The built environment and early childhood development: qualitative evidence from disadvantaged Australian communities

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Abstract

This paper explores neighborhood built environment features related to 'better than expected' and 'as expected' early childhood development outcomes (ECD) in fourteen Australian disadvantaged communities. This paper draws from mixed methods data collected in the Kids in Communities Study - an Australian investigation of community effects on ECD - in communities across five states and territories. In total, 93 interviews and 30 focus groups were conducted with service providers and parents, and geographic information systems used to create built environment measures for each local community. Housing factors (e.g. better affordability, tenure, less high-density public housing) were consistently related to disadvantaged local communities with 'better than expected' ECD outcomes. Physical access to services and public transport, living in a walkable area, having high quality public open space and a mix of local destinations was perceived to be consistently important by community members in disadvantaged communities regardless of ECD outcomes. Findings may help policy makers to consider neighborhood features that contribute to better ECD outcomes.

Keywords: neighborhood; community; built environment; early childhood development; mixed methods

Introduction

Early childhood (0-8 years) is one of the most critical development periods; brain development in the early years is strongly shaped by a child's social and physical experiences.(Moore, Arefadib et al. 2017) As demonstrated by socio-ecological frameworks of early childhood development (ECD), children are influenced by multiple layers of environment - the proximal family environment (e.g. parenting styles), through to the more distal neighborhood and societal environments (e.g. community family resources).(Bronfenbrenner 1979, Sampson, Morenoff et al. 2002, Komro, Flay et al. 2011)

The neighborhood setting, comprising its design and built environment, includes features such as housing, street design, traffic, parks, child care facilities and other infrastructure. Mounting evidence shows associations between neighborhood features and older children's behaviors (e.g. active play, physical activity and sitting time) and health (e.g. obesity),(Ding, Sallis et al. 2011, Ding and Gebel 2012) For example, more walkable neighborhoods characterised by connected streets, low traffic exposure, and availability of local destinations (e.g. schools, parks) have been positively associated with children's physical activity and independent mobility (i.e. freedom to move or travel without parental supervision). (Riazi, Blanchette et al. 2019) For older children with greater mobility licenses,(Mackett, Brown et al. 2007) being independently mobile allows children to explore their surroundings, develop spatial skills, a sense of independence.(Riazi and Faulkner 2018), and social interaction.(Horton, Christensen et al. 2014) The studies highlight the neighborhood's potential to shape children's behaviours, skills, and social connections.

While younger children are more restricted in navigating their environments alone, families with young children are particularly sensitive to their local neighborhood context because early childhood is a time when primary carers and young children tend to spend close to home. One mechanism in which built environment factors are theorised to influence ECD is through providing neighborhood resources that influence families raising children.(Sampson, Morenoff et al. 2002) Young children are exposed to their neighborhood through direct use (e.g. active play at parks helps with motor skill and social development) or indirect exposure (e.g. parent social networks, views and social norms). Theories from 'neighborhood effects' research (Leventhal and Brooks-Gunn 2000, Sampson, Morenoff et al. 2002) have suggested that the availability and accessibility of neighborhood and institutional resources such as parks, child care services and schools can stimulate healthy development through its influence on parent access to resources that support children's development, parent wellbeing and health, and parenting behaviour.(Minh, Muhajarine et al. 2017)

Empirical studies exploring the impact of neighborhood built environments on ECD is largely unexplored. The strongest evidence to date on neighborhood effects and ECD show that disadvantaged neighborhoods are most vulnerable to poorer early childhood outcomes. For children, socioeconomic status (SES) impacts wellbeing at multiple levels, including the family and neighborhood.(Bradley and Corwyn 2002) Differences in area-level socioeconomic status have translated into inequities in ECD outcomes such as developmental delay and behavioral and mental health problems.(Woolfenden, Goldfeld et al. 2013)

Alongside this research, place-based and health studies suggest more disadvantaged areas generally have poorer access to quality services and destinations compared with more advantaged areas.(Turrell, Haynes et al. 2013) This inequitable distribution may further widen health inequities. When poverty and other forms of disadvantage is geographically concentrated, negative impacts on child health and wellbeing are exacerbated.(Bradley and Corwyn 2002) For example, for those who are more disadvantaged (e.g. lower income families, lower education), fewer quality resources close to home may mean families need to travel further to access high-quality services and facilities;(Christian, Knuiman et al. 2013) this can translate to more travel time and its subsequent costs e.g. direct financial costs of longer commutes, and indirect costs such as less opportunity to build neighborhood connections.(Villanueva, Badland et al. 2016) Financial hardship for example is considered a family stressor, which can influence parent mental health, disrupt parenting and strain family relationships, which in turn influence children's health and wellbeing.(Masarik and Conger 2017) Others have suggested that compared with more advantaged neighborhoods, disadvantaged neighborhoods may have higher crime rates, neighborhood physical disorder (e.g. graffiti, litter).(Sampson and Raudenbush 1999) Unsafe neighborhoods may affect children's outdoor play and feelings of wellbeing.(Farver, Ghosh et al. 2000) In contrast, the availability of safe neighborhoods and associated social capital supports families with young children.(Shonkoff 2010)

Addressing locational (geographic) disadvantage and inequitable ECD outcomes is of research and policy interest,(Ryan and Whelan 2010), with actions on the social determinants of health seen as a way to narrow inequities. Neighborhood place-based interventions may be successful at improving population-level child development

outcomes beyond policy aimed at individual-based change. Understanding which neighborhood built environment features are related to better ECD outcomes is needed to ensure future place-based decisions effectively promotes ECD without widening inequities.

This paper aimed to explore: 1) built environment features related to better child development outcomes in disadvantaged neighborhoods; and: 2) perspectives from community members of factors important for families with young children's health and development in disadvantaged neighborhoods. This paper contributes to neighborhood effects research on child development through: 1) adding evidence from community perspectives about built environment factors important for ECD; and: 2) enhancing our understanding of the processes responsible for healthy child development in the neighborhood context. Others have suggested that qualitative research may help strengthen the available quantitative evidence about the mechanisms in which neighborhoods influence ECD.(Minh, Muhajarine et al. 2017)

Methods

This paper forms part of the Kids in Communities Study (KiCS), an Australian mixed methods study aimed at investigating community-level factors influencing young children's development in 25 advantaged and disadvantaged areas across Australia. Between 2015-2017, qualitative and quantitative methods were used to explore community factors conceptualised within five domains of influence: physical, service, social, socio-economic and governance domains; these factors were theorised to influence ECD and included in the KiCS conceptual frameworkdescribed fully elsewhere.(Goldfeld, Villanueva et al. 2017) The Royal Children's Hospital Melbourne

Human Research Ethics Committee (30016) provided ethics approval, and further ethics approvals received from other states and territories if required.

Setting and sample of local communities

Study sites were selected to represent socioeconomically advantaged and disadvantaged local communities in five Australian states and territories: Victoria; New South Wales; Queensland, South Australia, and the Australian Capital Territory(Tanton, Dare et al. 2015) Selection was based on a quintile-quintile matrix of ECD outcomes (developmental vulnerability on the 2012 Australian Early Development Census (AEDC)) relative to area-level socio-economic status (2011 Australian Bureau of Statistics (ABS) Socio-economic Indexes for Areas - Index of Relative Socio-economic Disadvantage (SEIFA-IRSD)). This paper focuses on disadvantaged local communities doing 'better than expected' (off-diagonal) and 'as expected' (on-diagonal) on ECD outcomes relative to their socioeconomic status **(Table 1).** The SEIFA-IRSD was available in the AEDC as an area-level disadvantage measure; it includes 16 indicators of disadvantage (e.g. low income, unemployment, low education, low occupation) (Australian Bureau of Statistics 2013). As the SEIFA-IRSD is a summary index of disadvantage, the index was validated against other disadvantage indicators (e.g. proportion of sole parent families, proportion of people not completing a year 12 high school education) to examine whether one indicator of disadvantage was driving the SEIFA-IRSD result for the local community.(Tanton, Dare et al. 2015) This ensured that the explanation for the local community's off-diagonal status did not emerge from one aspect of disadvantage high in the community and is therefore more likely to result from community factors such as built environment factors, or other community factors.

INSERT TABLE 1 ABOUT HERE

In the Australian context 'neighborhood' and 'community' are often used interchangeably. 'Local community' is herein used to align with AEDC nomenclature,(Commonwealth of Australia Department of Education and Training 2015) which equates to areas approximately 10,000 persons on average (suburb) in metropolitan and large regional areas.(Australian Bureau of Statistics 2016) Local communities are clustered within larger AEDC 'communities' or local government areas (i.e. municipalities).

Built environment features such as housing type and density, walkability, traffic exposure, access to destinations and services, public transport and public open space; and crime and incivilities (**Table 2**) were measuredusing perceived (focus groups, interviews and community surveys) and objective data (Geographic Information Systems (GIS) and ABS Census data).(Australian Bureau of Statistics 2011, Goldfeld, Villanueva et al. 2017)

INSERT TABLE 2 ABOUT HERE

Perceptions about the built environment

Between October 2015 and May 2017, trained researchers in each state and territory facilitated interviews and focus groups using semi-structured focus group and interview question guides designed to explore positive and negative (challenges or difficulties) community factors for young families and children. Participants were asked about their local built environment and prompted for further information if required. They were also asked how people travel around their local community (e.g. walk, cycle or drive).

All interviews and focus groups were audio recorded and participants provided informed written and verbal consent.

Interviews

Approximately 8-15 semi-structured interviews with a range of key stakeholders (e.g. managers of early years' services, local government staff, and school principals) were undertaken with each municipality. Recruitment occurred through purposive and snowball sampling.(Atkinson and Flint 2001) No further interviews were conducted when data saturation (i.e. no 'new' information obtained) was achieved. Interviews ranged from 35-90 mins.

Focus groups

At least two focus groups were conducted in each local community, one with local service providers and one with parents of children aged 0-8 years. Service providers were recruited through purposive and snowball sampling.(Atkinson and Flint 2001) Parents were recruited through service provider (e.g. playgroups, maternal and child health centres) networks, and flyers were distributednthrough local organisations. Parents were reimbursed with a $25 supermarket/department store gift card for their input. Focus groups ranged from 45-90 minutes. Parents were asked to report how long they have lived in the local community, whether they speak another language other than English, their age group, age group/s of children living in household, whether they were born in Australia, employment status and highest level of education completed. Interviews using focus group questions were completed where a focus group could not be organised.

Built environment measures

ECD-relevant spatial measures of the built environment were informed by previous studies,(Villanueva, Badland et al. 2016) and emergent themes from the qualitative analysis. Built environment measures (e.g. presence of, and distance to selected destinations, walkability) for the AEDC local community were created using GIS software (ArcGIS v10.3.1).(ESRI (Environmental Systems Resource Institute) 2010) and existing spatial datasets where possible. The walkability score was calculated as the sum of standardised scores of street connectivity, dwelling density and the daily living score. The daily living score refers to a set of destinations people might regularly visit; a sum of the presence (or absence) of convenience store, newsagent or petrol station; supermarket; and public transport stop. Additional indicators such as local living score (sum of the presence of eleven destinations a person may walk to daily) were explored. (Mavoa, Boulangé et al. 2018) Data sources included destination data from the Raising Children's Network,(Murdoch Children's Research Institute, Parenting Research Centre et al. 2006-2017) the Australian Urban Research and Infrastructure Network ,(National Research Infrastructure for Australia and The University of Melbourne n.d) the Public Sector Mapping Agencies Australia Ltd, and local government websites. Most of the datasets were manually supplemented by 'cross-checking' or validation with data from local government websites to ensure more accurate and comprehensive data for that region.

Analysis

Analysis was conducted in two phases. Phase 1 (Differentiating built environment factors) explored both qualitative and quantitative data, whereas Phase 2 (Important built environment factors) focused on qualitative data.

Phase 1 – Differentiating built environment factors

To answer objective 1, we used a comparative case study approach to explore

differences in qualitative and quantitative built environment factors between 14

disadvantaged local communities with 'better than expected' ECD outcomes and 'as

expected' ECD outcomes (two in Victoria, six in New South Wales; four in

Queensland, and two in the Australian Capital Territory) clustered within seven

community pairs. It was hypothesized that more supportive built environment features

were present in disadvantaged local communities with better ECD outcomes.

Supportive built environments may be protective of child outcomes and vice versa;

despite area-level disadvantage.

Qualitative. All focus groups and interviews were transcribed using a transcription

service (rev.com). Transcripts were checked for accuracy and imported into QSR

International's NVivo v11.(QSR International 2015) Content analysis using a deductive

approach was used to code the transcripts using pre-defined categories developed by the

research team; these categories aligned with the built environment features in **Table 2**.

The built environment features were based on previous place-based and health literature

and included in the KiCS conceptual framework. This more structured approach was

undertaken to align with the study's objectives of identifying consistent themes/factors

and patterns of the built environment across disadvantaged communities but also

accommodates the volume of data collected. Information that did not 'fit' within the

framework but could be important to the study was coded as 'other useful information'.

We analysed coded information using inductive iterative categorisation techniques to

summarize the content line-by-line in each category.(Neale 2016) Issues were

consolidated through regular team coding discussions and shared documentation to

ensure analytical rigor.(Harry, Sturges et al. 2005, Saldana 2009, Morse 2015)

Qualitative analysis identified themes or factors perceived by communities as facilitating or hindering young children's health and development, specifically eliciting themes that differed or were similar in the matched-disadvantaged community pairs. The aim was to identify consistent themes or factors across the communities.

Quantitative. All GIS-derived variables were imported into MS Excel, and Stata/IC 14.0 to explore descriptive comparisons between on- and off-diagonal local communities. For each local community, an absolute value for each built environment feature was reported, thus it was not possible to conduct any meaningful statistical analyses to compare values within each matched-disadvantaged pair. The mean and standard deviation (SD) for each built environment measure across the 25 local communities were calculated. A 'difference' between 'better than expected' (Off+) and 'as expected' (OnDis) local communities within each pair was considered as an absolute value less or more than 1SD from the mean.

Where available, a qualitative and (equivalent or proxy) quantitative measure was aligned. This triangulation was used to describe the results and provide a better understanding of the complex and dynamic nature of the community context.(Fielding 2012)

Phase 2 – Important built environment factors
To answer objective 2, we used a case study approach to explore community perceptions of important built environment factors for young children's health and development in disadvantaged local communities, regardless of area-level ECD

outcomes. The qualitative analysis techniques were like those used to elicit differentiating factors.

Results and Discussion

In total, 93 interviews and 30 focus groups (16 service provider and 14 parent focus groups) were conducted for the 14 disadvantaged local communities. The overall sample reflected a heterogeneous mix of parents in terms of age group, education level, and employment status with the exception that the sample was predominantly female. In 'as expected' local communities, 26% reported being unemployed or unable to work and 60% reported their highest level of education as year 12 or less. In 'better than expected communities', the proportions were 8% and 14% for employment status and highest level of education, respectively. There were no marked differences for other socio-demographic factors. **Table 3** presents qualitative and quantitative results for Phase 1: differentiating built environment factors. The results are presented as directional hypotheses to help visualise differentiating built environment factors between 'better than expected' and 'as expected' local communities within and across the seven matched-disadvantaged pairs. The hypothesis direction was informed by previous literature but driven by the data. A *consistent* finding or pattern was considered if the same result was found in at least four of the seven matched-disadvantaged community pairs.

Housing (affordability, tenure, higher-density public housing) was the only theme that appeared to consistently differentiate disadvantaged local communities with 'better than expected' and 'as expected' ECD outcomes. Compared with 'as expected' local communities, 5 of the 7 'better than expected' local communities perceived housing as more affordable and viewed less public housing in their local community. This was

supported by objectively-measured levels of public housing. However, perceived extent of public housing appeared to be related to housing type. For example, 'better than expected' local communities perceived more separate or semi-detached lower density public housing being available, rather than 'high-rise' density housing types (e.g. apartments and townhouses). Compared with 'as expected' local communities, 6 of the 7 'better than expected' local communities had less private renters and more home ownership, supported by objective data only. Perceived crime/incivilities also appeared to differentiate diagonality in 5 of the 7 disadvantaged pairs. No consistent differences were found for any other built environment feature (e.g. parks, destinations, walkability).

INSERT TABLE 3 ABOUT HERE

Table 4 summarizes the built environment findings perceived to be important for ECD by each disadvantaged local community, irrespective of ECD outcomes. Accessibility was perceived to be the most consistent finding: being able to physically access services, public transport; as well as having high quality public open space and a mix of local destinations was perceived to be important by community members in 11 of the 14 communities; while 9 of the 14 reported the importance of living in a walkable neighborhood.

Housing is discussed in detail in a separate paper,(Villanueva, Badland et al. 2019) but it is discussed here in relation to other built environment factors consistently found as important for families in disadvantaged local communities. The findings are supported by quotes from stakeholders, service providers or parents. While there may be differences between urban and regional local communities, or parents' vs

14

stakeholders/service providers, differences between groups were not considered in this paper.We reflect on why more differences were potentially not found in our study, and its implications for built environment measurement in future studies.

INSERT TABLE 4 ABOUT HERE

Housing in disadvantaged local communities

As the main source of shelter for children and their families, housing issues are at the forefront (most proximate) of built environment features that influence ECD, particularly in disadvantaged areas. Biological factors aside, living in environments that impair parent mental health appears to be associated with sub-optimal child health and development.(Conger, Ge et al. 1994) Poor parental mental health is negatively associated with children's behavioral problems, social withdrawal, and poor academic performance.(Evans and Ferguson 2011) Housing may impact parent mental health manifested through perceptions and experiences of their immediate housing and neighborhood environments.(Evans and Ferguson 2011, Giles-Corti, Ryan et al. 2012)

For example, housing affordability is closely related to income; lower income families may have fewer housing choices(Brooks-Gunn, Duncan et al. 1993, Leventhal and Newman 2010) and experience substandard housing quality such as structural defects, pest infestation, lack of heating, inadequate insulation, and noise.(Gagné and Ferrer 2006, Howden-Chapman, Matheson et al. 2007, Keall, Baker et al. 2010) High housing costs also limits family household income spent on basic necessities and services (food,

health care), which may lead to poorer outcomes for young children.(Harkness and Newman 2005)

Perceived neighborhood crime and personal safety is often linked with neighborhood satisfaction,(Leslie and Cerin 2008) which can influence social interaction.(Hur and Morrow-Jones 2008) Our participants perceived neighborhood crime as a reason for feeling unsafe and differentiated diagonality: *"[OnDis] was a bit of a hot spot for sort of crime and drugs, and violence and stuff, but what you're seeing is it's quite dispersed across suburbs – yes it's happening everywhere across [the region]"* (INT 141) Neighborhood safety concerns can influence family practices and parental restrictions on children's outdoor play (Molnar, Gortmaker et al. 2004) and interaction with others.(Carver, Timperio et al. 2008) Active play and social interaction are important for children's health and development.(Ginsburg 2007) *"There's a bit of graffiti, or needles being left around, so I think you've got to be careful with your children when you go to parks and that sort of thing, but that is everywhere, it's not just in that area"* (INT 141)

Perceived dispersion (location) and diversification (type) of public housing developments made a difference to diagonality. Our participants negatively perceived higher-rise density public housing located in 'concentrated' rather than 'scattered' pockets; stigma and perceived safety were potential reasons for these negative perceptions. Stigma attached to public housing and 'bad' neighborhoods (concentrated poverty) may affect those living in stigmatised areas, with residents internalising other people's perceptions of them.(Galster 2012) *"It's the highest government housing area. It gets all those names, labels, and things attached."* (INT025, OnDis) Stigma can

result in the risk of being judged, stereotyped, and consequently children may experience bullying.(Earnshaw, Reisner et al. 2018) Growing up in areas with a negative reputation may affect children's self-esteem and aspirations for the future and were an emergent consistent theme in the overall study (results not reported here).(Goldfeld, Villanueva et al. 2018)

Is it all about housing in disadvantaged local communities?

While the home environment represents the most proximate environment for families with young children, it is also co-located within the wider neighborhood context. Previous research suggests that many families with young children often prefer to live in low-density detached houses located in outer suburban neighborhoods because of its relative affordability.(McCulloch 2012,) While better housing affordability was one of the factors that differentiated diagonality, affordable housing tends to be situated in suburban neighborhoods located on the urban fringe; these areas are often less walkable and have poorer access to social and public transport infrastructure.(Southworth 1997) Public transport access, a mix of destinations, and quality parks were perceived as important features for families with young children in disadvantaged local communities regardless of ECD outcomes. Access to services and destinations (e.g. child care centres and parks) linked by walkable streets and public transport may indirectly influence ECD through providing or hindering opportunities for access to important places`.

Having a range of local places and services and being able to access them

Having local places (e.g. parks, lakes and beaches, recreation and community centres) and services (e.g. libraries, child care centres, and schools) for families with young children was emphasised in 11 of 14 disadvantaged local communities. Destinations important for daily living such as shopping centres, supermarkets and food outlets were

also frequently mentioned, with co-location of these places with other family-friendly destinations emphasised as improving convenience.

children's play and development.(Veitch, Bagley et al. 2006, Christian, Zubrick et al. 2015) Outdoor play supports interactions with nature, which affects children's restorative experiences and emotion regulation, attentional capacity, and self- discipline. (Korpela, Kyttä et al. 2002, Taylor, Kuo et al. 2002, Tillmann, Tobin et al. 2018). Poor proximity to green spaces has been associated with behavioral problems such as hyperactivity and inattention.(Markevych, Tiesler et al. 2014).

Good quality parks facilitate use: "*There was a park. They've done it up and incorporated a whole lot of sensory type activities within the park and it's used quite regularly and we've used it for our excursions are well. The fact that they put the money into fixing it up and all that and it is used a lot, I think there are definitely more families coming into the area*" (INT110). In our findings, it may be that governments are significantly investing in park infrastructure in disadvantaged areas,(Lawless 2004) which may partly explain why we found no differences between on- and off-diagonal disadvantaged local communities:*"I think they've upgraded parks. There's more facilities available, like in sporting and things like that, to what they used to"* (FG06, OnDis). Others have emphasised the benefits of children playing in nature (Chawla and Rivkin 2014); found that children playing in spaces with more natural elements such as trees and wood, may engage in more imaginative, physically demanding play, and have enhanced use of motor skills (e.g. climbing, balancing) (Fjørtoft and Sageie 2000, Bagot 2005).

While having local destinations were important, lack of access can impact use. Perceived walkability and and public transport presence and access affected use. Previous studies show that children (and parents) are more likely to use destinations and services located within walking distance of their home.(Page, Cooper et al. 2010, Napier, Brown et al. 2011, Tappe, Glanz et al. 2013, Kaczynski, Besenyi et al. 2014)

Public transport concerns included lack of public transport infrastructure close to home, non-direct routes to destinations, and frequency of public transport.*"Say I wanted to take public transport from my house to the kinder just here, I would have to take two buses or get off the bus down here and walk a fair way. It would be another half an hour's walk. It depends on whereabouts you are in the community, as to whether those facilities are easily accessible. I mean, don't get me wrong. I don't want to sound ungrateful. There is public transport facilities there but they're not as easily [accessible]…"* (FG05, parent) Our findings align with previous studies; Fritz (2007) found that physical inaccessibility was the most significant barrier to public transport use e.g. infrequent services (e.g. bus and train times), and geographic coverage (e.g. routes). Potential access barriers should be explored in future qualitative studies (e.g. non-family friendly policies such as folding prams before boarding, and the lack of assistance for embarking and disembarking).

For parents who rely on public transport services, difficulties in access may represent a key barrier to accessing essential services, facilitating social networks and local community participation.(Rosier and McDonald 2011) *"There's cheaper housing but there's one street in particular out there that's like a little ghetto. I think that's because the developments go ahead without the appropriate infrastructure* (INT053)*…they often*

don't have transport, so they're stuck" (INT053). Our study participants commented on the detrimental effects of feeling isolated. Poor access to essential destinations and services may translate into lost learning time for children and detrimental for development.

Policy implications

Thoughtful neighborhood design may help to overcome these problems experienced by families. We found it is not the mere presence (or absence) of public housing that might differentiate why some disadvantaged local communities are doing better than others on ECD, but housing type, quality, and its distribution across the community (e.g. located in concentrated pockets or otherwise 'scattered'), may help ameliorate stigma associated with living in public housing. Diversification, distribution and quality of public housing may be important for policy makers to consider. Careful building design (exterior housing façade) increases actual and perceived natural surveillance or 'eyes on the street': *"It's quite a high density" "They had issues, the little gangs and things happening over the years and then they ripped buildings down and made it more open which is a lot better. I don't think there's much [safety] issues now."* (INT137)

Better quality public housing and neighborhood design may enhance positive perceptions, and feelings of safety,(Valentine and McKendrck 1997, Zubrick, Wood et al. 2010) which may boost social capital, sense of community, trust and mutual support.(Prezza and Pacilli 2007) Neighborhoods with better social capital among residents encourage positive child development, even in poorer neighborhoods.(Sampson, Morenoff et al. 2002, Drukker, Kaplan et al. 2003, Hertzman 2004, Fan and Chen 2012) This may be because socially supportive neighborhoods encourage people to interact and 'look out' for each other; these social processes

prevent neighborhood crime and other problem behaviors,(Komro, Flay et al. 2011) and encourage more interaction with those living in the neighborhood. Without provision of public space, facilities and services, families may be more likely to stay indoors and have fewer opportunities for facilitating informal social networks(Yancey 1971). For families with poor socioeconomic circumstances living in poor neighborhoods with fewer amenities, the environmental effects on young children's development may be intensified.(Coley, Leventhal et al. 2013)

Challenges and limitations of this study

The main strength of this study includes the large qualitative component, enabling further opportunities to explore why children may have higher AEDC scores in disadvantaged local communities. Limitations exist particularly in relation to quantitative data in this study, which should be interpreted cautiously.

We examined only *disadvantaged* local communities with different ECD outcomes; this approach intended to *control for* neighborhood disadvantage and explore whether the built environmentmight help explain why children are performing better on the AEDC despite living in a disadvantaged area. A key limitation is the generalisability of results. Our findings cannot be generalised across all local communities or all groups. Previous research shows differences in built environment features for advantaged vs. disadvantaged areas,(Turrell, Haynes et al. 2013) but disadvantaged neighborhoods also vary in terms of risk factors (e.g. crime rates, neighborhood safety) and protective factors (e.g. social capital, collective efficacy). With advice from stakeholders, inclusion of families from different cultural and ethnic backgrounds prominent in the community were approached but not purposefully examined in this study. Thus differences in community sub-groups may not have been captured. Sub-groups may include those

from a variety of cultural and ethnic backgrounds, as well as family compositional factors e.g. families with multiple children, children with disabilities. Children were not engaged in this study; further research is needed to capture children's neighborhood perceptions, and their lived experiences including which destinations and facilities they use. The value of having localised information is crucial for informing more specific place-based interventions at the local level.

Data saturation was achieved when no 'new' information was obtained; this led to the large number of interviews and focus groups collected. We acknowledge that new theoretical insights can be made if data continues to be analyzed (Braun and Clarke 2021). New codes were added to the initial coding framework as more initial transcripts were analyzed, and a code for information that 'did not fit' the framework. Depending on the research question, future lines of enquiry may revisit the data with a more fluid, reflexive approach.

Spatial data were calculated at the 'local community' (suburb) level for descriptive purposes; it is the smallest spatial unit for which the AEDC data are publicly available. Finer resolution data (i.e. smaller than suburb-level) are generally considered as more appropriate for studying neighborhood effects(Hewko, Smoyer-Tomic et al. 2002, Duncan, Kawachi et al. 2013) to (Talen and Anselin 1998, Kwan 2012)capture more spatial heterogeneity, such as the flexibility to identify areas with poorer access to public transport.

Complex interactions between the built environment and other community factors (e.g. social and socio-economic) need to be explored further. It may be that built

environment factors play its role by interacting with other factors. That is, the built environment provides the conditions that help facilitate or hinder family lifestyle choices and behaviors (e.g. offer local destination and service opportunities), which in turn, impact on children's health and development. Future research should focus on sourcing appropriate objective data to model these associations and test the pathways in which the built environment may influence ECD. (Sallis, Floyd et al. 2012)

Conclusion

Except for housing factors, built environment features did not differentiate on- and off-diagonal disadvantaged communities. However, many were found to be consistently important for families with young children living in disadvantaged local communities. While it seems unlikely that neighborhood environments will exert large independent influences on ECD before children begin school, neighborhood conditions may contribute to development at young ages because of indirect effects on parent behavior and perceptions. The impact of the built environment on the family could not be assessed in this studyso our findings are inconclusive about the the built environment's contribution to the AEDC. Future research should link small scale built environment measures to the AEDC. This is a step forward to modelling built environment associations with ECD and ensuring that evidence informs policy with greater specificity.(Minh, Muhajarine et al. 2017) While the qualitative data in our study provides a rich source of information that may inform local place-based initiatives, exploring whether built environment factors can be modified 'at scale' has the potential to impact a large population of families with young children.

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