Does Density Matter?

The role of density in creating walkable neighbourhoods

Discussion Paper

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The role of density in creating walkable neighbourhoods

Authors: Tuesday Udell (Heart Foundation), Michelle Daley (Heart Foundation), Britt Johnson (Heart Foundation) and Dr Rodney Tolley (UK)

Based on a narrative review prepared by Dr Rodney Tolley and commissioned by Heart Foundation South Australia and Heart Foundation New South Wales.

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Executive Summary

Does Density Matter is a discussion paper for residents, professionals and experts involved in planning and developing neighbourhoods. It highlights that well designed and located, higher density neighbourhoods are desirable and add value to our communities.

The Heart Foundation supports the planning and development of urban environments that enable people to make healthy lifestyle choices and incorporate incidental physical activity into their daily routine.

We are particularly interested in how higher density neighbourhood environments influence transport choices and increase opportunities for physical activity and mobility. This report helps illustrate how higher density neighbourhoods can contribute to better physical activity outcomes, particularly walking, through increased amenity and appropriate location. Increasing walking is a cost effective, equitable and sustainable way to increase population levels of physical activity. However, the issue of density is complex and multiple factors need to be considered.

Australians need affordable housing choices, with a mixture of dwelling styles and densities that cater for all ages, and all life stages. This includes well designed neighbourhoods with higher residential density and mixed housing types, that will facilitate active lifestyles, social interaction and offer safe environments with access to amenities. However, these types of dwellings do not just create themselves.

Land use features associated with more walking and active transport can be categorised into the six Ds: Density, Design, Diversity, Distance to public transport, Destination accessibility, and Demand management (parking policies). This report identifies Placemaking as an additional and essential variable. These features make the biggest impact when they work together. Research confirms that neighbourhoods with the most Ds have more walking and lower distances travelled by car. Density is important because a minimum threshold of population density ensures public transport and local shops and services are more viable, situated closer to where people live, and increase the opportunities and convenience for local residents to do more walking.

While the combination of the six Ds will certainly increase the amount of walking, much of the potential will be unmet if no attempt is made to also improve the design quality of the street as a destination, not just as a thoroughfare. The walkable quality of the street environment is fundamental to the appeal of a neighbourhood. Creating attractive spaces, dramatically increases the time people spend in the street, whether strolling, window shopping, having conversations, stopping, playing, sitting or just watching the world go by, not so much travelling, but 'sojourning'.

In presenting our case we acknowledge that changes to the built environment, such as higher residential densities, will not automatically reduce car use and increase walking by those who live there. Cities of any

density can be designed to help residents make more active transport choices and walk more; however it is density that can underpin the creation of walkable neighbourhoods. Through this report we will provide evidence that:

- Australians are increasingly choosing higher density homes over traditional stand-alone houses.
- Compact development that retains a human scale is more appealing for pedestrians.
- People living in higher density neighbourhoods undertake more walking and physical activity than people living in low density neighbourhoods.
- The density of an area is related to walking because higher residential densities bring destinations closer together and support the presence of local shops, services and public transport.
- Density and six other key built environment features work *together* to create walkable neighbourhoods
- Density and the height of residential properties are not intrinsically linked. Increased density can be achieved through low to medium rise development.
- Higher residential densities along with mixed land use can encourage walking for transport.
- Higher density neighbourhoods should be located near high quality public transport and activity centres supporting a diversity of uses; and accessible to jobs and services.
- Additional amenity makes density work and can enhance community acceptance of density.
- Density alone does not provide the richness required for increasing walking. Density provides the foundation for other built environment elements that work together to create walkable neighbourhoods.

To support walking, the Heart Foundation encourages State and Local Governments, developers, built environment professionals and planners to consider the following:

- Prioritising walking and active travel, including cycling and public transport in urban planning, transport policy and infrastructure funding.
- Designing compact, mixed-use urban neighbourhoods to maximise the health benefits, as part of the overall growth plan for Australian cities.
- Developing neighbourhoods guided by design codes that foster the synergy between the built environment variables associated with more walking - collectively known as the six Ds- *Density, Distance to public transport, Destination accessibility, Diversity, Design, and Demand management (parking policy),* and Placemaking.
- Challenging the public discourse and debate about density, by implementing best practice principles and using case studies to illustrate the benefits that are achievable when density is done well.
- Investing in evaluation and measurement of the impact of denser, compact, walkable environments on walking levels, particularly in the Australian context. New higher density developments, including urban renewal and infill, create many opportunities for 'natural experiment' designs to measure the outcomes of changes to the walking environment.
- Documenting the lived experience of residents in higher density neighbourhoods to better understand what makes a walkable neighbourhood liveable.

Higher density in the right location, with appropriate height, land use mix, good design and accompanying amenity *can* contribute to creating walkable neighbourhoods and encourage more walking.

Great compact walkable neighbourhoods will attract people, who in turn will attract services and amenity. Ultimately, the Heart Foundation supports the creation of healthy active neighbourhoods, and higher densities should be seen as the means to achieve this, rather than the end. In a nutshell, we believe density does matter.

Introduction

The Heart Foundation seeks to advance policy, environment and lifestyle changes to help provide every Australian with opportunities to be active across the lifespan, in the places they live, work, and play.

Why we wrote this report

Physical inactivity is a significant risk factor for cardiovascular disease and other chronic diseases, such as type 2 diabetes and some cancers. Urgent action is needed to prioritise the prevention of inactivity.

Physical inactivity causes

1 out of 10

Australian deaths

How we design our neighbourhoods, cities and regions is vitally important to our health and wellbeing.[1] Urban planning, design and redevelopment offers an opportunity to address physical inactivity, a major driver of the overweight and obesity epidemic.[1] Physical inactivity puts a massive strain on our healthcare system, with a 2007 study estimating that if more Australians were physically active for just 30 minutes a day, the Australian healthcare system could save $1.5 billion annually.[2] Only 40% of Australian adults meet the recommended guideline of at least 30 minutes of physical activity a day.[3]

In the last four decades, there has been a rapid decline in walking (and cycling) for transport.[4] Walking is the most fundamental form of mobility and is an effective way to increase population levels of physical activity. Walking offers many advantages: it is inexpensive, emission-free, burns kilojoules rather than fossil fuels, offers important heart health benefits, and is accessible regardless of income.[5] This report focuses on walking because it presents an easy and sustainable opportunity for incorporating physical activity into daily routines. Where we live can influence health and opportunities for physical activity, including walking. There is a strong link between urban form, travel behaviour and environmental and community health outcomes.[6]

The community conversation about density needs to include some of the potential benefits of density done well; one of which is getting more people walking. The issue is topical- the National Urban Design Protocol,[7] together with planning strategies in many States and Territories across Australia,[8] are encouraging increased density through approaches variously termed: urban consolidation, transit oriented developments, transit corridors, 'smart growth', activity-centres, urban activation precincts and urban growth boundaries. Heart Foundation advocacy documents and resources

including our *Blueprint for an Active Australia, Built Environment and Walking Position Statement* and *Healthy Spaces and Places* guide, all support increased residential densities with mixed-use planning.[1, 9, 10]

Our concern is that the traditional low-density, suburban-sprawl model of Australian cities is having a negative impact on the health of both residents and the environment. People living in low-density car-dependent neighbourhoods engage in less physical activity (including reduced walking and active travel) and increased sedentary behaviours, such as sitting in the car,[11] both of which contribute to the prevalence of obesity and chronic diseases.[12, 13] Residents living in low-density outer suburbs often have poorer access to public transport and little option but to drive to meet daily needs. In an American study, Frank and colleagues calculated that every additional hour a day in a car translated to a 6% *increase* in obesity risk, while every additional kilometre walked translated into a 4.8% *reduction* in the likelihood of being obese.[14]

When considering housing affordability, what is often forgotten is affordable living. The Vulnerability Assessment for Mortgage, Petroleum and Inflation Risks and Expenses (VAMPIRE) index consistently shows stress in the outer suburbs where car dependence is high.[15] Suburban households can end up driving about three times more than households close to the city centre, with consequent costs to household budgets and to the economy.[16] With cheaper housing prices typically located in the outer suburbs of Australia's major cities, an increasing number of people are living further away from city centres. At the same time, many jobs – in particular, higher-skill, higher-paying jobs – are recentralising. This is leading to an increased distance between where people work and where they live and a growing need to more effectively connect homes and workplaces.[17]

Why denser neighbourhoods are for all ages

Higher density neighbourhoods aren't just for trendy young hipsters. Well planned density can help to provide a range of housing sizes, styles, housing tenure and price options, and include flexible and adaptable housing for all ages and stages of life.[10]

Existing cities and towns will have a role in accommodating Australia's future population, which is projected to double by 2075.[18] As the generation of baby boomers age, a greater proportion of the population will be over 65 years old, which will present economic, social and personal challenges for Australian society. With homeowners most likely to want to live in the same area as they grow older, many will be seeking to downsize their family home, while remaining close to family and friends in their existing neighbourhood. For older Australians, designing and locating safe, affordable, well-connected and mixed, higher density housing options will be critical for facilitating active lifestyles, social interaction, and access to amenities.[19, 20]

The needs of all age groups should be considered when designing and creating neighbourhoods. For older adults, it is important that walkability issues such as the quality of footpaths, perceptions of safety, and adequate road crossings are addressed.[21] For working age adults, it is important to have shops and services within a walkable distance from home and work.[22] Young people can be particularly sensitive to their surroundings; most likely because they can't drive. For young adults and older children, a mix of nearby destinations including schools, stores and friends' houses is associated with more walking. One study in Metro Atlanta showed that 12 to 15 year olds who lived in high density neighbourhoods were nearly five times more likely to

walk half a mile (0.9 km) or more a day than those who live in low-density (or suburban) neighbourhoods.[23] For children, the most important neighbourhood feature for walking is proximity to a park or playground. Children aged 5 to 8 years, were found to be 2.4 times more likely to walk at least half a mile a day than peers who did not live near a park.[23]

What do we mean by density?

Density is defined in many ways, but put simply density is the number of 'things' per unit of land area. For example, population density is the number of people divided by the size of a given area while residential density is the number of residences divided by the size of the given area (dwellings per hectare is the commonly used Australian measure).

But density is a complex concept and is about more than people and residences:

> *Density is often defined in terms of population per square mile (km), but such a crude measure makes it difficult to understand the relationship between density and city life. We need to think about urban density by including the density of jobs, schools, and services such as retail, transit, and recreational facilities.[24]*

While density is a broad concept, this report focusses primarily on the role of population and residential density in supporting walkable environments. Neighbourhoods are often described as being low, medium or high density. From an Australian perspective, the following definitions of residential density are generally accepted:[20]

- Low density is defined as less than 25 dwellings per hectare and is usually single residential housing.
- Medium density is generally considered to be 25 to 60 dwellings per hectare.
- High density is defined as over 60 dwellings per hectare.

What this report is about

This report seeks to:
- Explore the role of density in creating walkable neighbourhoods.
- Illustrate some Australian and international examples of higher density neighbourhoods that have supporting built environment features that encourage walking.

While it draws on current national and international evidence, this report is not a systematic review, nor is it prescriptive about the levels of density required for specific cities or neighbourhoods.

Case study 1: Increasing walking through urban renewal

Pyrmont – Ultimo, Sydney, New South Wales

The neighbourhood of Pyrmont-Ultimo, a former industrial hub in inner city Sydney, is now Australia's most densely populated suburb and home to approximately 18,700 residents, including over 4,000 families. Significantly, walking is the most common mode of transport for commuting among residents, and nearly 37% walk to work, compared to just four per cent in the greater Sydney area.[71] Vehicle ownership is among the lowest of any Australian suburb, with 37% of households car free, compared with an Australian average of nine per cent.

The proximity of Pyrmont-Ultimo to a variety of destinations has enabled and encouraged significant rates of walking for transport. There are numerous local amenities and destinations to walk to, including restaurants, coffee shops, parkland, retail shops, community and medical facilities and a primary school. Proximity to employment was also a conscious objective of the urban renewal plan which has resulted in a clustering of particular industries in the area, such as media companies. The workforce population rose from 5,000 in 1994 to an estimated 22,000 by 2004.[71]

A light rail link was established up-front, supplemented by several bus routes and numerous public transport stops within a 400m radius of most dwellings. Recreational walking has been encouraged by the creation of an extended foreshore promenade in Pyrmont, which links to existing waterfront paths to the city and the nearby fish markets and western foreshore. A pedestrian bridge connects directly with the Sydney city centre and is a well used thoroughfare for commuters on foot and bicycle. Open space provisions include a large park and several pocket parks throughout the development, as well as nearby access to significant public open space.

Creating strong transport and pedestrian links to the University of Technology nearby has been critical to the success of Pyrmont-Ultimo, which has a significant student population. Inclusion of an *Affordable Housing Program* (over 600 apartments) has also encouraged demographic diversity and ensured a mix of nearby workers. Lower than average car ownership and higher than average walking mode share reflect the close proximity to destinations and employment options, combined with urban design features that facilitate walking. This has been supported by proactive planning policy to restrict parking, encourage car sharing and promote alternative transport options, including walking and cycling.

Case study 2: Regenerating an inner city

Pearl District, Portland, Oregon, USA

The Pearl District is located just north of downtown Portland, Oregon. The area has been undergoing significant urban renewal since the mid-1980s, and now mostly consists of high-rise condominiums and warehouse-to-loft conversions.

Residential density has risen sharply, with 5000 units supplementing the 1900 that were scattered through the area before redevelopment. In the northern half of the area, mid- and high-rise apartment buildings make up blocks with densities between 175 and 310 units per hectare.

Green space threads through much of the Pearl in various forms, including highly walkable pocket parks made from closed streets and mid-block courtyards. Plans call for making stronger bicycle and pedestrian connections to the Central City, adjacent neighbourhoods and the waterfront. The street grid will be extended northward and two pedestrian bridges are planned for the area to cross railroad tracks and a parkway.

The first generation of residents - primarily young working professionals - were integral in the establishment of a community in the district. An increasing number of this first generation is beginning to have children and this is transitioning the Pearl into a new phase of community development. If their needs are not met, the district will lose these families, and the positive impact they bring to the city, once their children reach school age. In this sense, this challenge in the Pearl is typical of many re-generated inner-city sites that are now maturing.

www.travelportland.com/article/pearl-district-activities/

Source: Julie Campoli from *Made for Walking*

Why Australians need compact walkable neighbourhoods

Australians are willing to forgo the low density, car-dependent suburbs to live in higher density neighbourhoods that are walkable and have great public transport and great public spaces.

Australians need cities with housing diversity and housing choices. Australians need equitable cities that provide choices of higher density living or a traditional home, and such options need to be affordable to all. While higher densities and social housing are critical components of compact affordable housing policies, planned implementation has encountered some opposition from residents.[25] Objections most often occur in wealthier areas with the reason being to exclude particular social groups, and preserve the social and economic benefits of the area.[25]

Preference for "the Australian dream" with a large, detached house on a quarter-acre block has been ingrained in Australian culture, however research by the Grattan Institute suggests that our preferences are changing and we are willing to make trade-offs between housing type and size, in exchange for

location.[26] People of different ages and household types prioritise housing and location attributes in different ways, and a balance of dwelling and locational features is important.[26]

When we talk about compact walkable neighbourhoods, we generally describe an area that has a hub, with a mix of housing and businesses, schools, workplaces, and streets that are designed for use by people on foot, cyclists and cars. Residential density is a critical factor underpinning walkable neighbourhoods but is only one of a number of key urban elements that contribute to walkability that will be discussed in this report.

Examples of these compact walkable neighbourhoods are illustrated in the case studies throughout this paper, and demonstrate a diversity of places, across Australia and the world. The case studies illustrate a range of planning principles and features that can create vibrant, walkable places where people want to live. Opposition to higher density developments can best be won over by great examples of thoughtful designs that are sensitive to their context and that demonstrate real benefits.

Embracing higher residential density

Analysis of housing approval trends confirms that Australians are increasingly choosing medium density homes (defined as units, town houses and semi-detached homes) over the traditional, standalone home. Thirty eight per cent of home approvals were for medium density dwellings in 2012, compared to 31% five years ago. This trend has mainly occurred in capital cities, but also in selected regional areas.[27]

Increasingly, young people don't want to live in the outer suburbs. They are seeking out places where they can be less car-dependent and where they can live, work and play. In 2009, US 16 to 34-year-olds took 24% more bike trips than they took in 2001.[28] They walked to their destinations 16% more often, while their passenger 'miles' on public transport jumped by 40%.[28] Research shows that the talented younger workforce want to work and live in urban places that are walkable, cycle-friendly, connected by public transport, and hyper-caffeinated.[29]

Reducing car use or dispensing with the car altogether is already under way in cities of the industrialised world. Kilometres driven have been plateauing for much of this century, licence-holding among younger generations is sharply down, and denser city neighbourhoods are seeing a resurgence of growth and activity as many people adopt a car-free (or at least car-light) lifestyle.[30, 31]

Community perceptions of higher density

Density is both a simple and complex descriptor of the built environment. It is both objective and benign at the same time, as well as being an indicator of a potential emotional experience. Almost simultaneously, density is desired and feared by different stakeholders in the urban environment.[32]

As noted earlier, contemporary Australian planning policies advocate for higher densities to support population growth, and accommodate changing population demographics in an equitable manner.[33] Nevertheless, for many Australians density is still undesirable and is often associated with 'ugliness', 'high rise towers', 'crowding', 'congestion', 'parking problems' and 'undesirable residents'.[34] Many of the problems blamed on density are in fact a combination of problems relating to: location, design, inappropriate height, open space, tenure mix, integration, parking allocation policies, lack of management and maintenance.[35]

Despite recent trends, Australia is largely a nation of single-family homeowners who are accustomed to a lot of space between themselves and their neighbours. Indeed, it now has the largest average house size in the world.[36] This cultural bias often underlies discussions of growth and development, so that many people view density as a potential threat.

Established positions on the desirability of the big backyard and the car appear to be changing. For example, a Newspoll telephone survey of 1,403 adults previously commissioned by the Heart Foundation found a strong desire for urban design features that are associated with increased physical activity and social connection, such as living within easy walking distance to public transport and local destinations like shops and services. These attributes were all rated more highly than having a two car garage and large backyard.[37] The reality is that providing such services within walkable distance of most homes requires higher density than that of many traditional suburbs.

Well-designed, walkable communities can help overcome any loss of private space that accompanies higher density living. Homeowners seem more willing to forgo a big private space if they have access to sufficient open and green space and public tracts of natural land for recreation. For example, carefully placed and proportioned public realm helps compensate for the loss of large lots; green infrastructure (parks, greenways, and tree-lined streets) helps to facilitate connecting people with the natural world; and an interconnected street network that serves both vehicles and pedestrians contributes to making neighbourhood life more community orientated and convenient.[38] As described in the Australian context,

A key to the acceptance of medium density housing lies in convincing the community of the necessity of smaller private spaces…the challenge is to expand and improve open spaces nearer to where we live……We need to make our urban parks more permeable, make them places connected to and a part of everyday life.[39]

We know that higher residential density does not in itself result in crowding. Crowding is the subjective perception of too many people. Crowding and monotony are the consequences of poor design, not the inevitable results of density.[40] Higher density neighbourhoods may not be perceived as overcrowded if they are designed to comfortably accommodate many people. Density is often perceived to be greater than it is when the same building forms are duplicated across a broad area, producing a response that there are "too many" structures, regardless of the actual number.[24]

Encouraging mixed density supports the development of a variety of housing types with varying heights and sizes. Mixed density can support increased density, while ensuring that the built form isn't confronting. Having a variety of dwelling types and densities promotes a more diverse community that caters to the various needs of residents.[10]

Rather than lowering house prices, properties in compact walkable neighbourhoods have the potential to generate better returns than properties in less walkable neighbourhoods.[41] For example, an analysis of inner-city Melbourne properties using walkability data from 'Walkscore' found a positive correlation between a suburb's Walkscore (walkability) and pricing.[42]

Must higher density mean high-rise?

Density does not *mean* height. It is not true that higher density requires high-rise development, despite this perception persisting in the community debate around density.[34] In fact, many examples show that elevated

Case study 3: Prioritising pedestrians in high density areas

City of Port Phillip, Victoria

Located in one of the oldest areas of Melbourne, Port Phillip is known for its urban villages, heritage buildings and beautiful parks and gardens. The area has a variety of retail, entertainment, employment and leisure precincts; and well connected public transport networks including trams and trains.

To identify a strategic walking network within the area, in July 2013 Council completed a comprehensive Principal Pedestrian Network (PPN) across the municipality. Routes within the PPN allocate the highest level of priority to pedestrians. The key focus was to promote walking and shift transport trips that would normally be undertaken by car.

The PPN demonstrated that areas with significant residential densities also had access to multiple destinations within walking distance, which was a key factor to the walkable nature of the surrounding area.

www.portphillip.vic.gov.au/Report_8_pedestrian_attach_2.pdf

Source: Julie Campoli from *Made for Walking*

density levels can be achieved without high-rises, as seen in cities such as Paris, Barcelona, Vienna, and established suburbs such as Carlton in Melbourne, or Paddington in Sydney. Before elevators were invented, two-to four-storey "walk-ups" were common in cities and towns throughout Australia and America. Constructing a block of these types of buildings could achieve a density of anywhere from 45 to 175 dwellings per hectare.[40]

The argument for achieving higher density through lower rise built form (see Figure 1) is further supported by the Heart Foundation's own research that explored the potential health impacts of higher density development. Limiting building heights can maintain the human scale and enhance the walkability of an area. A Heart Foundation evidence review[12] found that development up to around six-storeys creates a compact urban form that is walkable, yet retains a human scale - which is important in terms of creating a pleasant, convivial, vibrant and walkable environment.

Figure 1. Different architectural forms that achieve the same density (i.e. 75 dwellings per hectare)[20]

A high rise   **A terraced street layout**   **A series of blocks enclosing Public Open Space**
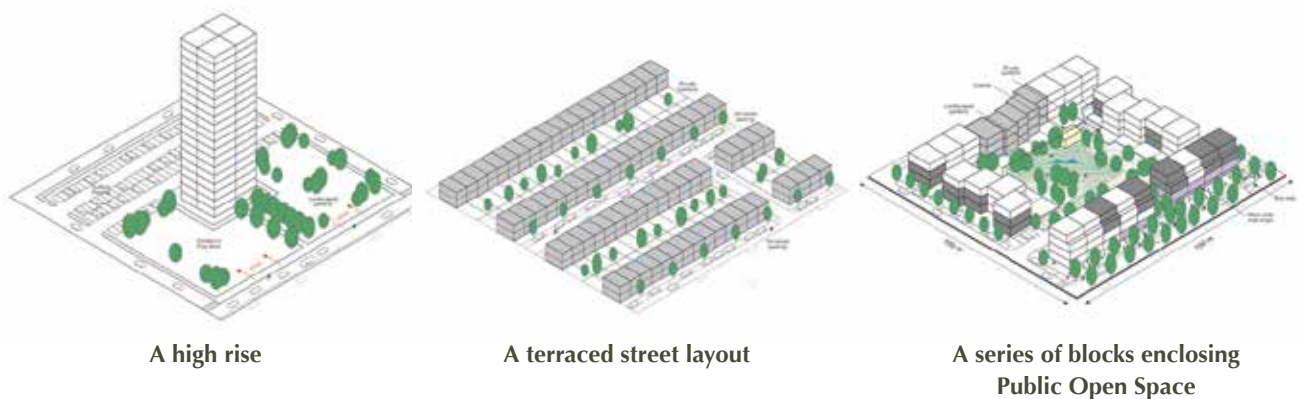
Adapted from: blog.pressan.is/arkitektur/files/2011/11/2832_N30_w.jpg

Case study 4: Healthy design in a medium density project

Lightsview, Northgate, South Australia

Lightsview is located 8 km north of the Adelaide CBD and is a 37 hectare medium density residential development which will eventually be home to around 2200 people. The development contains a diversity of housing options for changing demographics and lifestyles, including affordable housing. Eight hectares are set aside for senior living.

Since 2008 the developer has been applying the Heart Foundations *Healthy by Design: a planner's guide to environments for active living*[38] to Lightsview planning and design processes. This has influenced street layouts, open space planning, detailed design of public spaces and involvement in re-master planning of the mixed-use site and adjoining retail facilities.

Lightsview is also planned to connect to existing destinations nearby and has set aside land zoned as 'mixed-use' to provide for the daily needs of residents within 400-800m of their homes. The path networks have been designed for all users and provide seating and shade at regular intervals. Having local destinations within walking distance of homes improves walkability, promotes community identity and improves chances for social interaction between residents.

The street grid layout of Lightsview helps with ease of navigation on foot. The network of shared use paths connect to destinations inside and outside of Lightsview. Improvements to the pedestrian/bicycle road crossings were undertaken to ensure these routes are accessible to all users, while also providing benefits to neighbouring residents.

Large local parks are within 500m and small local parks with 150-300m of all homes. They are connected to the broader walking and cycling networks by 'greenways' or widened landscaped verges containing shared-use paths with good natural surveillance and seating. The verges also provide urban cooling which, along with street trees, will help reduce the 'urban heat island' effect, which can be an issue in higher density environments. Fences are low or transparent, ensuring that there is good surveillance over both homes and open space, while promoting human interaction.

The developers successfully negotiated for the early provision of bus services into Lightsview to encourage residents to adopt public transport as part of their travel patterns as soon as they move in. The Lightsview Development has won a number of planning and urban development awards.

www.saactivelivingcoalition.com.au
www.lightsview.com.au/

Higher density underpins walkable neighbourhoods

Density, travel behaviour and walking

Studies have found that higher residential densities, along with mixed-uses, are associated with walking for transport at all ages[20] and that people living in higher density neighbourhoods undertake more walking and physical activity than people living in low density neighbourhoods.[12] An international literature review on walking and cycling found that density was associated with walking for travel in most studies.[43]

The challenge in finding the link between density and walking has been explored by trying to separate out the role of density from other built environment features. One key study[44] found that walking for transport was most strongly related to land use diversity, intersection density and the number of destinations within walking distance. Despite measurement challenges, it has been shown that higher density neighbourhoods generally have a number of key elements that work together to create environments that support walking.

Density brings things closer together

There is now clear evidence that increasing density reduces the need to travel great distances for local needs and reduces the reliance on cars for transport. Higher density development is more compact and brings land uses closer together. In this way, density influences proximity, decreasing the distances between destinations and so making them more walkable.[1] Density also brings people closer together, which results in 'more eyes on the street' and contributes to the perceived and actual safety required to encourage physical activity, and more specifically walking.[45]

Increasing density can result in a clustering of destinations, making it convenient for residents to access a variety of needs such as housing, shops, schools, libraries, cafes, medical centres and so on, within one location.[10] This clustering is associated with shorter travel distances and increased walking for transport.[43] People in high density urban areas may achieve the recommended 30 minutes a day simply by walking to and from public transport and shops.[46]

It takes a certain number of people to support social infrastructure, such as schools and public transport, as well as a range of shops, services, local businesses and other amenities. Sufficient population density ensures that these local, walkable destinations have a customer base. Each of these activities needs a population threshold to remain viable and there is a clear relationship between the number of business and services that can be provided, relative to the number of people living (and/or working) in the surrounding area.

Location matters

The right location is critical for density to work. There are many examples of high density development that have not translated into lively streets and spaces with more walking. However, a key issue is frequently the

Source: Department of Planning, Transport and Infrastructure SA

lack of adequate public transport combined with a lack of diversity in land uses, facilities and services that would attract a mix of residents and along with it employment, shops, and community facilities.[47]

Research supports the notion that increasing residential density *alone* will not necessarily encourage more walking (and less car use).[45] Ewing and Cervero[44] suggest that measures of density may inadvertently act as proxies for other significant factors. So it is not density *per se* that will promote transport related walking, '*without mixing and connecting land uses to bring services and destinations closer to where people live and work.*'[45] When density, a connected mix of land uses, and enhanced public transport are put together, their synergistic outcomes are much greater than their individual contributions to improved walkability.[48]

Only the right location will foster the necessary interaction between density and other key variables. The consensus is that the best and most viable location for higher density development is close to:

- High quality public transport (diverse, safe and convenient).
- Activity centres supporting a diversity of uses.
- Existing concentrations of jobs and services.[49-51]

Well planned density and infill development in key locations optimises existing urban areas and enables neighbourhoods to capitalise on existing infrastructure and services. A Melbourne study makes the case that locating density in existing activity centres, public transport corridors and redevelopment sites, could accommodate a doubling of Melbourne's population while also protecting existing suburban areas.[49]

Increased density can maximise the number of people who can live in places that are already highly walkable. Particularly in existing urban areas, where there is little flexibility to modify walkability features such as street configuration, lot configuration (urban tissue) or location of activity centres, density is one aspect that can be varied over time, subject to market demand.

Amenity matters

A Heart Foundation review[20] argued that to maximise the potential health benefits a range of factors needed to be considered with density, including:

- The location, quality and design of the building.
- The physical environment and the geographic location.
- The socio-cultural make up of residents and the local neighbourhood and ensuring building designs and amenities are suited to the population (e.g. families with children).
- The quality of amenities present for both practical and recreational purposes, such as public transport, shops, services, sufficient public open space, and recreational opportunities.

A diverse range of amenity can make density enjoyable and help people accept that a neighbourhood is higher density.[40] Campoli agrees:

The main benefit of higher density neighbourhoods, for those who live there, is all of the amenity that goes with it, when it is 'done well' – e.g. open space, playgrounds, access to recreational facilities, mixed development, local shops, restaurants and cafes, schools, healthcare facilities, public transport, meeting places, landscaping/greenery, well lit paths, dog parks, cycle lanes, childcare …[24]

Green and open space matters

Green space is a major component in making density work. There is substantial evidence that people with better access to high quality open space and green space are more likely to walk and undertake physical activity than those who don't.[45] As urban planning seeks to maximise land-use, it is important to ensure good provision of open space as well as higher quality and flexible open space to compensate for the lack of private open space.[52] We should not reduce suburban lot sizes without increasing public open spaces.

Providing large amounts of green spaces does not guarantee that the space is useable, attractive and safe.[53] New higher density neighbourhoods should consider varied, high-quality green and open spaces, depending on local context – large and small, formal and wild - such as pocket parks, central greens, boulevards, community gardens, playing fields, roof gardens and greenways. There should be a balance of public, communal and private open spaces that collectively meet the needs of residents and connect people to surrounding communities. Penalosa argues *"cities need green in sizes S,M L and XL".[54]*

In summary, higher density in the right location, with land use mix, good design and accompanying amenity *can* contribute to creating walkable neighbourhoods and encourage more walking. The following section expands on the related land use features that interact with density to enhance walkability.

Case study 5: Master planning for higher density living

Victoria Park, Zetland, New South Wales

Victoria Park is a small suburb approximately 4km south of the Sydney CBD and forms part of the larger Green Square development that will eventually include a new town centre on the existing Sydney airport railway line. Redevelopment of the former manufacturing and naval stores precinct has spanned 15 years. The planning principle behind the Victoria Park Master Plan was 'to create a memorable and sustainable inner city urban community incorporating medium to high density living with abundant public open space...'[72]

The Victoria Park site is 25 hectares of urban renewal, with a mix of housing types including low, mid and high rise apartments and terraces, green space, commercial and retail uses. The suburb will eventually house up to 2,500 dwellings in a mixed-use precinct, with a number of walkable destinations including residential, commercial, retail and community uses.

Victoria Park has a grid street network that is connected into the surrounding area and open spaces which make pedestrian movement easy throughout the site. The area is serviced by three local bus routes and is a 10 to 15 minute walk to the nearest railway station. The narrow width of roads, wide footpaths and landscaping elements, collectively act to reduce the speed of cars in many of the internal streets. The design of Victoria Park was intended to reduce car ownership, and includes strategies such as restrictions on the number of car spaces per residence, prohibiting all day parking on surrounding streets, and providing car share spaces. Within the site, each building has bicycle storage, an internal garden, and a courtyard with barbecue facilities, pool and

gymnasium, all of which provide opportunities for community engagement. Additionally, 40% of the development is public open space. As the population of the Green Square precinct grows, the provision of adequate public transport will be critical to encouraging walking.

Neighbourhoods need more than density to be walkable

For neighbourhoods to be walkable, the six Ds must all work together. However, it is essential that they are augmented by the 'P' of Placemaking to ensure high quality streetscapes and public realm.

This section explores the related land use features that encourage more walking and public transport demand and are underpinned by higher density. The best known studies are those of Ewing and Cervero[44, 55] who categorised these features, including density, into the six Ds (see Figure 2): density, design, diversity, distance to public transport, destination accessibility and demand management (cost and availability of parking). They concluded that walking increases were less than would be expected from the degree of change in the built environment. However, they found that the *combined effect* of built environment variables on physical activity could be quite large. Simply, they found the six Ds make the biggest impact on walking when they work together. Frank and colleagues also reported that neighbourhoods with the most Ds have lower distances travelled in the car.[23]
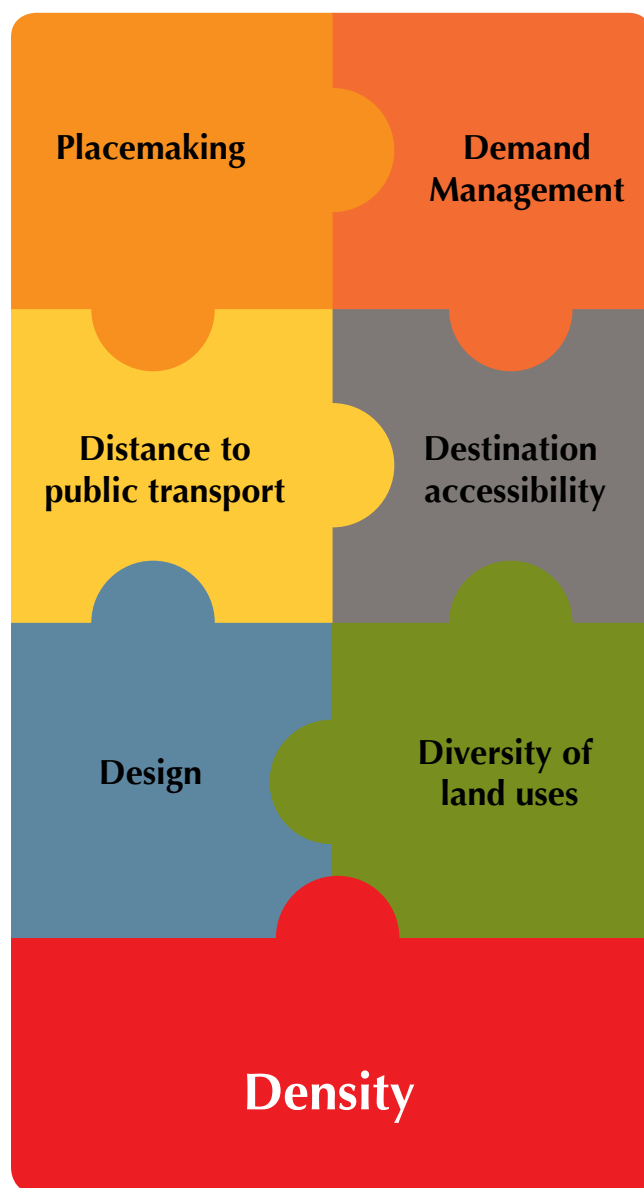
Figure 2: The six Ds and a P with density underpinning other built environment features.

Diversity

Diversity refers to the number of different land uses in a given area, and the degree to which they are represented in land area, floor area, or employment.[44] It includes the balance between jobs and housing, as well as diversity of housing choice itself, through varied lot size and housing type. As Campoli says,

A high level of diversity would include apartments and townhouses mixed with single family homes. Restaurants, drugstores, supermarkets, banks, hair salons, coffee shops, day care centres, fitness studios, software companies, and law, dental and insurance offices can all be spaced along the street or in upper stories…With a mix of services comes a greater potential for employment, and a sufficient mix of housing units means many people can work close to home[24]

Linking where people work and live allows more people to commute by foot. Ewing and Cervero's study[44] concluded that the propensity to walk for transport is most sensitive (elastic) to jobs-housing balance and the distance to shopping and services, both features of land use diversity.

Mixed land use influences neighbourhood walkability, travel costs and fuel use.[56] Greater land use mix tends to reduce vehicle travel and increase use of alternative modes, particularly walking.[57] Mixed land uses typically result in shorter distances between origins and destinations, which encourages walking,[45] and denser areas tend to be more compact and have more uses in close proximity. As Speck says:

…neighbourhoods with a diversity of uses – places to walk to – have significantly more walking than those that don't.[58]

Design

Relevant to walkability, design includes the concepts of intersection density and street connectivity, which relate to the directness of travel routes between homes, shops, workplaces and other destinations. Intersection density refers to the number of intersections in a given area and is influenced by block size (it is higher when blocks are small), while street connectivity refers to the layout of the actual street network.

In relation to street connectivity, neighbourhoods with grid pattern street networks typically have greater connectivity than those with curvilinear layouts (see Figure 3). Research indicates that walking for transport is encouraged when the street network is more connected, obstacles are kept to a minimum, and there is no requirement to cross major roads.[1] As Pharoah points out, even destinations being close together may not encourage walking, if the connections are poor:

The proximity between homes and the facilities available to residents will have a limited impact on the degree of walking if there are poor connections between them. Indirect and monotonous routes present little problem for car users because the journey is still quick for minimum physical effort. But such routes present a major deterrent to walking.[47]

Figure 3: Comparison of walking environments in neighbourhoods with rectilinear (straight-lined) blocks with and curvilinear street networks.[75]

800m radius walk in a compact neighbourhood
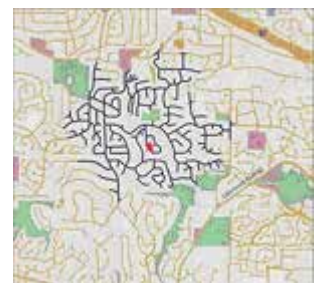
800m radius walk in a sprawling suburb

Intersection density is a key variable for increasing walking. Ewing and Cervero's work[44] showed that the mode share and likelihood of walking trips was most strongly related to intersection density, while Campoli reports that a doubling of intersection density results in about a 44% increase in walking.[24]

Neighbourhoods with smaller, rectilinear (straight-lined) blocks have more intersecting streets than places with large blocks and curvilinear street networks. In

Case study 6: State planning policy to create more compact, walkable neighbourhoods

Perth, Western Australia

In 1998, the Western Australian Government introduced the *'Liveable Neighbourhoods Community Design Guidelines'* (the Guidelines). This policy was intended to create more sustainable suburban communities across Perth. A key intention was to reduce low density, car dependent outer suburban developments and encourage more walking, cycling and public transport use. To achieve this, the Guidelines include design elements that promote more compact, self-sufficient, pedestrian-friendly neighbourhoods, with walkable destinations and public transport links. To facilitate housing variety, choice and affordability, and to cater for increasingly diverse household types, the Guidelines encourage increased residential densities and mixed lot sizes.

The *RESIDential Environment* (RESIDE) research study evaluated the implementation of the Guidelines and investigated whether greater levels of implementation resulted in better walking outcomes for residents.[73] Developments designed in accordance with the Guidelines were found to have a higher provision of medium-density lots and greater provision of smaller, higher density lots around neighbourhood centres, in comparison to conventionally designed developments. The provision of smaller, mixed lots near centres and public transport was found to help to achieve sufficient densities to ensure neighbourhood centres, businesses and services are viable. Positive impacts were observed for both transport and recreational walking among RESIDE participants.[73] The results support the notion that residents in walkable suburban neighbourhoods with higher residential densities may be more physically active.

This evaluation demonstrates that neighbourhoods designed and built according to liveable neighbourhood guidelines can positively impact on the walking and physical activity behaviours of residents.

www.planning.wa.gov.au/650.asp

walkable neighbourhoods blocks tend to be small, with intersections placed at frequent intervals. A grid pattern neighbourhood with large block sizes will not generate as much walking as a grid pattern with small block sizes. In neighbourhoods with many intersections per square kilometre and small average block sizes, the streets are woven into a fine mesh of connecting strands, with more route choices, creating a better walking environment. On the other hand, where blocks are large, for a neighbourhood to be walkable, pedestrian paths need to offer shortcuts through communal or public spaces and the middle of blocks.

In particular, it is intersection density, rather than street connectivity that most influences walking. Even with a grid street design, walkability may still be limited if blocks are too long. Intersection density is also associated with the other Ds as small block size implies land use diversity and in turn higher population densities.

Destination accessibility

Destinations give people places to walk to. Destination accessibility is the main environmental influence on trip length and it measures ease of access to destinations - in other words, how closely a place is located to the other places to which people travel most regularly. The distance to a central business district (CBD), or how many jobs or attractions are within a fifteen minute walk might be ways to measure this variable. An easily accessible and increasingly popular tool that uses destination accessibility for calculating the walkability of a given area is *Walkscore*.[59]

A number of evidence reviews have concluded that accessibility based on distance to destinations is associated with more walking.[45] Brent Toderian, the former Chief City Planner of Vancouver, talks about the 'power of nearness'- effectively people walk to get to places, when those places are nearby.[60] Research suggests the more desirable the destination, the further people are willing to walk (or ride) to access it.[45]

Local business activity can also generate more walking. A study focussed on retrofitting auto-oriented neighbourhoods in Los Angeles found that people living in neighbourhoods with more business establishments per acre (hectare) conducted more of their travel within their neighbourhood and were more likely to travel by walking. However, it also found that the business concentration needed to encourage walking appears to be larger than most neighbourhood residential populations can support, implying that policy must

focus not just on small and dense village centres but on knitting these together in larger transportation networks. This suggests connectivity to surrounding districts is also an important factor.[61]

Distance to public transport

A key principle in planning for increased residential density is ensuring accessibility to public transport.[48] Most public transport trips involve a walking trip at either end. For example, public transport users in metropolitan Melbourne average 28 minutes walking to and from public transport each day, plus six minutes walking for other purposes, while car travellers average only six minutes in total.[62] Having public transport stops nearby may stimulate walking, while living near a bus stop appears to be an inducement to ride public transport.[44]

Other variables interact with this one, as high intersection density and great street connectivity shorten access distances and provide more route options, both for walkers to public transport and for service providers. Furthermore, land use mix makes it possible to efficiently link public transport trips with errands on the way to and from bus stops and train/tram stations.

Campoli states that for people weighing the option of taking the bus or train, *"in the calculus of decision making, the biggest question is, 'how far away is the bus stop?"*.[24] She points out the connection between this variable and density, with many people close together within a tight web of access points, what she calls *"the virtuous cycle of density and transit"*. Feeding the system with riders by concentrating people and jobs next to public transport facilitates service improvements which make public transport more attractive and useful and the city more liveable. The key is locating everything together.

> *"A dense network of routes and stops ensures that transit riders don't have long walks tacked onto the beginning or end of their transit rides. And this is where density comes back in".[24]*

It should be understood however, that the quality, speed and frequency of service is also critical:

> *" a transit-rich location – with good frequency of service and multiple accessible lines – will be more influential even if the nearest stop is 10 minutes away than will a stop across the street that has only hourly service".[63]*

Demand management - cost and availability of parking

The availability and cost of parking has a major impact on travel behaviour.[24] However, its role is often overlooked, partly because it is so normal and routinely seen as a necessity. Too much parking encourages driving that would not otherwise occur without it.

> *Cheap and abundant parking holds down the cost of driving, which in turn encourages greater car use, spurs auto-oriented design, degrades the pedestrian environment and discourages trips by foot.[24]*

Further, *"parking consumes a disproportionate amount of space that doesn't serve active human uses because it lowers densities, forces destinations apart, and renders transit inefficient".[24]* If we design with less space for on and off-street parking, we release space

for housing, employment and recreation, which raises densities. This supports public transport, which in turn makes more frequent service possible and parking less necessary. In sum, replacing surface lots and street level garages and parking with homes or businesses improves the quality of the street; makes public transport more attractive; and encourages trips by bike or on foot. So better parking policies can help initiate a cycle of 'urban pedestrianisation' – fewer off-street car parks and residential parking spaces makes space for housing, employment and recreation, which requires locals to use public transport, which in turn makes services more frequent and parking less necessary.[24]

Placemaking- the street as a place for people

To optimise walking, streets also need to be places for people to gather and linger. Great streets are destinations in their own right. Especially in higher density neighbourhoods, streets become increasingly important as public spaces for social and commercial activity and are a crucial component in supporting walking.

However, conventional streets commonly favour and prioritise the movement of vehicles, with the quantity and quality of space for people on foot often only considered as an afterthought.[64] Instead, to support walking, the role of the street must be re-considered as a place to *be* somewhere, not just *get* somewhere. While streetscape design elements (such as narrowing streets, widening footpaths and adding crossings, street trees and bus shelters) are important for walkability,[40] it is Placemaking that transforms the street into a vibrant community place. Creating attractive, quiet spaces at a

human scale, designed specifically for people to meet and interact on foot, dramatically increases the time people spend in the street, not so much travelling, but sojourning.[65, 66]

Streets that have been designed to better welcome people on foot have been shown to provide the following benefits:

- Reducing traffic speeds and volumes are widely cited as incentives to walking and children playing.[67]
- Building Complete Streets creates space for non-motorised movement.[68]
- Making shared spaces often dramatically increases the use of the space by people on foot. For example the rebuilding of New Road, Brighton, UK as a shared space resulted in a 162% increase in pedestrians and a 600% increase in sedentary activities such as people gathering and socialising.[69]

These changes have a cumulative effect, as each increases the number of people present in the street, which in turn increases its attractiveness to others. Vibrant streets need people on foot to be there – and in turn this creates more vibrancy. In summary, the design and quality of the street is itself a major factor in repelling or attracting people on foot. We must therefore include Placemaking as a key variable, in addition to the six Ds.

Case Study 7:
Densification downtown

Kitsilano, Vancouver, Canada

Kitsilano is an urban district south-west of downtown Vancouver on the shores of English Bay. It was fully built up by the 1940s, mostly with single family homes, but subsequently there was much conversion into smaller units. Kitsilano had around 40 000 residents by 2006; a markedly young population with 45% between 20 and 39 years old.

Construction of midrise apartment buildings and conversion of many single family homes as well as a Neighbourhood Improvement Program sought to reduce dependence on vehicles and diversify housing options in the area. Nearly 90% of all Kitsilano dwellings are apartments, significantly higher than the norm for Vancouver (56%).[74]

There is much to walk to in Kitsilano. Although most streets are solely residential, services are clustered within easy walking distance. The walking is pleasant too: new townhouses have gardens that open to the footpath and present a friendly face to the street. Pathways between buildings provide mid-block connections to a network of green spaces and alleyways between streets have been transformed into spaces that double as driveways and public space. There is much public green space, including greenways, pocket parks and community gardens.

Fewer than half of Kitsilano residents drive to work due to the area's improved walkability, safer bike lanes and a comprehensive bus service. As a result, Kitsilano residents spend only 10% of their income on transport, some 20% less than Vancouver and 30% less than the metro region, indicating the lower levels of car use and higher levels of walking and cycling in the district.

www.vancouvereconomic.com/userfiles/kitsilano-neighbourhood.pdf

Source: Julie Campoli from *Made for Walking*

Source: Julie Campoli from *Made for Walking*

Conclusions

Supporting the integration of walking into everyday life is the most realistic option for increasing population levels of physical activity, while also providing significant co-benefits, including less traffic congestion and air pollution. This report has outlined how the trend towards higher density in many Australian cities creates an opportunity for developing compact, walkable neighbourhoods and increasing the levels of walking among those who live there. There appears to be a growing consumer demand for such neighbourhoods, however perceptions of density remain an issue. This report has found that:

Density *does* matter in the creation of walkable neighbourhoods

People living in higher density neighbourhoods undertake more walking (particularly for transport) than people living in low density neighbourhoods. Density underpins the creation of walkable neighbourhoods by bringing destinations closer together and providing a customer base to ensure that local shops, services and public transport remain viable. Higher density can also facilitate more people living in walkable places. Despite the public discourse around density, higher density does not mean, nor necessarily require high-rise buildings – what is appropriate depends on context. Achieving higher densities through low to medium rise buildings has potential health benefits,[20] and maintains a more human scale to a neighbourhood, thereby enhancing walkability.[12]

The six Ds and Placemaking make the biggest impact on walking when they work together

Density is one of seven key built environment features that work *together* to create walkable neighbourhoods. The six Ds include *Density, Distance to public transport, Destination accessibility, Diversity, Design, and Demand management (parking policy)*. This report has identified Placemaking as an additional and essential component. It is the cumulative effect of these features that creates walking friendly areas - compact neighbourhoods with a mix of residential and other activities, with street networks that directly connect people to places they want to go as well as providing a place for people to gather. Well designed streets are destinations in their own right and provide the opportunity to *be* somewhere, not just *get* somewhere.

When all of these variables are present and working in combination, they have synergistic benefits that are much greater than those of any single element by itself. Research confirms the more D variables that are present in an area, the more walking (and less driving) that takes place.[23]

> ….. *[Density] plays a crucial supporting role by shoring up the other Ds. It feeds diversity by supplying customers and workers to businesses. And it creates a deeper pool of transit riders that can support a comprehensive system with many routes and access points, thus shortening the distance to transit. Better transit accessibility makes density possible. It can also attract a greater diversity of uses, which in turn improves destination accessibility with a critical mass of population, housing and jobs in close proximity.[24]*

The right location is critical to encourage the synergy between variables

Despite the trend towards densification in many urban areas, higher density is not appropriate in all places, nor will it necessarily lead to more walking and other benefits if it is not strategically located. To encourage walking, higher density should be located near high quality public transport, near activity centres supporting a diversity of uses; and accessible to existing jobs and services.

Density done well needs amenity nearby

While the combination of the six Ds makes a place walkable, other attributes including Placemaking, make a place liveable. It is this additional amenity that makes density work and can enhance community acceptance of density. Greater density requires high quality public realm, including a diversity of green and open spaces for active recreation, interaction and solitude. Other valued amenity includes access to frequent public transport, shops, services, schools, cafes and restaurants. Locating density near existing amenity can

capitalise on the benefits. Quality matters - as various commentators agree: 'It's not how dense you make it, but how you make it dense.'[70]

Placemaking turns streets into places for people

Placemaking is an additional and important variable that turns a 'street route' into a 'street place' and thereby encourages the presence of more people on foot. Improving the quality of the street as a destination is essential to maximising the potential of the six Ds to increase the amount of walking. Great streets attract people and people attract people.

Case study 8: Imagining an (almost) car-free suburb

Vauban, Freiburg, Germany

Vauban was an old army barracks on the outskirts of Freiburg, Germany, that was redeveloped between 1998 and 2010. The master planned development created an innovative car-free/parking-free neighbourhood district.

Vauban has a population of 5,000 residents in a total area of 41 hectares. Residential buildings in Vauban are typically four or five stories in height, with a net density of approximately 95 units per hectare.

Vauban's streets are completely car-free, except the main thoroughfare where the tram runs to Freiburg and a few streets on one edge of the community. Car ownership is allowed, however it is not very convenient as you must buy a car space at one of the two large garages at the edge of the development. As a result only 16% of residents own a car and 57% of residents gave up their car when they moved to Vauban.[32]

Over 65% of all resident trips are made by walking or cycling, and 20% by public transport. In 2002, 81% of residents from car-free households stated they found organizing their life without their own car "easy" or "very easy." This can be attributed to the high quality walking and cycling infrastructure, the convenience of bicycle use, the provision of local services, proximity to the city centre, good regional public transport links and the availability of a car-sharing service.

The development is designed to prioritise walking and bicycle access and restrict cars. A boulevard for pedestrians and cyclists runs through the district, with a further network of non-motorised traffic routes on the northern side of the development. Internal roads double as play spaces and cars must travel at walking speed and may not park. A supermarket, neighbourhood grocery store, two cafes, pub/restaurant, fast-food take-away, bakery, banks, offices, doctor's surgery, pharmacy and primary school are interspersed among homes making them easy to access. Most residents have carts on their bicycles for shopping trips or transporting children.

www.itdp.org/documents/092211_ITDP_NED_Vauban.pdf

Source: *www.vauban.de.*

Glossary

Amenity

Aesthetic or other characteristics of development or area that increase its desirability to a community.

Compact development

A land use settlement pattern that features most or all of the following: concentrations of population and/or employment; medium to high densities appropriate to context; a mix of uses; interconnected streets; innovative and flexible approaches to parking; pedestrian-, bicycle-, and public transport -friendly design; and access to public transport.

Complete street

Streets designed and operated to enable safe, attractive and comfortable access for all users, regardless of transport mode.

Connectivity/ permeability

The directness of links and the density of connections in a transport network. A highly permeable network has many short links, numerous intersections, and minimal dead-ends.

Cross sectional studies

Studies that examine the relationship between conditions (e.g., physical activity behaviours) and other variables of interest in a defined population at a single point in time.

Distance to public transport

Measured as an average of the shortest street routes from the residences or workplaces in an area to the nearest railway station or bus stop. Alternatively, it may be measured as public transport route density, distance between public transport stops, or the number of stations per unit area.

Elastic/elasticity

The ratio of the percentage change in one variable associated with the percentage change in another variable (sensitivity).

Intersection density

The number of intersections within a given area (e.g. per square kilometre).

Land use mix

Diversity or variety of land uses (e.g. residential, commercial, industrial).

Mixed-use

Incorporation of residential and retail structures in the same geographic location.

Mixed density

Residential development that includes various housing types co-located, such as single dwellings and multi-units and development of varying size and height.

Placemaking

The art and science of developing public spaces that attract people, build community and create local identity.

Shared space

An urban design and traffic engineering concept that integrates pedestrians, vehicles and other road users through the removal of traditional street elements such as signs, traffic lights, pedestrian barriers, road markings and kerbs.

| Smart Growth	Metropolitan area development characterised by compact, mixed-used districts, efficient use of land and infrastructure, choices in travel mode, and protection of environmental resources and open space.
Sidewalk	Footpath.
Streetscape	The view along a street from the perspective of a driver or pedestrian, particularly views of natural and built elements in the street.
Suburban	A residential district outside the city centre, usually with a lower population density than urban areas.
Transit	Public transport.
Urban	Inner districts, or a main city, usually with a bigger population density than suburban areas.
Urban sprawl	The unforeseen spread of urban development into the urban fringe of a city, resulting in significant dependence on private vehicle transport and poor utilisation of infrastructure and services.
Urban tissue	The pattern of ownership of land and how it is divided into individual parcels within blocks.
Walkability	The extent to which a neighbourhood encourages and supports walking for transport and recreation.
Walkable community	A community where housing, workplaces, shopping areas, schools and recreation facilities are laid out in a manner that makes them relatively accessible by walking.

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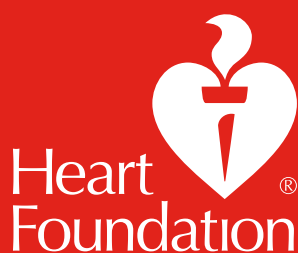
Heart Foundation ®

For heart health information
1300 36 27 87
www.heartfoundation.org.au

Australian Capital Territory

Canberra
Unit 1, Level 1,
17-23 Townshend Street,
Phillip ACT 2606
Tel: (02) 6282 5744

New South Wales

Sydney
Level 3, 80 William Street
Woolloomooloo NSW 2011
Tel: (02) 9219 2444

Illawarra
Kiama Hospital and
Community Health Service
Bonaira Street
Kiama NSW 2533
Tel: (02) 4233 0133

Newcastle and Hunter
32 Brunker Road
Broadmeadow NSW 2292
Tel: (02) 4922 1547

Tamworth and New England
Alliance People Solutions,
Level 1, 307 Peel Street
Tamworth NSW 2340
Tel: (02) 6766 1394

Northern Territory

Darwin
Darwin Central Offices
Level 3, 21 Knuckey Street
Darwin NT 0800
Tel: (08) 8981 1966

Queensland

Brisbane
557 Gregory Terrace
Fortitude Valley QLD 4006
Tel: (07) 3872 2500

South Australia

Adelaide
155-159 Hutt Street
Adelaide SA 5000
Tel: (08) 8224 2888

Tasmania

Hobart
Level 1, 89 Brisbane Street,
Hobart, TAS 7000
Tel: (03) 6224 2722

Victoria

Melbourne
Level 12, 500 Collins Street
Melbourne VIC 3000
Tel: (03) 9329 8511

Western Australia

Perth
334 Rokeby Road
Subiaco WA 6008
Tel: (08) 9388 3343