Urban Density and Equity of Access to Social Services in Australian Urban Areas

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Abstract

To measure access to social services (primary health care, early childhood care/education, and public transport), we create a social service access index (SSI) for Australian capital cities. We show that only two, Melbourne and Sydney, have some limited characteristics of a compact or 15-minute city, but only in city centres and inner cities where population densities are highest and have less low density housing types. In the outer suburban and peri-urban areas as well as across all of the remaining cities, proximity to social services is poor and residents suffer the consequences of spatial inequity.

Keywords: Spatial disadvantage, urban design, population density, essential services access

1 Questions

As Australian cities undergo population and urbanisation growth, the challenges to deliver equitable access to services posed by historic planning decisions and development patterns can be seen. Starting from early settlement urban form emphasising sprawling green-field self-sufficiency, Australian urban areas sprawled outward from highly centralised capital cities (in both form and administrative and commercial function) (Wilkinson et al., 2022) following radial public transportation links and preferencing suburban home ownership and low density (Troy, 2004). While some policy efforts in the 1990s sought to revitalise urban centres, they met with mixed success, with some increases of inner city population densities, but often resulting in density hot spots clustered around transport links (Coffee et al., 2016). The results are uneven distribution of access to services with considerable inequities bourne by residents in peri-urban areas (Nice et al., 2024; Stevenson et al., 2025). Consequences of these spatial inequities can include social inequalities and poverty (Harpham and Boateng, 1997), increased health risks (i.e. obesity observed to be 2.3x higher in outer-urban and regional areas (Australian Institute Of Health And Welfare, 2018)), and disadvantage in access to services such as education, health or transport (Dikeç, 2001).

There has been growing interest in recent times in the benefits of compact cities (Breheny et al., 1992; Burton, 2000, 2002; Daneshpour and Shakibamanesh, 2011; Elkin et al., 1991; Newman and Kenworthy, 1989), often defined as urban areas with high densities of population and infrastructure that facilitate short journeys to amenities (schools, retail, and workplaces) through mixed land use (Stevenson et al., 2016). Related, are 15- or 20-minute cities, designed so that essential services and amenities are within a 15 minute active transport (cycling or walking) journey from local areas (Bruno et al., 2024).

We aim to test access to essential services across the Australian capital cities and create a social service index (SSI). We ask the question, can any Australian city be considered or exhibit characteristics of a compact or 15-minute city? Additionally, what can the spatial distributions of this SSI show about the links between urban form, infrastructure and population density, demographics, and the distribution of spatial advantage/disadvantage across Australian capital cities?

2 Methods

We combine three main datasets that provide locations of primary health services, childcare centres, and proximity and frequencies of public transportation services. For additional context, we link to these to demographic data (housing types, population density, socioeconomic status) from the Australian Bureau of Statistics (2021a) 2021 Community Profiles and Socio-Economic Indexes for Areas (SEIFA) (Australian Bureau of Statistics, 2021b).

Health providers data was obtained from the National Health Services Directory, maintained by Health Direct Australia[1], and includes providers, service types (i.e. pharmacy, family practice, mental health, etc.), opening hours, billing practices, service address, and latitude/longitude. Childcare facility data was obtained from the Australian Children's Education & Care Quality Authority (ACECQA) National Register[2] and includes providers, provider street address, number of places, hours of operation, and service quality ratings. Data clean up for both involved geolocating missing latitude/longitude locations from street addresses. The number of public transport services (bus, train, and tram) per week at each latitude/longitude transport stop were calculated using General Transit Feed Specification (GTFS)[3] files for all Australian public transport providers (MobilityData IO, 2024). GTFS files are generated by public transport agencies to provide timetables and geographic locations of routes and stops.

Using the Australian Statistical Geography Standard (ASGS) digital boundaries, (ABS, 2021), distances to the three types of services were calculated for each SA1 (statistical areas designed to include a population of 200-800 persons). The number of services for each of the three categories was calculated within a flat earth distance of 800m (a distance approximating a 15 to 20-minute walk on the street network) from the centroid of each SA1.

To generate the SSI, counts of access to public transport, general practitioners and pharmacies and early childhood education and care within 800 metres were normalised and scaled 0 to 1 and all indicators were summed across each SA1. The resulting SSI could range from 0 (no access to any social services) to 3 (very high accessibility). Next, we aggregate the SSI results along with demographic characteristics to both SA2 (populations between 3,000 and 25,000) and SA4 levels to show the broader trends across the capital cities. SA4s are the largest sub-State statistical regions and are designed to contain at least 100,000 persons and best represent the boundaries of regions that contain both where residents reside and work (ABS, 2021).

3 Findings

Figure 1 shows maps of the estimated SSI at SA2 levels for six Australian capital cities and highlight the spatial and inequitable distributions of access to essential services such as public transport, primary health care and early childhood education that would be delivered by a 15-minute or compact city. Access to social services is only adequately met in the Central Business Districts (CBD) of Brisbane, Perth and Sydney with SSI scores of 1.75, 1.75 and 1.25 for the cities, respectively. Other than Sydney, which observed average SSI scores in the range of 0.50 to 1.0 across the large outer metropolitan areas, there was uniformly limited access across a large area of the metropolitan areas of Brisbane and Perth. Access to social services is very low across 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 of Melbourne (SSI range 1.2 to 2.7) and the north from the CBD (SSI range 1.8-2.1). Despite the accessibility in these locales of Melbourne, more than 75% of the Melbourne metropolitan area has limited access to services.

The proportion of property types (Figure 2) in each capital city was used as a additional proxy for urban density, percentages of detached houses compared to apartments. Other than Adelaide, Hobart and Darwin, the CBD area of Australia's capital cities, comprise approximately 70% of 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 city centres, Australia's continued focus on monocentric planning (Gleeson, 2015) delivers poor accessibility to

[1] https://www.healthdirect.gov.au/
[2] https://www.acecqa.gov.au/resources/national-registers
[3] https://developers.google.com/transit/gtfs/reference

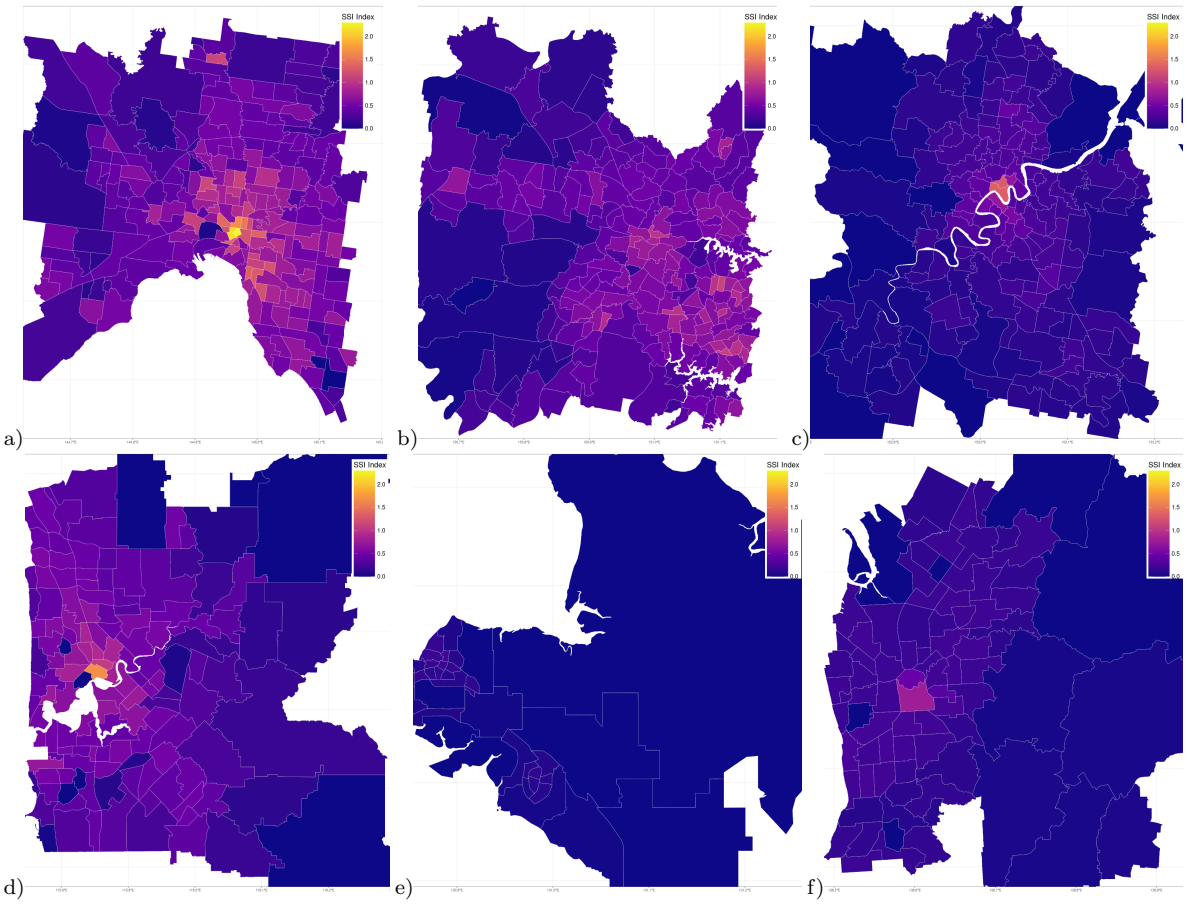

Fig. 1. Calculated Social Service access Indexes (SSI) at SA2 level for a) Melbourne, b) Sydney, c) Brisbane, d) Perth, e) Darwin, and f) Adelaide. Higher values (lighter colors) indicate higher access.

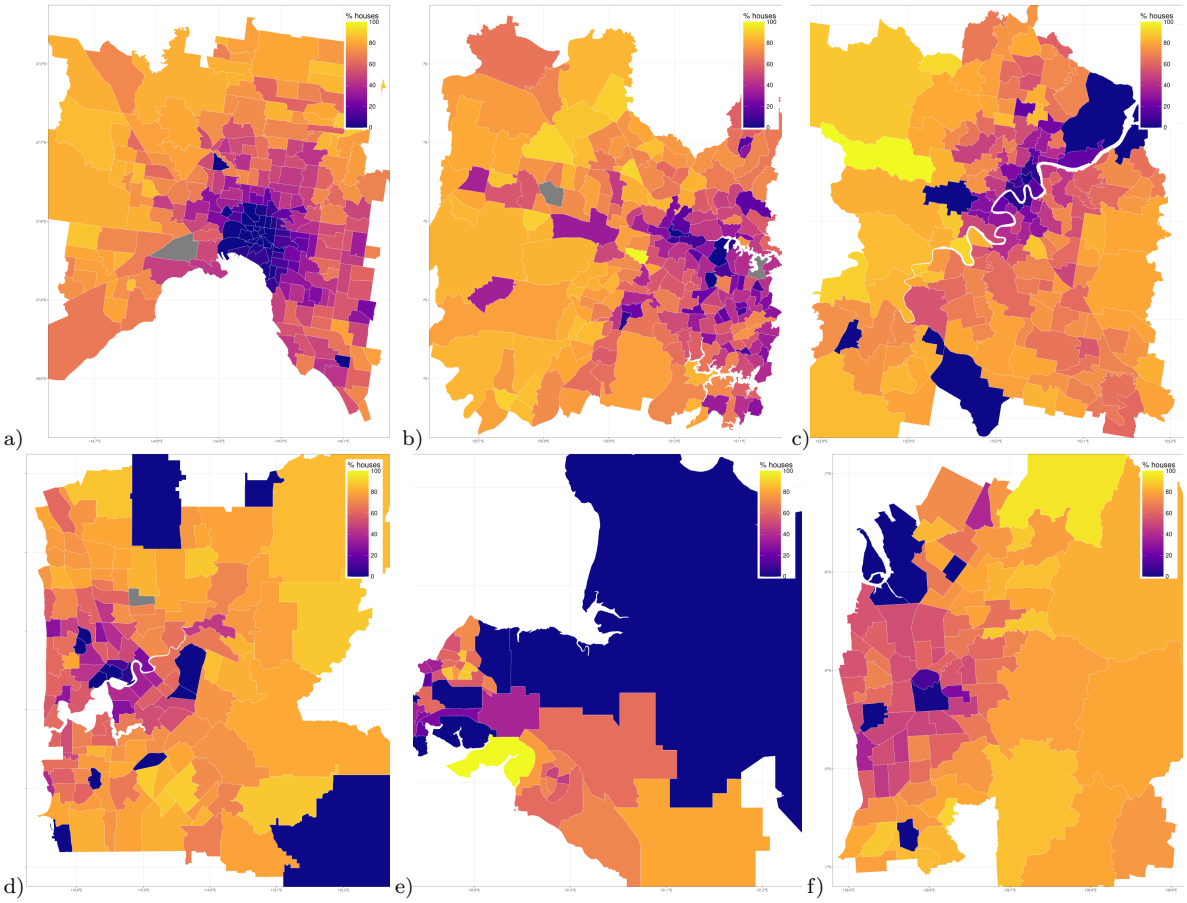

Fig. 2. Housing types, showing percentages of detached houses for each SA2 for a) Melbourne, b) Sydney, c) Brisbane, d) Perth, e) Darwin, and f) Adelaide.

essential services. Access to social services is especially limited particularly in Adelaide, Perth, Brisbane, Hobart, Canberra and Darwin where housing is predominately single detached dwellings.

At a broad level, Table 1 shows that urban regions (SA4s) with the highest accessibility are generally those with the greatest population density and the lowest percentage of standalone housing and highest percentage of apartments. These areas generally correspond to the inner city regions. In Melbourne, this consists of a single inner city region, where Sydney has a number of dense (but lower density) inner regions spread across the city. None of the other Australian cities have levels of density and access approaching Melbourne and Sydney.

In answering our questions, we show that two Australian cities (Melbourne and Sydney) have some characteristics of a compact or 15-minute city, generally in the CBD and the inner suburbs where greater housing density is situated. However, even in them, access quickly diminishes in the middle and outer regions. Overall, access to social services is limited and bereft in the peri-urban areas of Australian cities, areas with lower socioeconomic demographics, thereby exacerbating social inequalities.

These results are in line with Bruno et al. (2024)'s global assessment of 15-minute cities which found that no Australian cities can be considered 15-minute cities. Melbourne and Sydney performed best, with walking trips to 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.

Table 1. Social service index results aggregated to SA4 levels in Australian capital cities. Other demographic information including population density (persons/km^2), housing types (percent), and socioeconomic indexes (SEIFA) have also been aggregated to a SA4 level.

City	SA4	SSI Index	Density	Houses	Semi detached	Apt.	SEIFA
Adelaide	Central & Hills	0.18	2216	58%	11%	7%	69
Adelaide	South	0.15	1927	65%	8%	3%	61
Adelaide	West	0.14	2129	47%	10%	5%	37
Adelaide	North	0.13	2064	68%	6%	1%	35
Brisbane	Inner City	0.38	7327	37%	4%	35%	76
Brisbane	South	0.20	3097	63%	8%	9%	59
Brisbane	North	0.16	2826	60%	7%	10%	61
Brisbane	West	0.13	2273	69%	3%	8%	75
Brisbane	East	0.11	2129	62%	8%	2%	59
Brisbane	Logan-Beaudesert	0.10	2112	68%	8%	2%	27
Brisbane	Moreton Bay-South	0.07	1789	82%	6%	0%	74
Brisbane	Ipswich	0.05	1745	68%	6%	0%	33
Darwin	Darwin	0.08	1700	51%	5%	12%	45
Hobart	Hobart	0.13	1611	69%	2%	4%	46
Melbourne	Inner	0.97	13468	15%	15%	35%	68
Melbourne	Inner East	0.61	3452	51%	13%	11%	76
Melbourne	Inner South	0.59	3396	47%	14%	11%	71
Melbourne	South East	0.48	3431	55%	13%	8%	49
Melbourne	North East	0.42	2795	69%	9%	2%	51
Melbourne	North West	0.41	2841	65%	11%	1%	40
Melbourne	West	0.41	3270	69%	8%	3%	44
Perth	Inner	0.70	3372	41%	8%	22%	81
Perth	North West	0.47	2354	62%	12%	4%	57
Perth	South East	0.38	1965	62%	7%	2%	44
Perth	South West	0.38	1986	63%	6%	3%	56
Perth	North East	0.29	1567	69%	5%	1%	44
Sydney	Inner West	0.64	8820	34%	6%	36%	59
Sydney	Inner South West	0.63	6350	45%	9%	22%	35
Sydney	City / Inner South	0.53	6827	29%	7%	37%	46
Sydney	Parramatta	0.53	6854	45%	8%	21%	34
Sydney	Ryde	0.51	7264	49%	8%	22%	75
Sydney	North / Hornsby	0.48	5872	56%	2%	22%	79
Sydney	Sutherland	0.39	3426	62%	9%	11%	79
Sydney	South West	0.37	4356	68%	6%	7%	29
Sydney	Baulkham Hills/Hawkesbury	0.36	2964	76%	5%	4%	87
Sydney	Blacktown	0.34	3608	72%	7%	3%	49
Sydney	Outer West/Blue Mountains	0.31	2593	74%	6%	3%	45
Sydney	Outer South West	0.27	2730	74%	9%	1%	47

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5 Data Availability

Data is available at https://doi.org/10.5281/zenodo.17587608

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