The first thousand days: A case for investment

Strong Foundations collaboration | April 2019

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ARACY

Bupa Health & Care

Bupa Health Foundation

murdoch children's research institute

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Foreword

Bringing evidence and economics together to solve problems faced by young Australians

This paper, and the work of the Strong Foundations: Getting it Right in the First Thousand Days partnership in general, is designed to bring a new level of rigour to policy setting and investments in Australia's children and young people, most particularly, by focusing not just on effectiveness for the child, but value for the community as a whole.

There are many challenges faced by Australians of all ages, including our children. Some, for example, those with disability, those living in jobless homes and Aboriginal and Torres Strait Islander children, face additional, deep and persistent challenges. Our research tells us many of these obstacles will negatively impact the child for the rest of their lives and that investment is needed now to address this.

As such, there are many urgent calls upon government and upon the taxpayer. There are also many solutions being put forward as to how to help ensure more young Australians get the opportunities they need to reach their potential and live happy, productive lives.

On behalf of every community, its government must therefore constantly struggle with the age-old problem of applying limited resources to unlimited problems and doing so via the most effective means.

This paper seeks to make this challenge less daunting by providing examples of investments that research shows have a positive impact on children and which economics tells us will provide a return to our community into the future.

This paper sets out the costs to the community, the family and the child of living in unstable housing and smoking during pregnancy. It applies research that shows us that when these issues are addressed there is a positive impact for the child today, and throughout life. Finally, it provides robust economic modelling that assures the taxpayer, and therefore the government of the day, that money invested in effectively addressing these issues is a wise investment in our community, by our community.

Although in this paper we take this approach to just two factors influencing childhood wellbeing, it will be the template for further work by our partnership and we hope, help inform the work of other organisations seeking to better the lives and prospects of Australia's children.

Strong Foundations collaboration

Strong Foundations collaboration

The **Strong Foundations: Getting it Right in the First Thousand Days** (Strong Foundations) initiative is a collaboration between:

- PricewaterhouseCoopers Consulting (Australia) (PwC)
- Australian Research Alliance for Children and Youth (ARACY)
- Bupa Australia
- Bupa Health Foundation
- Centre for Community Child Health at the Murdoch Children's Research Institute (MCRI).

The *first thousand days* refers to the period from conception to age two. While early years experts have long been aware that this is an important developmental period, new research has started to uncover some of the mysteries surrounding the processes by which genes, experiences and environments interact to influence development at this time. These discoveries have increased experts' views of the significance of this earliest period of development, and the need to reform policies, practices and systems in response to the evidence.

In this context, the **Strong Foundations** initiative was formed to:

- **raise policymaker awareness** of the importance of the *first thousand days*, making the *first thousand days* a key issue for all levels of government, and ensuring that policies and investments are based on the best available evidence.
- **raise public awareness** of the *first thousand days* to influence support for required policy and practice changes, as well as to inform and support caregiving and parenting practices.
- **create a united, evidence-based narrative** about the importance of the *first thousand days* across the early years sector, including within practitioner and community groups, to help shift the dial on public and policy discourse and create a movement to effect action.

The collaboration brings together extensive research, policy and practice expertise, with each organisation providing unique skills and resources. The multi-sector nature of the collaboration is symbolic of the need for a whole-of-society effort to improve outcomes for young Australians.

The *first thousand days* refers to the period from conception to age two.

This report follows on from previous work to support these aims. Most notably, led by the MCRI, the Strong Foundations collaboration published a technical paper, *The First Thousand Days – An Evidence Paper,* that incorporates the latest evidence about the importance of the *first thousand days*. The report outlines the nature and significance of development during pregnancy and infancy, the ways in which experiences during the *first thousand days* shape development, and the long-term consequences of these experiences for health, wellbeing, learning and development throughout the life course. The collaboration also published a summary of the evidence paper to increase access to the information across a wide range of audiences.

This report builds on the evidence base by presenting an economic analysis of improved early childhood outcomes for two scenarios which illustrate the potential benefits to society of investing in this crucial developmental period.

Project partners

PricewaterhouseCoopers Consulting (Australia) (PwC)

PwC Consulting is part of Australia's largest professional services firm, PricewaterhouseCoopers Australia. We bring the power of a global network of firms to help Australian businesses, not-for-profit organisations and governments assess their performance and improve the way they work.

PwC's people come from a diverse range of academic backgrounds, including arts, business, accounting, tax, economics, engineering, finance, health and law. From improving the structure of the Australian service system, to performing due diligence on some of Australia's largest deals, and working side-by-side with entrepreneurs and high-net-worth individuals, PwC's teams bring a unique combination of knowledge and passion to address the challenges and opportunities that face our community.

PwC has a deep commitment to improving early childhood and education outcomes in Australia, working alongside governments, academics, not-for-profits and providers in the sector. It combines broader government policy and early childhood development knowledge, along with proven techniques to undertake targeted reviews and analysis. PwC continues to engage publicly on the debate in education through our thought leadership including *Putting a value on early childhood education* (early childhood reform), and *Breaking down the walls* (schools infrastructure reform).

Australian Research Alliance for Children and Youth (ARACY)

The Australian Research Alliance for Children and Youth (ARACY) is a research and results focused, apolitical organisation. It works with government, researchers and those providing services to children and their families.

ARACY's aim is to help children achieve a better life by focusing on heading off problems before they arise.

ARACY is unique in making the link between all areas of wellbeing for young Australians. It also makes the link between all areas of government, policymaking, research and service delivery to address the issues young Australians face.

Bupa Australia

Bupa in Australia and New Zealand are part of the Bupa Group, a leading international healthcare organisation that draws upon our international knowledge and expertise to provide health and care services.

Bupa has more than 84,000 employees around the world who share the common purpose of helping people live longer, healthier, happier lives.

Its global presence has allowed Bupa in Australia and New Zealand to draw on its international expertise and experience to provide people with better healthcare services, support and advice.

Bupa Health Foundation

The Bupa Health Foundation is one of the leading charitable foundations dedicated to health in Australia. It is committed to improving the health of the Australian community and ensuring the sustainability of affordable healthcare.

The Bupa Health Foundation's vision is to have enduring strategic partnerships with the research community to address the health needs of the Australian community, and deliver on its purpose to help people live longer, healthier, happier lives.

Since 2005 it has invested more than $32 million in over 130 partnerships across the country and remains committed to contributing to a strong economy by helping promote and ensure better health for all Australians.

Centre for Community Child Health at the Murdoch Children's Research Institute (MCRI)

The Centre for Community Child Health at the Murdoch Children's Research Institute (MCRI) is an international leader in early childhood development.

The Centre works with families, communities and governments to advance equitable health and developmental outcomes for all children, using evidence to understand and address the myriad of factors that influence children's development.

The Centre develops innovative solutions that make a measurable difference to children and families. Our work involves discovery, learning, testing and trialing, educating and influencing policy.

With the Centre for Community Child Health extending MCRI's reach into the community, and with The Royal Children's Hospital and the University of Melbourne as campus partners, MCRI is the only institution in Australia that truly works at the nexus of academic research, clinical practice and the real world.

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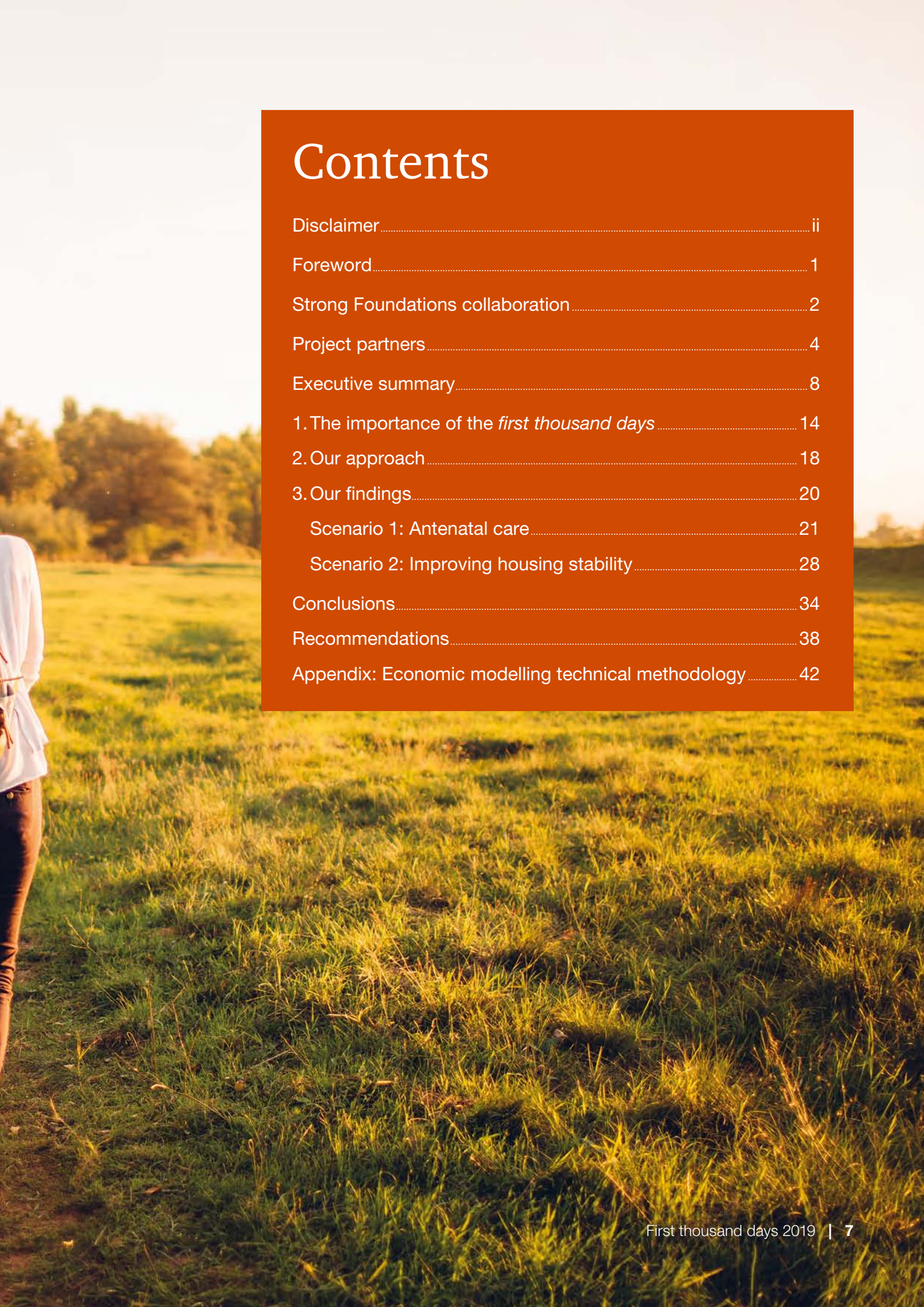


Executive summary

The *first thousand days* refers to the earliest stage of human development, from conception to the end of a child's second year. This is a period of maximum developmental plasticity, when the foundations of optimum health, growth, and neurodevelopment across the lifespan are established.

While people have recognised the importance of childhood experiences on adult life for a long time, it is only recently that research has revealed the significance of this very early period. New research is rapidly advancing our understanding of the biological processes and environmental characteristics that shape development during this time, and the significance of this period for future health, wellbeing, learning and development outcomes.

Despite this growing focus, the Australian public's understanding of the significance of the *first thousand days* is limited, and the policy response to date has not been in line with the weight of the evidence. While there are many examples of policies, programs and initiatives focusing on early childhood, with more than one in five Australian children considered developmentally vulnerable when they enter kindergarten, it is clear there is still work to be done to give all Australian children the best possible start in life.[1] Targeting this earlier period of development, the *first thousand days*, may be more effective in influencing not only child development, but lifelong outcomes. The authors of this report founded the Strong Foundations collaboration with the aim of raising awareness of the importance of this period and of the urgent need to reform our policies, practices and systems in response to the evidence.

Background context: *The First Thousand Days – An Evidence Paper*

The Strong Foundations Collaboration report, *The First Thousand Days – An Evidence Paper,* led by the Murdoch Children's Research Institute, provided a comprehensive summary of the evidence for the significance of the *first thousand days*, summarising the latest research on the impact of early experiences on all aspects of development and functioning, including health and wellbeing, mental health, social functioning and cognitive development. It also highlighted our growing understanding of how pathways that originate in early childhood contribute to challenges faced by adults, such as mental health issues, obesity, heart disease, criminality, and poor literacy and numeracy.[2]

Key findings from the evidence paper include:

1. The foetus uses cues provided by his or her mother's physical and mental states to 'predict' the kind of world into which he or she will be born and adapts accordingly. This adaptation can be either beneficial or detrimental, depending on the child's relationships and environments.
2. Generations can pass down disadvantage at a cellular level. Our biology changes in response to stress, poverty and other prolonged adverse experiences, and grandparents and parents can pass on these changes to children.
3. When children do not feel safe, calm or protected, the child's brain places an emphasis on developing neuronal pathways that are associated with survival, before those that are essential to future learning and growth.
4. In addition to loving caregivers, children need safe communities, secure housing, access to green parklands, environments free from toxins, and access to affordable, nutritious foods. Many of these needs are beyond the control of individual families. This means children can only develop as well as their families, community and our broader society enable them to.
5. Not all changes that occur within the *first thousand days* are permanent. However, as children grow, it becomes more difficult for them to compensate for negative experiences and environments that occurred in the early years.

The aim of this report

Following the report, *The First Thousand Days – An Evidence Paper,* the Strong Foundations collaboration elected to explore the impacts of the *first thousand days* on life outcomes, including how experiences in the *first thousand days* can influence major public health problems such as obesity, heart disease, and mental health problems, and broader social issues such as criminality, problems in literacy and numeracy, and economic participation.

Our aim is to draw attention to the need to shift the dial in policies, programs and initiatives to target this earlier developmental phase. This report highlights that the timing of interventions is key to improving child outcomes. We present two scenarios that illustrate the impact that experiences during the *first thousand days* can have over a life span, and use economic modelling to illustrate the potential benefits to society of improving these outcomes.

Our approach

Using the evidence presented in the report, *The First Thousand Days – An Evidence Paper,* we identified approximately 50 outcomes to explore. Through discussions with the Strong Foundations working group, supplemented by discussions with subject matter experts where appropriate, we assessed each outcome against key criteria to narrow our focus. We concentrated on areas for which there is enough data to conduct analysis and create a credible model based on quantitative estimates, where new evidence can be provided to enhance our appreciation of the impact of this early period, and where changes in policies, programs and interventions could have a significant impact on improving life outcomes.

Using these selection criteria, we chose antenatal care and housing stability as outcomes for modelling. The goal of modelling these outcomes is to demonstrate that improving access, quality, integration, and targeting of the service system for families and children could yield great benefits to individuals, families, communities, and the economy more broadly.

We chose **antenatal care** because it occurs during the very early period of development pre-birth and has the capacity to influence a wide range of highly influential factors at this time. Within this, we modelled the scenario of reducing the prevalence of smoking amongst pregnant women as a tangible example of the potential benefits of targeting this early period to affect change and the significant positive outcomes this could have for individuals and society.

We looked at **housing stability** because it has an influence throughout the *first thousand days* and into early childhood. We note the connections with parental stress caused by financial and housing instability, and the benefits of access to quality services and a strong sense of community that stable, quality housing affords. To estimate the potential benefits of housing stability, we modelled the economic gains shown in the research to result from home ownership. Importantly however, we do not advocate for home ownership as the solution to improve outcomes, but as a proxy to highlight the opportunity to provide greater stability for children within their *first thousand days*. Whether home ownership is beneficial over and above stable housing in the form of long term leasing for example, merits further investigation.

As the government has not yet developed actual programs that could improve these outcomes, the economic modelling does not consider their costs as part of a cost benefit analysis. However, the results of the economic analysis are important to guide potential funding for these programs.

Key findings

These specific scenarios relate to broader themes and research about the impact of experiences in the *first thousand days* and highlight the potential impact that policies, programs and initiatives targeting this very early developmental stage could have. In particular, they underscore the important role antenatal care and strong community networks play in screening for risk factors and improving outcomes.

We explored the connections between the impact of antenatal smoking and housing instability on life outcomes through the flow on effects on health, education, criminality and economic participation. A detailed explanation of how we arrived at the figures below and a breakdown of the costs is provided in the *Our Findings* section.

Scenario 1: Reducing the prevalence of smoking amongst pregnant women

In Australia, around **10%** of mothers smoke while pregnant, meaning that smoking affects **31,110** children in the antenatal period per year.

The annual potential benefit of all pregnant mothers ceasing smoking is close to **$1billion**.*

For each woman who stops smoking during pregnancy, an estimated saving of **$29,000** is projected over her child's lifetime.*

- **50%** of this total is due to a reduction in obesity costs
- **35%** as a result of increased earnings
- **15%** accounts for a reduced likelihood of smoking as an adult

* Nominal lifetime value

Scenario 2: Improving housing stability

In Australia, an estimated **27%** of families with dependent children rent their home. Based on this, an estimated **84,000** children are born into a rented home each year.

Based on the available evidence, we modelled the economic gains that result from home ownership, and used these to consider the potential benefits that stability, housing security and community relationships could provide:

- Growing up in a home owned by his or her parents or primary caregiver leads to societal benefits of approximately **$36,000** over the lifetime of that child.*
- **94%** is due to an increase in earnings as an adult.
- If every Australian child grew up in a home that his or her parent owned, the annual potential economic benefit would be nearly **$3 billion**.*

* Nominal lifetime value

Recommendations and next steps

The clinical guidelines for antenatal care published by the UK National Collaborating Centre for Women's and Children's Health state that ten antenatal care visits should be adequate for most first-time mothers, and fewer are required on subsequent births.[3] Systematic reviews of trials have found that a moderate reduction in the number of visits did not lead to any worsening of biological outcomes. Uptake of antenatal care is generally high already in Australia with over 99 per cent of women having at least one visit, and 57 per cent having 10 or more. However, 31 per cent of mothers did not have an antenatal visit in the first trimester, and families that experience adversity and live in disadvantaged or remote areas are less likely to access antenatal care, particularly in that period.[4, 5] Potential gains could be made by providing a more seamless, connected experience of antenatal care that focuses on the relationship between expectant parents and care providers, as well as combating barriers that prevent more marginalized families from accessing available services.

Stable housing enables expectant parents to experience better, connected antenatal care, as well as a stronger sense of community overall. Experiencing social support during pregnancy reduces the likelihood of maternal stress, depression and risk taking behaviours during and after pregnancy.[6] Supports that provide stability for families during pregnancy and the early years could alleviate stress, offer the stability needed to build strong social support networks, and enable parents to benefit from a more connected experience of antenatal care.

We acknowledge that governments are currently working to improve early childhood outcomes; therefore, we present suggestions for how we can improve on policies, programs and initiatives to do what we are doing now, but better. Our recommendations include:

- A **holistic approach that focuses on the whole child,** rather than on specific aspects of an individual's health, wellbeing, learning and development.
- **Better integrated policies, programs and services aimed at the *first thousand days*** and early childhood more broadly to provide a streamlined and connected approach.
- Supporting the development of **better, stronger relationships between parents and antenatal care providers** by creating a more connected experience of antenatal care, services and programs.
- Ensuring the service system provides a **universal platform of support for parents, children and families** in acknowledgement of the critical importance of the *first thousand days*, with more **targeted and tailored supports** designed and provided to parents, children and families with greater or more complex needs.
- Supporting the establishment and **strengthening of community relationships and safe, nurturing environments,** recognising the influence that community and the environment has on early development.
- Using **Australian and international evidence to inform policies and initiatives** wherever possible. To help build the evidence base, policymakers should conduct **independent evaluations** to assess the implementation and outcomes of policies and initiatives.
- **Long-term funding** to support new services and programs **that provides sufficient time to implement, optimise and evaluate** objectively their effectiveness and efficiency in improving outcomes for children and families.

We see the key next steps to achieving these outcomes as being:

- **Raising awareness of the importance the first thousand days** in terms of the impact this time has on lifelong health, wellbeing, learning and development outcomes.
- **Change the environment** by investing in the environmental determinants of health and disease, which will avoid the need for later expenditures to address inequalities.
- **Improve and target services** to the earliest stages of childhood and conception, and on programs that target the most impactful interventions.
- **Further research to map current investments and gauge their success,** to ensure that we understand what is currently happening, what currently works and whether innovative ideas could work in future.

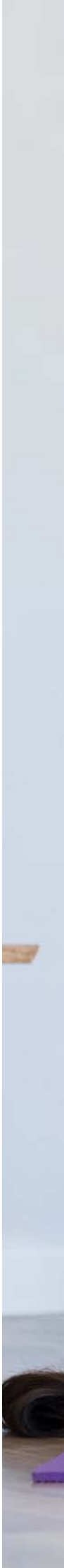
The importance of the *first thousand days*

More than one in five children in Australia is considered developmentally vulnerable at the time they enter kindergarten.[7] This means at a very early stage they are falling behind their peers in at least one of the AEDC's five key domains of early childhood development: physical health and wellbeing, social competence, emotional maturity, language and cognitive skills, and communication and general knowledge. Moreover, research suggests that when children start school on the back foot, they usually don't catch up – they fall further behind, and the impact of this is not limited to childhood. It can have an impact on outcomes over a lifetime.

The previous report by the Strong Foundations collaboration, *The First Thousand Days – An Evidence Paper,* led by MCRI, summarised new research and made the case for considering the significance of this earliest period of development, from conception to age two, on outcomes into adulthood, highlighting that there are multiple influences on children's development at the level of the individual child, the family the community, and broader society.

Early childhood more broadly has long been recognised as a critical period for shaping health and wellbeing outcomes in adult life. As a result, there are many examples of existing policies, programs and initiatives focusing on early childhood, from both Federal and State governments, as well as other organisations and research institutes across Australia. Some examples include:

- **Government investment in frameworks and reforms** such as the National Early Childhood Development Strategy, the Roadmap for Reform in Victoria,[8] the Maternity and Neonatal Service Capability Framework in New South Wales,[9] and place-based approaches to child and family services.[10]
- **Targeted programs and initiatives** such as the Minderoo Foundation and the Telethon Kids Institute working together as CoLab partnering with Government to improve development outcomes for children from conception to age four in Western Australia,[11] and the right@ home initiative based on the Maternal Early Child Sustained Home Visiting (MECSH) program, where parents receive 25 home visits by a specially trained MCH nurse from pregnancy to age two, further supported by a social worker.[12] There is also a collaboration between MCRI, Bain & Company and Social Ventures Australia, Restacking the Odds, which uses a combination of data-driven, evidence-based approaches to develop measurable best practice indicators of quality, quantity and participation in five key interventions in early childhood: antenatal care; sustained nurse home visiting; early childhood education and care; parenting programs; and the early years of school.[13]



- **Research and recommendations** such as the E4Kids study of over 2,600 children from Victoria and Queensland investigating the impact of participation in long day care, family day care and kindergarten on children's learning, development and social inclusion,[14] and the development of the NEST action agenda to improve the wellbeing of Australia's children and youth, led by ARACY in partnership with the Bupa Health Foundation.[15]

However, as the statistics on AEDC domains show, there is still work to be done to give all Australian children the best possible start in life. While there are many programs and initiatives in place, the responses are fragmented and there are disparities in accessibility and quality of services that need to be addressed. For example, we know there are significant benefits of a seamless, connected experience of antenatal care that fosters strong relationships between expectant parents and care providers, and in which information is shared between healthcare practitioners and social workers effectively. This was presented in the WHO's 2016 recommendations on antenatal care for a positive pregnancy experience which prioritised person-centred healthcare, well-being of women and families, and positive perinatal and maternal outcomes.[16] However there is still considerable work to be done to achieve this experience for everyone.

Furthermore, as recent research on the *first thousand days* highlights, targeting this earlier period may be more effective in influencing not only child development, but also lifelong outcomes. New research has revealed whole aspects of biological functioning that were not previously recognised as playing a role in development, such as telomere effects and the role of the microbiome.[17] It has shown how environmental exposures such as stress or undernutrition during critical periods of development can have long-term effects on chronic disease risk by 'programming' organs, tissues, or body system structures or functions. Adult conditions such as coronary heart disease, stroke, diabetes, and cancer that once were regarded solely as products of adult behaviour and lifestyles are now seen as being linked to processes and experiences occurring in pregnancy or infancy.

This new knowledge has served to increase experts' views of the significance of this period, and of the urgent need to reform our policies, practices and systems in response to the evidence. Focusing on programs and initiatives that support couples and families prior to conception, during the pregnancy period, and post-birth is a potentially powerful strategy to reduce exposure to risks that compromise a child's cognitive, physical and social development.

In this context, this report explores two scenarios to demonstrate the scale of potential benefits to the individual and society of policies, programs and initiatives focused on improving outcomes in the *first thousand days.*

Our approach

We selected two scenarios to demonstrate the impact that policies, programs and initiatives targeting the *first thousand days* can have on improving outcomes. We use these scenarios as case studies to represent the broader impacts of intervening in the *first thousand days*, to illustrate the links between experiences in this early period of development and the impact on long-term life outcomes, and to give an indication of the scale of potential benefits to society of improving outcomes over the lifespan.

We developed a model for each scenario to illustrate the impact that interventions in the *first thousand days* can have on lifetime outcomes. In this context, the two outcomes we selected to model are:

- **Antenatal care,** using the scenario of **reducing the prevalence of smoking amongst pregnant women.**
- **Housing stability,** using the scenario of **home ownership** as a proxy for stability based on the availability of evidence.

We chose these outcomes after lengthy consideration, following the process outlined below.

Scenario selection

The aim of this exercise was to focus on areas where:

- there is enough data to conduct analysis and create a credible model based on quantitative estimates.
- new evidence can be provided to enhance our appreciation of the impact of this early period.
- changes in policies, programs and interventions could have a significant impact on improving life outcomes.

The criteria we used to review the long list of options were as follows:

	Scoring		
Criteria	1	2	3
Magnitude	0-10 per cent or unknown	10-20 per cent	>20 per cent
Data	Not collected	Collected, but not regularly	Collected regularly and nationally
Long term implications	No evidence of long term impact	Short-term association (not extending into adulthood)	Long term impacts (into adulthood)
Strength of evidence	Weak	Moderate	Strong
Opportunity for investment	Already a lot of investment – little opportunity	Some investment already, but scope for improvement	Little current investment – significant opportunity

Related to **antenatal care,** we chose to model the economic benefits of **reducing the prevalence of smoking amongst pregnant women** because it clearly stresses the importance of intervening early, including pre-birth, and the far-reaching impact this can have. In this way, this scenario feeds into a broader discussion about the role of antenatal care in screening for risk factors, and providing appropriate support and guidance to expectant parents.

As a proxy for the impact of **housing stability** in the *first thousand days*, we chose to model the effects of **supporting home ownership.** Financial and housing instability have an impact on levels of parental stress, the ability to build a sense of community, and the development of positive relationships between families and care providers. We looked at home ownership specifically, rather than long-term leasing, as there is more evidence that has focused on this. It was hard to draw reliable connections for a credible model for long-term leasing; however, this is an area that merits further investigation. We are not advocating for home ownership as the solution to improve outcomes; instead, we use it as a proxy to highlight the potential benefits of supports to provide stability during this phase.

Modelling approach

The purpose of economic modelling is to highlight the potential economic benefit to Australia from improving outcomes by intervening in the *first thousand days*. Because policymakers have not yet identified programs that could achieve these benefits, the economic modelling does not consider costs as part of a cost benefit analysis. However, the results of the economic analysis are important to guide potential funding for these programs.

We undertook four steps to develop the model for these scenarios.

The modelling uses a conservative approach to estimate the benefits and focuses on areas that are quantifiable and supported by literature: education, employment, justice, and health benefits. In addition, there is a range of qualitative benefits that are difficult to quantify that were out of scope for this analysis.

In conducting the modelling, we used the following key assumptions:

- The affected population lives until 82 years, works from 21 until 67 years, and is at risk of obesity, smoking and criminal activity from 18 years until death.[18]
- All individuals in the target population experience a spectrum of benefits, resulting in one average benefit.
- One year's worth of children were 'treated', i.e. the modelling estimates assume that the scenario only lasts for a year.
- Crime costs are pro-rata reduced (i.e. no accounting for fixed costs of policing) in line with prevalence reductions.

The appendix presents a detailed methodology.

We undertook four steps to develop the model for these scenarios.

Step 1

Reviewed the literature to determine the effects of antenatal smoking and housing instability on the child's future earnings and likelihood of obesity, criminal participation and smoking.

STEP 2

Considered a variety of data sources to identify the potential increases in earnings, and reduction in the costs of obesity, crime and smoking.

STEP 3

Multiplied the effect on earnings, obesity, crime and smoking with the potential gains over the relevant years of life (e.g. from starting work at 21 to retiring at 67 for earnings).

STEP 4

Aggregated effects to the population using data on the number of mothers smoking during pregnancy and children living in rented homes.

Our findings

Many policies, programs and interventions focus on early childhood as a key period for influencing child development and improving life outcomes. However, there are a range of factors experienced in the earlier pre-birth phase that have a significant impact on lifelong health, wellbeing and opportunity. Antenatal care plays a key role in intervening in this period to influence habits and lifestyle factors during pregnancy, which can improve lifetime outcomes of the child.

The effects of smoking during pregnancy is a clear example of the impact experiences during this period from conception to birth can have beyond the health of the baby, extending into adulthood in a number of ways.

Smoking during pregnancy remains an issue in Australia

Although there has been a strong focus on the harmful effects of smoking, which has seen smoking rates decline over the last half century, tobacco use continues to be a daily habit for 14.5 per cent of adults in Australia aged 18 years and over.[19] While the prevalence of smoking varies considerably depending on a range of factors, higher rates are typically reported for more disadvantaged, marginalised or vulnerable groups including people who are unemployed, are sole parents, have a mental health issue, have a substance use problem, are in prison, are experiencing homelessness or are Aboriginal and/or a Torres Strait Islander.[20] Statistics from the Australian Institute of Health and Welfare show one in ten mothers who gave birth in 2016 smoked at some time during their pregnancy, with higher rates of smoking in the first 20 weeks of pregnancy (9.5 per cent) compared with after 20 weeks of pregnancy (7.3 per cent).[21]

Based on these figures, we estimate that antenatal smoking affects approximately **31,110 children** per year born in Australia. The real figure is likely to be higher because underreporting is common in intervention trials, given the social stigma associated with smoking during pregnancy.[22]

Smoking during pregnancy impacts lifelong health, wellbeing and opportunity for the child

It is well known that the mother's habits during pregnancy can influence the development of the child. Nutrition, stress, smoking and alcohol habits all play a role. New research is shedding light on the influence of these factors on life outcomes.

There are a number of harmful effects linked to exposure to toxins from tobacco smoke in this very early period of development, which can have a lasting impact over a lifetime.

Scenario 1: Reducing the prevalence of smoking amongst pregnant women

In Australia, around 10% of mothers smoke while pregnant, meaning that smoking affects 31,110 children in the antenatal period per year.

The annual potential benefit of all pregnant mothers ceasing smoking is close to $1billion.*

For each woman who stops smoking during pregnancy, an estimated saving of $29,000 is projected over her child's lifetime.*

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* Nominal lifetime value

Low birthweight

It is well established that smoking during pregnancy is linked to low birthweight, which increases the risk of longer-term health problems into adulthood. Nicotine causes the blood vessels to narrow, restricting blood flow and reducing the supply of nutrients and oxygen to the foetus.[23] There is growing evidence that smoking during pregnancy affects the normal development of the brain systems that regulate oxygen uptake and heart function, increasing the risk of stillbirth, neonatal death and SIDS, as well as long-term health problems in adulthood.[24]

Studies have linked low birthweight to an increased likelihood of diabetes, heart disease, high blood pressure, intellectual and developmental disabilities, and obesity. These can have a significant impact on the health and educational outcomes of children that endure into adulthood.

While there are other factors that can influence birthweight, pregnant women who smoke are three and a half times more likely to have a small gestational age baby than women who don't smoke.[25] Stopping smoking during pregnancy leads to a 200 gram increase in birthweight, approximately 5.9 per cent increase from the average. This shows that smoking during pregnancy is one of the most preventable factors linked to low birthweight, which reinforces the impact interventions targeting this could have on the health and wellbeing of children and adults.

Obesity

Researchers have identified smoking during pregnancy as a key prenatal influence on the development of childhood obesity.[26] A study looking at the relationship between antenatal smoking and adolescent obesity found that adolescent body mass index and prevalence of overweight and obesity were greater in children whose mothers had smoked during pregnancy than in those whose mothers had never smoked.

The study also found that body mass index and levels of overweight and obesity among adolescent children whose mothers stopped smoking during pregnancy but smoked at other times in the child's life were similar to those among children whose mothers had never smoked. These results were independent of a range of potentially confounding factors and suggest a direct effect of maternal smoking during pregnancy on adolescent overweight and obesity.[27] This serves to underline the importance of the pre-birth period on child development, and the impact changing habits, even for this period alone, can have much later in the child's life.

Education and behavioural outcomes

Studies have found that compared to children of non-smokers, the children of smokers do not perform as well at school, with lower scores in cognitive tests and greater likelihood of behavioural problems, including hyperactivity and shorter attention spans.[28] This can lead to difficulty with reading, mathematics and related skills from an early stage. This is particularly concerning because research suggests that if children fall behind their peers in at least one of five categories of physical health, behaviour, emotions, language and communication before they start school, then they usually fall further behind once at school.

Both direct and indirect pathways link prenatal exposure to nicotine to childhood hyperactivity, aggression and disruptive behaviour problems.[29] As well as influencing education outcomes, behavioural problems can also make it more challenging to participate in the workforce, and increase the likelihood that an individual will be involved in criminality at some point in their lives.

Antenatal smoking encourages adult smoking

Children whose mothers smoked while pregnant are more likely to smoke and become nicotine dependent themselves as adults. During pregnancy, nicotine passes through the placenta and may act directly on the developing foetal brain. Possibly, during a critical prenatal period of brain development, nicotine might modify the dopaminergic system, making the system more susceptible to the effects of nicotine later in life.

These children are also more likely to start smoking as adolescents. Research shows those who start smoking early are more likely to continue smoking, to become daily smokers, to smoke heavily, to remain chronic heavy smokers and to become nicotine dependent. As the health effects of smoking are cumulative and substantial across the life course, identifying the origins of the development of smoking behaviours is of considerable public health importance.

The impacts of passive smoking

Children of mothers who smoked during pregnancy are also at a much higher risk of experiencing many health problems including asthma and respiratory infections. While discussions of harmful effects often focus on the mother's habits during pregnancy, exposure to environmental tobacco smoke during infancy and childhood has been associated with slower rates of growth in lung function and increased risk of asthma, middle ear disease and respiratory disease. Exposure to environmental tobacco smoke or passive smoking may also influence breastfeeding; non-smoking women who experience passive smoking are likely to stop breastfeeding sooner than mothers who do not experience passive smoking. In this respect, interventions looking at this period should not only focus on mother's behaviours, but also on the people and communities around them.

There are significant potential benefits to society of reducing the prevalence of smoking amongst pregnant women

Smoking during pregnancy clearly has a wide-ranging impact on development and longer-term life outcomes. We model these impacts by using benefits that we can quantify, that are supported by literature, and that are linked to potential benefits that can be costed. In particular, we looked at the economic burden of low birthweight births through flow on effects on education outcomes, earnings, and children smoking later in life to illustrate the incentive to support interventions to reduce the prevalence of smoking amongst pregnant women.

We looked at three main outcomes:

- **Reduction in obesity** – as a result of better foetal health
- **Reduction in smoking as an adult** – due to better foetal health
- **Increase in earnings** – due to improved cognitive ability and productivity.

The diagram below shows how these factors could influence the health, wellbeing and opportunity of the child over their lifetime.

Table 1 shows the total benefits for each of these areas for an individual. This shows that for each woman who stops smoking during pregnancy, society benefits by close to $30,000 over her child's lifetime.

Table 1: Individual benefits from antenatal smoking cessation (2018-19 dollars, $)

Individual benefits	Net Present Value (NPV) lifetime	Nominal lifetime
Increase in earnings	$2,142	$10,482
Reduction in obesity	$2,671	$14,675
Reduction in smoking	$1,311	$4,397
Total	**$6,124**	**$29,555**

Note: Net present value (NPV) refers to the value of a sum of money in the present, meaning it has been discounted back using a specified discount rate (in this case, four per cent) based on the type of investment.

We used these to estimate the benefit if all women who smoke during pregnancy in Australia in a given year stopped. This shows that the annual potential benefit from pregnant mothers stopping smoking is close to $1 billion.

Table 2: Treatment population benefits from antenatal smoking cessation (2018-19 dollars, $ millions)

Treatment population benefits	NPV lifetime	Nominal lifetime
Increase in earnings	$66.6	$326.1
Reduction in obesity	$83.1	$456.6
Reduction in smoking	$40.8	$136.8
Total	**$190.5**	**$919.5**

As these figures show, the potential economic benefits to society of reducing the prevalence of smoking amongst pregnant women are significant.

We also considered longer-term benefits such as a reduction in crime costs (as a result of better high school graduation rates), however, as the magnitude of these effects were small, we have not included them in the quantitative estimates.

Conclusions

There are many reasons mothers continue to smoke during pregnancy, and it is important to note that raising awareness of the risks is only one element in reducing the rates of antenatal smoking. Some mothers think smoking will help them control their weight during pregnancy, or mean their baby is smaller and delivery is easier. While explaining that low birthweight carries risks for their child's development may go some way towards countering those myths, for many smoking is heavily influenced by environmental factors. These could include stressors such as financial instability, depression, job strain or workload, relationship difficulties, exposure to intimate partner violence, low levels of practical support, or having a partner or family members who smoke.[30,31] This view is supported by the fact that women who quit spontaneously before or during pregnancy are more likely to have higher social status, no smoking partner, a lower degree of nicotine dependence, low parity and less concern about weight gain.[32] In discussions about programs or initiatives to address antenatal smoking specifically, it is therefore important to consider potential adverse effects, such as guilt, anxiety and additional stress experienced by those who continue to smoke, especially through 'high risk' pregnancies, and the detrimental effect on relationships with family and maternity care providers. In this sense, we should view antenatal smoking as a broader issue for communities and society, rather than one just for expectant mothers.

The good news is that antenatal smoking is one of the few preventable factors associated with low birthweight and other adverse pregnancy outcomes, and the message is getting across. A higher proportion of women stop smoking during pregnancy than at any other time in their lives. Up to 45 per cent of women who smoke before pregnancy quit before their first antenatal visit, a rate substantially higher than the general population.[33] Quitting before conception or in the first trimester results in similar rates of adverse pregnancy outcomes, compared with non-smokers, and quitting at any time during pregnancy produces health benefits.[34] The fact that the highest success rates of quitting smoking is for pregnant women, demonstrates that this is an important 'teachable moment' to affect change that can have a long and lasting impact in terms of benefits to the individual and society.[35]

While we have modelled reducing the prevalence of smoking amongst pregnant women in this instance to show how a modifiable change that affects this very early period could benefit individuals, and society as a whole, we could have chosen a number of factors. They all link to broader themes about the role of antenatal care to identify risks and address them, and the importance of environmental factors and community support to ensure the optimal development in the *first thousand days* to support lifelong health, wellbeing and opportunity.

Antenatal care: targeting smoking cessation

In Australia, around **10% of mothers smoke while pregnant.** This implies **31,110 children per year** are affected by antenatal smoking.

Stopping smoking leads to a 200g increase in birthweight*, approximately **5.9%** increase in birthweight (from the average)*.

Children of mothers who smoke during pregnancy are 59% **more likely to smoke.**

12.8% of Australians adults smoke now, and the annual cost of smoking per smoker is $3,436.

For children of antenatal smokers, the rate is 20.4% now, 14.6% in 2036 (when those born now will be 18).

Antenatal smoking leads to a **50%** increase in the likelihood a **child will be overweight as an adult*.**

28% of Australian adults are obese*, and the annual cost of obesity per obese person is **$1,7478.**

For children of antenatal smokers, the rate is 42%*

2018 treatment (0yo)

2036 graduate/risk of obesity/risk of crime (18yo)

2039 start working (21yo)

2085 finish working (70yo)

2100 die (82yo)

Stopping smoking leads to a **0.53% increase in likelihood of a child graduating.**

A 10% increase in birthweight leads to a 0.9% increase in likelihood of graduation*, therefore a 5.9% increase leads to a **0.53% increase in likelihood of graduation*.**

Children of mothers who don't smoke during pregnancy **earn 0.59% more.**

Assuming treatment population earns the minimum wage ($37,398 per year), a 10% increase in birthweight leads to a 1% increase in earnings. A 5.9% increase in birthweight leads to a **0.59% increase in earnings*.**

*See appendix for sources

Scenario 2: Improving housing stability

In Australia, an estimated **27%** of families with dependent children rent their home. Based on this, an estimated **84,000** children are born into a rented home each year.

Based on the available evidence, we modelled the economic gains that result from home ownership, and used these to consider the potential benefits that stability, housing security and community relationships could provide:

- Growing up in a home owned by his or her parents or primary caregiver leads to societal benefits of approximately **$36,000** over the lifetime of that child.*
- **94%** is due to an increase in earnings as an adult.
- If every Australian child grew up in a home that his or her parent owned, the annual potential economic benefit would be nearly **$3 billion**.*

* Nominal lifetime value

Access to stable and adequate housing is a basic human need and has a significant impact on the health and wellbeing of families and children because it provides a safe environment, autonomy, and security which is needed for full participation in social, educational, economic, and community life.

Research continues to demonstrate the direct (cognitive, social, emotional, and biological outcomes) and indirect (parent's caregiving capacity) impact of physical environments on children's development.[36] Negative home environments during the *first thousand days* have been linked to a host of developmental issues, including inferior language development; behaviour problems; insufficient school readiness; aggression, anxiety and depression; and impaired cognitive development.[37]

Research has also documented longer-term effects: decreased likelihood of high school graduation; increased likelihood of teen parenthood; increased likelihood of adult unemployment; decreased income; and higher rates of poverty.[38]

In this broad context of environmental factors, we have looked at the impact of home ownership as a proxy for stability and the impacts of the related stress that housing instability can cause. We chose to look at the benefits of supporting home ownership rather than housing stability more broadly for the purposes of modelling because the research and evidence around the benefits of long term leasing as related to the *first thousand days* was

less robust. Children who grow up in a home owned by their parents experience better outcomes, likely because home owners are more financially stable, experience less stress and are more invested in their communities. This may account for the benefits of home ownership over long term renting.

Importantly, we are not advocating for home ownership as the solution to improve outcomes. Instead we use this as a proxy to highlight the potential benefits of supports and services targeting financial and other stressors, and providing stability for families during pregnancy and the early years of the child's life.

A child's home and community environment during the ***first thousand days*** of that child's life impacts the lifelong health, wellbeing and opportunity for the child.

In Australia, an estimated **27 per cent of families with dependent children rent,** implying that around at least **84,000 children** are born into a rented home.

Housing stability during the *first thousand days* has been shown to impact development in a range of ways which have implications for life outcomes.

Behavioural problems

A study looking at the impacts of moving house on very young children showed moving two or more times during the first two years of the child's life led to increased internalising behaviours at age nine, such as anxiety, sadness, and withdrawal. The effect remained significant even when controlling for relevant demographic characteristics, such as maternal education and income, whether the move was upward or downward, as well as other changes in the child's life (i.e. change in elementary schools, parental unions, and number of children in the home).[39]

One residential move prior to age four led to more problem behaviours at age four, and each additional move exacerbated the effect, when controlling for child and family characteristics. However, moves between ages five and eight did not produce the same effects.[40] This is striking because it shows that contrary to what we might expect, the negative impacts of moving are amplified for younger children, highlighting again the importance of experiences during an earlier period of development than has typically been considered.

Education outcomes

Children experiencing residential instability demonstrate worse academic and social outcomes, such as lower vocabulary skills, problem behaviours, grade retention, increased high school drop-out rates, and lower adult educational attainment.[41] Interestingly, research shows home ownership specifically has been associated with less behavioural problems and better educational outcomes in children.[42]

Parental stress

Family stress can be related to housing affordability where housing costs are the main source of economic hardship and/or family conflict.[43] An Australian analysis of housing affordability stress found that rates of stress have been increasing, especially among those living in rental accommodation. Focusing on children, this study found that 41 per cent of children from two-parent low-income families living in rented accommodation were experiencing housing affordability stress, a rate that jumps to 67 per cent with single parent families.[44] While parents can protect their children from the adverse effects of stress, it is hard to sustain over a prolonged period.

During pregnancy, maternal stress impacts the foetal nervous system and reduces foetal growth and length of gestation. High levels of maternal anxiety are significantly associated with increased risk of intrauterine growth restriction.[45] This is a major risk factor for a number of subsequent health problems in the child's later years, and has been linked to conditions such as heart disease, hypertension, and low birth weight, which increases the risk of developing conditions such as obesity and diabetes.[46] A growing body of evidence has revealed that maternal gestation stress can also negatively impact health and developmental outcomes including cognitive development, language development, behavioural and emotional development, and physical and neuromuscular maturation.[47]

Parenting capacity

Lack of affordable housing can also impact parenting capacity and mental health. Parents facing financial hardship face an increased risk of chronic stress, depression and partner conflict, which, in turn, correlates with more inconsistent, unsupportive, and punitive parenting styles. Studies have shown that poor quality interactions between parent and child are related to a greater likelihood of poor health and emotional and educational set-backs in later life.[48]

Social support networks

Continuous moving may also change social connections by eliminating a family's close social networks that provide emotional support and information about the community. The level of social supports that a child's caregiver(s) has access to, drastically impacts their caregiving capacity; while a child's physical environments (including the quality and nature of their housing and the natural environments they can access) have the power to affect multiple and concurrent health and wellbeing outcomes throughout the lifespan.

Research shows that renters, particularly those on low incomes, experience higher levels of mobility and that the negative effects of mobility are magnified with increased moves when changes in schools and residential mobility are combined.[49] This issue is exacerbated by unaffordable housing which can cause chronic mobility, particularly among low-income families. In extreme cases, this can lead to homelessness, which brings with it a whole raft of additional risks.[50]

Obesity and health

There is conflicting evidence about the impact of home ownership on health. The significant health impact, in economic terms, is obesity as in Scenario 1. However, evidence shows that children living in a home owned by their parents are only slightly less likely to be obese as adults. This could be for a number of factors, including health factors of the parents, given homeowners have a 2 per cent lower rate of health conditions relating to obesity. Nonetheless, there are important lifestyle factors linked to nutrition based on affordability and access to a healthy diet. For example, high housing costs can affect child wellbeing through the experience of family financial or material hardship. Families who allocate a disproportionate amount of their income to housing have to cut back on other basic needs such as food, clothing, and heating. This is not only related to a greater likelihood of obesity, but also a number of other health problems such as respiratory difficulties that can be caused by an unhealthy environment. Due to the small magnitude of benefits relating to reduced obesity, we have not included these in the quantitative impacts.

Economic gains result from children growing up in a home owned by their parent(s) or primary caregiver(s), which could indicate the potential benefits of stable, secure housing.

As this illustrates, housing stability and home ownership have a wide ranging impact on development and longer term life outcomes, both on the child, and indirectly through the effects of stress and the lack of support for parents exacerbated by frequent moves.

For modelling purposes, we selected outcomes which can be quantified and supported by literature, and which are linked to potential benefits of home ownership that can be costed. We modelled the potential benefits to society of supporting home ownership for parents during the *first thousand days* of their child's life based on two main outcomes for the child:

- **Increase in earnings** – due to improved cognitive ability and productivity.
- **Reduction in crime** – linked to higher school graduation rate.

The diagram below shows how these factors could influence the health, wellbeing and opportunity of the child over their lifetime.

The total benefits for each of these areas for an individual are presented in the table below. This shows that growing up in a home owned by your parents leads to $36,000 of lifetime benefits to society.

Housing stability

In Australia, an estimated **27% of families with dependent children rent**, implying that around **84,000 children** are born into a rented home.

Moving to a more affluent area reduces the likelihood of obesity.

Moving from the lowest quartile property value to the second lowest property value leads to a **14% reduction in obesity***

Children living in housing in the lowest quartile are more **likely to be obese as adults.**

28% of Australian adults are obese*, and the annual cost of obesity per obese person is $1,747*. For children living in a house in the lowest **quartile** of property values, **the rate is 31.4%*.**

2018 treatment (0yo)

2036 graduate/risk of obesity/risk of crime (18yo)

2039 start working (21yo)

2085 finish working (70yo)

2100 die (82yo)

Children who grow up in a home owned by their parents do better at school.

Living in a home owned by parents leads to an **8% increase in test scores*, and a 9.6% increase in the probability of graduation*.**

Children who grow up in a home owned by parents **earn 1.9% more.**

Assuming treatment population earns the minimum wage ($37,398 per year), a standard deviation increase in test scores leads to a 8% increase in earnings*. Living in a home owned by parents leads to a **1.9% increase in earnings*.**

*See appendix for sources

Table 3: Individual benefits from home ownership (2018-19 dollars, $)

Individual benefits	NPV lifetime	Nominal lifetime
Increase in earnings	$6,793	$33,246
Reduction in crime	$409	$2,245
Total	**$7,202**	**$35,490**

Note that components may not sum to totals due to rounding.

We used these individual benefits to estimate the benefit if the intervention was extended to the treatment population, being all children born in Australia in a given year. If every Australian child grew up in a home their parent owned, the annual potential benefit would be nearly $3 billion.

Table 4: Treatment population benefits from home ownership (2018-19 dollars, $ millions)

Treatment population benefits	NPV lifetime	Nominal lifetime
Increase in earnings	$570.60	$2,793
Reduction in crime	$34.30	$189
Total	**$604.90**	**$2,981**

Note that components may not sum to totals due to rounding.

As these figures show, the potential benefits to society of home ownership for parents during the *first thousand days* of their child's life are significant for all children born in one year.

Our modelling also involved considerations of the economic benefits from a reduction in obesity, however, due to the small effect we have not included it in the tables above.

Conclusions

Although we have focused on home ownership for the purposes of the modelling, there are a number of issues relating to housing that have an impact on child development during the *first thousand days* and lifelong outcomes. Housing instability and financial instability can be a big cause of parental stress, which is known to have a negative impact on foetal development and young children, and the impact is often greater for young children than for older children. Unstable housing arrangements can often be linked to poor housing conditions, which are also known to have an impact on the health and wellbeing of the mother and child.

On the other hand, supporting housing stability for expectant parents and families with young children brings a number of benefits, including alleviating parental stress, helping to build a stronger sense of community and belonging, and supporting a more connected experience of antenatal care, and the development of stronger relationships with care providers. These benefits are explored further in our *Conclusions*.

Conclusions

Adverse experiences early on in life can have lasting effects on all aspects of growth and development.

To build on the evidence base presented in the MCRI report, *The First Thousand Days – An Evidence Paper*, we have shown through two specific examples how the experiences in this earliest period of development can be linked to health, education, wellbeing and opportunity as adults. We have also shown the costs associated with these connections, to highlight the potential benefit to society of investing in policies, programs and initiatives to intervene and improve outcomes in this earlier developmental period of the *first thousand days*.

We selected these examples because they highlight the impact of both direct influences on the child pre-birth as a result of the mother's habits (reducing the prevalence of smoking in pregnant women), and indirect influences on the child through environmental factors and parental interaction (supporting home ownership). However, it is important to note that these examples are intended to be indicative and highlight the potential broader impacts of experiences in the *first thousand days*.

Links with other risk factors

For example, as noted previously, smoking during pregnancy is correlated with other risk factors, such as financial insecurity, domestic violence, stress related to job strain or workload, or exposure to a partner who smokes. Studies have shown the incidence of antenatal smoking is higher in groups already identified as being at risk. For example, almost 50 per cent of pregnant smokers have a mental health disorder of some kind.[51] Smoking rates are higher in young women and 37 per cent of teenage mothers smoke during pregnancy.[52] Smoking during pregnancy is strongly associated with socioeconomic disadvantage and is particularly prevalent in Aboriginal and Torres Strait Islander populations.[53] It is important to consider that mothers who continue smoking during pregnancy, and their partners and support networks, are often also contending with a wide range of other stress factors in their lives when thinking about how policies, programs or initiatives could be designed to help in the most meaningful and lasting way.

Similarly, housing instability is often a more pressing issue in lower socio-economic groups, and is linked to other stress factors including financial instability caused by unaffordable housing. The child's physical environment is significant to their lifelong health and wellbeing, and children are particularly vulnerable to inadequate housing in terms of the structural quality of the house, housing affordability, homelessness and continued housing mobility. Lack of appropriate housing can also impact a caregiver's mental health, which in turn impacts their caregiving capacity.

Stress can impact on parents' caregiving ability, which has a notable impact on child development, especially in this very early period. Moving during the period of pregnancy and the child's early years also disrupts the parents' exposure to social support networks and access to care providers. The perception and experience of insufficient support has a visibly detrimental effect on not only maternal psychological wellbeing, but also adverse health and wellbeing outcomes for the child.[54]

The importance of support networks

Pregnancy is a time of significant life change and requires significant psychological adjustment and support. Experiencing social support during pregnancy reduces the likelihood of maternal stress, depression and risk taking behaviours during and after pregnancy.[55] Studies have shown that the level of social supports during pregnancy can impact a woman's protective behaviours during this period. For example, a German study found that 33 per cent of women who had low social supports smoked during their first trimester of pregnancy compared to only 17 per cent of women who reported having high social supports.[56]

A caregiver's sense of community and access to social supports can also impact child development, because they greatly impact a parent's caregiving capacity. This brings with it all the benefits of improved parent-child relationships, more consistent parenting styles, and decreases the risk of child maltreatment after birth.

The role of antenatal care and housing stability in improving outcomes in this crucial developmental period.

We have identified many factors which have an impact on life outcomes and can be changed by better provision of support during the very early developmental period of the *first thousand days*. One key intervention to consider is the role of antenatal care both in identifying and addressing risk factors, and in providing some of the support that is so important during this period.

Research from the UK National Collaborating Centre for Women's and Children's Health indicates that offering more antenatal visits above a minimum level has not been shown to markedly improve pregnancy and child outcomes. Moreover, most mothers in Australia already participate in antenatal care programs. (99.9 per cent) who gave birth in 2015 had at least one visit, and 95 per cent had five or more visits.[57] In particular, regular antenatal care in the first trimester is associated with better

maternal health in pregnancy, fewer interventions in late pregnancy and positive child health outcomes.[58] 35 per cent of mothers did not attend a visit in the first trimester (less than 14 weeks).[59]

There are marked differences in the antenatal care attendance based on socioeconomic status (SES). Mothers living in the lowest socioeconomic status (SES) areas began antenatal care later in pregnancy. 64 per cent of mothers living in the lowest SES areas attended in first trimester compared with 72 per cent in the highest SES areas in 2016.[60]

Another key factor in developmental outcomes during early childhood is the home environment. As with antenatal care, the evidence on obvious approaches to improve stability and security in the home environment is mixed, and intuitive solutions do not necessarily hold up in the research. As well as home ownership (as detailed above), how often the home and community environment changes is also an important, albeit complex variable in early development. According to a study by the Australian Institute of Family Studies in 2012,[61] children can experience fewer than five house moves without significant effects on vocabulary scores; only once they experience five or more house moves do scores fall, while those children that had yet to experience a house move had Strengths and Difficulties Questionnaire scores that were lower than average. Although Sandstrom and Huerta found that school age children appear to be more sensitive to residential change compared with younger children in terms of educational outcomes,[62] a finding also supported by Jellyman and Spencer in their 2008 systematic review,[63] the impact of moving on behavioural development has been shown to be strongest with very young children. Moving two or more times during the first two years of the child's life led to increased internalising behaviours at age nine, such as anxiety, sadness, and withdrawal.[64] One residential move prior to age four led to more problem behaviours at that age, and each additional move exacerbated the effect, when controlling for child and family characteristics. However, moves between ages five and eight did not produce the same effects.[65]

As these studies show, there are clear effects on families and children in their *first thousand days* from housing instability, financial stress resulting from housing costs, or poor residential and community conditions. Furthermore, children of homeowners achieve higher test scores and have higher probability of graduation once other relevant factors are controlled for (see Appendix).

How to improve antenatal care and housing stability in the future

These findings provide an opportunity to think differently about how policymakers approach the *first thousand days*. As this report shows, there are a number of highly influential factors in a child's development out of sight of government and community services. Nonetheless, our understanding of these is improving rapidly thanks to new research focusing on the *first thousand days*. Nutrition and education factors are prominent in parents' minds but other elements such as the environment, and levels of parental stress (particularly for the mother) can also have notable impacts. These can result from housing and financial insecurity, job strain and relationship difficulties. Suggestions for key areas where changes could be made include:

- Better identification of important risk factors to enable earlier intervention to give children the best possible start in life. This is particularly relevant for those most vulnerable.
- In addition to the current focus on education and communicating health messages, provide guidance and support to address challenges caused by the circumstances and environment the parents are living in.
- A more connected pathway for parents through the antenatal, perinatal and postnatal periods, providing seamless support.

These ideas are explored in more detail in the next section of this report which presents our recommendations for key principles for programs, policies and initiatives targeting the *first thousand days* to improve life outcomes, and our suggested next steps.

Recommendations

Recent years have seen an increasing acknowledgement of the importance that the *first thousand days*, and the early years more broadly, have on setting the foundations for future health, wellbeing, learning and development. In recognition of this crucial period of an individual's life, a range of policies and programs exist with the aim of lifting early childhood experiences and outcomes. Examples of these include policies to expand access to early childhood education, and programs to support parents and promote better parent-child attachment.

While there exist opportunities to develop and implement new policies, programs and initiatives that support the *first thousand days*, improved outcomes can also be achieved through improving and/or expanding on what is already being done. These could be grouped into three areas of focus:

- **Downstream factors** which deal directly with treating problems such as obesity, and cognitive and behavioural problems.
- **Midstream factors** by addressing the conditions under which families are living such as immediate housing needs, fostering social connections, and assisting with financial support.
- **Upstream factors** such as government policies which impact on factors such as the affordability of housing.

Key Principles

Whether focusing on existing or new policies, programs and initiatives that target the *first thousand days*, the following design principles are proposed for the system as a whole in order to improve health, wellbeing, learning and development outcomes for individuals:

- A **holistic approach that focuses on the whole child,** rather than on specific issues or domains of an individual's health, wellbeing, learning and development. This means that social, emotional, behavioural, physical, psychological and learning outcomes should all be taken into consideration, with policies and initiatives seeking to support development in as many of these areas as possible.
- Policies, programs and services aimed at the *first thousand days*, and at early childhood more broadly, should **be integrated to provide a streamlined and connected approach.** This should apply not just to a child, but also to parent and family services. Ideally, this should be reflected in a continuum of care being offered to families beginning with support to parents from conception through to antenatal care, maternal and child health, early childhood, and family services.

- By creating a more connected experience of antenatal care, services and programs should **support the development of better, stronger relationships between parents and antenatal care providers.** The nature of the relationship between service providers and parents is a key medium for any change to occur, as parents are more likely to accept advice from practitioners with whom they have a trusted relationship.
- The service system should provide a **universal platform of support for parents, children and families** in acknowledgement of the critical importance of the *first thousand days* to every individual's lifelong trajectory, with more **targeted and tailored supports** designed and provided to parents, children and families with greater or more complex needs.
- Recognition that influencers in the *first thousand days* include the community and the environment around which a child and family live, grow and play. As such, responses should include initiatives that support the **establishment and strengthening of community relationships and safe and nurturing environments** for children and families.
- Policies and initiatives should be **informed by Australian and international evidence** wherever possible. To help build the evidence base, **independent evaluations should be conducted** to assess the implementation and outcomes of policies and initiatives in the Australian context, and to optimise the service system.
- Where new services and programs are implemented, these should be supported through **long term funding that provides sufficient time to implement, optimise and evaluate** objectively the effectiveness and efficiency in contributing to improved outcomes for children and families.

Next steps

There are a number of steps we can take to improve outcomes by targeting the *first thousand days*. In terms of policies, programs and initiatives, we can focus on improving information and education, we can improve services and supports provided to families during this period, and we can improve the environment families and children live in.

The purpose of this report is not to advocate for a specific area for intervention, which is why our economic modelling does not consider the costs of interventions as part of a cost benefit analysis. The results of the economic analysis are important to guide potential funding for these programs, whatever they may be.

What we do propose, is the following key areas of focus for next steps to improve outcomes:

- **Raise public awareness of the importance the *first thousand days* has on lifelong health, wellbeing, learning and development outcomes.** The importance of the *first thousand days* remains poorly understood by many in the community. Many people are aware of the impact of a child's experience in early childhood, but research shows that the period pre-birth and very early in a child's life has a powerful impact on later development and life outcomes. This message needs to be shared with a wide range of audiences. While there are examples of those working to raise awareness of the importance of early childhood to certain segments of the community, more needs to be done to raise awareness among governments, early childhood and family service practitioners, communities, businesses, and families.
- **Change the environment.** Evolutionary biologist Daniel Lieberman[66] suggested that one course of action to improve the children's experience and health during their *first thousand days* is to re-engineer the environments in which they are living. This involves addressing the social determinants of health and disease (including housing environments) to create environments that are more equitable for everyone. This is what economist James Heckman refers to as 'pre-distribution instead of redistribution'[67]; he argues that 'predistribution - improving the early lives of disadvantaged children—is far more effective than simple redistribution in promoting social inclusion and, at the same time, at promoting economic efficiency and workforce productivity.'
- **Improved and targeted services.** Focusing service provision on the earliest stages of childhood, and at conception, is the most effective and efficient means of preventing poor health, wellbeing, learning and development outcomes later on in life. Greater investment should be directed towards services that target the most impactful interventions for future parents and new families, such as antenatal smoking cessation programs. For those parents, families and children with greater and/or more complex needs, targeted services should be provided for these at-risk populations. Targeted services should involve not just provision of information, but also where possible, directly help families implement best practice at home.
- **Further research to map current investments and gauge their success.** One of PwC's challenges when undertaking the economic modelling was the scarce evidence on what works in antenatal care, and how housing circumstances interact with children's development. A first step in being able to do things better, and to facilitate a more connected system, is to gain a better understanding of what is being spent on what programs, and determine whether they are working. A subsequent step is to fund rigorous studies on innovative interventions to decide what to invest in next.

Appendix

Appendix: Economic modelling technical methodology

PwC's estimations of the potential economic benefits of antenatal smoking cessation and children growing up in a home owned by their parents are based on the following assumptions, and informed by empirical literature, and economic and demographic data.

Key assumptions

Category	Assumption	Justification
Economic estimation	All individuals in the target population experience a spectrum of benefits, resulting in one average benefit.	The purpose of the economic modelling is to illustrate the estimated potential quantified benefit that Australia could experience if we were to achieve cessation of antenatal smoking and stable housing for all families. While we have outlined recommended approaches to work towards this, the type and length of the actual intervention is yet to be determined.
	The economic benefit is based on the treatment population being affected for one year (i.e. assumes intervention only lasts for one year).	
	The affected population live until 82, work from 21 until 67, and are at risk of obesity, smoking and criminal activity from 18 years until death.	Standard economic assumptions based on demographic current trends: • Life expectancy for Australians born today is 82.[68] • The current pension age is 67 for those born from 1957 onwards.[69] Our assumption means we have not included the benefits accruing from employment while studying, nor productive work in retirement. • Individuals are at risk of obesity, smoking and criminal activity prior to 18 years old, however, the total costs of these have been divided by the number of adults in Australia to obtain an average cost per adult.
	The affected population earns the minimum wage for their entire lives.	This is a simplifying assumption that is conservative as many in the target population are likely to earn significantly higher than the minimum wage. We tested an alternative assumption that adjusted the average wage for unemployment and participation and
Crime	Crime costs are pro-rata reduced (i.e. no accounting for fixed costs of policing).	This is a simplifying assumption that is appropriate due to very small estimated crime benefits.
Housing	In the case of home ownership, the proportion of families with dependent children (27 per cent) can be linearly applied to the total number of children born per year to obtain an estimate for the number of children born per year into rented homes.	This is a conservative assumption, as the percentage of renters would probably be higher for those who are pregnant because they are younger.

Empirical literature relating to the benefits of antenatal smoking cessation

Effect	Evidence used	Paper	Study design	Sample	Commentary
Ceasing smoking while pregnant	200 gram (0r 5.9 per cent on average) increase in birthweight	Lumley et al. 2009[70]	Meta-analysis of 72 trials, 56 randomised controlled trials and 9 cluster-randomised controlled trials	25,000 pregnant women from 72 studies from the US, Canada, Europe and Australasia	200 gram effect is based on comparing women in intervention groups who ceased smoking with those in the control groups who did not cease smoking.
	Antenatal smoking leads to a 42 per cent increase in likelihood of child being obese as an adult	Al Mamum et al. 2006 (a)[71]	Observational, prospectively collected data from the beginning of pregnancy until 14 years of age	1,590 children (out of a total cohort sample of 3,253) born in Brisbane	Comparing the adjusted odds ratios of obesity for children of mothers smoked before and after pregnancy, but not during, and those who smoke during pregnancy. See Table 4, Model 2.
	Children of mothers who smoke during pregnancy are 59 per cent more likely to smoke as young adults	Al Mamum et al. 2006 (b)[72]	Observational, prospectively collected data from the beginning of pregnancy until 14 years of age	2,984 children born in Brisbane whose smoking status was reported	Comparing the adjusted odds ratios of adult smoking for children of mothers smoked before and after pregnancy, but not during, and those who smoke during pregnancy. See Table 4, Model 2, Column 2.
Increase in birthweight	A 10 per cent increase in birthweight leads to a 0.9 per cent increase in likelihood of graduation	Black et al. 2005[73]	Administrative data from Norway analysed using ordinary least squares (OLS) and within-twin estimation	13,472 Norwegians	An increase in birthweight of 10 per cent increases the probability of high school graduation completion by 0.9 per cent.
	A 10 per cent increase in birthweight leads to a 1 per cent increase in earnings	Black et al. 2005[74]	Administrative data from Norway analysed using ordinary least squares (OLS) and within-twin estimation	34,788 (5,858 twin pairs) Norwegians	An extra 10 per cent birth weight raises earnings by about 1 per cent.
Graduating high school	Graduating high school leads to a reduction in overall criminal participation by 14 per cent	Lochner and Moretti. 2004[75]	OLS estimation using self-reported crime data in the US	National Longitudinal Study of Youth (US) with a sample size of approximately 6,000 males	High school graduation reduces participation in criminal offending by 14 per cent among Caucasian men (for which data is more reliable and comparable).

Empirical literature relating to the benefits of home ownership

Effect	Evidence used	Paper	Study design	Sample	Commentary
Home ownership	Children of homeowners leads to an 8 per cent increase in test scores	Haurin et al. 2001[76]	Self-reported data analysed using OLS regression	National Longitudinal Study of Youth (US) 1979 cohort, with around 12,000 children	8 per cent increase in test scores is based on the average of a 9 per cent increase in maths scores and 7 per cent increase in reading scores.[77]
	Homeowners experience a 2 per cent lower incidence rate of health conditions such as hypertension, cardiovascular disease, diabetes and obesity	Oritz and Zimmerman 2013[78]	California Health Interview Survey data analysed using count regression estimation	107,656 white Californians	This study considers the effect of race on socioeconomic and health factors. The results are statistically significant for non-Latino white respondents, but non-significant for black and Latino respondents. The results for white respondents have been used because they more closely resemble Australian population characteristics. The use of the 2 per cent effect relies on the effect of home ownership on obesity itself being similar to the effect on the range of general health conditions. Given the frequency of obesity and small size of the effect, this is a reasonable assumption.[79]
	Children of homeowners have a 9.6 per cent higher probability of graduation	Aaronson 1999[80]	Probit regressions using panel data	Panel Study of Income Dynamics (PSID) (US), sample size of 5,143	Includes controls for family characteristics, but not previous mobility or asset size (as these are linked too closely to whether a child lives in a home owned by their parents).
Higher test scores	A standard deviation increase in test scores leads to a 8 per cent increase in earnings as an adult	Krueger 2003[81]	Meta-analysis of three studies (Neal and Johnson, Currie and Thomas, and Murnane et al.)	Neal and Johnson: NLSY (US) Currie and Johnson: British National Child Development Study Murnane et al: High School and Beyond survey (US)	Paper looks primarily at findings around the effect of class sizes on achievement, but the author also considers other effects such as the impact of education on earnings. Test scores relate to those in elementary schools.
Graduating high school	Graduating high school leads to a reduction in overall criminal participation by 14 per cent	Lockner and Moretti 2004[82]	OLS estimation using self-reported crime data in the US	Not stated, however, sample of dataset used – National Longitudinal Study of Youth (US) – was approximately 6,000 males	High school graduation reduces likelihood of offending by 14 per cent for Caucasian men (for which data is more reliable and comparable).

Key economic and demographic data used economic modelling

Category	Data point	Value	Source
Antenatal care	Number of births per year	311,104	http://www.abs.gov.au/ausstats per cent5Cabs@.nsf/0/8668A9A0D4B0156CCA25792F0016186A?Opendocument
	Mean birthweight in Australia	3,370 grams	http://www.abs.gov.au/AUSSTATS/abs@.nsf/0/04FEBEF9C81FE6BACA25732C002077A2
Housing	Number of families with dependent children who rent their home	27 per cent	https://pursuit.unimelb.edu.au/articles/is-rent-for-life-becoming-the-new-norm-for-families
Earnings	Minimum weekly wage	$719	https://www.fairwork.gov.au/how-we-will-help/templates-and-guides/fact-sheets/minimum-workplace-entitlements/minimum-wages
Obesity	Proportion of Australians who are obese	28 per cent	https://www.myhealthycommunities.gov.au/our-reports/get-report-file/hc27/publication/AIHW_HC_Report_Overweight_and_Obesity_Report_December_2016
	Total annual cost of obesity to Australia	$9.3bn (2018-19 dollars)	Derived from: https://www.pwc.com.au/pdf/weighing-the-cost-of-obesity-final.pdf
Smoking	Proportion of mothers who smoke during pregnancy	10 per cent	https://www.aihw.gov.au/getmedia/728e7dc2-ced6-47b7-addd-befc9d95af2d/aihw-per-91-inbrief.pdf.aspx?inline=true
	Proportion of Australian adults that smoke	12.80 per cent	https://www.quit.org.au/resources/fact-sheets/smoking-rates/
	Trend annual reduction in smoking rates	0.20 per cent	Derived from: https://www.aihw.gov.au/getmedia/15db8c15-7062-4cde-bfa4-3c2079f30af3/21028.pdf.aspx?inline=true
	Annual societal cost of tobacco use per smoker	$3,436 (2018-19 dollars)	Derived from http://www.tobaccoinaustralia.org.au/chapter-17-economics/17-2-the-costs-of-smoking and http://www.abs.gov.au/ausstats/abs@.nsf/mf/4831.0.55.001
Crime	Offender rate per 100,000 population	1,949	http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4519.0Main+Features12016-17?OpenDocument
	Total cost of crime to Australia	$54.6bn (2018-19 dollars)	Derived from: Smith et al 2014, Counting the Costs of Crime in Australia: A 2011 Estimate, Australian Institute of Criminology, pxiii

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