricultural land into urban areas (Millar and Roots 2012), along with enhanced health and social cohesion.

Recent studies (Arbury 2005; Kotulla et al. 2019; Bibri and Krogstie 2017; Bibri 2020; Jabareen 2006; Næss et al. 2011; Newman and Kenworthy 1998) have espoused sustainability co-benefits from compact cities citing reduced need for travel, shorter commute times, less car dependency, less pollution and importantly, the ability to maintain the diversity of choice with respect to place of employment, service facilities and social contacts while at the same time limiting the loss of green and natural areas. The co-benefits associated with compact cities also extend to enhancing social connections and community cohesion, leading to social equality and inclusive urban environments (Victoria State Government n.d.).

Research by Leyden (2003) found that residents of walkable, mixed-use neighbourhoods reported significantly higher levels of social capital, measured across 4 dimensions: knowing neighbours, political participation, trust in others, and overall social engagement, compared with those living in car-dependent suburbs. Similarly, Rogers et al. (2011) found that people living in neighbourhoods with greater walkability – defined by the number of destinations within walking distance – reported higher levels of social capital as measured by indicators such as trust in neighbours, participation in community activities, and the strength of social networks. Urban sprawl is minimised when urban densification is prioritised (Burton 2000). Cities that have adopted a compact city model have enhanced urban connectivity, providing access to essential social services such as schools and primary health care (Rashid 2022). Under a compact city model, a

private motor vehicle is not a necessity, while in many other cities, the lack of a private vehicle precludes the socially disadvantaged from access to services (Alasadi et al. 2020).

Ahlfeldt et al. (2018) analysed 321 empirical studies covering economic density, morphological density, and mixed land use, and found that the majority of studies (69%) reported positive effects associated with compact urban form, specifically improved access to jobs and services. However, they also highlighted significant costs associated with higher density. Therefore, compactness alone is not sufficient; it must be accompanied by targeted policy interventions to maximise its benefits and mitigate its drawbacks. For instance, without supportive infrastructure, such as high-capacity public transport, increased density can lead to traffic congestion, pollution, and overstretched services, ultimately offsetting many of the intended benefits. To avoid these pitfalls, effective compact city models are typically characterised by integrated land-use and transport planning, ensuring that density is matched with investments in mass transit systems, active transport networks, and decentralised social infrastructure.

As we live in an anthropogenic period, environmental sustainability must be prioritised rather than a 'business as usual' policy, which is increasingly being promulgated across the globe and particularly in the United States. The very definition of a compact city means that sustainability takes priority by ensuring access to public transport, delivering infrastructure that supports active transport (walking and cycling) and shorter commutes due to increased population and infrastructure density, leading to improved air quality and reduced carbon emissions (UN-Habitat 2014a).

Adopting a compact city model is not entirely a win-win approach: research points to the challenges associated with urban overcrowding (Tan et al. 2005); limited green space, which can exacerbate mental health conditions (Arbury 2005; Newman and Kenworthy 1998); and social and political tensions due to unequal access to services and employment opportunities (Bibri and Krogstie 2017; Bibri 2020).

For related information, refer to the topic summary on Built environment and health.

Compact cities and urban planning

Cities increasingly face challenges in providing equitable services (Australian Human Rights Commission 2012) and since inequality of access to services such as education, health or transport is reproduced spatially (Dikec 2001), reducing spatial inequality is paramount if equitable services are to be provided.

Attributes associated with compact cities include social co-benefits, enhanced job opportunities, access to services and increased social contacts (Næss 2013). The latter is reflected in surveys of residents residing in compact cities reporting being more satisfied with their immediate surrounds than residents living in sparsely populated peri-urban areas (Mouratidis 2018).

For some decades Australian cities have explored and attempted to implement compact city policies. Limb et al. (2020) suggest many of the policies have come up against consumer preferences that do not support urban densification, the demography of employment opportunity, and transport access. These factors have been observed globally (Brewer and Grant 2015), along with political and institutional resistance.

Important insights from Limb and colleagues' research points to the fact that market-oriented planning policies such as increasing land use density through zoning do not facilitate compact city approaches. The research found that property factors along with socioeconomic factors were the greatest determinants of urban densification or compactness (Limb et al. 2020).

Promoting a concept like urban densification, therefore, requires understanding the complex interplay between the social determinants of urban dwellers and the role public policy can play in play in mitigating the social inequalities across cities.

Access to Social Services Across Urban Australia

(Note: The content below contains multiple maps and may take a moment to load.)

Planning approaches that encourage compact cities have been shown to enhance social equity (Burton 2000; Rashid 2022). Early research by Burton explored the relationship between urban compactness and social equity where social equity was defined as a combination of the following attributes:

- Access to employment
- Retail services
- Public transport
- Green space
- The ability to walk and cycle
- Availability of housing
- Incorporating key health risks.

Burton's research reported that urban compactness enhanced social equity with respect to access to retail services, public transport and green spaces. Recent findings (Rashid 2022) suggest that the relationship between urban compactness and social equity is more nuanced, and that to understand the relationship a focus on individual factors rather than an array of composite factors is needed.

The early associations between urban compactness and social equity seldom considered the spatial relationships between urban form and structure. Recently, Rashid explored the distance and accessibility in street networks (topology) in relation to urban compactness and social equity finding that all 3 are associated and that topological accessibility, plays an important role in the spatial elements linked to social equity.

Methodology and Datasets

We (the authors) explored the spatial elements across Australian state and territory capital cities to understand the relationship

between urban compactness (defined as the ability to walk to one of the 3 identified social services within 10 minutes) and social equity (defined by access to key social services, namely primary health care including access to bulk-billing general practitioners and pharmacies, public transport (by frequency of service across a week) and early childhood education and care).

We obtained data from across Australia and developed a Social Service Index (SSI) using the centroids of the Statistical Area Level 1s (SA1s) for the selected cities. We counted the number of services that could be reached within a 10-minute walk or approximately 800 metres (given centroids were used, the distance would equate to 15- to 20-minute walks if taken using the street network). Each of the social service indicators – access to public transport, access to general practitioners and pharmacies and access to early childhood education and care – were normalised and scaled 0 to 1. All indictors were summed across each SA1 to create an SSI. The SA1 results were then aggregated to an SA2 level to allow easier identification of the broader access trends. Finally, the SSI ranged from 0 (no access to social services) to 4 (very high accessibility to all the types of social services).

Data sources used in the Social Services Index

Some examples of the datasets used in the analysis, as well as reference datasets, are shown in the interactive map below, using Perth as a detailed case study at a fine level of resolution down to aggregated SA2s (a coarser level than SA1). This allows us to

observe inequality not just between cities, but within them.

This map shows the percentage of standalone houses across Perth as an example. The darkest green zones are where most homes are houses.

NOTE: use the button to the right to explore other input datasets. Maps may take a moment to load.

This map shows population density across the same region.
Darker areas mark denser neighbourhoods.

This map shows how many bus stops are within walking distance
(1600 m used here as an example, defined by centroids of SA2s.
This research explores multiple thresholds in each area.

This map shows how many general practitioners are within 1.6 km of each area, again the threshold is selected as an example.

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The Vulnerability Indices for Mortgage, Petroleum and Inflation Risks and Expenditure (VAMPIRE) index highlights areas most vulnerable to rising fuel and housing costs.

NOTE: The darkest outer regions appear this way due to limited data coverage (these areas have no available data).

This map shows heat vulnerability among Culturally and Linguistically Diverse (CALD) populations. Darker areas are more vulnerable because they experience more heat, are more sensitive to it, and have fewer resources to cope.

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Results

Drawing on these datasets we explore the access to social services across Australia's seven major metropolitan areas. As we explore these results, remember that a higher score (light colour) indicates better overall access for residents in that area.

Here is the map highlighting the distribution of Perth's Social Service Index. Use the buttons below to explore the Social Service Index (SSI) for the remaining capital cities across Australia.

Perth

Brisbane

Adelaide

Darwin

Hobart

Melbourne

Sydney

Canberra

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The maps show the estimated SSI for each of the capital cities. This highlights to what extent Australian cities deliver access to services such as public transport, low-cost primary health care and early childhood education within a 10-minute walk. The maps highlight that access to social services within a 10-minute walk is adequately met only in the central business districts (CBDs) of Brisbane, Perth and Sydney, with SSI scores of 1.75, 1.75 and 1.25 respectively. Sydney observed average SSI scores across the large outer metropolitan areas in the range of 0.50 to 1.0, but there was uniformly limited access across much of the metropolitan areas of Brisbane and Perth.

Access to social services is very low in Darwin, Canberra and Adelaide with scores ranging from 0.25 in Darwin to 0.75 in Canberra and Adelaide. Melbourne delivers the highest levels of access to social services extending from the CBD to the inner east (SSI range 1.2 to 2.7) and the north (SSI range 1.8 to 2.1) from the CBD. Despite the accessibility in these locales of Melbourne, more than 75% of the metropolitan area has limited access to services.

The proportion of property types in each capital city was used as a proxy for urban density. Other than in Adelaide, Hobart and Darwin, the CBD areas of Australia's capital cities comprise about 70% apartments as the main housing stock, reflecting the increased density in the monocentric Australian cities. Although access to services is delivered well in the densely housed and populated CBDs, a continued focus on monocentric planning is not sustainable (Gleeson 2015). Not unexpectedly, houses predominate across all Australian metropoles particularly Adelaide, Perth, Brisbane, Hobart, Canberra and Darwin, where access to social services is limited.

A Tale of 2 Suburbs

To illustrate how urban density can facilitate access to social services, we explored two suburbs with similar socioeconomic status but differing spatial characteristics, Mt Lawley, an inner northern suburb 5km from the Perth CBD and Willetton, a southern suburb 21km from the Perth CBD. Some demographic features of the 2 selected suburbs are described in the table below.

Demographics	Mt Lawley	Willetton
SEIFA - Decile (Socioeconomic indicator range: 1=disadvantaged to 10=advantaged)	9	8
Density	.17 (high density)	.01 (low density)
Social Service Index (0 no accessibility – 4.0 very high accessibility)	0.84	0.53
Percent houses versus apartments	50	79
Percent Culturally and Linguistically Diverse	15	42

Mt Lawley

Mount Lawley is an inner northern suburb of Perth, Western Australia. The suburb is bounded by the Swan River to the east, Vincent, Harold and Pakenham Streets to the south, Central Avenue and Alexander Drive to the north, and Norfolk Street to the west.

Willetton

Willetton is located about 12 kilometres (7.5 miles) south of the Perth central business district. It is built on a section of flat sandy coastal plain that was originally covered with open Banksia woodland and stands of paperbark trees marking the edges of shallow seasonal swamps.

Keep scrolling to see the map displaying the locations of Mt Lawley and Willetton, along with key details about each suburb.

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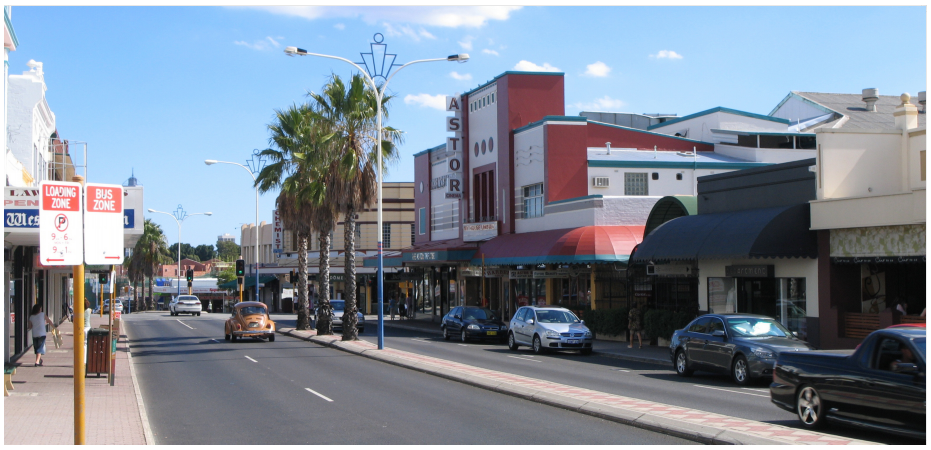
Mt Lawley:

Population: 11,328 (ABS Census 2021)

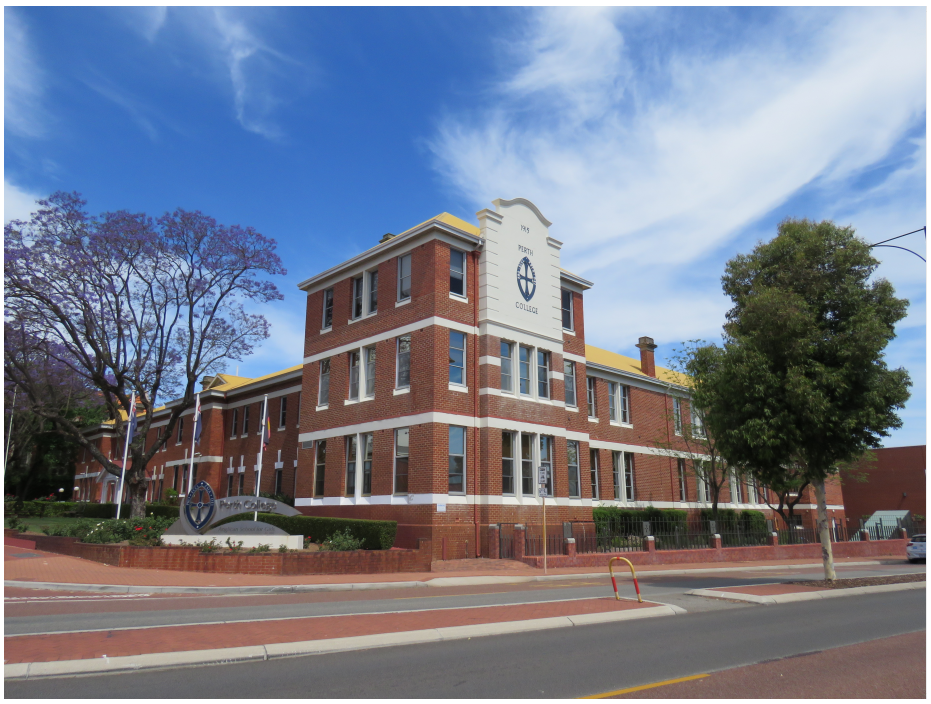
Area: 4.0 km^2 (1.5 sq mi)

LGA(s): City of Stirling, City of Bayswater, City of Vincent



Beaufort Street

Before the establishment of the Swan River Colony, the area was occupied by the Yabbaru Bibbulman Noongar people, who used the nearby Boodjamooling wetland (later known as Third Swamp Reserve, and now as Hyde Park) as a camping, fishing and meeting ground.

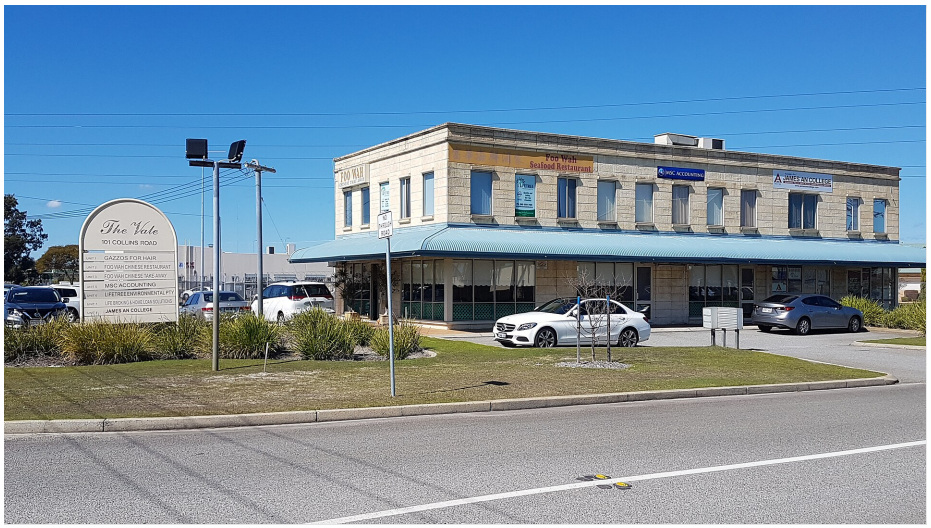


Willetton:

Population: 19,262 (ABS Census 2021)

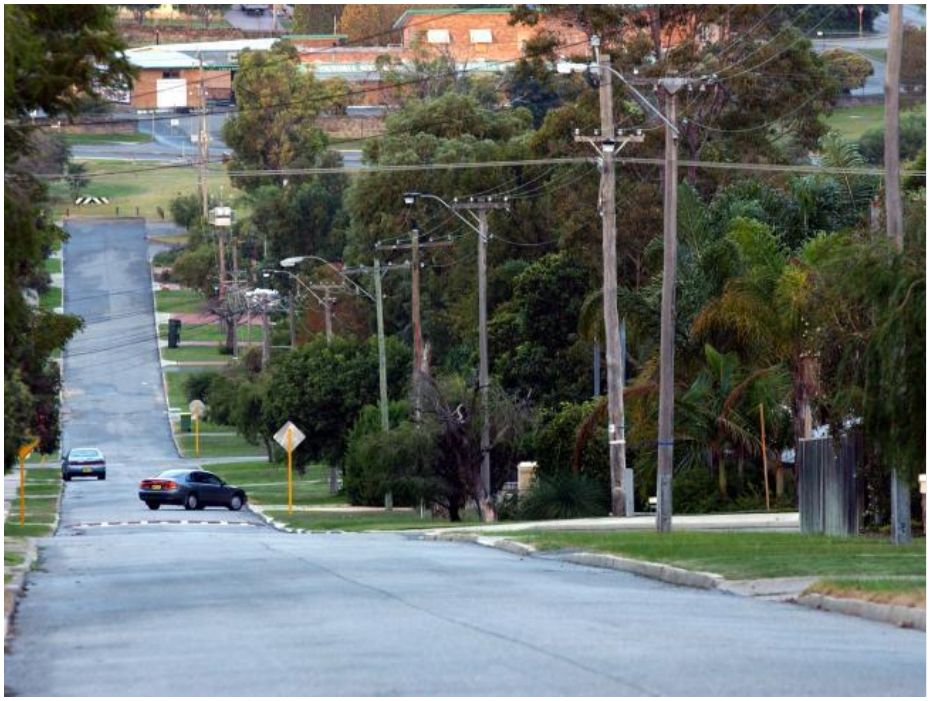
Area: 8.6 km^2 (3.3 sq mi)

LGA(s): City of Canning



"The Vale", a business premises on Collins Road, Willetton

Willetton is named after Henry Willett, who settled in the area in 1832. Originally, the name was proposed for what is now Lynwood and Parkwood, but after several changes and suggestions – including "Burtsdale" and "Clovercrest Estate" – the name Willetton was officially gazetted in its current location in December 1965.



Let's zoom in further to understand the data shaping the two suburbs. The maps and visualisations that follow dive into specific layers such as accessibility to health services and public transport frequency, community characteristics like population age and dwelling types, and socio-economic indicators.

Exploring these different facets reveals why their access scores vary and how socio-demographic factors often align with these disparities, providing a richer picture than a single index alone. Keep scrolling to view these detailed maps and uncover the specific stories within each suburb.

NOTE: Use the slider in the middle to compare the two maps.

The left map (in brown) shows population density: darker shades indicate higher density. The right map (in blue) displays the overall accessibility index: lighter blue means better access to key social services.

Mt Lawley, the inner-city suburb, has higher population and housing density (key features of a compact city) as well as better access to the previously mentioned key social services, compared to Willetton.

In this map, the colour of each circle represents the mix of primary health care services and GPs within a 1,600 m radius: pink indicates more health care services, blue means more GPs, and purple shows areas with a high number of both. The size of each circle reflects the number of early childcare facilities – larger circles mean more facilities.

As can be seen from the map, Mt Lawley has considerably better access to primary health care and early childcare education, whereas Willetton is characterised by a higher level of cultural and linguistic diversity (see the next map for reference).

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(For reference) Culturally and Linguistically Diverse (CALD) Index.

Darker areas indicate greater diversity.

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Next, let's look at access to public transport stops (bus, tram, train) and how often they run.

The colour of each circle shows the number of stops within 800 m or 1,600 m: blue means more stops within 1,600 m, orange indicates more within 800 m, and green shows high numbers in both. The size of each circle represents public transport frequency within 1,600 m. Again, larger circles mean more frequent service.

While the frequency doesn't vary much (as seen in the similar circle sizes), the colour suggest there are generally more stops within both 800 m and 1,600 m for Mt Lawley.

But access isn't just about where services and bus stops are located; it's also deeply connected to the people who live there.

Let's now explore the socio-demographics of the two suburbs, examining factors like age groups, dwelling types, and socio-economic indicators to understand who resides in these contrasting suburbs.

This map shows the percentage of residents aged 65 and over in each suburb (darker means higher).

Mt Lawley and Willetton appear to have similar proportions of older adults, suggesting their age profiles are comparable to each other and to nearby suburbs.

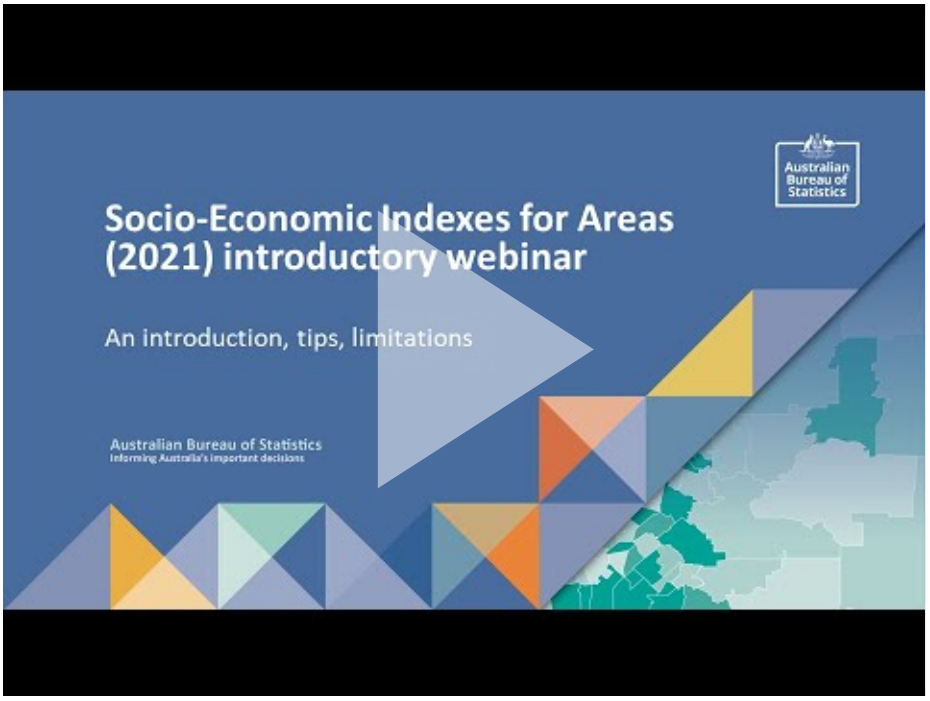
This map shows the Dwelling Type Distribution in Mt Lawley and Willetton using pie charts. Each chart represents an area, with slices showing the proportion of Houses (red), Semi-Detached (blue), and Apartments (yellow).

Willetton appears to have a significantly higher proportion of standalone houses compared to Mt Lawley, which shows a greater mix of dwelling types.

Lastly, this map compares the access Index (on the left) with the Socio-Economic Indexes for Areas, also known as the SEIFA index (on the right).

On both sides of the swipe, lighter colours indicate higher values, meaning better access on the left and greater socio-economic advantage on the right.

SEIFA is a widely used Australian index measuring socio-economic advantage and disadvantage in an area.



Socio-economic Indexes for Areas (SEIFA) 2021 introductory webinar

Note that the main focus of the generated index rests more on the role of form and density rather than socio-economic demographics as the primary drivers.

The Epilogue

Urban planning promoted by Ebenezer Howard in the early 20th century supported a central city in which the population travelled, mostly by car, to work and commuted back to the outer suburbs in the evening (Washino 2008). This approach influenced Australia's urban planning, with Australians spending much of their work day moving between work in the CBD and outer suburban areas at the end of the day. This model of urban planning has led to spatial inequalities with vary spatial inequalities observed across state and territory cities.

The compact city can deliver across a number of complex urban challenges, such as sustainability and social inequalities. The latter is exacerbated by spatial inequalities of access to social services such as health, education and transport. The challenges of implementing planning policies to support urban densification in Australian cities have been complex. This may be a direct

consequence of the challenges faced by the tiered governance structures in play across Australian cities (Troy 2004).

As highlighted here, social services that can be reached by a 10-minute walk are situated predominantly in the CBD and the inner suburbs of Australia's larger cities, where housing density is greater. Access to social services is limited and bereft in peri-urban areas, particularly areas with lower socioeconomic demographics, thereby exacerbating social inequalities.

The nature of urban density and access to social services are key to delivering equitable outcomes in Australian cities. However, urban density is not a necessary or sufficient cause but rather a component cause on the pathway to delivering social equity. Neuman (2005) suggests it is counterproductive to focus solely on urban density to achieve sustainable and equitable cities. He advocates a dynamic approach to planning, moving away from static planning and zoning tools. Clearly, a dynamic response to planning could facilitate the opportunities and attributes of compact cities that extend beyond merely urban density.

There exists an exciting opportunity to address the challenges being faced in our highly urbanised country. By placing social determinants such as access to social services at the forefront of strategic planning alongside consumer and or resident support there is a likelihood that future Australian cities would be well placed to respond to the challenges posed by car dependency, food insecurity, and growing social inequality. As Bruno et al. (2024) propose, moving to a compact city framework would mark a shift from a time-based city to a value-based city.

Dataset Used

Health providers data was obtained from the National Health Services Directory, a national directory of health services and providers maintained by Health Direct Australia. This data includes providers, service types (i.e. pharmacy, family practice, mental health, etc.), opening hours, billing practices, service address, and latitude/longitude. Data clean up involved geolocating missing latitude/longitude locations from street addresses.

Childcare facility data was obtained from the Australian Children's Education & Care Quality Authority (ACECQA) National Register. This data includes providers, provider street address, number of places, hours of operation, and service quality ratings. Data clean up geolocated latitude/longitude locations from street addresses.

General Transit Feed Specification (GTFS) files for all Australian public transport providers were downloaded from the Mobility Database Catalogs repository. GTFS files, compliant with the GTF specification are generated by public transport agencies providing timetables and geographic locations of routes and stops. Using these files, the number of services per week at each latitude/longitude transport stop were calculated. The modes included are bus, train, and tram.

Data from the Australian Bureau of Statistics 2021 Community Profiles and SEIFA was used at a SA1 and SA2 level for each Australian capital city, including population density, age distributions, and housing types.

Some of the datasets listed above are available through the AURIN Data Provider or via the AURIN Data Request Form.

Acknowledgement

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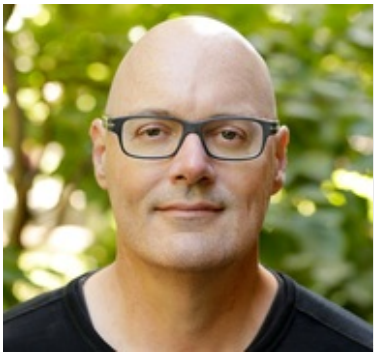

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