

FACTBase

Bulletin 48, May 2016

The Impacts of Employment Decentralisation on Commuting in the Perth and Peel Regions

Gemma Davis

Introduction

Since the 1960s and 1970s, major Australian metropolitan regions have had strategies designed to decentralise employment into sub-regional activity centres. The key aims of these policies have been to increase proximity to work for people living in suburban locations; minimise congestion in the central business district; and maximise the use of transport infrastructure.

Yet despite a long-term commitment to employment decentralisation within metropolitan regions, there has

been limited examination of the success of these strategies in meeting the core objectives outlined above. Until recently, insights into the impact of employment decentralisation and the spatial organisation of cities on economic performance and enterprise productivity have also been limited.

This bulletin has been prepared as part of the Committee for Perth and RAC *Get a Move On!* project, which aims to deliver a comprehensive analysis of land use and transport in the Perth and Peel regions and provide recommendations for the future.

The purpose of the bulletin is to gain an insight into the impacts of employment decentralisation and types of spatial organisation on commuting distances, patterns and times through a review of current literature and an examination of published statistics.

Literature Review

Over recent years, a number of studies have examined the employment structure of cities and the travel characteristics that they exhibit. A summary of the reported city structures and resulting travel characteristics is summarised in Table 1.

Table 1:
Relationship between Spatial Organisation and Travel Characteristics

Type of city structure	Spatial layout	Travel characteristics
Monocentric	A declining density gradient from the city centre outwards with centralised economic activity. Centralised jobs can result in agglomeration benefits, increased productivity and provide higher wages.	Strong radial movement that favours public transport provision with limited need for private cars. Potential for long commutes in areas with dispersed urban form; increases pressure on radial infrastructure; and increased potential for congestion in inner areas.
Mono-Polycentric	CBD remains the main area of economic activity but increasing decentralisation of jobs has weakened the dominance of CBD	Strong radial travel to CBD and high public transport use to central locations, but suburban travel/travel to outer employment locations remains mainly by private car.

Type of city structure	Spatial layout	Travel characteristics
Polycentric (urban village or activity centre based employment centres throughout the region)	Intra-urban patterns of clustering of population and economic activity consisting of independent multiple centres	<p>Potential for people to live near work and travel locally with a higher share of sustainable travel modes to outer and middle employment locations.</p> <p>Potential to support agglomeration economies. Capacity to increase the share of reverse commuting. However, can increase commute distances, car use and reduce proximity to work, if levels of self-containment are low and public transport infrastructure is inadequate.</p>
Dispersed Polycentric (sprawl)	Sub-centres present but no dominant centre with dispersed employment and services.	Each sub-centre generates trips from dispersed areas of the city creating relatively random patterns of movement. Car dominated and difficult to serve with public transport.
Decentralisation to inner and middle suburban sub-centres	CBD remains dominant area with employment and centres decentralised to sub-centres in inner and middle sub-regions	Can increase capacity for public transport use (in comparison for dispersal of jobs in outer sub-regions) and increases accessibility for nearby workers. Limits capacity to reduce congestion on inner transport networks.
Connected Decentralised	CBD remains dominant area with employment centres decentralised to employment nodes, located along existing public transport routes.	Capacity to increase share of journeys by public transport and maximise use of the public transport network.

Source: BITRE, 2015; Burke, Dodson and Gleeson 2010; Burke, 2011

Literature suggests that theoretically, different spatial structures deliver clear positive and negative outcomes. In particular, there is a body of work that argues that the decentralisation of employment offers a range of potential benefits, including increased proximity between the places people live and work, shorter commutes and reverse commuting (Burke, 2010).

'Urban village polycentric' structures have been identified as having the capacity to reduce commuting. Tokyo and Seoul has been cited as examples of 'urban village polycentric' regions that have successfully reduced wasteful commuting and increased public transport (Merriman et al, 1995; Ma and Banister, 2006).

Garreau (1991) also identified 'edge cities' such as Silicon Valley California and Southfield, Michigan (i.e. secondary cities with more than 465,000 square metres of office space; 56,000 square metres of retail space; and more jobs than bedrooms) as delivering the potential to shorten commutes, and generate into vibrant, diverse neighbourhoods with opportunities for small business employment and entrepreneurialism.

However, there is a significant body of work which indicates that the relationship between spatial organisation and commuting is not clear and that actual commute times and distances within monocentric and polycentric structures are generally longer than the theoretical minimum (Kwong, 2015; Ma and Banister, 2006; O'Kelly and Lee, 2005; White, 1988; Giuliano and Small, 1993).

This work also suggests that in some regions, employment decentralisation can contribute to longer commute distances and increased car use (BITRE, 2015; Trujillo, 2014; Burke, 2010; Ma and Banister, 2006; Chen, 2000; Dielman et. al., 2002).

In particular, decentralised structures have been associated with longer commute distances within metropolitan regions in the United States. An analysis of statistics adapted from Kneebone and Holmes (2015) and Tomer et al (2011) for regions in the United States supports this finding with a small positive relationship identified between the proportion of employment locations more than 15km from the CBD and commute distance.

Figure 1:
Relationship between Employment Decentralisation and Median Commute Distance in Metropolitan Regions in the United States

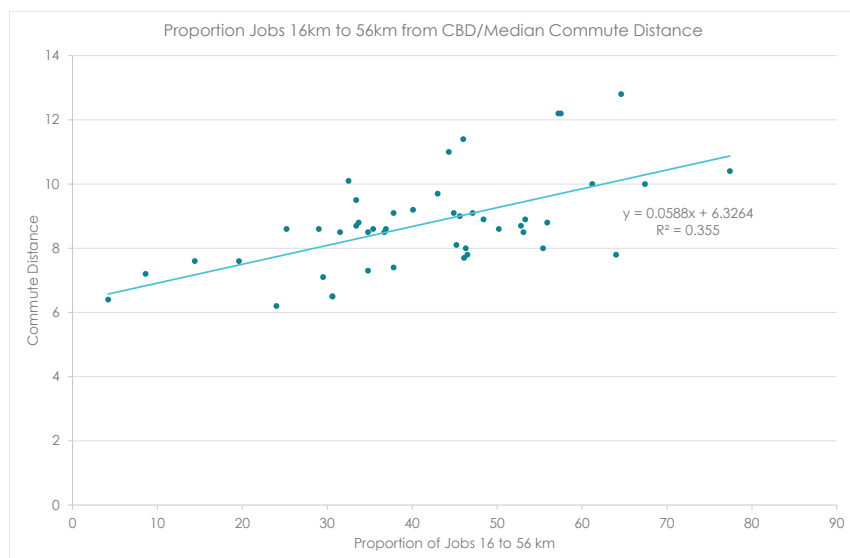
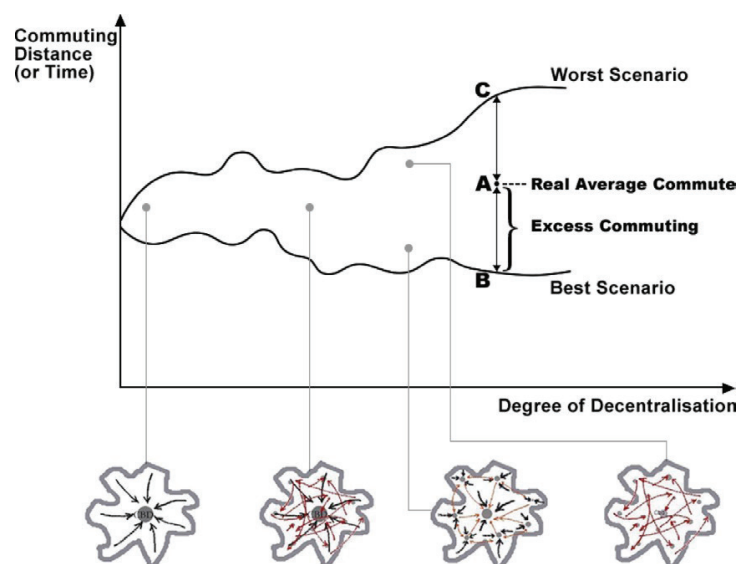


Figure 2:
Impact of Decentralisation on Commute Distances



Decentralisation scenarios: 1) the mono-centric model, 2) the mono-centric model with simultaneous radial and random movement, 3) the polycentric model with a weakened CBD but with planned sub-centres, and 4) the polycentric model with a weak CBD, dispersed employment and random movement. Source: Banister, 2102

According to Ma and Banister (2006) and Banister (2012) the reason for longer than expected commutes in some decentralised, polycentric regions is that employment decentralisation increases the total distance between live and work locations in a region, growing the potential for 'excess commuting' (Kwong, 2015). However it suggests that polycentric regions with planned sub-centres can reduce 'excess commuting'.

This is supported by Lee and Gordon (2011) who found that commute times in the United States are influenced by the size of the region and that polycentric structures may have an edge in mitigating congestion in large metropolitan regions.

However it has also been established that 'excess commuting' in metropolitan regions is influenced by more than spatial organisation.

Specifically, commute distance and time are affected by the choices people make about where they live and work and these choices are influenced not only by home-work proximity or numerical parity between workers and jobs, but by factors including accessibility to employment areas; wages; skill compatibility; housing affordability; and residential amenity (Cervero, 1995; BITRE, 2013).

Economic and Social Impacts

Accessibility has been found to impact on the function of the economy, by influencing the access of employers to appropriately skilled labour markets, and employees to job choice.

Better access to workers increases enterprise productivity because 'employers are more productive when they have a larger pool of employees to draw on' and 'employees with a larger choice of potential employers are more likely to develop and make the best use of their skills' (Kelly and Donegan, 2014, p. 21).

Evidence also indicates that centralised employment clusters deliver agglomeration benefits, particularly for knowledge-intensive firms (BITRE, 2015).

Conversely in the United States, Kneebone and Holmes (2015) established that as employment shifts to suburban locations, the number of jobs near the

typical city and suburban resident falls and this reduced accessibility has negative social consequences, particularly for low-income workers living in outer suburban locations.

Employment Decentralisation and Commuting in Australian Cities

Despite parallels in planning policy, and strong similarities in spatial organisation, major Australian metropolitan regions do not conform to a single structure (BITRE, 2013).

Sydney's spatial form most resembles a polycentric urban village structure. It is the only Australian region that has successfully established strong high-density agglomerations of employment, with more than 25,000 jobs, within activity centres outside the central business district (BITRE, 2013). These centres accommodate 34% of employment in the Sydney region (BITRE, 2015).

By contrast Perth, Melbourne and Brisbane more closely resemble inner/middle decentralised structures. In these regions, central business districts and inner and middle locations accommodate the majority of employment and employment outside the CBD is relatively dispersed (BITRE, 2013).

The four major Australian metropolitan regions also exhibit similar patterns of residential density, with low-density growth on the urban fringe and high-density growth in and immediately around city centres (BITRE, 2015). However, residential densities vary considerably.

In particular, population weighted densities in Perth's CBD and inner locations are considerably lower than those in other major Australian capitals, while the number of people per hectare within areas located 5km to 45km from the Sydney CBD are consistently higher than in other regions (Loader, 2012).

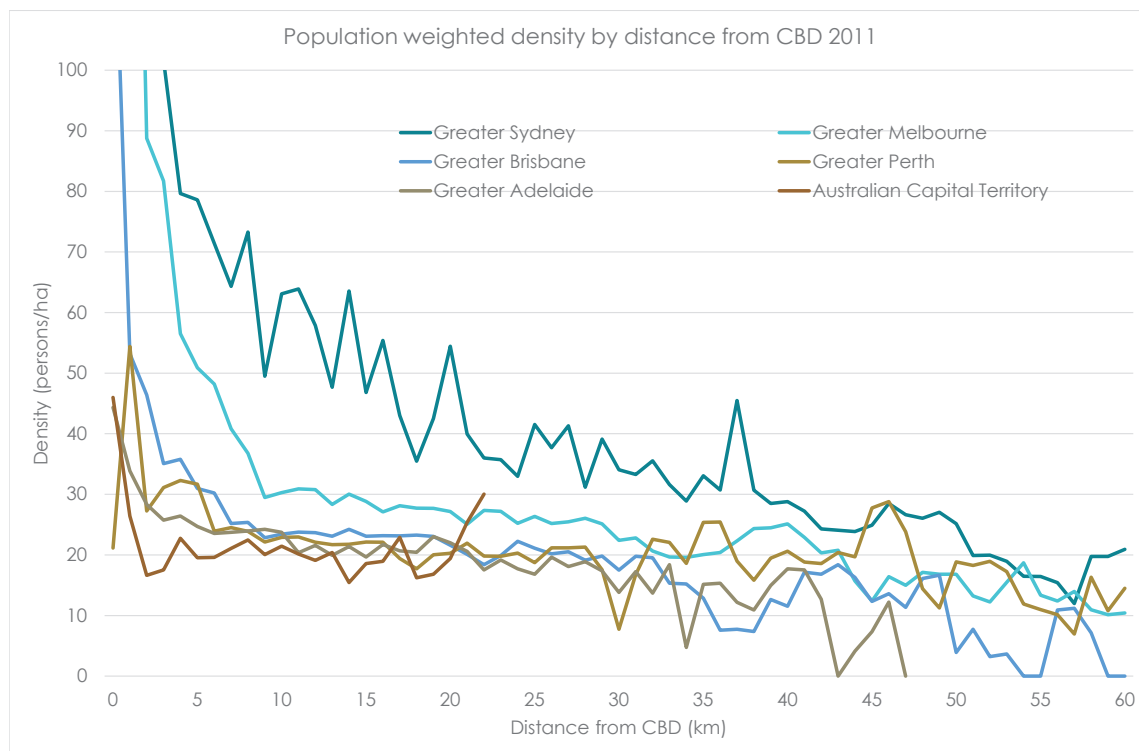
Table 2:
Employment Distribution Major Australian Metropolitan Regions (2006)

	Population Weighted Density / Persons per Hectare (2011)*	CBD employment (2006)	Share of employment within 5km of CBD (2006)	Share of employment within 10km of CBD (2006)	Share of employment within 10-15km of CBD	Share of employment more than 15km from CBD	Dominant Spatial Structure
Sydney	52	20.7%	25.5%	40.1%	51.1%	49%	Polycentric urban village
Brisbane	25	13.5%	33.8%	50.7%	60.2%	39.8%	Decentralisation to inner and middle locations
Perth	23	17.7%	28.8%	51%	64%	36%	Decentralisation to inner and middle locations
Melbourne	33	19.2%	26.7%	39.9%	55.9%	44%	Decentralisation to inner and middle locations

Source: BITRE, 2013 p. 61; Loader

*Population weighted density is an estimation of the density at which the average person actually lives.

Figure 3:
Population Weighted Density in Major Australian Metropolitan Regions by Distance from the CBD



Source: Loader, 2012

Relationship between Spatial Structure and Travel Characteristics

Despite differences in spatial structure, average commute distances and travel patterns within major Australian metropolitan regions vary very little and have been stable in recent times, ranging between 14.9 km and 15 km in 2006 and 14.6 km to 15 km in 2011 (BITRE, 2013; BITRE, 2015). Commute distance is currently shortest in Melbourne (14.6 km) and longest in Sydney (15 km).

Metropolitan commute patterns also show little variation between regions. All four capitals exhibit a pattern of inner ring residents having the shortest average commute distance (7–10 km), followed by the middle (10–15 km) and outer ring residents

(greater than 15 km) (BITRE, 2015 p. 17). Cross-suburban commuting is also a key feature of all regions (BITRE, 2015).

Therefore, while distance between residential and employment locations explains 65–83 per cent of commute patterns in the four major Australian capitals (BITRE, 2013 p. v), there is no clear evidence that modest variations in employment distribution significantly impact on metropolitan average commute distances or overall commute patterns.

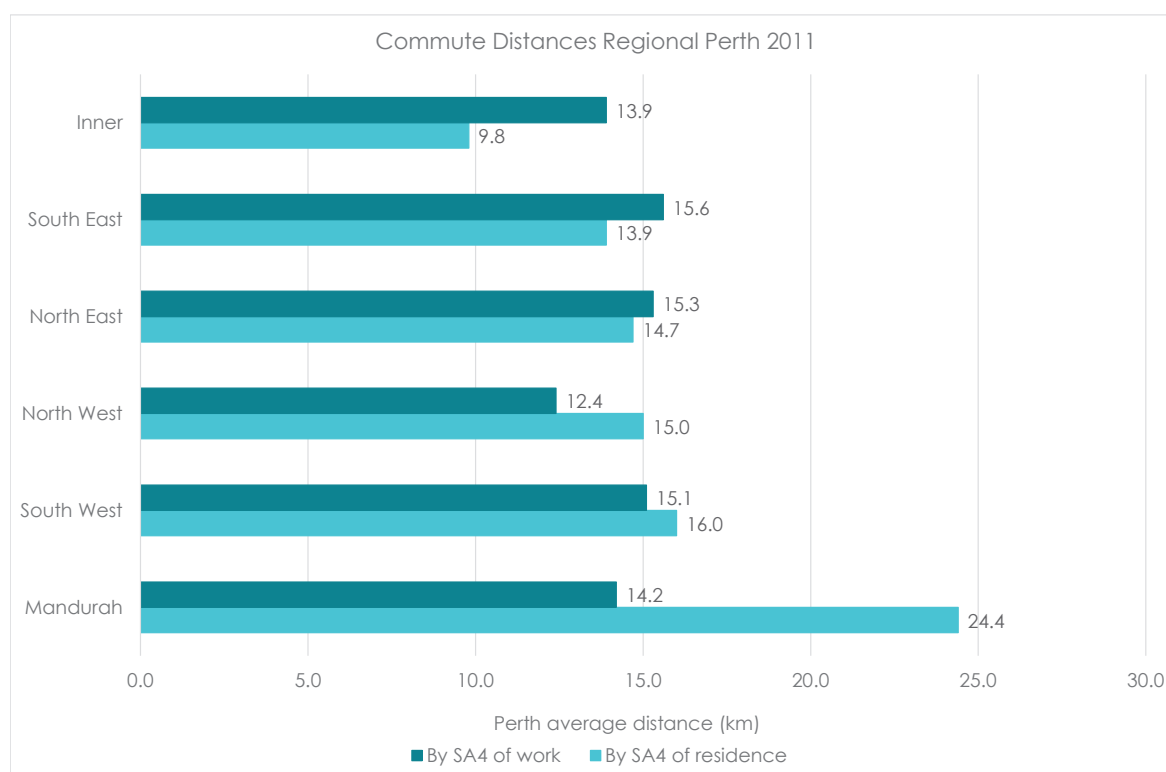
However, when examined by place of work, commute distances in Australian cities exhibit more variation.

In all four major metropolitan regions, people residing in central locations have the

shortest commutes. However in Sydney, Melbourne and Brisbane, people working in inner locations travel longer distances to work, on average, than workers accessing employment in outer sub-regions (BITRE, 2015). The primary explanation for this is that workers are willing to travel longer distances to access the professional, knowledge intensive employment opportunities, primarily clustered within inner urban locations (BITRE, 2015).

However in Perth the reverse pattern is evident (BITRE, 2015). The average travel distance to workplaces within the Perth central business district is 13.9 km compared to the overall average of 14.9 km (BITRE, 2015).

Figure 4:
Commute Distances in Regional Perth 2011



Source: BITRE, 2015

Commute distances in Australian metropolitan regions also exhibit variations on a per capita basis, with commute distances in Brisbane and Perth exceeding those in Sydney and Melbourne by head of population (BITRE, 2013). This implies that commute distances do not increase exponentially with population growth.

Differences in the spatial organisation of cities, particularly the higher residential densities in parts of Sydney and Melbourne, are likely to partially explain per capita distinctions between cities.

Research by the BITRE (2013) has also established that disparities in commuter behaviour and live-work choices can explain variations in commute patterns

and differences between cities. Key factors identified as influencing commuter behaviour include:

- **Infrastructure:** Distance has been identified as less of an impediment to travel for origin-destination pairs connected by direct freeway or rail links.
- **Congestion:** Congestion can increase journey to work time, impeding the distance that commuters are willing to travel between home and work.
- **Skills alignment:** The greater the alignment between the skills available in the origin and the skills demanded in the destination, the more likely commuting flows between those two locations (BITRE, 2013).

	What share of jobs in the entire metro area can CBD residents reach?		What share of the entire metro labour force can CBD-based firms access?	
	By car (45 mins)	By public transport (60 mins)	By car (45 mins)	By public transport (60 mins)
Sydney	53	53	23	37
Melbourne	90	46	45	34
Brisbane	79	61	54	42
Perth	89	74	93	58

Source: SGS Economics as cited by Kelly, 2013, p 29.

Commute Time

While little variation has been observed in metropolitan average commute distances across the four major Australian capitals, journey to work travel times vary significantly.

In 2006, average journey to work time for full-time employees in Australia's four largest cities ranged from 35 minutes in Sydney, to 26 minutes in Perth. This variation has been linked to multiple factors including urban footprint, infrastructure, congestion, topography and mode choice (i.e it takes longer to travel the same distance by public transport, walking and cycling than by car) (Kelly, 2013).

In major Australian metropolitan regions, employment is generally more accessible by car than it is by public transport.

Employment accessibility by car and public transport is maximised in inner city residential and employment locations, particularly in Melbourne, Brisbane and Perth. This reflects the radial, hub and spoke form of the transport system coupled with relatively centralised employment structures.

In Melbourne, Brisbane and Perth, accessibility to employment by public transport and car is lowest for residents in outer suburbs where, in some locations, the share of jobs that can be accessed within 60 minutes by public transport 'falls below 1 per cent' (Kelly, 2013 p 28).

Sydney, which has a higher proportion of employment (34%) in major activity centres serviced by rail, exhibits slightly more

dispersed patterns of public transport accessibility combined with reduced accessibility by car (BITRE, 2015; Kelly, 2013).

As a result the Sydney region has the highest proportion of commuters who travel to work using public transport, (BITRE, 2013) however there are large parts of outer suburban Sydney in which access to employment within a 60 minute public transport commute is very limited (Kelly, 2013).



Key Findings

A number of observations have been made as a result of a literature review and analysis of available statistics and are summarised below:

There are costs and benefits associated with all forms of spatial organisation and there is no evidence of an 'ideal' spatial structure in an international or Australian context.

While decentralised employment structures have been associated with lengthier commutes in the United States, there is no clear evidence of either a positive or negative relationship between employment decentralisation and commute distance in Australian metropolitan regions.

A strong correlation between the skills of local residents and the skill requirements of local employers increases the potential for employment decentralisation to be associated with higher levels of employment self-containment.

Spatial organisation, particularly higher residential densities, is likely to limit growth of commute distances as the population of metropolitan regions expand.

Commute patterns and distances are influenced by the decisions people make about where they live and work. Proximity to work is just one of multiple factors that can influence live-work choices.

High quality infrastructure connections between residential locations and distant employment destinations can increase the efficiency of long commutes.

In Australia, more dispersed employment structures are currently associated with increased car dominance but also higher levels of accessibility by car.

Labour accessibility to and from CBD locations is highest in the smaller, mid-sized cities of Perth and Brisbane which have smaller urban footprints and more centralised employment structures supported by radial 'hub and spoke' public transport systems.

Labour and employment accessibility by public transport decreases as metropolitan populations increase and regions expand outwards.

Outer suburban residents in all major Australian metropolitan regions have access to the lowest proportion of jobs within a 45 minute car and 60 minute public transport commute.

In Sydney, access to jobs by public transport, and public transport use for commuting purposes, appear to have been enhanced through the development of planned sub-regional activity centres that are well served by public transport. Public transport use may also be associated with reduced accessibility by car.

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About FACTBase

FACTBase is a collaborative research project between the Committee for Perth and The University of Western Australia to benchmark the liveability of Perth and its global connectedness through an examination of Perth's economic, social, demographic and political character.

The FACTBase team of academics and researchers condense a plethora of existing information and databases on the major themes, map what is happening in Perth in pictures as well as words, and examine how Perth compares with, and connects to, other cities around the world.

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Davis, G. (2016) *The Impacts of Employment Decentralisation on Commuting*, FACTBase Bulletin 48, The University of Western Australia and the Committee for Perth, Perth.

Acknowledgement

The author acknowledges the peer review undertaken by Professor Matthew Tonts, Head of School, School of Earth and Environment at The University of Western Australia.

About the author



Gemma is Manager of Research and Strategy for the Committee for Perth and is an Honorary Research Fellow with The University of Western Australia. She is a policy and strategic planning professional with 19 years' experience and has prepared research and strategy reports for the Committee on a contract basis since 2007. During this time she has also worked as a consultant in Australia and New Zealand, undertaking research and strategic planning projects for public and private organisations. She holds an Honours Degree in Urban and Regional Planning from Curtin University and has undertaken studies in Arts and Psychology at The University of Western Australia and Aboriginal Studies at Curtin University.

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