

# Growing Up in Australia's Child Health CheckPoint 2019 Student Projects

The Murdoch Children's Research Institute,  
Royal Children's Hospital, Melbourne, and  
CheckPoint collaborators



**Melbourne  
Children's**  
A world leader  
in child and  
adolescent  
health



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children's  
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institute**



[checkpoint-lsac.mcri.edu.au](http://checkpoint-lsac.mcri.edu.au)

## Introduction

Dear student,

We are delighted you are considering undertaking a student project within *Growing Up in Australia's* Child Health CheckPoint.

The Child Health CheckPoint offers new researchers involvement in Australasia's premier national children's study. This booklet summarises some projects available for commencement in 2019 - many more are possible, depending on the student's interests. We offer PhD projects to students with funding stipends, e.g. via APA, university or international scholarships. All students contribute actively to the data management and derivation relevant to their project. If you are interested or would like to find out more about the project, please email

[lsac.childhealthcheckpoint@mcri.edu.au](mailto:lsac.childhealthcheckpoint@mcri.edu.au)

Our supervisors are themselves top researchers spanning multiple disciplines, including

- Community child health
- Epidemiology
- Biostatistics
- Epigenetics
- Biobanking & biomarkers
- Health economics
- Health-related quality of life
- Use of time
- Mental health
- Respiratory health
- Cardiovascular health
- Obesity
- Inflammation & infection
- Physical activity and fitness
- Eye health
- Dental health
- Hearing
- Bone health

For more information about *Growing Up in Australia's* Child Health CheckPoint: [checkpoint-lsac.mcri.edu.au](http://checkpoint-lsac.mcri.edu.au)

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## The Longitudinal Study of Australian Children

*Growing Up in Australia*, also known as the Longitudinal Study of Australian Children (LSAC) is Australia's largest and only nationally-representative children's longitudinal study. It is funded by the



Australian Government, and governed by three Government agencies: The Department of Social Services (DSS), Australian Institute of Family Studies (AIFS) and Australian Bureau of Statistics (ABS).

*Growing Up in Australia* was designed in 2002 to provide 'a strong evidence base for policy development and service delivery on a wide range of issues relating to children's development'. LSAC recruited two nationally-representative cohorts in 2004: the birth ('B') cohort aged 3-19 months, and the kindergarten ('K') cohort aged 4-5 years (not included in the Child Health CheckPoint). In a two-stage clustered sampling design, 10% of all Australian postcodes were randomly selected, stratified by state and urban/rural. 5,107 infants were recruited (64% uptake), with 91%, 88%, 86%, 91% and 84% retained to Waves 2, 3, 4, 5 and 6 respectively. The main method of data collection is a biennial home interview, supplemented with questionnaires (children, parents, teachers), time diaries, limited direct assessments and data linkage to a number of national administrative data sets (e.g. Medicare, NAPLAN). There is a broad focus including health and development, education, family and parenting characteristics and socioeconomic environment.

LSAC has ongoing funding and is already highly productive with over 500 peer-reviewed papers and government reports.

Find out more at: [growingupinaustralia.gov.au](http://growingupinaustralia.gov.au)

## The Child Health CheckPoint

Today, diseases of ageing increasingly drive the world's burden of disease. The seeds of these non-communicable diseases—characterised by slow progression and long duration—are sown in childhood. They have related determinants and often cluster in individuals and families. It is believed that family, social, and environmental experiences all interact with the child's innate biology to create shared modifiable pathways (such as chronic inflammation) to multiple diseases. Precursors of these diseases are already measurable as wide gradients of normal across many body systems in healthy children.



LSAC's bold response to this 'public health emergency in slow motion' was to support a group of senior health researchers to leverage additional funding in a unique one-off addition to *Growing Up In Australia*. Throughout 2015-16, the LSAC 11-12 year olds from the B cohort participated in the **Child Health CheckPoint**. Each child and their accompanying parent attended a purpose-built assessment centre as it travelled around Australia. They undertook multiple state-of-the-art health measurements and provided biosamples (blood, saliva, hair, urine) during a busy 3.5 hour session. Nearly 2000 parent-child dyads took part, with the resulting digital and biological resource housed at the Murdoch Children's Research Institute.

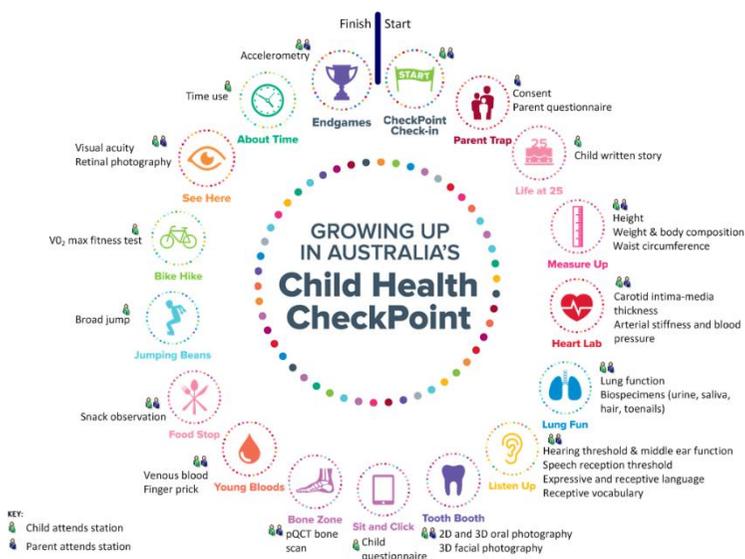
The Child Health CheckPoint targets multiple Australian health priorities. It will show how biology, environment and psychology 'get under the skin' during childhood and midlife via physiological adaptations that ultimately lead to the major causes of death and morbidity. We hope its findings will inform public health and service strategies that lessen the future of non-communicable diseases.

In this booklet, you will find a range of student opportunities. But these are only the beginning! If you have an important question that you think CheckPoint could answer, please contact us to discuss. Please note that many of the Honours projects that are advertised in this booklet could be expanded into PhD research.

## About the Child Health CheckPoint visit

A series of interactive ‘CheckPoint’ stations, each assessing distinct body systems, were offered to the LSAC B Cohort at purpose-built assessment centres and home visits across Australia. This involved the participation of children and one of their parents.

The measures collected within each station are shown in the circuit diagram below. Briefly, these included body composition measurements, cardiology assessments, lung function tests, dental photos, bone scans, retinal imaging, audiology ... and many more!



## The Murdoch Children's Research Institute

MCRI specialises in discoveries that transform child health.

The Murdoch Children's Research Institute (MCRI) is the largest child health research institute in Australia and one of the top five worldwide. Our team of more than 1900 talented researchers is dedicated to making discoveries to prevent and treat childhood conditions. Many of our researchers are also clinicians at the Royal Children's Hospital in Melbourne, where the Institute is based. Their research is informed by the problems facing their patients but it also means when a discovery is made, this is quickly transformed into practical treatments for children in the hospital.

MCRI research improves the lives of millions of kids each year. We research health conditions including diabetes, allergies, asthma, premature birth and mental health problems, which are on the rise in our children, and conditions including cancer and genetic disorders that remain unsolved.

We study the health of communities to understand what factors influence child health at the population level and research common infections and immune conditions both locally and globally.

At the MCRI we work with our campus partners [The Royal Children's Hospital](#) and [the University of Melbourne's Department of Paediatrics](#) to improve the health and wellbeing of children.

Find out more about the MCRI at our website [www.mcric.edu.au](http://www.mcric.edu.au)



## PhD Project 1: Building your best day: optimising activity compositions for health?



**Supervisors:** Prof Tim Olds ([tim.olds@unisa.edu.au](mailto:tim.olds@unisa.edu.au)), Prof Melissa Wake, Prof Julie Ratcliffe, Dr François Fraysse and Dr Dorothea Dumuid.

*This project can be supervised from the University of South Australia or the Murdoch Children's Research Institute (University of Melbourne, Australia), and may be broad enough for more than one PhD student. This project would suit a PhD student with a background in computer science, engineering, maths or stats, epidemiology, or any science background with a love of numbers.*

**Duration:** 3 years

**Aims/objectives:** This project will examine the relationship between activity compositions (how we use our time across a 24-h day) and health outcomes, and will identify the optimal activity composition for health.

**Background:** The three “movement behaviours” of physical activity (PA), screen time and sleep have each been linked to a wide range of physical and mental health outcomes in children and adults. Until recently, the focus has been on these behaviours individually, with governments and medical bodies producing separate guidelines for recommended amounts of physical activity, screen time and sleep. However, there is emerging evidence that optimal health may be associated with patterns of behaviours rather than individual behaviours.

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Reframing the lifestyle-health link in terms of the 24-h day makes sense, because the day can be construed as a set of mutually exclusive and exhaustive behavioural domains. This means that to increase the time spent in one domain (such as PA) we must necessarily decrease the time spent in at least one other domain (such as sleep). The overall health effect will be a function of the overall change across all domains. The new paradigm talks of the activity composition rather than individual behavioural domains.

This requires a novel mathematical approach: compositional data analysis (CoDA). Like many paradigm-changing ideas, this is a simple and obvious concept, but it means that the statistical models we have been using have been in many cases inappropriate, that many of our conclusions may be spurious, and that our conceptual frameworks have been poorly formulated.

Because activity compositions involve trade-offs of one behaviour against another (more physical activity may mean less sleep), it is not easy to locate the ideal activity composition for any given health outcome. To find the optimal activity composition for a given outcome or set of outcomes, we need to combine CoDA with another branch of mathematics called optimisation theory.

The primary dataset for this program of research will be the [Child Health CheckPoint](#) study of about 1800 11-12 year old children and their parents, which is embedded within the Longitudinal Study of Australian Children (LSAC). The CheckPoint study has a very wide range of health outcomes, plus 7-day 24-h accelerometry and 3-day 24-h use-of-time recalls using the MARCA. Through data linkage, we also have access to health services usage and academic performance.

The PhD candidate will be contributing to the data derivation and management of the relevant CheckPoint and LSAC datasets, in collaboration with the study team, and conducting quantitative analyses of the study data to address the study objectives. This project is available to students able to attract funding stipends, e.g. via university or international scholarships.

## Honours or Masters Project 1: Equivalence curves: Trading off lifestyle behaviours



**Supervisors:** Prof Melissa Wake ([melissa.wake@mcri.edu.au](mailto:melissa.wake@mcri.edu.au)), Prof Tim Olds and Dr Dorothea Dumuid.

*This project can be undertaken by a student based at the Murdoch Children's Research Institute (University of Melbourne, Australia).*

**Duration:** 1 year

**Aims/objectives:** How much time do I need to allocate to any given lifestyle behaviour (e.g. physical activity) to have the same benefit for a given outcome (e.g. fatness) as a given change in some other behaviour (e.g. sleep)?

**Background:** The way we use our time affects our health. In general, more sleep, more physical activity and less sitting are good for us. But we only have 24 hours in a day, and our choices are often constrained. If we have to choose which behaviours to modify, how should we choose? What is the “exchange rate” between behaviours in terms of health outcomes? For example, if both physical activity and sleep are good for quality of life, how much longer would I need to sleep to get the same benefit as say 30 min of physical activity each day?

The primary dataset for this program of research will be the Child Health CheckPoint study of about 1800 11-12 year old children and their parents, which is embedded within the Longitudinal Study of Australian Children (LSAC). The CheckPoint study has a very wide range of health outcomes, plus 7-day 24-h accelerometry and 3-day 24-h use-of-time recalls using the MARCA.

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This project will suit someone who enjoys working with numbers, and is considering a future career in biomedicine, medicine, public health, sports science, epidemiology and/or biostatistics. They will have fun. They will learn about compositional data analysis, which is a paradigm-changing approach to analysing use-of-time data. They will develop skills in infographics. Statistics will be completed in R using packages developed by Dr Dumuid. Graphical displays will use templates designed by Prof Olds.

## Honours Project 1: Backyard benefits: Do children living in homes with larger and greener backyards have higher levels of physical activity?



**Supervisors:** Dr Karen Lamb ([Karen.lamb@mcri.edu.au](mailto:Karen.lamb@mcri.edu.au)), Dr Suzanne Mavoa and Prof Melissa Wake.

*This project can be undertaken by a student based at the Murdoch Children's Research Institute (University of Melbourne, Australia).*

**Duration:** 1 year

**Aims/objectives:** The aim of this project is to investigate associations between backyard size and vegetation levels (i.e. 'greenness') and objectively measured physical activity levels in 11-12 year old children. We will use socio-demographic data from Wave 6 (10-11 years) of the Longitudinal Study of Australian Children (LSAC), physical activity data from the Child Health CheckPoint (11-12 years), and geographic information systems (GIS) derived measures of backyard size and vegetation levels.

**Background:** Having places to be active is important for children's physical activity behaviours. Previous research has shown that having parks and open spaces in the neighbourhood are associated with greater physical activity levels in children. However, despite the importance of the home environment for children, there has been little research on whether the size and characteristics of the backyard are correlated with physical activity levels. Existing research suggests that the home backyard might be important for children's physical activity, yet to date characteristics of the backyard lack objective assessment.

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This project will suit someone interested in epidemiology, statistics, and the use of spatial/GIS/mapping data in health research. The student will work with supervisors to undertake statistical analysis and aspects of the spatial/GIS analysis/mapping.

## Honours project 2: Residential air pollution effects on cardio-respiratory health in early and mid-life: A population-based study



**Supervisors:** Dr Kate Lycett ([kate.lycett@mcri.edu.au](mailto:kate.lycett@mcri.edu.au)), Prof Melissa Wake, Prof Sarath Ranganathan and Dr Susan Clifford.

*This project can be undertaken by a student based at the Murdoch Children's Research Institute (University of Melbourne, Australia).*

**Duration:** 1 year

**Aims/objectives:** Is residential air pollution exposure over the preceding decade associated with cardio-respiratory health at 11-12 years of age and in mid-life?

**Background:** The adverse effects of air pollution exposure are well documented and wide-ranging. Exposure to particle matter (PM<sub>2.5</sub>), even at low levels, has been associated with cancer, cardiovascular- and respiratory-related morbidity/mortality, eczema, allergies, reproductive issues and low birth weight. In particular, the intermediate and long-term effects on cardio-respiratory health have been studied widely in other countries. However, Australian data are lacking and very few studies have considered these effects early in life, which is important given that the pathogenesis of cardio-respiratory diseases begins in childhood.

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Although Australia's air quality is considered favourable in the global perspective, recent data shows that even these low levels account for more deaths annually than the current road toll. Recent emission trends, particularly from diesel vehicles, are also of concern. Unlike other countries that have begun to implement policy changes to reduce traffic emissions, diesel car ownership has recently increased by 60% in Australia and new road infrastructure continues to be rolled out without mitigation systems to reduce air pollution (e.g. lack of filtration on tunnels).

We have established a collaboration with The University of Queensland to assist in creating the participant air pollution exposure data. They will assist us to employ their novel land-use regression models to create national spatial datasets of modelled NO<sub>2</sub> and PM 2.5 and use road hierarchy data as a proxy for traffic-related air pollution. The student will be heavily involved in this body of work that is estimated to take 6-8 weeks - ideal for an Honours project. Unadjusted and adjusted linear regression models will then be used to estimate associations of residential air pollution and cardio-respiratory.

Novel statistical methods now allow us to estimate Australian's air pollution exposure using geographic information system technology. By combining this with the Child Health CheckPoint's unique cardio-respiratory data (i.e. spirometry, carotid IMT, cardio-metabolic profiles and vascular function data), we have a unique opportunity to examine whether residential air pollution is associated with cardio-respiratory health at 11-12 years and mid-life in a well-phenotyped sample.

## Honours project 3: 'Beating the odds': Early life experiences influencing the association between genetic prediction and health characteristics in mid-childhood



**Supervisors:** Prof Richard Saffery (Richard.saffery@mcri.edu.au) and Dr Katherine Lange.

*This project can be undertaken by a student based at the Murdoch Children's Research Institute (University of Melbourne, Australia).*

**Duration:** 1 year

**Aims/objectives:** Which early life experiences counteract genetic prediction to improve health characteristics in mid-childhood?

**Background:** In the modern age of complex population epidemics, such as obesity, cardiovascular disease, and the substantial divide between socioeconomic classes in health and wellbeing, early intervention can have a remarkable impact on long-term quality of life. However, many non-communicable diseases and outcomes involve a complex interaction between 'nature' (genetic predisposition) and 'nurture' (lifestyle stressors). In a large cohort of Australian 11-12 year old children and mid-life adults, this project aims to investigate the association between genetic prediction and the measurement of a health characteristic, and the early life exposures that overcome genetic predisposition to improve outcomes in children with poorer genetic profiles.

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The Child Health CheckPoint was a physical health and biospecimens module nested within the Longitudinal Study of Australian Children (LSAC), a national, population-derived cohort assessing children and their families every two years since birth. The CheckPoint includes detailed outcome measurements at 11-12 years in almost 2000 children and one of their parents, and from whom DNA has been collected and genotyped for over 1700 children and 2500 adults for 7 million genetic variants. A wide range of outcome measures are available, including anthropometrics; physical health in cardiovascular, respiratory, musculoskeletal, renal, hearing and visual systems; physical activity and sleep, allergies, pain, mental wellbeing; and societal outcomes such as educational attainment.

The student will (1) use previously published results to generate a polygenic risk score within the CheckPoint cohort for a characteristic of interest to the student. The student will then (2) examine the association between the generated polygenic risk score and the phenotype measured in the CheckPoint cohort, and (3) investigate the mediation of this genetic- phenotype association by a range of relevant lifestyle exposures in the preceding decade, such as home environment, activities, diet, community and health service use, parental involvement, socialisation and family demographics.

## Honours project 4: Obese parents, obese child? Investigating the resilience factors amongst children of obese parents who maintain normal weight throughout childhood.



**Supervisors:** Dr Susan Clifford ([susan.clifford@mcri.edu.au](mailto:susan.clifford@mcri.edu.au)), Prof Melissa Wake, others to be confirmed

*This project can be undertaken by a student based at the Murdoch Children's Research Institute (University of Melbourne, Australia).*

**Duration:** 1 year

**Aims/objectives:** What are the predictors and correlates of normal weight children of obese parents, and how well can we predict their BMI future?

**Background:** Overweight clusters in families, due to shared genetics, environments and lifestyle behaviours. Approximately 75% of children have an overweight or obese parent. Mainstream advice to prevent or treat overweight by 'moving a little more, eating a little less' isn't working to reduce the prevalence of overweight/obesity down from a quarter of Australian children and two thirds of Australian adults. Insights into protective factors against childhood overweight may be found by studying children of obese parents who maintain normal weight. This group of children, who are so-far 'beating the odds' by not realising their high risk for obesity, may hold the key for halting intergenerational transmission of overweight and its associated health consequences.

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Using data from the Longitudinal Study of Australian Children (LSAC, n=3500 families), a wide range of predictors of child body mass index (BMI) status can be examined, including sociodemographic, lifestyle, psychosocial, parenting and cognitive characteristics. This project can also analyse the data from LSAC's Child Health CheckPoint study (n≈1900 families) to characterise the physical health (e.g. cardiovascular, renal, bone, respiratory) and genetic risk of obesity of children from obese and non-obese families.

These datasets could be analysed to explore numerous related research topics including:

- Do the predictors (including protective factors) of future BMI status differ between children of obese ('higher-risk') and non-obese ('lower-risk') parents?
- What is the typical profile of normal weight children of obese parents, and do multiple factors interact to protect children from future overweight?
- How strongly do child lifestyle and environment factors predict future weight status, compared to parental BMI and genetic risk of obesity?
- How accurately can we predict the future BMI status of the children of obese parents?

The project will suit someone interested in health, epidemiology and/or statistics, and working closely with a strong interdisciplinary team.

## Next steps

If you would like to hear more about any of the projects listed in this booklet, please contact the supervisor listed under each project title. You may also find it helpful to read general advice about Honours and PhDs in each of the universities where our current potential supervisors are based:



### University of Melbourne

<https://mdhs-study.unimelb.edu.au/degrees/honours>

<https://study.unimelb.edu.au/find/courses/graduate/doctor-of-philosophy-medicine-dentistry-and-health-sciences/>



### University of South Australia

<http://study.unisa.edu.au/health-science/>

**University of  
South Australia**

<http://www.unisa.edu.au/Research/Research-degrees/How-to-apply/>

To keep in touch and up to date with the Child Health CheckPoint please visit [checkpoint-lsac.mcri.edu.au](http://checkpoint-lsac.mcri.edu.au). An updated list of Honours and PhD projects will be listed here.