

RIO TINTO CHILDREN'S DIABETES CENTRE

A J D R F G l o b a l C e n t r e o f E x c e l l e n c e



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Student project booklet 2023

AUGUST 2022

STUDENT OPPORTUNITIES

IMPROVING
THE LIVES OF
YOUNG PEOPLE
WITH DIABETES



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PROJECTS

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Exploring the associations between exercise variables and glycaemic variability in children and adolescents with Type 1 Diabetes

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	January 2023
Chief Supervisor	Dr Craig Taplin (Telethon Kids Institute, Perth Children's Hospital)
Other Supervisors	Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital) Dr Vinutha Shetty (Telethon Kids Institute, Perth Children's Hospital) Dr Shaun Teo (Telethon Kids Institute)
Project Outline	<p>Glycosylated haemoglobin (HbA1c) has generally been an important tool for monitoring glucose control, and its association with physical activity (PA) levels has been investigated widely in the Type 1 Diabetes population. However, HbA1c does not provide information on daily glucose variability, which is crucial in the efforts to improve health outcomes of people with Type 1 Diabetes.</p> <p>Given the fact that PA can result in large blood glucose fluctuations, exercise prescription for Type 1 Diabetes management in adolescents remain a complex and dynamic process. By identifying the associations of the different components of PA and glucose variability, this may assist healthcare professionals in the development of individualised prescriptions that aid increments in physical activity levels safely.</p> <p>Hence, the project aims to observe and explore the associations between PA components (i.e. exercise frequency, intensity and duration) and glucose control in youth with Type 1 Diabetes as measured by triaxial accelerometry (Actigraph GT3x).</p>
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Psychology, Health Science, Education, Health Promotion or related degree• Excellent communication skills
Ethics Approval	<input checked="" type="checkbox"/> Obtained <input type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group

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A formative evaluation of healthcare professionals' level of knowledge and confidence relating to physical activity and Type 1 Diabetes

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	January 2023
Chief Supervisor	Dr Shaun Teo (Telethon Kids Institute)
Other Supervisors	Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital) Dr Vinutha Shetty (Telethon Kids Institute, Perth Children's Hospital)
Project Outline	<p>Despite the key role that exercise plays in both the management of Type 1 Diabetes (T1D) and prevention of T1D associated cardiovascular complications, children and adolescents with T1D are less active than their healthy peers.</p> <p>Healthcare professionals have been identified as playing an important role in promoting exercise in children and adolescents with T1D. However, research has indicated that there is less confidence and consensus among healthcare professionals regarding the promotion of exercise when compared to the level of confidence in prescribing medication, treatment and diet interventions for people with T1D.</p> <p>Thus, the aim of the project is to conduct a formative evaluation of healthcare professionals working with children and adolescent with T1D, around physical activity knowledge and confidence. The evaluation will provide critical information relating to the characteristics, decisions and behaviours of healthcare professionals, to inform and develop future education and training programmes for this group, that will consequently, improve T1D service provision in respect of physical activity and exercise.</p>
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Psychology, Health Science, Education, Health Promotion or related degree• Excellent communication skills
Ethics Approval	<input type="checkbox"/> Obtained <input checked="" type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group

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Assessing physical activity levels and patterns of healthcare professionals and parents of children living with Type 1 Diabetes.

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	January 2023
Chief Supervisor	Dr Shaun Teo (Telethon Kids Institute)
Other Supervisors	Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital) Dr Craig Taplin (Telethon Kids Institute, Perth Children's Hospital) Dr Vinutha Shetty (Telethon Kids Institute, Perth Children's Hospital)
Project Outline	<p>Healthcare professionals (HCPs) play an important role in promoting a physically active lifestyle by prescribing regular physical activity (PA) to children and adolescents living with Type 1 Diabetes (T1D), to improve their health and intervene in their T1D management. In this regard, HCPs possess the knowledge that puts them in a key position to advise on PA and T1D. Previous research has shown that HCPs lifestyle habits can potentially influence the attitudes and counselling of their patients. Additionally, previous research indicate that parents strongly determine the social and physical environment of their children and this influence may also provide an unexplored, but potentially important link between parents' PA levels and that of their children.</p> <p>As such, the overarching aim of the project is to assess both the HCPs' and parents' physical activity levels as measured by triaxial accelerometry (Actigraph GT3x). In addition, the project will examine the associations between HCPs/parental PA with that of their patient/child living with T1D.</p>
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Psychology, Health Science, Education, Health Promotion or related degree• Excellent communication skills
Ethics Approval	<input type="checkbox"/> Obtained <input checked="" type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group
<i>For more information, please contact:</i> Jessica Sheppard 08 6456 4622 Jessica.Sheppard@telethonkids.org.au	

The impact of early morning exercise performance on acute post-prandial glucose time in range and 24h glycaemic control in youth with Type 1 Diabetes

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	January 2023
Chief Supervisor	Dr Craig Taplin (Telethon Kids Institute, Perth Children's Hospital)
Other Supervisors	Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital) Dr Vinutha Shetty (Telethon Kids Institute, Perth Children's Hospital) Dr Shaun Teo (Telethon Kids Institute)
Project Outline	<p>Although regular physical activity (PA) is a key recommendation for the management of Type 1 Diabetes (T1D), participation in exercise presents unique challenges for children living with T1D. These challenges result in them having significant barriers towards exercise-related diabetes management, with the most frequently reported barrier being fear of hypoglycaemia.</p> <p>Consequently, previous research has focused on the manipulation of exercise variables such as: i) exercise type; ii) intensity and; iii) duration, to provide the evidence needed to address the concerns relating to PA and T1D management. However, despite the availability of these evidence, PA levels in children remain lower than their non-T1D peers. As such, new contemporary methods of manipulating exercise variables are needed to help improve upon exercise prescription for children and adolescents living with T1D.</p> <p>The diurnal timing of exercise could be an important factor that has started to gain attention in recent times and may play a crucial role in T1D management during exercise performance. Hence, the overarching aim of the project is to explore the effect of a morning exercise session on acute glycaemic control measures when compared to a no-exercise control session in youth with T1D.</p> <p>This study will involve working with the team to recruit participants, supervise participants during in-clinic exercise sessions, and collect and analyse data.</p>
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Psychology, Health Science, Education, Health Promotion or related degree• Excellent communication skills
Ethics Approval	<input type="checkbox"/> Obtained <input checked="" type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group

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Is the recommendation to decrease basal insulin dose pre-exercise conducive to severe hyperglycaemia during and after exercise?

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity
Start Date	January 2023/ July 2023
Chief Supervisor	Professor Paul Fournier (School of Human Sciences, University of Western Australia)
Other Supervisors	Professor Tim Jones (Telethon Kids Institute, Perth Children's Hospital) Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital)
Project Outline	Current guidelines recommend that people with type 1 diabetes (T1D) should reduce their basal insulin dose by 25-50% prior to exercise to minimise their risks of hypoglycaemia both during and after exercise. However, these recommendations are challenged by our recent findings that when exercise is performed under basal insulin conditions, with no prior insulin dose adjustments, blood glucose levels remain stable or change little. These findings suggest that reducing basal insulin levels prior to a bout of high intensity exercise might be conducive to a marked increase in blood glucose levels, and thus be detrimental to blood glucose management. For this reason, our aim is to test the hypothesis that the recommendation to reduce basal insulin dose by 25 or 50% prior to engaging in a bout of high intensity exercise is conducive to a high increase in blood glucose levels in people with T1D.
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Health Science, Biomedical Science or related degree• Initiative and dedication• High level of written communication skills• High level of organisation and time management skills• Ability to complete projects on time• Willingness to learn new skills• Excellent ability to work independently and as part of a team• Good interpersonal skills• Good communication skills
Ethics Approval	<input type="checkbox"/> Obtained <input checked="" type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input checked="" type="checkbox"/> Full scholarship offered by project group

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Effect of swimming and head-out water immersion in cold water on the risk of hypoglycaemia in type 1 diabetes

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity
Start Date	January 2023/ July 2023
Chief Supervisor	Professor Paul Fournier (School of Human Sciences, University of Western Australia)
Other Supervisors	Professor Tim Jones (Telethon Kids Institute, Perth Children's Hospital) Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital)
Project Outline	<p>Physical activity increases the risk of hypoglycaemia in individuals with Type 1 Diabetes (T1D), with the associated increased fear of hypoglycaemia contributing to their lower participation rates in regular exercise and lower than average fitness levels. For this reason, a number of recommendations have been published to reduce such risks of hypoglycaemia. Unfortunately, one major limitation with these recommendations is that they generally overlook the impact that some environmental conditions may have on blood glucose response to exercise.</p> <p>Since cold water immersion increases glucose oxidation rate and may inhibit the production of glucose by the liver, this raises the issue of whether upright immersion or swimming in cold water increases hypoglycaemia risk in people with T1D. This is a clinically important issue given the increased risk of drowning associated with hypoglycaemia. Since this issue has not been investigated before, the primary aims of this proposed research project are to test the hypotheses that (a) head out of water immersion in cold (20°C) compared to thermoneutral water (32°C) is associated with a faster rate of fall in blood glucose level; and (b) exercising in cold water causes a greater rate of fall in blood glucose level compared to exercising under thermoneutral conditions.</p>
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Health Science, Biomedical Science or related degree• Initiative and dedication• High level of written communication skills• High level of organisation and time management skills• Ability to complete projects on time• Willingness to learn new skills• Excellent ability to work independently and as part of a team• Good interpersonal skills• Good communication skills
Ethics Approval	<input checked="" type="checkbox"/> Obtained <input type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input checked="" type="checkbox"/> Full scholarship offered by project group
<p><i>For more information, please contact:</i> Jessica Sheppard 08 6456 4622 Jessica.Sheppard@telethonkids.org.au</p>	

Using continuous glucose monitoring and a carbohydrate algorithm to manage blood glucose levels during exercise in adolescents with type 1 diabetes

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	January 2023
Chief Supervisor	Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital)
Other Supervisors	Professor Paul Fournier (University of Western Australia)
Project Outline	Physical exercise can cause both low and high blood glucose levels in children and adolescents with Type 1 Diabetes (T1D). Due to the immediate and potentially serious consequences of untreated low blood glucose levels, it is often being regarded as the main barrier to a physically active lifestyle.

In recent years, there has been an increase in the use of real-time continuous glucose monitoring (rtCGM) technology to better manage glucose levels. However, studies have not yet demonstrated the optimal use of rtCGM to reduce the time spent with low and high blood glucose levels during physical activity.

The aim of this study is to trial a carbohydrate algorithm based on rtCGM readings during 60 minutes of moderate intensity cycling, in 14-16 year old adolescents with T1D. Participants will complete a familiarisation visit with a VO2 peak test followed by two testing sessions. One session will use the carbohydrate algorithm based on the rtCGM and the other will give carbohydrates based on the standard guidelines.

Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Psychology, Health Science, Education, Health Promotion or related degree• Excellent communication skills
Ethics Approval	<input checked="" type="checkbox"/> Obtained <input type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group

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Developing educational resources for sports coaches and teachers to support children and adolescents with type 1 diabetes be physically active

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity Research (Rio Tinto Children's Diabetes Centre)
Start Date	January 2023
Chief Supervisor	Professor Elizabeth Davis (Telethon Kids Institute, Perth Children's Hospital)
Other Supervisors	Dr Vinutha Shetty (Telethon Kids Institute, Perth Children's Hospital) Miss Rachel Lim (Telethon Kids Institute)
Project Outline	<p>Along with insulin and diet, exercise has been recognised as one of the three essential components of managing type 1 diabetes (T1D). A research project conducted through the Children's Diabetes Centre found that a significant challenge experienced by adolescents when physically active was dealing with a lack of T1D knowledge in sports teachers and coaches in the community. This not only meant that they didn't receive the support they needed to be physically active but 'wrong' knowledge and lack of trust caused frustration and stress.</p> <p>The aim of this project is to develop resources to assist people in the community to support young people with type 1 diabetes to engage in physical activity. The first phase of this study is collected information from coaches, young people with T1D and parents to determine what resources were needed and how they should be presented. This project will use this information to develop the resources which will be a combination of short online learning training modules, handouts, and content on our website in consultation with participants from the first phase.</p>
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Psychology, Health Science, Education, Health Promotion or related degree• Excellent communication skills
Ethics Approval	<input checked="" type="checkbox"/> Obtained <input type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group
<i>For more information, please contact:</i> Jessica Sheppard 08 6456 4622 Jessica.Sheppard@telethonkids.org.au	

How is maternal Vitamin D sufficiency during pregnancy associated with the risk of islet autoimmunity development in children at risk of type 1 diabetes?

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	Feb 2023
Chief Supervisor	Dr Aveni Haynes, Children's Diabetes Centre (Telethon Kids Institute)
Other Supervisors	Mr Grant Smith, Children's Diabetes Centre (Telethon Kids Institute) Professor Elizabeth Davis, Diabetes & Endocrinology (Perth Children's Hospital)
Project Outline	<p>Early environmental determinants of pancreatic islet autoimmunity: a pregnancy to early life cohort study (ENDIA) in children at risk of type 1 diabetes (T1D) is a multi-centre study involving researchers in South Australia, Victoria, New South Wales, Western Australia and Queensland. (www.endia.org.au). Over 1,300 pregnant women who have T1D or where their unborn child has a first degree relative with T1D have been recruited to the study and the children are being followed up from birth to 10 years of age.</p> <p>There are numerous observational epidemiological studies reporting an association between low Vitamin D levels with increased risk of childhood T1D. ENDIA has the unique opportunity to further examine the influence of vitamin D levels on the development of islet autoimmunity by analysing the association between prenatal vitamin D levels and modifiable environmental factors such as dietary intake during pregnancy and infancy, compliance with supplementation or treatment if vitamin D deficiency is diagnosed, and the risk of islet autoimmunity in children at risk of T1D.</p> <p>This study aims to:</p> <ol style="list-style-type: none">1. Determine the prevalence of vitamin D deficiency during pregnancy in the ENDIA study cohort2. Investigate the association between vitamin D deficiency and antecedent factors being evaluated in the ENDIA study cohort3. Investigate the association between vitamin D deficiency during pregnancy and the development of persistent islet autoimmunity in the ENDIA study cohort
Suitable For	<input checked="" type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Health Science, Public Health or related degree.• Use of SPSS/STATA/R or other statistical package• Good communication and organisational skills
Ethics Approval	<input checked="" type="checkbox"/> Obtained <input type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group
<i>For more information, please contact:</i> Jessica Sheppard 08 6456 4622 Jessica.Sheppard@health.wa.gov.au	

Dealing with foods high in fat and protein – A qualitative evaluation of resources to help educate families living with type 1 diabetes

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children’s Diabetes Centre)
Start Date	February 2023
Chief Supervisor	Dr Amelia Harray (Telethon Kids Institute)
Other Supervisors	Naomi Crosby

Project Outline Emerging research suggests foods high in fat and protein require additional insulin for optimal glycaemic control. These foods have been shown to delay meal rises for more than five hours after eating. Foods high in fat and protein contribute a significant amount of daily energy intake in Australian children, and glycaemic control at Perth Children’s Hospital (PCH) remains above the recommended target of an HbA1c <7%. Little is known about how families understand and apply learnings around fat and protein in real-life scenarios and whether the current clinical advice is being translated to patients in a consistent and evidence-based approach. Currently, resources exist for how to deal with foods high in fat and protein for patients using different treatment methods, including boluses for different insulin pumps, or when using multiple daily injections.

This study aims to review, update and evaluate patient resources used to educate children with T1D and their families and develop new clinician education plans to aid translation. This study will involve recruiting families who already engage in changes to their diabetes management when dealing with foods high in fat and protein, and families who have not yet received education for dealing with these foods. The clinical team within the diabetes service at PCH will also be engaged to provide qualitative feedback on the patient resources and education plans. Focus groups and a questionnaire will be used to collect data to help explore the complex understanding and behaviours related to this topic, and improve patient centred, evidence-based care provided to children with diabetes in Western Australia. The student project to commence in February 2023 will involve the recruitment of families to education seminars, evaluation of seminar and a 4 week follow up questionnaire regarding use of new knowledge in free-living scenarios. This study provides the opportunity for students to engage with patient education and efficacy of knowledge translation.

Suitable For	<input checked="" type="checkbox"/> Honours	<input type="checkbox"/> MD	<input type="checkbox"/> Masters	<input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Nutrition & Dietetics, Health Science, Health Promotion or a related degree• High level of written communication skills• High level of organisation and time management skills• Excellent ability to work independently and as part of a team• Good interpersonal skills			
Ethics Approval	<input checked="" type="checkbox"/> Obtained		<input type="checkbox"/> Not Obtained	
Funding	<input checked="" type="checkbox"/> Top-up scholarship offered by project group <input type="checkbox"/> Full scholarship offered by project group			

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What is the burden of cardiovascular disease in Western Australian children and adolescents diagnosed with type 1 and type 2 diabetes?

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	February 2023
Chief Supervisor	Dr Aveni Haynes (Telethon Kids Institute)
Other Supervisors	Mr Grant Smith (Telethon Kids Institute) Dr Matthew Cooper (Telethon Kids Institute) Adult Endocrinologist supervisor TBD
Project Outline	<p>Childhood diabetes is associated with significant long term health complications and an average reduced 14-year reduced life expectancy. Major cardiovascular complications including heart disease and strokes are a significant contributor to the high morbidity and mortality associated with childhood diabetes. Previous research from our group, led by Dr Cooper investigated the incidence of hospitalisations and risk factors for vascular complications experienced during early adulthood in children diagnosed with type 1 diabetes in Western Australia between 1992-2012, reporting a higher incidence in women and those with higher average glycaemic control in childhood.</p> <p>This project aims to determine the incidence of major cardiovascular outcomes and premature mortality in children diagnosed with type 1 and type 2 diabetes in Western Australia from 1992 to 2022, including an additional 10 years of new onset cases and follow-up period for those included in the previous study.</p> <p>Children with diabetes will be identified from the Western Australian Children's Diabetes Database (WACDD) maintained at Perth Children's Hospital and record linkage conducted by the Western Australian Data Linkage Unit (https://www.datalinkage-wa.org.au/) to the Hospitalisations and Morbidity Data System (HMDS) and Mortality Register to determine the incidence of cardiovascular outcomes in this cohort (Cooper et al, <i>J Diabetes Complications</i> (2017) 31(5):843-849).</p> <p>The findings of this study will be not only be novel but also make a significant impact on informing future models of care for children diagnosed with diabetes which aim to minimise the risk of long-term adverse effects for individuals affected by this lifelong condition so that they can be prevented in future generations.</p>
Suitable For	<input type="checkbox"/> Honours <input type="checkbox"/> MD <input checked="" type="checkbox"/> Masters <input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Health Science, Epidemiology/Public Health related area• Excellent communication, team work and organisational skills
Ethics Approval	<input type="checkbox"/> Obtained <input checked="" type="checkbox"/> Not Obtained
Funding	<input checked="" type="checkbox"/> Competitive Top-up scholarship offered by Research project group <input checked="" type="checkbox"/> Competitive Full scholarship offered by Research group
<i>For more information, please contact:</i> Jessica Sheppard 08 6456 4622 Jessica.Sheppard@telethonkids.org.au	

Investigating geospatial patterns in the occurrence of childhood onset type 1 diabetes in Western Australia

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	February 2023
Chief Supervisor	Dr Aveni Haynes (Telethon Kids Institute)
Other Supervisors	A/Prof Ewan Cameron (Telethon Kids Institute) Song Zhang (UWA)

Project Outline Childhood type 1 diabetes remains one of the commonest chronic conditions of childhood, affecting over 600,000 children aged <15 years worldwide. Type 1 diabetes is an autoimmune condition, with a peak age of onset in 10-14 year olds, requiring daily insulin replacement therapy in order to survive. Despite intense efforts, the cause of type 1 diabetes remains unknown.

In Western Australia, all children newly diagnosed with type 1 diabetes are admitted to hospital for commencement of insulin therapy and diabetes related education and are then routinely followed by the diabetes team at Perth Children's Hospital in metropolitan and State-wide outpatient clinics every 3 months until the age of 18 years. Data on these children are available from the Western Australian Children's Diabetes Database (WACDD) maintained at Perth Children's Hospital, which has an estimated case ascertainment rate of >99.9%. This population-based complete data provide a unique opportunity for investigating the incidence and trends in type 1 diabetes in Western Australia and identify potential environmental risk factors involved in its cause.

This project aims to investigate the association between newly available covariates on from the "digital WA" project led by A/Prof Cameron and the incidence of type 1 diabetes in the State, which has been shown to have spatial and temporal patterns which have yet to be explained. Examples of such area-level covariates now available include traffic flux, number of playgrounds/ovals or fast food outlets, amount of greenspace. These factors have previously been associated with either type 1 diabetes in other populations e.g Finland/Scandinavia or immune-mediated conditions (asthma/atopy), as well as the microbiome and hence there is sufficient rationale for conducting exploratory analyses.

Suitable For	<input checked="" type="checkbox"/> Honours	<input type="checkbox"/> MD	<input type="checkbox"/> Masters	<input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Health Science, Epidemiology/Public Health related area• Excellent communication, team work and organisational skills• Interest in GIS, geo-coding/spatial analysis and data modelling			
Ethics Approval	<input checked="" type="checkbox"/> Obtained	<input type="checkbox"/> Not Obtained		
Funding	<input type="checkbox"/> Competitive Top-up scholarship offered by Research project group <input checked="" type="checkbox"/> Competitive Full scholarship offered by Research group			

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Using novel mathematical approaches to analyse continuous glucose monitoring data from children at risk of type 1 diabetes

Research Focus Area	Chronic & Severe Diseases
Research Group	Diabetes and Obesity (Rio Tinto Children's Diabetes Centre)
Start Date	February 2023
Chief Supervisor	Dr Aveni Haynes (Telethon Kids Institute)
Other Supervisors	Dr Lyron Winderbaum (UniSA, STEM)

Project Outline The cause of type 1 diabetes, one of the commonest chronic conditions of childhood, affecting over 600,000 children aged <15 years worldwide, remains unknown. Prospective, longitudinal studies conducted over the past decades have vastly improved our understanding. Type 1 diabetes is now thought to occur in stages, commencing with Stage 1 type 1 diabetes where blood sugar levels are normal but individuals have >2 detectable islet autoantibodies in their blood which signal that the autoimmune process is underway. Stage 2 is when there is some evidence of dysregulated glucose control (dysglycaemia) but the individual has no symptoms or signs of the condition, and Stage 3 of clinical type 1 diabetes is when individuals have symptoms/signs and the condition is usually diagnosed and insulin replacement therapy started.

This project aims to apply novel mathematical approaches to continuous glucose monitoring (CGM) data being collected from a subset of the 1,473 children being followed in the Australian Environmental Determinants of Islet Autoimmunity (ENDIA) study (www.endia.org.au) from pregnancy to 10 years of age. Children with and without islet autoimmunity are invited to undergo serial CGM every 3-6 months from the time autoantibodies are detected until they are diagnosed with type 1 diabetes or withdraw from the study. As of June 2022, 42 children have completed at least one CGM session with some having completed 5 sessions.

The Dexcom G6 CGM being used for this study captures sensor glucose values every 5 minutes, 24 hours/day for up to 10 consecutive days, providing very rich data for analysis of trends and patterns. CGM metrics currently being investigated include standard summary measures according to guidelines for individuals with diagnosed type 1 diabetes. We are looking for a mathematics student with an interest in conducting exploratory analyses of time-series data, using novel methods to (a) identify patterns that taken into account the dynamic nature of glucose levels e.g rates of change following meals, day/night time circadian patterns, extended periods of high or low glucose (b) develop metrics to predict worsening metabolic control/progression to clinical type 1 diabetes.

Suitable For	<input checked="" type="checkbox"/> Honours	<input type="checkbox"/> MD	<input type="checkbox"/> Masters	<input type="checkbox"/> PhD
Essential Skills & Qualifications	<ul style="list-style-type: none">• Undergraduate degree in Mathematics/statistical modelling methods• Excellent communication, team work and organisational skills			
Ethics Approval	<input checked="" type="checkbox"/> Obtained		<input type="checkbox"/> Not Obtained	
Funding	<input type="checkbox"/> Competitive Top-up scholarship offered by Research project group			
	<input checked="" type="checkbox"/> Competitive Full scholarship offered by Research group			

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