

Crowding, housing and health: An exploratory study of Australian cities

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Abstract:

Australian capital cities are among the most expensive in the world, and the persistent shortage of affordable housing is a significant driver of housing overcrowding, particularly in the private rental sector. Health and wellbeing issues arise from closer contact between household members including increased spread of communicable infections, sleep disruption, lack of privacy and an inability to care adequately for sick household members.

The aim of this paper is to examine the extent and the spatial distribution of overcrowding in the five largest cities in Australia – Sydney, Melbourne, Brisbane, Perth and Adelaide, and consider its distribution in relation to socioeconomic disadvantage. The analysis begins by critically reviewing available standards for quantifying overcrowding – e.g. World Health Organisation, Eurostat, Canadian National Occupancy Standard for Housing Appropriateness and Proxy Occupancy Standards. Drawing from the above frameworks, the investigation extends to compute indicators of crowding using 2011 Australian Bureau of Statistics Census data. The chosen unit of analysis (i.e. SA2) enables local level geographies of overcrowding to be mapped within and across cities. We then compare incidence of overcrowding and the distribution of socio-economic disadvantage measured by Socio-Economic Index for Areas (SEIFA) - the Index of Relative Socio-Economic Disadvantage (IRSD). Our findings indicate Sydney and Melbourne have the highest incidence of crowding in housing amongst the largest five cities, accounting to 26% and 17% of residents living in such dwellings respectively. We also find a strong overlap of geographies of overcrowding and socioeconomic disadvantage and, contrary to the conventional wisdom, overcrowding seems to be most evident in middle-city areas in all the cities investigated except for Adelaide. The geographical analysis thus generates policy-relevant spatial knowledge about the locations and extent of crowding in specific Australian cities.

Key words: overcrowding; housing; health; housing affordability; spatial analysis

Introduction

Overcrowding is linked to poor physical and mental health and while Australia is a relatively well-off country, a significant number of our disadvantaged population live in crowded and poor condition dwellings. This has not gone unnoticed by media and social commentators. Recent media reporting on overcrowded dwellings has sparked a national outcry over higher safety risks and negative impacts of overcrowding on residents. The newspaper articles reported on situations where “58 beds crammed into 19 dirty, makeshift rooms”, “10 people shoehorned into one bedroom, tenants sleeping in bathrooms, and in one case, a pantry” and “a hallway converted into a makeshift shower cubicle” (Han, 2015). Similar reports have emerged consistently over the past several years revealing situations where students lived in shipping containers, cubicles and a toilet (Olding, 2014) and up to 20 students were hot bunking (i.e. sharing same beds at different times of the day and night) (Han and O'Brien, 2012). Though these are extreme cases portraying the grim nature of overcrowding, it has been recognised as a widespread problem in many Australian cities (COAG Reform Council, 2012).

Overcrowding occurs when a dwelling is not of an adequate size to meet the needs of the household taking into account the number and composition of occupants living in it. Adequate housing was recognised in the 1948 Universal Declaration of Human Rights as part of the right to an adequate standard of living and, overcrowding has thus been considered an important indicator of living conditions in many countries. Different definitions (or *standards*) of overcrowding range from simple metrics, such as persons per bedroom and living area per person, to more sophisticated indicators taking into account both family size and composition (e.g. age, gender and marital status), such as the widely-used Canadian National Occupancy Standard for Housing Appropriateness (CNOS) and Proxy Occupancy Standards. Such standards have also been developed in other countries including New Zealand, Britain and the US (Gray, 2001). Despite conceptualised in a number of different ways, there seems to be a considerable overlap between different standards of overcrowding (see Section 2 below). An associated phenomenon that is evident in Australia but more difficult to capture is

'functional overcrowding' – i.e. people sharing small spaces/beds due to restrictions placed by heating/cooling and security concerns (Heyman et al., 2011).

Australian capital cities are among the most expensive in the world, and the rising housing costs and persistent shortage of affordable housing is considered to be a significant driver of housing overcrowding, particularly in the private rental sector (Easthope et al., 2017). Other possible explanations for overcrowding include profit-driven, situational and/or socio-economic reasons.

The negative consequences of overcrowding can be broadly classified into two main groups: resident-related (negative health and wellbeing outcomes) and property-related (fire safety risks, property damage). Amongst resident-related consequences are an increased risk of infection-based illness, irregular sleep, poor school performance, increased parental stress resulting in punitive parenting and parent-child conflict, greater vulnerability to abuse and poor mental health (Commissioner for Children and Young People, 2014). Though outside the remit of this paper, property-related concerns include fire safety risks such as insurance payout disputes and property damage that can range from ripping down walls and adding makeshift walls (to accommodate more people) to worn out carpets and appliances due to excessive use. Living in *severely overcrowded dwellings*¹ has been recognised as 'the most common form of homelessness' in official statistics in Australia (Department of Prime Minister and Cabinet, 2014, p. 11), because it is a less secure and inferior form of housing. In other words, such residents do not have control of, or access to space for social relations and adequate personal hygiene – e.g. limited access to personal living space and privacy, and lacking exclusive access to kitchen facilities and a bathroom.

In Australia, recent research on overcrowding has primarily focused on Indigenous communities (Memmott et al., 2012, Australian Institute of Health and Welfare, 2014). This is due to the higher incidence of overcrowding amongst these communities – for instance, Indigenous Australians are more than five times as likely to live in overcrowded accommodation as non-Indigenous Australians (Memmott et al., 2012). Indigenous homelessness rates are 14 times higher than the non-Indigenous population, and Indigenous Australians living in severely crowded dwellings make up 75% of that Indigenous homeless population. The situation is extreme in very remote Australia – Indigenous people living in severely overcrowded accommodation in very remote areas of the Northern Territory represent 11.2 per cent of all homeless Australians (COAG Reform Council, 2012).

Whilst it is important to look at the most affected Indigenous groups, the national level of overcrowding also demonstrates exacerbating signs. In Australia, the number of people living in severely crowded dwellings increased by 9859 (31.3%) between 2006 and 2011 (COAG Reform Council, 2012). Apart from remote Indigenous communities, most of this increase came from Australia's major cities. Given close to two thirds of Australia's population currently live in its largest five cities, how our cities rate in terms of overcrowding needs to be investigated, due to above-mentioned resident-related and property-related negative consequences of overcrowding.

The disproportionate presence of new/recent immigrant families may at least partly explain overcrowding in our cities. Immigrant families tend to be relatively large and they also have different cultural norms including intergenerational occupancy of housing (Dhanji, 2010, Robinson, 2011). For instance, a study of migrant suburbs in Sydney and Melbourne acknowledged the difficulties faced by large families in finding affordable and appropriate accommodation – "it is not uncommon to have families with two adults and five children sharing a two-bedroom property" (Easthope et al., 2017). A lack of housing diversity appropriate for extended families, and overcrowding due to migrant families providing informal accommodation to other similar families have aggravated the situation (Zappia and Cheshire, 2014).

The aim of this paper is to examine the extent and spatial concentrations of overcrowding in the five largest cities in Australia – Sydney, Melbourne, Brisbane, Perth and Adelaide. This spatial knowledge is vital in understanding and addressing overcrowding in Australia's cities. Health, wellbeing and local housing quality are responsibilities of local and state governments, and place-based policies can play a major role in these areas. A spatial understanding of overcrowding is also useful for planning health resource allocation.

¹ People who lack control of space as a result of living in a dwelling which needs four or more extra bedrooms to meet the Canadian National Occupancy Standard.

The paper addresses two main research questions:

1. What are the key national and international standards of housing overcrowding?
2. What is the extent of overcrowding in Australian cities and where are the spatial concentrations?

In tackling the first research question, we review published official documents and international literature to identify the key features of different overcrowding standards, including their cultural assumptions. In addressing the second research question, we analyse the locations of small-areas with severe overcrowding, measured relative to respective CBDs. This should reveal whether overcrowding occurs mainly at inner-city, amenity-rich and expensive locations. This inquiry also examines distribution of overcrowding in relation to socioeconomic disadvantage in areas.

Key national and international standards of overcrowding

The analysis begins by critically reviewing available key standards for quantifying overcrowding, including their cultural context – e.g. World Health Organisation, Eurostat, Canadian National Occupancy Standard for Housing Appropriateness (CNOS) and Proxy Occupancy Standards. Whilst we recognise that all measures have definitional problems, specific strengths and weaknesses of given indicators can guide us on appropriate indicators, provided the context.

Widely-used statistical definitions of overcrowding include simple metrics based on room standards, such as persons per room (e.g. The American Crowding Index (ACI)) and living area per person, and other sophisticated measures using room standards and compositional aspects of overcrowding – e.g. children five years of age or over of different sexes should not share a bedroom. The former definitions are easy to use and have some authority from being used in official statistics (e.g. United States Census Bureau, UK Office of National Statistics). However, using simple definitions that do not take account of household composition can limit the effectiveness or usefulness of research (Gray, 2001). The following comprehensive metrics take into account household size and compositional aspects more broadly:

The World Health Organisation (WHO) accepted standards for floor space (World Health Organization, 1987) are as follows:

Table 1 – Floor space requirements, WHO standards

Area (in sq. metres)	No. of persons
11 or more	2 persons
9 to 10	1.5 persons
7 to 9	1 person
5 to 7	0.5 persons
Under 5	Nil

Source: World Health Organization, 1987

A baby under 12 months is not counted, and children between 1 and 10 years are counted as half a unit. Overcrowding is considered to exist if two persons over 9 years of age, not husband and wife, of opposite sexes are obliged to sleep in the same room.

According to UK's Housing Act 1985 - Part X, 'the room standard is contravened when the number of persons sleeping in a dwelling and the number of rooms available as sleeping accommodation is such that two persons of opposite sexes who are not living together as husband and wife must sleep in the same room' (Clements, 1996). The standard states, each pair of adolescents aged 10 to 20 of the same sex can share a bedroom. Any person aged 10 to 20 left over after this pairing is paired with a child under 10 of the same sex. If this is not possible, that person has a separate bedroom. For calculation purposes, children under the age of ten shall be left out of account, and a room is available as sleeping accommodation if it is of a type normally used in the locality either as a bedroom or as a living room. This definition, particularly the description of a 'room for sleeping accommodation', is somewhat ambiguous.

Based on the standards adopted by Eurostat (2014), a person is considered as living in an overcrowded household if the household does not have at its disposal a minimum number of rooms equal to:

- one room for the household; one room per couple in the household;
- one room for each single person aged 18 or more;

- one room per pair of single people of the same gender between 12 and 17 years of age;
- one room for each single person between 12 and 17 years of age and not included in the previous category; and
- one room per pair of children under 12 years of age.

This standard is more detailed as 'severe housing deprivation rate' is defined as the percentage of population living in dwellings which are considered as overcrowded, while also exhibiting at least one of the housing deprivation measures – a leaking roof, no bath/shower and no indoor toilet, or a dwelling considered too dark. However, the criterion that permits two children up to 12 years of age in a single room is open to criticism (see below).

Proxy Occupancy Standard is a 'measure of the appropriateness of housing' related to the household size and household composition in Australia (Australian Institute of Health and Welfare, 2013). This has been replaced by CNOS (see below) in official statistics since 2011. Proxy Occupancy Standard determines the bedroom requirements of a household, and households that require two or more additional bedrooms to meet the standard are considered to be overcrowded (see Table 2):

Table 2 – Bedroom requirements, Proxy Occupancy Standard

Household component	Dwelling size required
Single adult ² only	1 bedroom
Single adult (group)	1 bedroom (per adult)
Couple with no children	2 bedrooms
Sole parent or couple with 1 child	2 bedrooms
Sole parent or couple with 2 or 3 children	3 bedrooms
Sole parent or couple with 4 children	4 bedrooms
Sole parent or couple with more than four children	Number of bedrooms as same as children

Source: Australian Institute of Health and Welfare, 2013

Canadian National Occupancy Standard for Housing Appropriateness (CNOS) provides a broadly accepted definition of overcrowding. The following criteria are used to assess bedroom requirements, and households requiring at least one additional bedroom are considered to be overcrowded:

- there should be no more than two persons per bedroom
- children less than five years of age, of different sexes, may reasonably share a room
- children five years of age or over, of different sexes, should not share a bedroom
- children less than 18 years of age and of the same sex may reasonably share a bedroom
- household members aged 18 years or over should have a separate bedroom, as should parents and couples.

As argued by Goodyear et al. (2011), the most appropriate overcrowding standard should be determined by considering the features of a particular context such as cultural attitudes to space utilisation within a household. Though similar to the WHO, UK and Eurostat standards (see above) in terms of sensitivity to both household size and composition, CNOS has been the preferred standard of Australian Bureau of Statistics (ABS), Statistics New Zealand and the Australian Institute of Health and Welfare (AIHW). CNOS has been adopted by Australia on the following grounds:

First, as highlighted by Gray (2001), the way 'age of persons' is considered within CNOS seems to favour the Australian and New Zealand context:

"The (CNOS) standard differs from that used in Britain in respect to the age limits for sharing bedrooms. In the Canadian standard, children under five of different sexes are permitted to share a room, compared with children under ten in Britain. The age at which young adults should have their own room is also lower - 18 years compared with 21 years in Britain (p. 11)."

The age and sex separation thresholds involve assumptions about the age of puberty and adulthood. In Australia, it is usually acceptable for children of the same sex to share a bedroom before puberty. Considering the recent evidence that the age of puberty is falling for children, and that they had started to show signs of puberty by the age of eight (Mundy et al., 2015), it can be argued that sexes should be separated before the age of 10.

Secondly, CNOS "was considered by the National Housing Strategy and the Australian Institute of Health and Welfare to conform reasonably to social norms in Australia" (Trewin, 1999). However, this

² Adults include children aged 16 or more.

statement should be reflected upon cautiously. This is because all crowding indexes are based on assumptions of the dominant culture, and the “social norms” represent the customs of that predominant group. The prevalence of dominant values is apparent in the CNOS, which “evolved to reflect today’s societal housing expectations” (Canadian Mortgage and Housing Corporation, 1992), and these housing expectations incorporated were predominantly those of the non-native rather than the native population (i.e. American Indian population).

Linking this to the disproportionately high number of aboriginal persons living in crowded conditions in Australia (see above), the “social norms” associated with the overcrowding standard maybe those of the majority and reflect their values about privacy, space, safety and health. In fact, Steering Committee for the Review of Government Service Provision (2012) agrees that CNOS will reflect the culture and preferences of some but not all Indigenous people, as cultural and social factors influence the way housing is used by different communities. Particularly, indexes based on rooms (or bedrooms) would not be appropriate if a large single space is used for sleeping and other household activities. For instance, traditional Japanese and Pacific houses use living spaces rather than separate bedrooms for sleeping (Goodyear et al., 2011). In this context, a bedroom with more than two people would not necessarily be incompatible with the cultural attitudes of Pacific and Māori peoples towards space (ibid: p.19). This suggests cultural attitudes to space utilisation within a household is crucial in understanding overcrowding, and the indexes based on number of bedrooms might be culturally inappropriate for some ethnic groups.

Note, however, that when it comes to considering some of the pathways between crowding and health such as transmission of infections such as rheumatic fever (related to bacterial infection), it is living in close quarters per se that is relevant irrespective of cultural norms of housing or nuances of measurement of crowding. Other pathways, such as that between overcrowding and mental health are more likely to be determined by cultural expectations.

The extent and spatial concentrations of overcrowding in Australian cities

Drawing from the above review, we extend our analysis to compute indicators of crowding using 2011 ABS Census data. In view of the official recognition of Canadian National Occupancy Standard (CNOS) and its appreciation as the most appropriate metric available for measuring overcrowding in Australia (Trewin, 1999), our detailed analysis utilises that metric to explore the spatial incidence of overcrowding in the five largest cities in Australia – Sydney, Melbourne, Brisbane, Perth and Adelaide. The chosen unit of analysis (i.e. Statistical Area Level 2, or SA2) enables local level geographies of overcrowding to be mapped within and across cities. SA2 is designed as a ‘general-purpose medium-sized area ... to represent a community that interacts together socially and economically’ (ABS, 2016), and it is closely synonymous to the ‘Australian suburb’ with an inherent familiarity and meaning to residents and policymakers. Using the SA2 level fine-grained information, the geographical analysis generates policy-relevant spatial knowledge about incidence of crowding in Australian cities.

ABS defines ‘persons living in severely crowded dwellings’ as those who were counted in a private dwelling that they were usual residents of, and based on CNOS, the dwelling required *four or more extra bedrooms* to accommodate them. This calculation thus takes into account the number of bedrooms in a dwelling and household demographics – i.e. marital status, age and sex of residents living in it. Those who are identified as living in crowded dwellings according to CNOS, but require less extra bedrooms to comfortably accommodate them, are categorised as ‘persons living in other crowded dwellings’.

Historically, ABS has produced estimates of homelessness using information from the censuses 2001, 2006 and 2011. As it is recognised in the Australian context that ‘severe overcrowding’ is a main form of homelessness, the operational groups (i.e. sub-categories) of homelessness include “persons living in severely crowded dwellings”. ABS also publishes “persons living in other crowded dwellings” as an auxiliary column within this table. Albeit the usefulness of this data in understanding overcrowding in Australian cities, a major limitation is that it is only available at relatively large geographies (i.e. SA3 level in 2011). In order to investigate the small-area differences of overcrowding, we use a dataset obtained via a customised request to the ABS at the fine-grained SA2 level.

Our city-level aggregate analysis shows 44% of persons living in ‘severely crowded dwellings’ in Australia lived in the largest five cities in 2011. Strikingly, a two third living in ‘other crowded dwellings’ also resided in these cities. In total, 57% of persons living in crowded dwellings in Australia were from these cities. Given that the total population living in these five cities accounts to a two third of the

country's population, persons living in severely crowded dwellings are underrepresented although those living in other crowded dwellings are overrepresented. The former doesn't indicate that we should focus less on these cities as the numbers involved are large, accounting to 18,122 persons living in severely crowded dwellings and almost 40,000 persons living in other crowded dwellings.

Fig. 1 – Persons living in crowded dwellings in major cities, Australia, 2011



Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

Fig. 1 shows the city-level composition of overcrowding in the five largest cities in Australia. In Sydney, persons living in severely crowded dwellings are representative of the usual resident population. In other words, Sydney hosts 21% of usual residents in Australia and it also has 20% of persons living in severely crowded dwellings. In the other four cities, persons living in severely crowded dwellings are underrepresented relative to usual resident populations. In contrast, persons living in other crowded dwellings are considerably overrepresented in Sydney and Melbourne. Notably, 30% of persons living in other crowded dwellings in Australia lived in Sydney (again, compared to 21% usual residents). Persons living in other crowded dwellings are yet again underrepresented in Brisbane, Adelaide and Perth. Sydney also hosts a high 26% of the total overcrowded population, relative to 21% resident population. The other four cities report lower proportions of total overcrowded population in comparison to their respective usual resident populations. This highlights that, of our five largest cities, overcrowding is more problematic for Sydney closely followed by Melbourne suggesting a high correlation with cost of housing.

Where in the city are dwellings overcrowded?

To understand the intensity and spatial incidence of overcrowding in the five cities, a mapping exercise was undertaken (see Fig. 2A-2E). These maps demonstrate the spatial extent of 'severe overcrowding' – a set of variant maps generated based on 'other crowded' dwellings showed similar spatial patterns in all five cities but are not included due to space reasons³).

Notable in the maps is that SA2s with highest levels of severe overcrowding (i.e. '101 – 250 persons' and 'more than 250 persons') are absent in Brisbane, Adelaide and Perth, perhaps partly testament to affordability in these three cities compared to Sydney and Melbourne. In turn, Sydney and Melbourne include SA2s with most concentrated severe overcrowding amongst the cities examined.

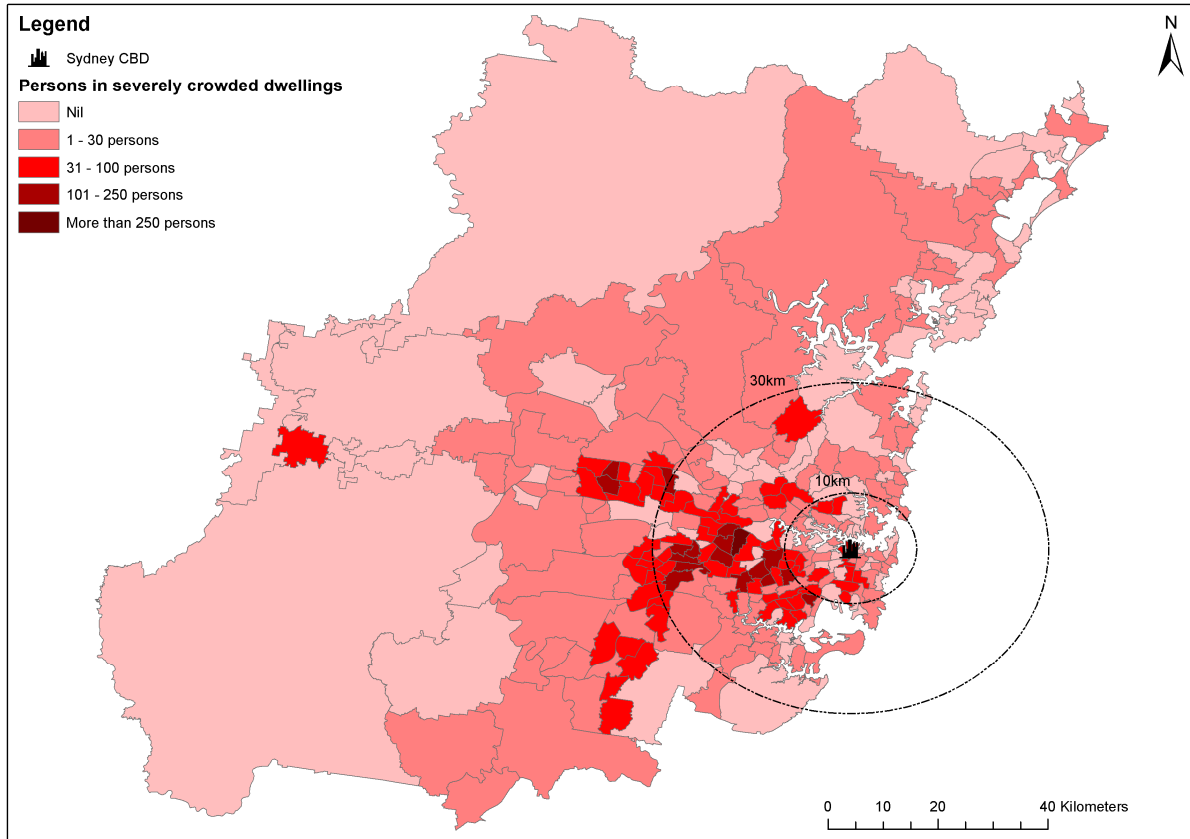
The maps also reveal important information about the locations of overcrowded dwellings in the cities. They divide each city into three regions based on distance from the CBDs – inner (<10km), middle

³ These maps are available on request

SOAC 2017

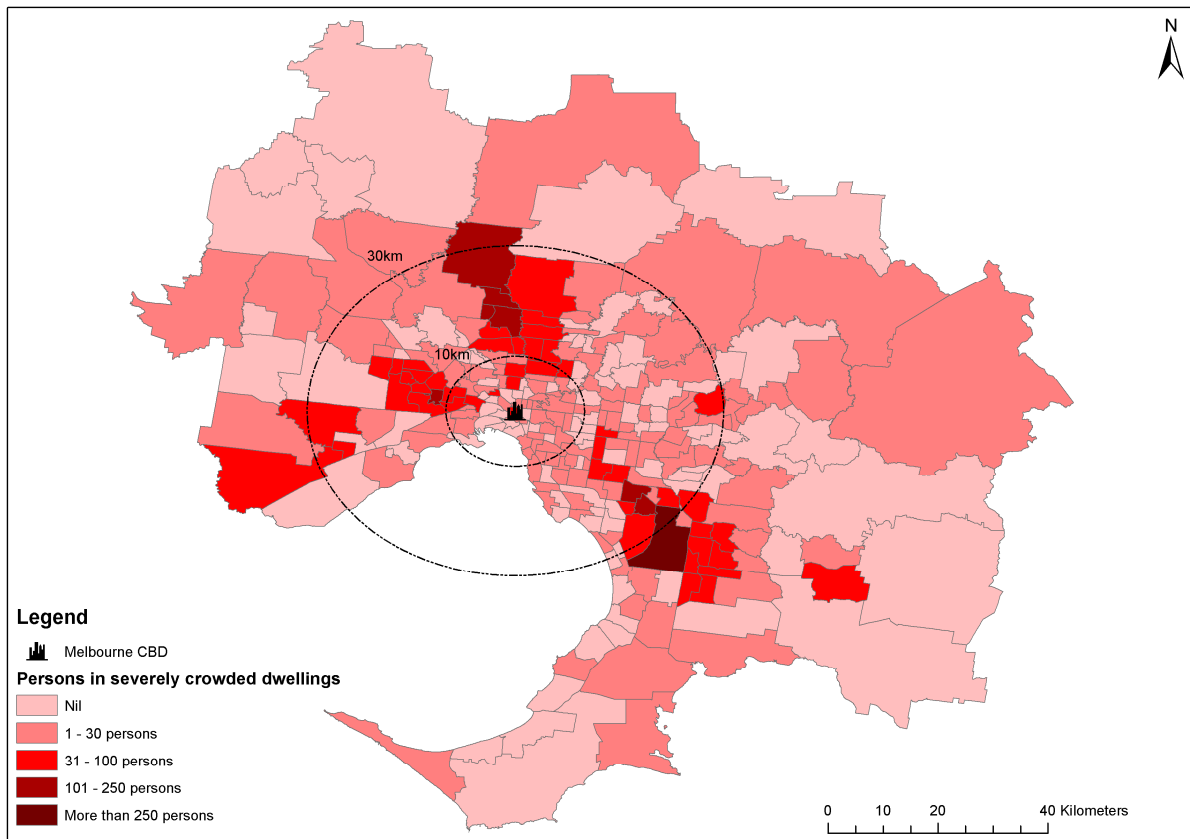
(10-30km) and outer (>30km). Overcrowding is clearly concentrated in the middle-city locations in Sydney, Melbourne, Brisbane and Perth. In Adelaide, the concentrations were spread across inner and middle areas in the city.

Fig. 2A – Persons living in 'severely crowded dwellings' by SA2 in Greater Sydney, 2011



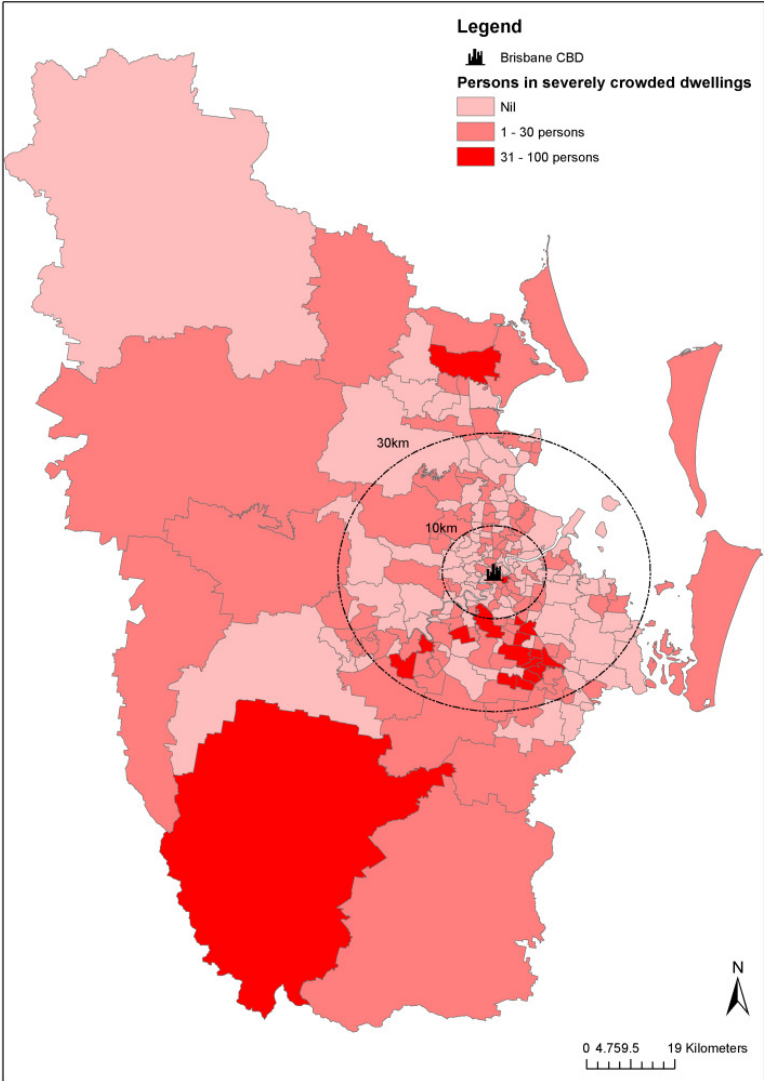
Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

Fig. 2B – Persons living in 'severely crowded dwellings' by SA2 in Greater Melbourne, 2011



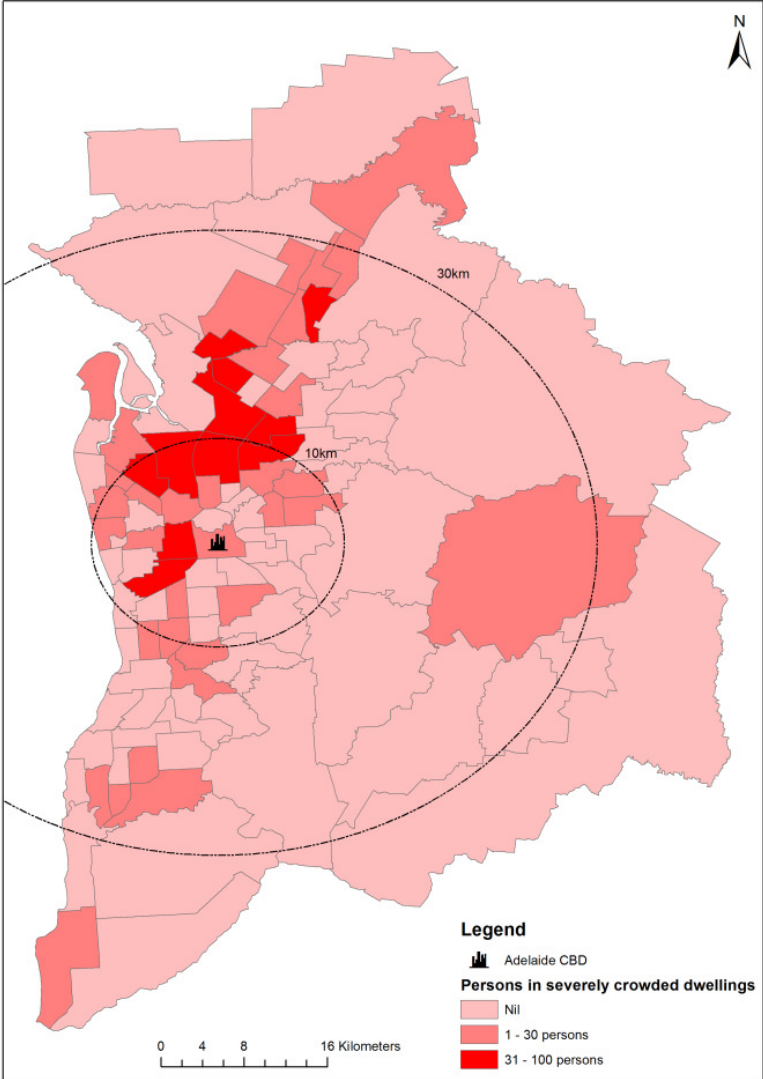
Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

Fig. 2C – Persons living in ‘severely crowded dwellings’ by SA2 in Greater Brisbane, 2011



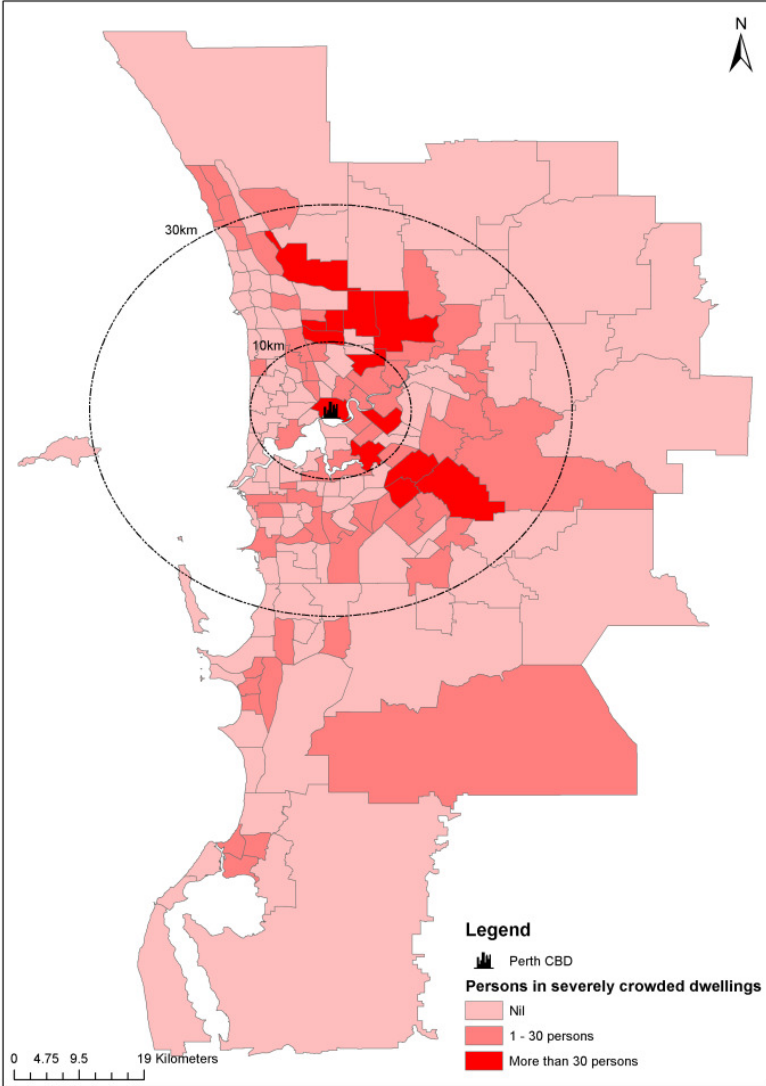
Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

Fig. 2D – Persons living in ‘severely crowded dwellings’ by SA2 in Greater Adelaide, 2011



Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

Fig. 2E – Persons living in ‘severely crowded dwellings’ by SA2 in Greater Perth, 2011



Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

These observations are substantiated in the tables below by classifying the numbers of affected persons and SA2s into inner, middle and outer areas in each city. As presented in Table 3, 56% to 72% of SA2s in the highest quintile of severe overcrowding were located within middle suburbs in Sydney, Melbourne, Brisbane and Perth. Only in Adelaide there was a majority concentrated in the inner city (55%). Similar patterns are present in terms of proportion of persons living in severely crowded dwellings in inner, middle and outer areas. In Sydney, Melbourne, Brisbane and Perth, 57% to 71% of persons were living in severely crowded dwellings in middle-city areas. In Adelaide, a slight majority (51%) was located in the inner city.

Table 3 – Persons living in ‘severely crowded dwellings’, 2011

	% of SA2s in the highest quintile			% of persons living in severely crowded dwellings		
	Inner	Middle	Outer	Inner	Middle	Outer
Sydney	18	58	24	15	57	28
Melbourne	15	64	22	15	63	22
Brisbane	17	72	11	15	71	14
Adelaide	55	40	5	51	46	3
Perth	32	56	12	30	59	11

Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

Table 4 presents the same statistics for ‘other crowded dwellings’. Adelaide again stands out as an exception. There is a concentration of highest quintile SA2s in the middle suburbs of all cities except Adelaide, where concentrations were distributed evenly across inner and middle areas (50% in each area). Similar to ‘severe crowding’, the proportions of persons living in ‘other crowded dwellings’ in middle-city areas dominate in all the cities analysed (ranging from 58-62%) except Adelaide. In Adelaide, a majority of persons living in other crowded dwellings (58%) were concentrated in the inner city.

Table 4 – Persons living in ‘other crowded dwellings’, 2011

	% of SA2s in the highest quintile			% of persons living in other crowded dwellings		
	Inner	Middle	Outer	Inner	Middle	Outer
Sydney	20	54	27	17	58	25
Melbourne	14	68	18	18	61	21
Brisbane	13	68	19	22	62	16
Adelaide	50	50	0	58	40	2
Perth	37	57	6	30	58	12

Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report.

If overcrowding occurs in inner city locations, then it is consistent with the following explanations: new and recent immigrants are less likely to drive a car, and desire to live near the CBD to be closer to employment, and sharing a room in an overcrowded apartment may be the most viable option. Time efficiency is also important for new and recent immigrants and students, particularly for those undertaking two or more jobs (as best-paying job prospects are in the CBD). These groups are time-poor to commute from affordable, outer-ring suburbs. Additionally, there is also a shortage of three to four bedroom properties that can affordably be shared in the CBD areas, and this means smaller apartments suffer overcrowding as a way to keep costs down for these renters.

Alternatively, the most plausible reason for the concentrations of severe overcrowding in the middle SA2s is the extreme housing unaffordability in the inner-city areas. This may particularly affect low-income and large families. Immigrant families are potentially large and also have different cultural norms including intergenerational occupancy of housing (see p. 2 above), and there is a mismatch between what’s required and what’s available in the inner city housing stock. Additionally, socio-economic disadvantage is primarily a middle-city occurrence in our largest cities (Pawson and Herath, 2015), and due to lower accumulated wealth, immigrant families are likely to reside in these

inexpensive middle-city suburbs. Other explanations include situational reasons – an example for this is when a family seeks help from a friend or relative in an emergency. Recent research has confirmed community life in disadvantaged places can have important positive qualities such as stronger social networks (Pawson and Herath, 2017). In view of our findings, these triggers of overcrowding are likely to be at play in the cities examined.

Are overcrowded areas socio-economically disadvantaged?

To further shed light on whether affordability and social connections/networks are associated with concentrations of overcrowding, the spatial patterns of overcrowding and city-level incidence of socio-economic disadvantage were compared. Interpreted differently, this analysis should reveal whether concentrations of overcrowding have occurred in elite, advantaged and expensive areas or most disadvantaged areas in the five cities. In identifying most disadvantaged SA2s, we relied on ABS Socio-Economic Index for Areas (SEIFA), more specifically the Index of Relative Socio-Economic Disadvantage (IRSD)⁴. Given our interest in exploring city-level patterns, the lowest quintiles of SEIFA values (thus, most disadvantaged) were computed using the relevant state-wide rankings.

Table 5 – Highest levels of ‘severe crowding’ and the disadvantage status of SA2s, 2011

	Total SA2s	'Severe crowding' - no of highest quintile SA2s	'High disadvantage' - no of lowest quintile SA2s	%
Sydney	279	55	26	47.3
Melbourne	281	55	32	58.2
Brisbane	236	46	17	37.0
Adelaide	109	20	8	40.0
Perth	173	34	11	32.4

Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report & SEIFA data.

Table 6 – Highest levels of ‘other crowding’ and the disadvantage status of SA2s, 2011

	Total SA2s	'Other crowding' - no of highest quintile SA2s	'High disadvantage' - no of lowest quintile SA2s	%
Sydney	279	56	32	57.1
Melbourne	281	57	35	61.4
Brisbane	236	47	20	42.6
Adelaide	109	22	10	45.5
Perth	173	35	11	31.4

Source: Based on ABS 2017, 2011 Census of Population and Housing, custom report & SEIFA data.

Tables 5 and 6 present the numbers of SA2s with highest levels of ‘severe’ and ‘other’ crowding in the five cities. Note that the value in the third column in each table is approximately equal to 20% of the total SA2s in each city (i.e. highest quintile of crowding incidence). The fourth column presents the number of most disadvantaged (i.e. lowest quintile of SEIFA index values) SA2s within most crowded SA2s (i.e. column 3). If we assume most disadvantaged SA2s are evenly distributed within the most crowded SA2s, the proportions should approximately be equal to 20%. However, in each city, and in relation to both severe (Table 5) and other crowding (Table 6), the proportions of most disadvantaged SA2s are much larger. This disproportionate incidence of crowding in most disadvantaged SA2s is especially evident in Melbourne and Sydney. An alarming 58% of SA2s with highest levels of severe crowding in Melbourne and 47% in Sydney were amongst the most disadvantaged SA2s in the respective states. Similarly, 61% of SA2s with highest levels of ‘other crowding’ in Melbourne and 57% in Sydney were also labelled as most disadvantaged.

⁴ A limitation of using SEIFA for classifying ‘socio-economic disadvantage’ is that it is essentially compositional, and as such is vulnerable to the ecological fallacy (Pawson and Herath, 2015, Darcy and Gwyther, 2012). In other words, socio-economic disadvantage classified at the SA2 level doesn’t mean all the individuals in such areas are disadvantaged. Despite this criticism, SEIFA is still considered to be the most meaningful metric of disadvantage currently available in Australia.

A city-wide analysis can provide important information about the crowding patterns in a city or a state. In Australia, states play a significant role in housing provision, and this knowledge can inform state policies on reducing crowding in housing. For instance, the Public Health and Wellbeing Act 2008 in Victoria covers prescribed accommodation and registered premises including rental and related accommodation, and overcrowding is a main consideration addressed in this legislation. Similarly, NSW Government via NSW Fair Trading passed strata reforms addressing overcrowding in 2015 that allowed owners corporations to make by-laws limiting the number of people who can reside in a lot. An assessment of spatial incidence of crowding is key to formulating effective policies to curb crowding on the ground.

Furthermore, a micro-level analysis is beneficial in identifying 'hotspots' of overcrowding, and in initiating local action. For instance, City of Sydney Council has taken a more active approach recently, creating a taskforce with powers to search properties. Formed in March 2015, City of Sydney Investigation Squad is charged with shutting down the short-term rental black market. These measures are needed as local governments are concerned about the impact of crowding on residents and neighbours, and other related issues such as fire safety and illegal profiteering.

Conclusion

Housing overcrowding in urban areas is poorly understood and under-acknowledged in policy and planning in Australia. This means a number of families including children live in crowded conditions, and there exists opportunities for profiteering by landlords. For instance, some dwellings in NSW have partitions stretching from the floors to just below the ceilings to take advantage of a legal loophole that classifies such walls as furniture rather than illegal modifications (Devine and Conway, 2015). In addition, overcrowding offenders are often aided by tenant laws that require prior notification for all inspections, giving them enough time to cover their trails.

A more specific reason for investigating overcrowding in Australia is the understanding that health and wellbeing issues arise from closer contact between household members (children sharing a bed or bedroom, increased physical contact) including increased chance of spreading infections, lack of sleep, lack of privacy, poor hygiene practices and an inability to care adequately for sick household members. For instance, studies looking at the incidence of common infectious diseases such as colds, asthma and influenza have found an association between prevalence and crowding, and a New Zealand study identified crowding as a major risk factor for meningococcal disease (Gray, 2001).

The critical discussion of overcrowding standards raises the question as to whether the disproportionate incidence of overcrowding amongst Indigenous communities in Australia has at least been partly influenced by cultural insensitivity of CNOS criteria to Indigenous community values. Scholars have also questioned the current overcrowding metrics on the ground of ignoring the non-bedroom-related uses of housing (Memmott and Nash, 2016) including the size and utility of other parts of a house, the number of toilets, bathrooms and living spaces, availability of a quiet space or room to study. The consideration of culturally-specific differing use of space amongst ethnic groups within overcrowding indices is a step forward in this direction. As advocated by Gifford (2007) and (Memmott et al., 2011), it may be possible to operationalise such a resident-centred model that includes the cultural context within which housing is used – e.g. by incorporating the subjective feeling that too many others are around. However, the usefulness of such measures should be considered cautiously as compliance on cultural values about using space may lead to increased overcrowding, and physiological stress and disease risk as a result of crowding occur for different ethnic groups regardless of whether they perceive themselves as crowded.

Since this study is of exploratory nature, we do not offer any definitive reasons as to why overcrowding occurs in our cities. However, our findings suggest that:

- the cities affected most by concentrated overcrowding are Sydney and Melbourne;
- the spatial patterns clearly demonstrate that highest levels of overcrowding are mainly evident in the middle-city areas in all the cities except Adelaide; and
- there is a strong overlap of the geographies of overcrowding and socioeconomic disadvantage.

The first two findings indicate that much of the overcrowding maybe due to unaffordability in inner areas and stronger social networks/connections in the middle-city areas, as opposed to people moving to inner-cities to benefit from better job prospects and amenities. The third finding is particularly problematic given socioeconomic disadvantage in itself has negative health consequences (Adler and Stewart, 2010, Braveman and Gottlieb, 2014), and a combination of crowding and disadvantage can

compound health risks in certain areas. There is a clear need for research to examine the health consequences of overcrowding in our cities, likely to continue while the costs of housing in our cities are high compared to other countries.

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