



Influencing children's health: critical windows for intervention

Research highlights

About this research

Healthy behaviours are influenced in many ways and in all contexts of life – at school, work, home and in neighbourhoods. They may be helped or hindered by such things as individual perspectives of parenting practices, ideas about safety, and urban design. This research focuses on understanding the roles of these factors during key life transition periods, such as that between childhood and adolescence and therefore represents critical windows of opportunity for intervention. Better understanding of these influences and how they interact over time will help to identify ways to improve population rates of physical activity, healthy eating and obesity by identifying important levers for policy and programs across a range of sectors.

It is worth noting that the findings in this report are based on studies that can show associations (links) between factors and a child's physical activity or eating behaviour, rather than show causation.

Introduction

In Australia, almost one in four children (23 per cent) are overweight or obese (AIHW 2012). Although the rate of increase in the prevalence of childhood overweight and obesity appears to be slowing, the current figures still represent 430,000 Australian children aged 5–14 years who are at increased risk of short- and longer-term health problems because of their body weight (AIHW 2012). Modelling estimates that the proportion of overweight and obese Australian children will have increased to one in three by 2025 (ABS 2013).

Children who are obese are more likely than other children to develop asthma, type 2 diabetes, cardiovascular conditions and some cancers. Children who are overweight are more

In this report

- Key childhood transitions
- Family environment
- Built environment
- Neighbourhood food environment
- Facilitating healthy lifestyles

likely than others to carry their excess weight into adulthood (NHMRC 2013a), placing them at increased risk of many life-limiting chronic diseases and conditions (AIHW 2012; NHMRC 2013a). The negative effects of excess body weight in children are not only physical: overweight children may be subject to discrimination and victimisation that can lead to poor relationships, negative school experiences and reduced psychological wellbeing (AIHW 2012).

Key behavioural risk factors for overweight and obesity are evident among Australian children: fruit and vegetable intake is often less than recommended (ABS 2013; Pearson et al. 2011); only one in five are achieving the recommended hour of physical activity every day; and fewer than one in three meet the recommendation for daily screen time limits¹ (ABS 2013). There is also evidence that unhealthy behaviours tend to 'cluster', meaning that heightened risk in individuals is likely to be related to multiple factors such as TV viewing and unhealthy eating habits, or to high levels of sedentary behaviour and lower levels of physical activity (Leech et al. 2014).

KEY TERMS

Active travel Non-motorised travel between destinations, such as walking, cycling, scooting and skateboarding (VicHealth 2014).

Adiposity Overall, the term ‘adiposity’ is used to describe the extent to which an individual is overweight.

BMI, overweight and obesity Body mass index (BMI) is used to indirectly measure overweight and obesity in the population. It is calculated as the ratio of weight in kilograms divided by the square of height in metres (kg/m²). Adults are classified as overweight if their BMI is 25.00–29.99 and obese if it is 30.00 or more. International cut-off points are used to determine overweight and obesity in children, based on their age and gender (AIHW 2012).

In research, BMI-z scores are often used. These describe a child’s BMI with statistical reference to the population average for their age and gender.

Children and adolescents For the purposes of this summary, generally the term ‘children’ refers to those of primary school age, while ‘adolescents’ are those in their secondary schooling years.

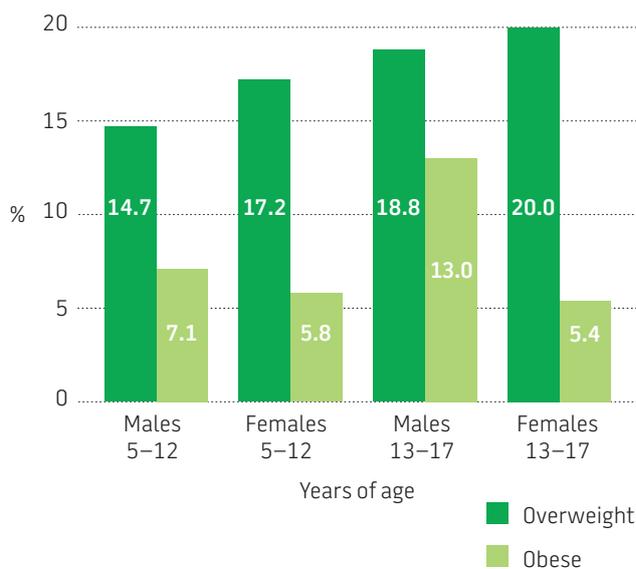
Physical activity Any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen et al. 1985, p. 129).

Screen time Time spent using a screen-based device such as a television, computer or electronic gaming device (ABS 2013).

Sedentary behaviour Sitting or lying down for activities, excluding sleeping (ABS 2013).

Despite these relationships, the number and complexity of the factors affecting children’s body weight present significant challenges to reversing the current trends. Genetics, individual behaviour, family influence, neighbourhood environments, socioeconomic status and other factors all play a role. They influence children’s patterns of physical activity, their sedentary behaviours, eating habits, body weight, and ultimately their current and future health and wellbeing.

Figure 1. Overweight and obesity in Australian children by age group 2007–08



Note: Based on measured height and weight.

Source: Australian Institute of Health and Welfare analysis of the ABS 2007–08 National Health Survey (AIHW 2015)

Setting the course: predictors of health ‘track’ over time

Longitudinal trends have highlighted the importance of establishing healthy lifestyle habits and healthy weight early in childhood: overweight and in particular obesity can become ‘more entrenched and possibly less reversible by the middle-school years’ (AIHW 2012). Eating patterns, physical activity levels and TV viewing habits, as well as body mass index (BMI), have been shown to ‘track’ within individual children and adolescents over time (Carver et al. 2011; Pearson et al. 2011). This means that while Australian children are, as a group, becoming heavier, those who are in the heaviest categories at a young age are likely to remain in those categories, and those with the least healthy lifestyle habits (in terms of physical activity and healthy eating) are likely to maintain them. These trends suggest that targeted interventions may be required to ‘derail’ unhealthy lifestyle patterns, particularly among those most at risk.

Key childhood transitions and opportunities for intervention

Important childhood transitions can present challenges to – and opportunities for – maintaining healthy lifestyle habits. Research indicates that the transition from primary to secondary-school is associated with significant decreases in physical activity levels during lunch and recess (Ridgers et al. 2012), outside school hours (Arundell et al. 2013; Cleland et al. 2011), on weekends (Carver et al. 2011; Cleland et al. 2011) and overall (Ball et al. 2009).

The transition from primary to secondary schooling is associated with significant decreases in physical activity levels during lunch and recess, outside school hours, and on weekends.

While it has been suggested that sport accounts for 45% of children's activity-related energy use (Active Healthy Kids Australia 2014), statistics show that children's involvement in organised out-of-school sporting activities declines from 66% among those aged 9–11 years to 60% among those aged 12–14 years (ABS 2012). Not surprisingly, increases in children's BMI-for-age (z-score) and the proportion of children classified as overweight or obese have been noted over the same transitional period (MacFarlane et al. 2009; Timperio et al. 2008a, 2010). Another indicator of physical activity levels, time spent outdoors during the warmer months, also tends to decrease and is associated with higher rates of obesity in children aged 5–6 and 10–12 years (Cleland et al. 2008).

Children spend a significant proportion of their time at school, so it is likely to be an important setting in which to tackle the physical activity declines noted in the primary–secondary school transition. Schools may be able to improve students' physical activity levels by providing activity opportunities in break times, and providing or encouraging students to bring their own sporting equipment (Ridgers et al. 2013).

However, while overall physical activity levels decline as children move into adolescence, active travel increases (Carver et al. 2011) and children are given greater 'mobility licences' – for example permission to travel home from school, cross or cycle along main roads and go out after dark alone (Carver 2011). These factors represent a significant health promotion opportunity to utilise research findings to optimise family and neighbourhood environments for active travel.

The influence of the family environment

Unsurprisingly, the family environment and parental behaviours have long been considered vital factors influencing healthy eating and physical activity patterns in children. While parental behaviour modelling is associated with a range of positive health behaviours, these do not always match the specific behaviour modelled, highlighting the complex interplay between the family environment and lifestyle behaviours.

Parental behaviour modelling is associated with a range of positive health behaviours.

For example, children whose parents eat breakfast, and girls whose parents report high physical activity modelling behaviours, are more likely to consume fruit and vegetables at least five times a day² (Pearson et al. 2009). Among boys in particular, greater involvement in food planning and preparation, and eating family meals together, has been associated with a healthy eating pattern, although these associations may not persist over time (Leech et al. 2014). The same study showed that regular consumption of family dinners may also reduce the likelihood of boys having a more 'energy-dense' eating pattern (i.e. high consumption of foods with high kilojoule content such as sweet or high fat foods and sugar-sweetened beverages) that may contribute to overweight in the long term (ABS 2014).

Behaviour modelling is also important in determining physical activity levels. For both boys and girls, high physical activity modelling by parents has been associated with a combined pattern of high physical activity and high fruit and vegetable intake (Pearson et al. 2009). In addition to parental modelling, parents' co-participation in activities, having active siblings, logistical support (e.g. travel), financial support (e.g. payment for children's involvement in activities and purchase of equipment) and encouragement and reinforcement of active behaviours all correlate with childhood activity levels and BMI (Cleland et al. 2011; Crawford et al. 2010; Pearson et al. 2009; Timperio et al. 2013). For children living in socioeconomically disadvantaged areas, maternal support for physical activity has been found specifically to correlate with lower BMI (Crawford et al. 2012).

¹ Australian Physical Activity and Sedentary Behaviour Guidelines suggest no more than two hours of screen-based entertainment per day for children aged 5–12 years (Department of Health 2014).

Over-use of electronic media continues to be associated with negative health consequences for children, with screen time in excess of recommended limits (two hours a day) associated with overweight or obesity, increased risk of the precursors to cardiovascular disease and negative effects on academic performance and social skills. Importantly, these consequences persist even among children who meet physical activity (but not screen time) recommendations (ACHPER Victorian Branch 2013). Among Victorian families, more frequent eating of dinner in front of the TV has been associated with overweight/obesity in 10–12 year-olds (MacFarlane et al. 2009) and, for those living in socioeconomically disadvantaged communities, placing a TV in a child’s room and using TV as a reward have been associated with higher adiposity levels (Crawford et al. 2010).

Over-use of electronic media continues to be associated with negative health consequences for children.

Again, behaviour modelling appears to be important in determining children’s screen time, and children in families without household rules limiting screen time have higher electronic media use (Downing et al. 2014; Granich et al. 2011; Te Velde et al. 2011). While many parents are concerned about their children’s TV viewing, the use of parenting strategies that seem inconsistent with these concerns (e.g. allowing children to eat in front of the TV or using screen time as a reward for good behaviour) is evident and these are likely to be counter-productive to the aim of reducing screen time (Pearson et al. 2011).

Optimising the built environment

Beyond the family and home environment, neighbourhoods are important influences on children’s current and future health and wellbeing, either facilitating or acting as a barrier to physical activity, active travel (e.g. walking or bike-riding to destinations) and healthy eating habits.

Elements of route safety and connectivity appear to be key factors in neighbourhood design that are likely to contribute to greater use of active travel, increased activity levels overall, and reduced adiposity. Road safety features such as pedestrian and traffic lights, slow points and speed humps, and lower-speed local roads, are all conducive to physical activity among youths (Carver et al. 2008, 2010). In terms of route connectivity, areas with a higher density of four-way intersections was associated with greater decreases in BMI-z scores (see ‘key terms’) over three years among children in early primary school (Timperio et al. 2010).

Features of connectivity are important elements for facilitating physical activity.

These neighbourhood elements that are either positively or negatively associated with active travel for children have been identified and are summarised in Figure 2, although research suggests differences in facilitating factors according to gender and age (Carver et al. 2008).

Figure 2. Active travel to school: conducive and non-conductive elements

Non-conductive	Conductive
→ greater distance to school	→ proximity to school
→ having to cross a busy road	→ safe routes
→ high traffic volume	→ social networks
→ insufficient traffic lights/pedestrian crossings	→ high street connectivity
	→ low traffic volume
	→ pedestrian lights/crossings
	→ walking tracks

Source: Carver et al. 2008; Giles-Corti et al. 2011; Hume et al. 2009; Timperio et al. 2006; Trapp et al. 2011, 2012.

Access to, and parental satisfaction with, local public open space is also associated with less screen time among 8–9 year-olds (Veitch et al. 2011), although particular features of these open spaces (e.g. presence of playgrounds; recreational facilities such as ovals and water features) have mixed and inconsistent associations with children’s and adolescents’ physical activity levels (Timperio et al. 2008b).

The neighbourhood food environment

Another emerging aspect of research into community environments and their effect on healthy weight is the local ‘food environment’. In Australian research, greater availability of fast food and convenience stores within 800 metres of a child’s home was associated with lower odds of the child meeting fruit consumption recommendations. The presence of a convenience store within 800 metres was associated with a decreased chance of meeting vegetable consumption recommendations (Timperio et al. 2008c). Although more frequent consumption of fast food at home is associated with a greater risk of overweight in children (MacFarlane et al. 2009), related research found no relationship between its availability either close to home or on the way to school and children’s consumption of these foods (Timperio et al. 2009), or levels of overweight and obesity among children or their parents (Crawford et al. 2008).

² Australian Dietary Guidelines recommend 4.5–5.5 serves of vegetables and 1.5–2 serves of fruit daily for children aged 4–18 years (NHMRC 2013b).

Family and neighbourhood environments interacting to facilitate healthy lifestyles

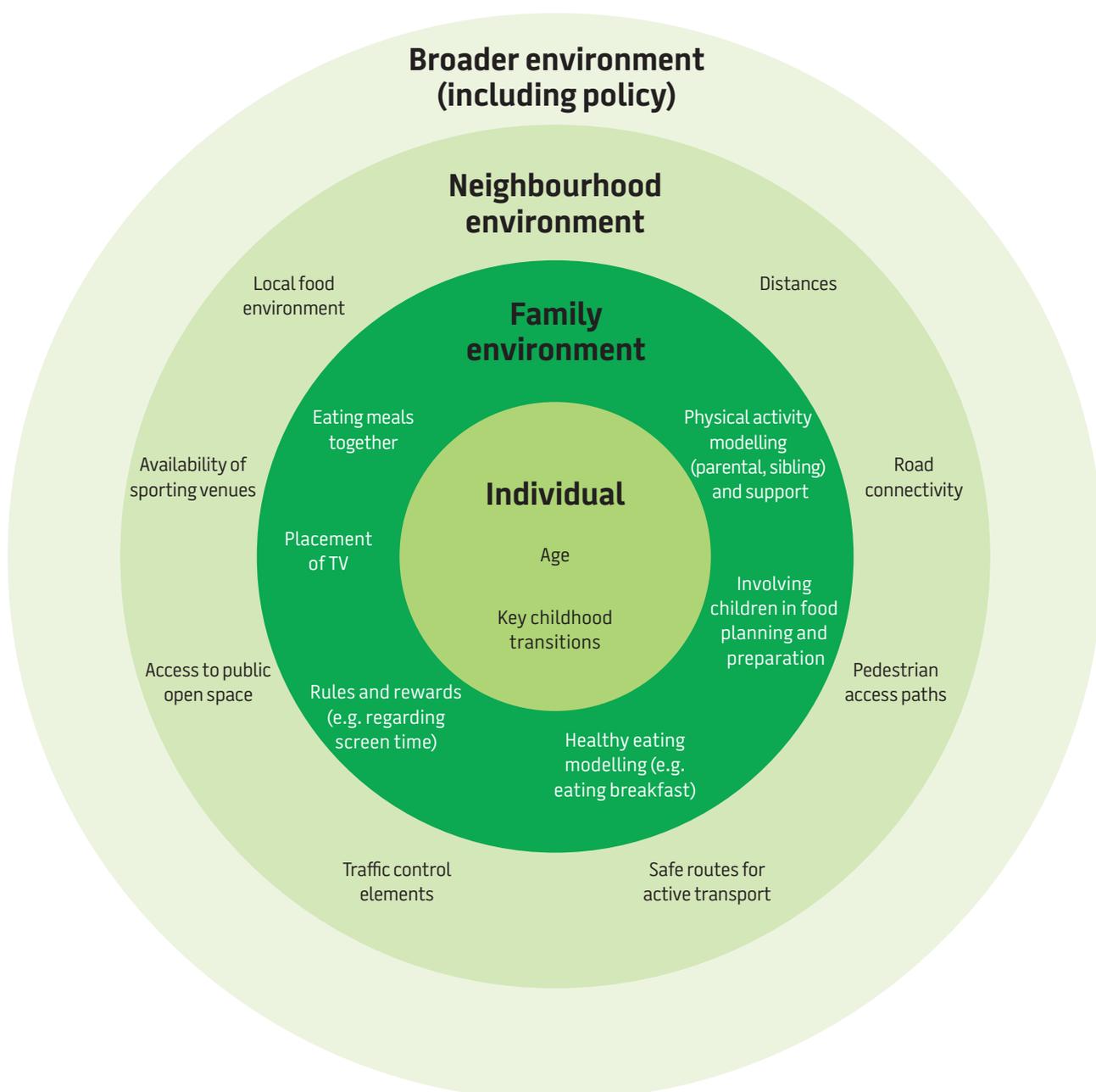
Family and local built environments are important influences on children’s and adolescents’ eating patterns, physical activity levels and weight, but the complex interplays between them should also be considered to optimise opportunities for improving children’s health.

While elements of the family environment appear to be most important in determining children’s physical activity levels (Crawford et al. 2008), the built neighbourhood environment

appears to affect the strength of these associations. That is, the neighbourhood environment provides the conditions within which families operate to influence physical activity levels (see Figure 3). For example, while parental participation in physical activity correlates with children’s physical activity among those living in an area that has many sporting venues, this association is not apparent among those who believe their area has few sporting venues (D’Haese et al. 2013).

The complexities of these interactions highlight the importance of comprehensive, multi-sectoral strategies for optimising interventions (and, ultimately, health outcomes) across communities to reduce the burden associated with childhood overweight and obesity.

Figure 3: Family and neighbourhood environments: influences and interplay



Conclusion

Due to the ever-increasing recognition of the importance of physical activity, healthy eating and healthy weight in the health of Australian children and communities, the body of evidence describing the roles of family and neighbourhood influences in shaping children's health and wellbeing is burgeoning. However, the complexities of the interactions between these environments and other factors at play during key childhood transitions remain significant challenges in optimising the weight, physical activity, eating patterns, health and wellbeing of Australian children and adolescents.

Identifying the public health and health promotion challenges associated with these transitions creates an opportunity to effectively support individuals and communities in developing and maintaining healthy lifestyle habits through childhood and adolescence and into adulthood.

Clear opportunities for families, urban planners, policy-makers, education and community sport sectors and other stakeholders can be identified, and some of these are summarised below. In particular, late primary and late secondary-school years (heralding key transition periods) provide 'critical windows' and vital opportunities to intervene to promote and facilitate healthy active lifestyles for all Australian children and adolescents.



Recommendations

- Policy-makers, local government and urban planners
 - Consider children in urban planning and community design to facilitate active travel, e.g. incorporation of pedestrian/traffic lights, road crossing points, play space design, lower-speed roads and streets that are well connected, allowing more direct routes to a range of different destinations
 - Increase access to places and spaces and foster a culture that supports children to be active, e.g. cycling and walking paths, accessible and appropriate sports facilities, accessible parks and open spaces for play, family-focused sports clubs.
- Health and health promotion professionals
 - Understand the critical windows for intervention and tailor programs and/or advice to encourage physical activity and healthy eating at these points
 - Consider the complex interplay between family and neighbourhood environments in intervention design.
- Education sector, schools, teachers
 - Shift time sitting to time spent being active, e.g. standing for part of the lesson; outdoor, active learning as opposed to indoor classroom teaching
 - Provide equipment during lunch and recess breaks to facilitate active choices
 - Promote active travel to and from school from early primary years and reinforce over the primary–secondary-school transition.
- Community sport sector
 - Provide sport options to appeal to different needs, skills, abilities and audiences within a community
 - Consider changes to membership and participation models of club-based sport to allow more social, flexible or casual options
 - Allow flexibility when scheduling junior sport programs and competitions and consider the length of seasons or programs to better meet the time constraints of children and families
 - Consider ways that junior sport programs can maximise children's participation and activity levels during play, enhance their skill development and enjoyment, and support ongoing participation
 - Improve quality and accessibility of sports facilities
 - Explore opportunities for casual use of sporting facilities by community members, e.g. swimming pools.

- Parents
 - Keep TVs and other electronic entertainment devices in communal family areas rather than in children's bedrooms
 - Turn the TV off before family dinners
 - Eat family meals together daily
 - Facilitate activity, e.g. keeping sporting equipment near the back door rather than packed away in cupboards
 - Use active travel whenever possible, e.g. short trips to buy milk, walking to school
 - Introduce rules regarding children's screen time, e.g. not during meals, TV-free times
 - Use rewards other than unhealthy foods or screen-based entertainment to promote good behaviour
 - Model healthy lifestyle behaviours and support children's physical activity
 - Eat breakfast as the research shows children are more likely to eat the recommended amounts of fruit and vegetable if their parents eat breakfast
 - Involve children in providing family meals including meal planning, shopping and food preparation
 - Support children's independent play and travel; encourage children to have unstructured physical activity and play alongside organised physical activity and sport
 - Encourage children to choose a physical activity they enjoy.
- Future research
 - Investigate changes in lifestyle behaviours over other important life transitions, e.g. transition into primary-school and out of secondary-school
 - Use cutting-edge technologies (e.g. inclinometers, wearable GPS devices) to objectively measure physical activity and sedentary behaviour, how these behaviours are accumulated and where they occur
 - Establish the contribution of sport to overall physical activity and health outcomes among children and adolescents
 - Consider the complexity of built environment characteristics that influence behaviour, e.g. examine different combinations of neighbourhood features and how different built environment characteristics interact to influence behaviour
 - Further examine the inter-relationships between family and neighbourhood influences on health behaviours among children and adolescents
 - Develop and evaluate interventions, e.g. interventions that engage families to change the family environment and/or parenting approaches around physical activity and sedentary behaviour and that promote active travel; interventions to maintain physical activity over key transition periods
 - Test/trial strategies to reduce prolonged sitting time in key settings (e.g. schools, transportation, home)
 - Harness opportunities to evaluate the impact of changes to the built environment on physical activity and other health behaviours, e.g. natural experiment studies.

**Associate Professor Anna Timperio,
Centre for Physical Activity and Nutrition Research
(C-PAN), Deakin University**

VicHealth Public Health Research Fellow, 2005–13

This summary is based on the work of Associate Professor Anna Timperio, whose research is concerned with understanding the broad range of contextual influences on physical activity, eating and overweight in children and adolescence.

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Associate Professor Timperio currently holds a National Heart Foundation of Australia Future Leader Fellowship.

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Victorian Health Promotion Foundation
PO Box 154 Carlton South
Victoria 3053 Australia
T +61 3 9667 1333 F +61 3 9667 1375

vichealth@vichealth.vic.gov.au
vichealth.vic.gov.au
twitter.com/vichealth
facebook.com/vichealth

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