2024 STUDENT PROJECT HANDBOOK

HONOURS | MASTERS | PhD

menzies school of health research

CHARLES DARWIN UNIVERSITY AUSTRALIA

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Menzies School of Health Research
2024 Student Project Handbook

As one of Australia's leading medical research institutes dedicated to improving the health and wellbeing of Aboriginal and Torres Strait Islander people, and a leader in global and tropical research into life-threatening illnesses, Menzies School of Health Research continues to translate its research into effective partnerships and programs in communities across Australia and the Asia-Pacific region.

With a history of over 35 years of scientific discovery and public health achievement, Menzies continues its endeavour to break the cycle of disease and to reduce health inequities in Australia and the Asia-Pacific region, particularly for disadvantaged populations.

In partnership with Charles Darwin University, Menzies School of Health Research delivers high quality research degrees to PhD, Master by Research and Honours students. Our students are supported and mentored by world-class researchers in their respective research fields.

This booklet contains a list of currently available research projects for students in a range of research areas of Indigenous health, global and tropical health, infectious diseases and child and maternal health. Students studying at Menzies School of Health Research are enrolled through Charles Darwin University.

More information about eligibility criteria and how to apply can be found on Charles Darwin University's webpage. To find out more about scholarship opportunities available and application process please contact: **researchdegrees@menzies.edu.au**

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Developing clinical decision support tools for medication prescribing using contemporary linked electronic health records

WELLBEING AND PREVENTABLE CHRONIC DISEASES **PhD**

An exciting PhD opportunity exists within a multidisciplinary team of researchers in the Renal Research Program at Menzies, Darwin.

Approximately half of the population of Australia have at least one chronic health condition, which disproportionately affects First Nations peoples. The Northern Territory has one of the highest burdens of chronic conditions including diabetes, cardiovascular and kidney disease in Australia. Primary care services in remote NT communities are faced with an immense burden of chronic condition management and care provisions is often fragmented across multiple clinical specialties. Coordinated care is made difficult bu the disjointed and siloed nature of health services in the NT and the lack of a readily accessible and comprehensive shared electronic health record. This presents a major clinical safety risk for patients that attend multiple health services and have complex care needs.

We have developed a novel, bespoke and innovative electronic health record that integrates patient level data from six public hospitals, 56 government primary health care services and 11 Aboriginal community controlled primary health services in the NT. It provides the largest database of comprehensive and consolidated primary and tertiary health data in the NT.

We are seeking an outstanding doctoral candidate with a strong interest in programming and generative AI (ML including large language models and neural networks). The project aims to use the clinical components of observations (weight, BP, etc); coded data (ICPC, ICD), results (pathology and investigations) and prescription data along with demographic information to develop guideline based medication prescribing clinical decision support. The tool will be integrated with TKC and add to other clinical decision support tools within TKC.

In addition, the student will have the opportunity to contribute significantly to the wider TKC initiative including other AI development.

The successful applicant will be eligible to undertake a Doctor of Philosophy through Charles Darwin University and work within the Renal Research Program under the guidance of A/Prof Asanga Abeyaratne, a Clinical Informatics and Digital Health Fellow, and A/Prof Gillian Gorham, Head of Renal Health Program. The successful candidate will work within a large multidisciplinary team of programmers, clinicians and qualitative and quantitative researchers. Opportunities to work on other projects within Menzies are high.

A/Prof Gillian Gorham

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Age, period and cohort effect on the prevalence of chronic diseases in Northern Territory, Australia

WELLBEING AND PREVENTABLE CHRONIC DISEASES | MASTER BY RESEARCH | PhD

An exciting PhD opportunity exists within a multidisciplinary team of researchers in the Renal Research Program at Menzies, Darwin.

Approximately half of the population of Australia have at least one chronic health condition, which disproportionately affects First Nations peoples. The Northern Territory has one of the highest burdens of chronic kidney disease and diabetes in Australia. About 60% of people over 50 years in NT live with at least two chronic conditions. This study will utilise a large cohort of patients within the Territory Kidney Care (TKC) system. This innovative clinical decision support tool contains linked electronic health records from six public hospitals, 56 government primary health care services and 11 Aboriginal community-controlled primary health services. It provides the largest database of comprehensive and consolidated primary and tertiary health information in the NT.

We are seeking an outstanding doctoral candidate with a strong interest in biostatistical modelling. The project aims to model the effect of age, period and cohort on the prevalence of chronic diseases in Northern Territory, Australia. In addition, the student will have the opportunity to contribute significantly to a wider TKC project.

The successful applicant will be eligible to undertake a Doctor of Philosophy based in Darwin and work within the Renal Research Program under the guidance of A/Prof Oyelola Adegboye, a chartered bio-statistician with extensive experience in public health, environmental epidemiology and spatial-tempopral modelling. This will be in conjunction with a group of clinical experts specialising in renal disease at Menzies.

A/Prof Oyelola Adegboye

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Improving cardiovascular disease risk prediction in Aboriginal and Torres Strait Islander people

WELLBEING AND PREVENTABLE CHRONIC DISEASE PhD

The Australian Stroke and Heart Research Accelerator (ASHRA) Centre will transform the field of cardiovascular research in Australia by bringing a new sector-wide focus on clinical impact and entrepreneurship. Menzies School of Health Research is a core partner of ASHRA and is leading research that will improve cardiovascular disease risk prediction in Aboriginal and Torres Strait Islander people. Menzies is offering a generous postgraduate scholarship to support outstanding candidates to undertake a research higher degree in cardiovascular disease screening and prevention.

The overall aim of the scholarship and the associated research program is to improve primary health clinical tools used in the early detection of cardiovascular disease among Aboriginal and Torres Strait Islander people. Cardiovascular disease substantially affects the health and well-being of Aboriginal and Torres Strait Islander people, leading to excess risk of hospitalisation and premature mortality. Cardiovascular diseases in Aboriginal and Torres Strait Islander people frequently co-exist with diabetes and chronic kidney disease and emerges at a younger age and is more common in females than males. This project aims to improve the early detection of CVD among Aboriginal and Torres Strait Islander people, by improving the risk algorithms used to identify individuals at high risk of cardiovascular disease. Earlier detection of high-risk individuals provides opportunities for preventative CVD risk management, including prescription of medicines and tailoring advice on lifestyle and nutrition.

The PhD student will play a key role in analysing data from large epidemiological cohorts and health administrative databases. The student will draw on their high-level skills and experience in epidemiology and biomedical statistics within the Stata Statistical Software environment. In addition, the student will work collaboratively with team members, including Aboriginal and Torres Strait Islander staff and stakeholders to translate research findings to clinical practice and policy. The PhD opportunity is based in Darwin.

Dr Elizabeth Barr

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Evaluating diabetes in pregnancy co-design and/or diabetes in pregnancy clinical registers

WELLBEING AND PREVENTABLE CHRONIC DISEASES **PhD**

Do you have an interest in improving the health of Aboriginal and Torres Strait Islander women and families? Are you passionate about ensuring that our health services are culturally safe and appropriate?

The Diabetes Across the Lifecourse: Northern Australia Partnership, led by Professor Louise Maple-Brown, is seeking talented candidates who answer yes to these questions to apply for a PhD within our Diabetes in Pregnancy team.

Commencing in 2011 in the Northern Territory with a focus on Diabetes in Pregnancy, the Diabetes Across the Lifecourse: Northern Australia Partnership has since expanded. With study sites and staff across the NT, Far North Queensland and the Kimberley, the Diabetes Across the Lifecourse: Northern Australia Partnership has a strong background of collaborating with Aboriginal and Torres Strait Islander people, health services and policymakers with a focus on intergenerational impacts of diabetes, including type 2 diabetes in children and young people.

Funding from the Medical Research Future Fund is enabling our Diabetes in Pregnancy work to focus on two main aims:

1. Enhancing and sustaining the NT and FNQ Diabetes in Pregnancy Clinical Registers to support ongoing continuous quality improvement.
2. Reducing diabetes-related risk for Aboriginal and Torres Strait Islander women before, during and after pregnancy through participatory research approaches.

Opportunities exist within this program of work for PhD projects. These include the implementation and/or evaluation of co-designed research activities to reduce diabetes-related risks, and/or evaluation of the DIP Clinical Registers. The successful candidate would live in Northern Australia for the duration of the project and undertake relevant cultural awareness and methodological training as required.

We have a strong team of outstanding PhD students, all of whom have been awarded NHMRC Postgraduate Scholarships to support their candidacy. Our team provided great opportunities for peer support and mentoring in your research journey.

Assoc Prof Renae Kirkham

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Understanding stigmas amongst young First Nations people with type 2 diabetes and the implications for diabetes care

WELLBEING AND PREVENTABLE CHRONIC DISEASES | MASTER BY RESEARCH | PhD

Rates of type 2 diabetes amongst young First Nations people are increasing, and diagnosis of this condition is occurring at earlier ages. Current models of care and educational resources do not adequately meet the needs of or appropriately engage First Nations young people. Appropriate, culturally safe models of care have the potential to improve the health of young First Nations people and reduced the risk of the intergenerational transmission of diabetes and of diabetes-related complications.

There is an opportunity for a student to undertake a project within our program of work on experiences of social stigma amongst young First Nations people with type 2 diabetes. This project is an in-depth qualitative study that will explore the aspects of diabetes and diabetes care that lead to stigma amongst young First Nations people; and how these experiences relate to First Nations concepts of shame, the social roles of young First Nations people and to biomedical constructs of self-efficacy.

This project will analyse the implications for models of diabetes care, clinicians' approaches to diabetes management and patient education and will contribute to the development of patient and clinician resources. Your research will be part of a project enhancing model of care for young First Nations people with type 2 diabetes and is situated within the Diabetes across the Lifecourse: Northern Australia Partnership.

Assoc Prof Renae Kirkham
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Dr Stefanie Puszka
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Baseline in the Grass: Advancing harm reduction for alcohol and drugs at music festivals

WELLBEING AND PREVENTABLE CHRONIC DISEASES | HONOURS | MASTER BY RESEARCH | PhD

Previous studies show that young festival attendees are more likely to consume alcohol at risky levels and use illicit drugs compared to the rest of the population. Festivals present an opportunity for harm reduction interventions to high-risk groups, as well as an opportunity to collect data on AOD related risk behaviours and harms. **Local evidence on AOD behaviours and harms is essential to inform effective harm reduction services.** Further, **evidence on the effectiveness of harm reduction services** can guide future implementation on the Northern Territory and elsewhere.
The Baseline in the Grass study has two main aims:

1. To evaluate the impact of the DanceWize peer-based harm reduction service delivered at Bass in the Grass in 2022
2. To generate new evidence on alcohol and drug use in the Northern Territory including patterns of behaviour, factors influencing harm outcomes and opportunities for future harm reduction services

We conducted a survey with more than 500 people at Bass in the Grass and followed them up two days post-event. We also collected data on the delivery of the DanceWize service and will undertake qualitative interviews with key stakeholders to gather information on the broader impact of the service at the event. We will conduct epidemiological analyses of administrative data including ambulance, police, and hospital data to look at patterns of alcohol and drug harms related to major events in the NT. The student would be welcome to combine a range of data sources for their project, depending on their skills and interests.

Any students interested in alcohol and drug related projects are also welcome to contact me to discuss other possible project opportunities or their own ideas and interests.

Dr Cassandra Wright

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Iron Infusion in Haemodialysis Study: Intravenous Iron Polymaltose For Indigenous Patients with High Ferritin Levels on Haemodialysis (INFERR); A Prospective, Open-Label, Blinded Endpoint, Randomised Controlled Trial

WELLBEING AND PREVENTABLE CHRONIC DISEASES | MASTER BY RESEARCH | PhD

The INFERR study explores the safety and effectiveness of giving intravenous iron to Aboriginal and Torres Strait Islander patients on haemodialysis with anaemia, high ferritin (a marker of both iron levels and inflammation) and low blood levels of iron.

This treatment will potentially benefit the majority of haemodialysis patients in the Northern Territory (NT) who are currently receiving routine iron treatment, but for whom the safety and efficacy of treatment remains poorly defined.

A recent, large scale, multicentre, prospective, open label, blinded endpoint clinical trial from the UK (PIVOTAL) confirmed the safety and efficacy of high dose IV Iron (400mg of iron once a month). This provides the best evidence for standard iron treatment in people on dialysis. Most importantly, there were no differences in adverse effects such as increased risk of infections. However, the exclusion of patients with high ferritin makes the results of this trial difficult to extrapolate to dialysis patients in the NT given that the majority (> 80%) would have a ferritin higher than 700µg/L. This reinforces the need for a clinical trial to assess the safety and efficacy of IV iron in haemodialysis patients within the NT with high ferritin.

This study will generate evidence to underpin a part of routine care and to ensure we use IV iron appropriately for the benefit of Aboriginal and Torres Strait Island dialysis patients in the NT.

The MSc/PhD student will play a core part in this project and participate in all relevant aspects of the conduct of a large clinical trial. The focus of the PhD could be to address a range of planned analyses of key study outcomes using quantitative biostatistical methods; or to use qualitative methods to explore critical issues around engagement of Aboriginal and Torres Strait Islander Australians in clinical trial research.

Prof Alan Cass

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Return to Country: A national platform study to return Indigenous renal patients home

WELLBEING AND PREVENTABLE CHRONIC DISEASES | MASTER BY RESEARCH | PhD

End-stage kidney disease (ESKD), when dialysis or a kidney transplant is required to maintain life, has a devastating impact on Indigenous patients and their families.

In remote communities, rates of ESKD are 15 or more times higher than amongst non-Indigenous Australians of the same age and sex, and people need to relocate to distant urban centres to take up dialysis.

Community-based dialysis or a kidney transplant allows a patient to return to live in their community.

Indigenous Australians have very low rates of such community-based treatment: a third the non-Indigenous chance of home-based dialysis treatment, and a quarter (overall) the non-Indigenous chance of a kidney transplant.

This multicentre mixed methods registry-based prospective interventional study is led by a team of Indigenous and non-Indigenous researchers who bring renal specialist, community-controlled health service and patient perspectives to inform research design, conduct and translation. It is characterising the socioeconomic, environmental, health service and biomedical factors driving the health outcomes and patterns of health service utilisation experienced by Indigenous Australians with ESKD in 13 tertiary renal services around the country and will test if health service changes to address these identified barriers can get more people home for treatment.

This national collaboration, addressing a key priority in health service delivery - how to help Indigenous Australians get treatment at home - is essential to improve access to best-practice care.

Yomei Jones

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Understanding the impact of the Banned Drinker Register and other alcohol policies in the Northern Territory

WELLBEING AND PREVENTABLE CHRONIC DISEASES | MASTER BY RESEARCH | PhD

This project is part of a comprehensive evaluation of the impacts of alcohol policies in the NT (Learning from Alcohol policy Reforms in the NT [LEARNT]). LEARNT provides important information for policy makers, treatment agencies and key stakeholders within the NT, nationally and internationally. One of the key focuses of the LEARNT project is evaluating the impact of the Banned Drinker Register (BDR) which involves placing identified problem drinkers onto a register which prohibits the consumption, possession or purchase of alcohol for a period of at least three months. A key part of the BDR is the use of identification (ID) scanners linked to the Register at all alcohol takeaway outlets, with a statutory form of ID scanned for every customer. This intervention is unique in its focus on individualised control of problems around packaged liquor.

LEARNT is a multicomponent mixed-methods study, involving analyses of epidemiological and linked data (police, emergency departments, child protection, hospital admissions, AOD treatment, school attendance), as well as qualitative data from key stakeholders and people who have been placed on the BDR, and their families and communities to understand how people perceive the BDR to have impacted on their attitudes and behaviours including substance use; their experiences of the health and justice system; social cohesion and family/kinship relationships; access to alcohol and drug treatment. We are also interested in whether there are unintended consequences of the BDR for individuals, their family members, or the broader community.

The student's project could focus on alcohol availability and harmful outcomes; alcohol use outcomes for Aboriginal and Torres Strait Islander people; the cumulative impact of alcohol policies on high-risk drinkers and their families or a different topic relevant to the study's aims, negotiated with the study investigators and supervisors.

Dr Cassandra Wright

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Evaluation of housing repair and maintenance program in NT remote Aboriginal communities

WELLBEING AND PREVENTABLE CHRONIC DISEASES PhD

The student will work with a project to monitor and evaluate the activities, outputs, and outcomes of the Healthy Homes program. Adequate housing is fundamental to health and well-being. The Northern Territory (NT) and Australian governments have invested significant funding to overcome the challenge of providing adequate housing for NT Aboriginal people living in town camps and remote communities.

The NT Government has established the Healthy Homes program to deliver an enhanced approach to preventive and cyclical housing repairs and maintenance across remote communities and selected town camps, to ensure that houses' health hardware is functioning to support the nine Healthy Living Practices in the National Indigenous Housing Guide.

Menzies School of Health Research has been contracted by the NT Government to monitor and evaluate the activities, outputs, and outcomes of the Healthy Homes program.

Prof David Thomas

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Iron deficiency anaemia: epidemiology and prevention in Aboriginal children of the Northern Territory

CENTRE FOR CHILD DEVELOPEMENT AND EDUCATION HONOURS MASTER BY RESEARCH

Iron deficiency anaemia (IDA) has been shown to negatively impact on physical, behavioural, and cognitive development as well as academic achievement in children. While iron supplementation has shown to have positive effects on mental development in older children, there is no evidence that it has similar effects in children aged 3 years or younger. This suggests that the negative impact of IDA on infants may be irreversible leading to recommendations for preventive low dose oral iron supplementation in high-risk populations.

The prevalence of anaemia is high in Aboriginal children living in remote Northern Territory (NT) communities and IDA is the predominant type. A prevalence of anaemia of 68% among children aged under 2 months was reported for two remote NT communities for the period of 2004-2006. Other studies from this period have reported prevalence of 22-25% in children aged 0-5 years. A recent survey, in 2018, conducted in six remote communities reported a prevalence of 42% in infants aged 0-2 months. To date, there has been limited population level information on the epidemiology of IDA among Australian Aboriginal infants and the effectiveness of routine oral iron supplementation has not been evaluated.

This project will investigate the prevalence of IDA in young Aboriginal children in the NT; the impact of anaemia on early childhood development and academic performance and evaluate the effectiveness of oral iron supplementation in preventing anaemia. The project will utilise a large-scale data repository with records for the same child linked across multiple datasets from health, education, and social services sectors.

Dr Jiunn-Yih Su

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Prof Steven Guthridge

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Using Big Data to understand life course trajectories for young Territorians

CENTRE FOR CHILD DEVELOPMENT AND EDUCATION | MASTER BY RESEARCH | PhD

The Population Health and Wellbeing program at the Centre for Child Development and Education undertakes large scale population studies, using statistical and epidemiological methods, to describe the impact of multiple factors on the life course trajectories of children and young people. Central to the research program is a data repository with linked records for the same individual across many domains that include health, education child protection and justice. The current repository contains de-identified information for more than 370,000 individuals across 24 datasets. The repository allows analysis of the influences on life-course development from before birth to young adulthood, with the opportunity for the inclusion of intergenerational, family and community influences. The research program has strong links to policy makers and service providers and has an emphasis on research to inform practice.

The repository provides the opportunity for PhD studies across a wide range of topics which include but are not limited to the following areas:

- Optimising education outcomes
- Understanding juvenile offending and recidivism
- Assessing the effectiveness of interventions in health, education, child protection and youth justice
- Predictive modelling for multiple outcomes
- Mapping development pathways from birth to adulthood
- Assessing the impact of alcohol and family violence on child development

Prof Steve Guthridge

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The MECSH Evaluation Project

The MECSH evaluation project is funded by the Northern Territory Government Department of Health from 2019-2024 and includes researchers at Menzies/CCDE and the College of Indigenous Futures, Arts and Society (CIFAS) at Charles Darwin University.

MECSH is an evidence-based program of sustained nurse home-visiting intended for mothers from pregnancy through their child's third year. It is being implemented by four remote Aboriginal Community Controlled Health Services, Miwatj Aboriginal Health; Katherine West Health Board; Sunrise Health Aboriginal Corporation and Anyingingyi Health Aboriginal Corporation. It is a complex program involving development of systems of nursing practice, collaboration with social care workers and Aboriginal community-based practitioners and the formation of partnerships between practitioners, parents, and their families.

The evaluation project will investigate a number of areas of the MECSH program and maternal and child health services, including the implementation and delivery of MECSH services, the long- and short-term outcomes for children, the perspectives of mothers and their families and the cultural context of delivery of a safe and effective service. The evaluation aims to develop reports and methods that can contribute to ongoing quality assurance initiatives for use by health services.

Parents' perspectives on child development, parenting and care: the social and cultural context of maternal and infant care in remote communities

CENTRE FOR CHILD DEVELOPMENT AND EDUCATION | PhD

The MECSH program of nurse home-visiting is being implemented for Aboriginal mothers in remote communities. The Evaluation will investigate determinants of outcomes of care for mothers and their babies in the social and cultural context of remote NT communities. This project will involve qualitative or mixed methods of investigation to understand the social and cultural context and determinants of parenting and its contribution to children's development and early learning. The project will involve work with community-based research associates in multiple communities.

It will study experiences of remote Aboriginal mothers during pregnancy and childbirth, their use of maternal and child health services, understandings of child development and social and cultural influences on parenting. Mixed methods using formal questionnaires, exploratory focus groups or structured interviews are proposed.

Assoc Prof Kayli Wild

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Supporting maternal and infant health in remote communities: capacity building for improved outcomes

CENTRE FOR CHILD DEVELOPMENT AND EDUCATION | MASTER BY RESEARCH | PhD

This project will be located within the framework of the evaluation of the MECSH program of sustained nurse home-visiting for Aboriginal mothers and their infants in remote communities.

It will investigate determinants of processes of capacity building to support the MECSH program in remote NT communities and the development of specific elements of the model of care: for example, the roles of MECSH Nurses, Social Care Practitioners, and Aboriginal Community practitioners in engagement and delivery of quality services.

It will involve qualitative or mixed methods of investigation of the outcomes of training and support for practitioners and the determinants of successful engagement of remote Aboriginal mothers during pregnancy and after the birth of their children.

Assoc Prof Kayli Wild

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Parasite and human genomics for the emerging Plasmodium knowlesi malaria

GLOBAL AND TROPICAL HEALTH **PhD**

Insights gained from genomic analyses of human malaria parasites have advanced our understanding of basic disease biology, drug resistance, malaria epidemiology, and molecular ecology. Technological advancements coupled with reduced costs in molecular and genomic tools are being leveraged across malaria elimination efforts, including large-scale (> 20,000 *P. falciparum* whole genomes), collaborative efforts to produce publicly available population-level whole genome data and the use of targeted sequencing approaches to monitor real-time genetic changes within malaria populations. Much of this work has been focused on the primary human malaria causing parasites *P. falciparum* and *P. vivax*. However, as many countries approach the elimination of malaria caused by these two species, other malaria parasites, including the under-studied zoonotic *P. knowlesi*, are becoming a growing concern. Thus, part of our research program is using cutting-edge genomic and bioinformatic techniques to better understand the biology, ecology, and epidemiology of *P. knowlesi*. This work is conducted collaboratively with partners both overseas in Malaysia, Indonesia, Singapore, Thailand, United Kingdom, United States and the Netherlands, and also within Australia. Our genomic-centred program involves genome-wide association studies, large-scale population genetics analysis and the development of molecular surveillance tools. Our ultimate goal is to contribute to the malaria elimination efforts in Southeast Asia.

There is an opportunity for a PhD student to undertake a bioinformatics project within our program of work on zoonotic *P. knowlesi* malaria. The student will play a key role in large-scale genomic analyses, drawing on their high-level computational and statistical experience to develop and modify appropriate genomic tools for analyses in *P. knowlesi.* The student will be supervised by a team of world-leading malaria researchers and bioinformaticians from the Menzies School of Health Research and James Cook University and will work collaboratively within an international team. The research activities are the culmination of years of fieldwork and an unprecedented number of samples, as well as whole genome sequencing of the largest dataset of *P.knowlesi* isolates to date and genotyping of the first *P. knowlesi* infected human dataset. This is a great opportunity for a student looking to further develop their computational skills in applied bioinformatics.

Jacob Westaway

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Molecular characterisation of the hidden splenic parasite reservoir in human malaria

GLOBAL AND TROPICAL HEALTH | MASTER BY RESEARCH | PhD

Malaria is parasitic disease and a significant global health problem causing over half a million deaths each year. Hidden reservoirs of infection represent additional obstacles in malaria elimination. We recently discovered a large hidden biomass of malaria parasites in the human spleen and the presence of novel intrasplenic parasite lifecycle, a major paradigm-shift in understanding this illness. The fundamental biology underlying the hidden splenic malaria reservoir remains understudied.

This project will use unique spleen and blood samples from a cohort of individuals with current or past malaria infections in Indonesia. You will study the genetic diversity of the hidden splenic reservoir and compare transcriptomics profiles of parasite populations in the spleen and circulating blood. You will apply advanced molecular and phenotypic techniques (including qPCR, NGS, single-cell RNAseq, flow cytometry, spatial profiling) and analyse data using bioinformatic pipelines and advanced statistical methods.

This work will provide seminal knowledge advancements on the mechanisms of splenic parasite survival, will search for unique signatures of splenic malaria parasites, and may reveal novel parasite populations/forms related to dormancy and their susceptibility to treatment. Findings may contribute to future improvement of malaria detection, prevention, and treatment strategies.

This project requires an individual with fluent Bahasa Indonesia and a background in molecular biology and/or bioinformatics.

Dr Steven Kho

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The association of melioidosis with soil disturbance and the weather in Darwin

GLOBAL AND TROPICAL HEALTH | HONOURS

Melioidosis is a severe infectious disease affecting humans and animals in Northern Australia. It is caused by the soil bacterium Burkholderia pseudomallei. Cases mainly occur during the wet season and there is a strong association with rainfall. We hypothesise that large-scale soil disturbance and earthworks during large construction projects also increase the melioidosis incidence rate locally.

This is a desktop-based project in collaboration with the Research Institute for the Environment and Livelihoods (RIEL) at CDU. There is a spatial data component where the student will extract spatiotemporal data from historical archives of satellite data and compute indices for changes in vegetation and earthworks followed by a biostatistical component performing time series analyses to assess whether melioidosis incidence rates are associated with soil disturbance and the weather.

Mirjam Kaestli

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Immunological correlates of melioidosis survivors

GLOBAL AND TROPICAL HEALTH | MASTER BY RESEARCH | PhD

Melioidosis is caused by the bacterium *Burkholderia pseudomallei* and is predominately a disease of tropical climates, especially in Southeast Asia and Northern Australia where it is widespread. The bacteria causing melioidosis are found in contaminated water and soil. Melioidosis was first described in 1912 in Burma as a newly recognised glanders-like disease of humans. Reports from other Southeast Asian countries soon followed. While only first described in Australia from 1949, melioidosis is endemic across tropical Northern Australia, with the highest incidence rates of disease globally being reported from urban Darwin, although total case numbers are higher in Thailand. The Darwin Prospective Melioidosis Study (DPMS) commenced at Menzies School of Health Research (Menzies) and Royal Darwin Hospital (RDH) on 1 October 1989, prospectively documenting all melioidosis cases in the tropical Top End of the Northern Territory, Australia. As of 1 November 2020, there have been 1,196 culture-confirmed melioidosis cases, with 134 (11%) deaths. We have detailed epidemiological and clinical data on all cases and one or more (~5,000 total) *Burkholderia pseudomallei* (Bp) isolates stored from 1,156 (97%) DPMS cases. We also have stored serum samples on the DPMS with 300 plus serum samples from consented patients available for melioidosis research.

This project aims to investigate the clinical data collected from patients who have survived a melioidosis infection and compare it to immunological correlates, which are biological markers such as disease-specific antibodies which correlate with protection against disease, and which are measurable with immunological assays. Menzies has a collaboration between Menzies Melioidosis Program and Northern Arizona University Keim Laboratories which has successfully characterized antibody responses to *Burkholderia pseudomallei* (Bp) in humans using a machine called the MAGPIX. Major antigens eliciting antibodies during melioidosis have been identified and ongoing analysis is looking at patterns of antigen response that correlate with severity and outcomes of melioidosis.

The Master by Research/PhD student will join the Melioidosis programme at Menzies and working with a multidisciplinary team (clinical, laboratory and genomics team) to research Immunological correlates of melioidosis survivors.

Mark Mayo

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The occurrence of the melioidosis agent *Burkholderia pseudomallei* in the Darwin urban environment

GLOBAL AND TROPICAL HEALTH | MASTER BY RESEARCH | PhD

Melioidosis is caused by the bacterium *Burkholderia pseudomallei* and is predominately a disease of tropical climates, especially in Southeast Asia and Northern Australia where it is widespread. The bacteria causing melioidosis are found in contaminated water and soil. Melioidosis was first described in 1912 in Burma as a newly recognised glanders-like disease of humans. Reports from other Southeast Asian countries soon followed. While only first described in Australia from 1949, melioidosis is endemic across tropical Northern Australia, with the highest incidence rates of disease globally being reported from urban Darwin, although total case numbers are higher in Thailand. The Darwin Prospective Melioidosis Study (DPMS) commenced at Menzies School of Health Research (Menzies) and Royal Darwin Hospital (RDH) on 1 October 1989, prospectively documenting all melioidosis cases in the tropical Top End of the Northern Territory, Australia. As of 1 November 2020, there have been 1,196 culture-confirmed melioidosis cases, with 134 (11%) deaths. We have detailed epidemiological and clinical data on all cases and one or more (~5,000 total) *Burkholderia pseudomallei* (Bp) isolates stored from 1,156 (97%) DPMS cases. We also have 600 human Bp isolates from Australian and international collaborators, 645 animal Bp isolates and from our environmental studies ~8,000 Bp soil and water isolates and ~5,000 near-neighbour Burkholderia isolates.

This project aims to add to our existing knowledge of the presence of bacterium *Burkholderia pseudomallei* in the Darwin urban environment. It will enhance previous environmental sample, testing and analysis and help us to understand the ecological niches that exist in and urban setting. Further analysis examining the geographical associations and genomic similarities between clinical and environmental isolates will allow for better understanding of melioidosis source attribution in Darwin and may help to develop public health measures mitigating against the infection in other endemic regions.

The Master by Research/PhD student will join the Melioidosis programme at Menzies and working with a multidisciplinary team (clinical, laboratory and genomics team) will be using various microbiological, molecular and genomic approaches to understand the nature of in the Top End of Australia.

Mark Mayo

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Whole genome analysis of *Burkolderia pseudomallei* from animal and environmental samples in the Northern Territory

GLOBAL AND TROPICAL HEALTH | MASTER BY RESEARCH | PhD

Melioidosis is caused by the bacterium *Burkholderia pseudomallei* and is predominately a disease of tropical climates, especially in Southeast Asia and Northern Australia where it is widespread. The bacteria causing melioidosis are found in contaminated water and soil. Melioidosis was first described in 1912 in Burma as a newly recognised glanders-like disease of humans. Reports from other Southeast Asian countries soon followed. While only first described in Australia from 1949, melioidosis is endemic across tropical Northern Australia, with the highest incidence rates of disease globally being reported from urban Darwin, although total case numbers are higher in Thailand. The Darwin Prospective Melioidosis Study (DPMS) commenced at Menzies School of Health Research (Menzies) and Royal Darwin Hospital (RDH) on 1 October 1989, prospectively documenting all melioidosis cases in the tropical Top End of the Northern Territory, Australia. In endemic areas, melioidosis has also been identified in a wide array of animal species. Certain animals are acknowledged to be particularly susceptible to infection and disease, including goats, sheep, camels and alpacas. Cases have also been reported in domestic pets and native wildlife, with the animals often having prior ill health. Exotic animals imported to zoos in endemic regions appear especially at risk, most notably primates, including iconic species such as gorillas.

This project main aim is to analyse the whole genome sequences (WGS) of *Burkholderia pseudomallei* isolates from animals and environmental samples (soil and water). The environmental samples have been collected during environmental investigations to find the potential source of the animal case/s in the Northern Territory. WGS analysis will help use not only compare animal and environmental isolates but enable further understanding of how this relates to human cases in an endemic region.

The Master by Research/PhD student will join the Melioidosis programme at Menzies and working with a multidisciplinary team (field, clinical, laboratory and genomics), will be using various microbiological, molecular and genomic approaches to understand animal melioidosis in the Northern Territory.

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Epidemiology and clinical management of non-tuberculous mycobacteria in the Northern Territory: a cohort study

GLOBAL AND TROPICAL HEALTH | MASTER BY RESEARCH

A range of mycobacteria other than Mycobacterium tuberculosis complex (tuberculosis) and Mycobacterium leprae (leprosy) are known to cause disease in humans – these are collectively known as non-tuberculous mycobacteria (NTM). Previous reports have suggested that the incidence of NTM disease is increasing, however our understanding of the epidemiology of NTMs is limited. The clinical management of NTM disease is complex, requiring prolonged treatment with several anti-mycobacterial agents. There is limited evidence available to guide decisions on when to initiate treatment, when to cease it, and which agents to include in the treatment regimen.
The aim of this study is to:

- Describe the current epidemiology of NTM disease in the Northern Territory, and
- Describe the clinical management of NTM disease in the Northern Territory, including duration of treatment, anti-mycobacterial agents used and treatment outcomes

Laboratory data will be used to identify the cohort of cases of NTM disease in the Northern Territory between 2010 and 2017. Demographic, clinical, treatment and outcome data will then be obtained from the patients' medical records. A descriptive analysis of the epidemiological features of NTM disease and clinical management of patients will then be undertaken.

This project will provide an opportunity for the student to develop skills in management of complex clinical data and descriptive data analysis using their choice of statistical software (SPSS, Stata or R, +/- Q-GIS). We anticipate that the student would undertake data collection, cleaning and analysis and prepare a manuscript for publication in a peer reviewed journal.

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Comparative genomics of bacteria: derivation and utilisation of polymorphisms sets optimised for informative power

GLOBAL AND TROPICAL HEALTH | HONOURS | MASTER BY RESEARCH | PhD

The genomics revolution has transformed microbiology. The technical and economic accessibility of whole genome sequence analysis has resulted in the generation of very large volumes of genome sequence data. A single typical experiment can now involve whole genome analysis of hundreds or even thousands of microbial isolates. This has not simply impacted research. Genetic analysis (genotyping) methods that involved sampling a small proportion of the genome have been fundamental to public health driven microbiological surveillance. Such methods were also used in the clinical setting, to support inference of clinically relevant phenotype, and inform the practice of infection control. In large part, these genotyping approaches have been, or are being, replaced by whole genome analysis. There is an irony in this. The massive genome-wide data accumulated in the genomics revolution can inform the design of highly optimised and efficient genotyping methods. These may involve the interrogation of very small numbers of genetic polymorphisms and be very cheap. Genotyping methods based on these could potentially be used for very thorough and cost-effective microbial surveillance, direct analyses of clinical material, in point of care/field instrumentation, or in resource poor contexts.
We are asking the following questions:

1. What is the most robust, and user friendly bioinformatic pipeline for deriving and testing resolution optimised SNP sets that can be developed? The SNP sets are derived from comparative genome-wide data from microorganisms. Our current focus is on bacterial pathogens of particular relevance to the Northern Territory. A pipeline has already been established, and this has involved the construction of new bioinformatics software. We are at the stage of refining the SNP mining algorithms and streamlining and automating the pipelines for in-silico testing the informative powers of SNP-sets in diverse data-sets.
2. What is the relationship between algorithms designed to yield sets of polymorphisms optimised for surveillance, and algorithms that yield genetic polymorphisms that directly confer phenotypes of interest? This is a deep question. Addressing this requires knowledge of a range of current comparative genomic techniques that are designed to yield genetic determinants for phenotypes of interest. Typically, such methods are termed genome-wide association studies.
3. How can the knowledge gained in addressing questions 1 and 2 be best applied to the development of specific genotyping applications? This involves translation of the bioinformatic work into lab techniques.

The above questions can define projects that are aligned with the interests and experience of the student, and current imperatives in infectious disease relevant research in the NT. There are options for projects that are completely computer-based, and there are options for translation of this into working laboratory methods.
This would interest students with an interests and competencies in:

- Computer science/coding
- Infectious disease, particularly in disadvantaged populations, and the potential for microbial genetic analysis and surveillance to inform interventions.
- Genetic analysis technology.

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The Communicate Study: improving Aboriginal patient experiences and outcomes of care in the Northern Territory

GLOBAL AND TROPICAL HEALTH | MASTER BY RESEARCH | PhD

Aboriginal people interacting with healthcare services often experience racism, poor communication and poor quality of care. Health systems need to change to genuinely meet the needs of Aboriginal peoples. Health system improvements that incorporate cultural safety, wider uptake of Aboriginal interpreters and greater utilisation of Aboriginal health practitioners, can be implemented within existing systems to start to bridge these gaps in quality of care, create a cultural shift among healthcare providers, and improve the experience of care and health outcomes for Aboriginal peoples.
To date, the dynamic Communicate Study team has forged collaborations with NT Health, NT Aboriginal Interpreter Service and Aboriginal community leaders in the Top End. Research has focused on Royal Darwin Hospital. We are keen to expand the body of work to other hospitals and primary health care. This project has both qualitative and quantitative PhD/Master by Research opportunities.

Examples of study activities to be undertaken by the qualitative research scholar include:

- Scale up and evaluate the impact of novel cultural safety educational approaches for NT healthcare providers, building on the multi-award winning podcast, 'Ask the Specialist' which is delivered alongside reflexive discussion groups.
- Implement and measure the effects of a suite of health service interventions including clinical championing of cultural safety, new models of working with Aboriginal interpreters and Aboriginal Health Practitioners.
- Explore the impact of cultural safety interventions on health provider attitudes and behaviour with a particular focus on intercultural communication.
- Explore the impact of cultural safety interventions on patient healthcare experience and outcomes of new approaches to communication including around surgical consent.

Alongside this work, a quantitative research scholar will:

- Develop, monitor and analyse key performance indicators (KPI) on language documentation, interpreter use, and rates of self-discharge (leave against medical advice) from hospital in the tertiary system, and /or long-term medication adherence in the primary care setting.
- In partnership with health services, implement initiatives to help achieve KPI targets including technological improvements such as iPad-based interpreter access via video link and development of resources for common medical conditions in Aboriginal languages.
- Feedback data in a continuous quality improvement process to key health system stakeholders and front-line healthcare providers to build momentum to achieve better KPI targets.

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Blood transfusion in the Northern Territory: improving patient outcomes through better understanding of risks and benefits in the Northern Territory context

GLOBAL AND TROPICAL HEALTH | HONOURS | MASTER BY RESEARCH | PhD

In certain settings, blood transfusions have the potential to offer benefit to patients and can save lives. Blood transfusions are used in the setting of major bleeding, severe anaemia, and in a variety of bleeding disorders. However, transfusions also carry some risk of harm. Recipients of blood transfusions may develop alloantibodies to foreign antigens present in the blood donor but not the recipient of the transfusions. These alloantibodies can affect future pregnancies in women and pose a higher risk for both men and women in finding compatible blood for future blood transfusions. There are biological reasons why Aboriginal and Torres Strait Islander people (respectfully referred to as First Nations people herein) are more at risk of such reactions, due to different blood group antigens compared to the general blood donor population of Australia. Transfusion also poses a risk of other immune related reactions, and infection, and is associated with increased length of hospital stay.

In the Northern Territory context, the risks, and benefits for blood transfusion for First Nations people are poorly understood. In addition, the tyranny of distance in the NT poses unique challenges to the management of blood transfusions: remote clinics and hospitals are based many hundreds of kilometres from tertiary hospitals with comprehensive transfusion services.

This research project aims to inform best practice in blood transfusion for First Nations, rural and remote Northern Territorians with respect to blood transfusion.

This project offers a range of opportunities to candidates for either a PhD or MSc. This includes a large multicentre five retrospective cohort study examining transfusion triggers and outcomes across all NT hospitals for obstetric and intensive care patients, and NT patients referred to South Australia for heart surgery. The focus of a PhD or MSc program of research could also include a systematic review, qualitative studies on the patient experience of blood transfusion, the design and evaluation of patient health education tools, and a health economics/cost effective analysis.

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Identifying novel pheno-endotypes in children with chronic cough

CHILD AND MATERNAL HEALTH PhD

An exciting opportunity exists to join our Brisbane-based research group investigating paediatric respiratory disease.

Chronic wet cough is among the commonest symptoms of chronic lung disease. In Australia, the most common cause of child chronic wet cough is protracted bacterial bronchitis (PBB), a clinical entity we first described. It has now shown to be a precursor to bronchiectasis which causes substantial morbidity and mortality, especially from acute respiratory exacerbations.

Novel gene expression signatures are proven biomarkers for respiratory exacerbations and can provide novel molecular mechanistic insights. Biomarkers add to clinical decision-making by informing diagnosis during stable and acute phases of disease, making them useful for diagnostic and disease progression monitoring, as well as patient's response to therapy.

Extracellular vesicles (EV's) are stable, measurable in bodily fluids and their ability to concentrate bioactive cargo reflective of disease state makes them attractive as biomarkers. EV's have been studied widely as non-invasive biomarkers in some diseases, however, they have not been studied in paediatric lung diseases.

We are looking for an exceptional PhD student to drive a body of research to determine whether biomarker signatures using EVs can be identified and used diagnostically for diseases associated with chronic wet cough in children. The successful applicant will gain skills in gene expression (using RNA seq and Nanostring technologies), bioinformatics, a range of laboratory skills utilising human samples and EV isolation, together with clinical skills including participating in randomised clinical trials, patient recruitment and data collection.

The project will be based at the Centre for Children's Health Research, Brisbane and the applicant will join a multi-disciplinary team undertaking several paediatric respiratory clinical trials (funded by NHMRC/ MRFF). The successful applicant will be a key member of the laboratory team and will also be involved in the clinical trials.

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The Hearing for Learning Initiative-a stepped wedge cluster randomised trial to evaluate a model of primary health care workforce enhancement through local training and job creation

CHILD AND MATERNAL HEALTH | PhD

The goal of the project is to improve ear and hearing services for First Nations children in remote and rural communities of the Northern Territory. Ear disease and associated hearing loss is devastating the lives of many children and families. Children with hearing loss and sound deprivation experience communication and language difficulties, isolation, discrimination, behavioural problems, and social and educational disadvantage. Yet ear disease is an infection that is preventable.

This project aims to train local community members in the skills needed to use screening equipment (otoscopy and tympanometry, and basic hearing tests). This saves health professionals time, can be done in the home, school, or clinic. Local Ear Health Facilitators have potential to provide a sustainable culturally appropriate service. The student will join the HfLI to evaluate the workforce model. There are opportunities to apply quantitative methods, qualitative, or a mixed methods approach. There is potential to evaluate the effectiveness (general, health, and economic impacts) of all phases of the HfLI, from initial community consultations, implementation, and effectiveness of the training component, and transition to employment in the health service.

The student will visit remote communities to conduct structured and in-depth interviews with trainees, the Community Reference Group members, health service and school staff, parents, and children about their perspectives of the workforce model. The outcomes will be publishable and will inform policy regarding upscaling and funding of this model Territory-wide and across different health issues.

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Early life microbiome, immune development and susceptibility to acute respiratory infection

CHILD AND MATERNAL HEALTH | MASTER BY RESEARCH | PhD

We are recruiting for a Masters/PhD student project within part of a research program that aims to achieve sustainable improvements in the respiratory health of Aboriginal children.

Background: Indigenous children have a high burden of early infectious disease. A growing body of research shows the early life gut microbiome shapes future immune function and health. Exposure to antibiotics, preterm birth, C-section, and bottle feeding are shown to influence the composition of the infant gut microbiota increasing the risk of ARI. Understanding the relationship between the gut microbiome and infant susceptibility to infectious disease is an essential stepping stone toward larger studies and clinical trials of microbiome modifying factors such as probiotics. These simple interventions could have profound benefits for Indigenous child health.

Hypothesis: Early life events can alter the neonatal gut microbiome, impacting immune development and the risk of acute respiratory infection (ARI) in the first year of life.

The aims of this pilot study are to describe associations between the neonatal gut microbiome and:

1. Upstream drivers: Antibiotic exposure, gestation at birth, mode of delivery and mode of feeding
2. Downstream outcomes: Oral and nasopharyngeal (NP) IL-22 levels, NP pneumococcal carriage, ARIs

Project outline: We propose a pilot microbiome study among a cohort of NT Indigenous infants. Nested within the D-Kids RCT (NHMRC 1138604; HREC 2018-3160) the clinical team are collecting faecal samples from consented infants at both birth and 4 months of age. Following stool DNA extraction, shotgun metagenomic sequencing will be conducted at the Australian Genome Research Facility. Microbiota (MetaPhlAn2, Kraken2) and functional (KEGG) profiles will be produced using established pipelines.7 Non-stool sampling, microbiology, systemic immunology assays and clinical data generated by the funded D-Kids trial and will contribute to the analysis.

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What is the role of Moraxella catarrhalis in chronic lung disease in children?

CHILD AND MATERNAL HEALTH | HONOURS | MASTER BY RESEARCH | PhD

Chronic suppurative lung disease (CSLD) is responsible for a high burden of paediatric disease and for some children, reduced life expectancy. Moraxella catarrhalis is one of the three major respiratory bacterial pathogens, yet its role in paediatric CSLD has received little attention. We are looking for Honours, Masters and PhD students who are interested in a program of work incorporating a selection of the following projects:

a. Perform systematic reviews

b. Use whole genome sequence data to improve M. catarrhalis diagnostics

1. Determine reliability of commonly used phenotypic methods for identifying M. catarrhalis

2. Develop a sensitive and specific diagnostic PCR target for M. catarrhalis

c. Use whole genome sequence data to study M. catarrhalis global epidemiology

1. Assess the population structure of M. catarrhalis global genomes using phylogenetics with Bayesian analysis

2. Develop a core genome MLST scheme for enhanced typing and surveillance of M. catarrhalis

d. Use whole genome sequence data to investigate the virulence and antimicrobial resistance determinants in M. catarrhalis

MI. Perform GWAS on M. catarrhalis isolates from asymptomatic carriage and paediatric CSLD to identify disease correlates

MII. Analyse antimicrobial resistance determinants in M. catarrhalis

e. Use microbiomic data from lower respiratory specimens and in vitro assays to investigate the role of M. catarrhalis in polymicrobial CLSD

1. Investigate the relative prevalences of M. catarrhalis, other Moraxellaceae, and closely related genera in carriage versus CSLD-associated lower respiratory specimens, and across different disease states

2. Perform interaction assays to identify the potential role of M. catarrhalis and other Moraxellaceae in modulating growth and virulence of other respiratory species in polymicrobial infections

Significance: This program of work will develop accurate M. catarrhalis diagnostic tests; facilitate epidemiological studies and surveillance for M. catarrhalis carriage, disease and antimicrobial resistance; improve understanding of M. catarrhalis pathogenesis and potential vaccine targets; improve understanding of polymicrobial CSLD, and potentially elucidate alternative therapies for testing.

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Better management of paediatric bronchiectasis

CHILD AND MATERNAL HEALTH | MASTER BY RESEARCH | PhD

The Centre for Research Excellence (CRE) in preventing and managing bronchiectasis, especially in Aboriginal and Torres Strait Islander children is led by the Menzies School of Health Research and funded by the National Health and Medical Research Council. The CRE is offering a postgraduate scholarship to support outstanding candidates to undertake a research higher degree in areas related to the CRE, specifically bronchiectasis management.

The overall aim of the scholarship and the associated research program is to reduce the burden of bronchiectasis, especially for Aboriginal and Torres Strait Islander children, through clinical research and translation of findings. Bronchiectasis is a major cause of chronic lung disease and its prevalence among Northern Territory First Nations children is very high. Current management is dependent on regular physiotherapy, airway clearance, regular exercise, optimal nutrition, reduced environmental exposures and timely vaccinations. Personalised management plans have been shown to be beneficial for managing childhood asthma, and it is likely that personalised bronchiectasis management plans would also benefit children with bronchiectasis.

The student will play a key role in the conducting and analysing a randomised clinical trial to assess the benefits of personalised bronchiectasis management plans. In addition, the student will join the CRE and will nationally collaborate on similar projects.

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