PhD projects

Menzies welcomes highly motivated individuals thinking of pursuing a career in medical research. The following PhD projects are available by application. Please contact the supervisor to inquire or apply.

We have five research themes:

PHPC = Public Health and Primary Care
CRHD = Cardiorespiratory Health and Diseases
NDBI = Neurodegenerative Diseases/Brain Injury
CGI = Cancer, Genetics and Immunology
MSK = Musculoskeletal Health and Diseases

Theme	Supervisor	Title	Goal	Student background
PHPC	Dr Costan Magnussen costan.magnussen@utas.edu.au	Cardio- metabolic risk trajectories from childhood to midlife	Modifiable risk factors account for much of the burden of cardiovascular disease and type 2 diabetes (cardio-metabolic disease) and are very common in young Australians. Using data from the Childhood Determinants of Adult Health study, this project will define the trajectories of adiposity (body mass index and waist circumference) and physical fitness from childhood to adulthood that most strongly determine markers of cardio-metabolic disease in midlife, and ascertain the factors that predict and modify them.	Health Sciences

PHPC	Dr Amanda Neil Amanda.Neil @utas.edu.au	Assessment of the predictors of costs in people with psychosis using the Study of High impact of Psychosis (SHIP) Costs Database and seven-year follow-up linked data.	A data analysis project with a strong health economics focus that will seek to establish the predictors of the costs of psychosis using a pre-existing data source; the Study of High Impact Psychosis (SHIP) Costs Database, and linked datasets.	Health economics and/or psychiatry or psychology and/or biostatistics
PHPC	Amanda.Neil @utas.edu.au	Assessment of costs in people with chronic kidney disease.	A data analysis project with a strong health economics focus that will seek to establish the costs and predictors of the costs in people with chronic kidney disease.	
PHPC	Amanda.Neil @utas.edu.au	Acute emergency care and other emergency care of current and prior clients of public sector specialized mental health services in Tasmania, by region, 2008- 2014.	An epidemiological data linkage project that will aim to: 1) Assess the underlying cause of presentation for all acute emergency care, by region, care status and utilization of the MHHL in patients that are current or prior clients of public specialized mental health services in Tasmania 2) Assess the comparative importance of the Mental Health Helpline (MHHL) as a "gatekeeper" in the care pathway for emergency care in Tasmania 3) Assess the proportion of patients admitted to inpatient care from emergency departments; and waiting times until admission. 4) Assess the levels of representation and re-admissions within 28 days, relative to care status and regionality, and discharge source.	Health economics and/or psychiatry or psychology and/or biostatistics
PHPC	Environmental Health Research Group Assoc Prof Fay Johnston Fay.Johnston @utas.edu.au	The Latrobe ELF Study: Using data linkage to understand long term health impacts of early life exposure to air pollution	The Latrobe Early Life Follow-up (ELF) Study is one part of the Hazelwood Health Study. It was established to investigate possible health impacts of a fire in the Hazelwood open cut coal mine in the Latrobe Valley of Victoria that caused degraded air quality for several weeks. The ELF Study aims to understand the impact of the fire smoke on the health and development of children who were aged less than 2 years, or whose	A background in clinical medicine or epidemiology. Strong skills in statistical modelling. An interest in health communication and health policy is an asset. This government funded project has

			mothers were pregnant at the time of the fire. See www.hazelwoodhealthstudy.org.au/ The PhD project will include the evaluation of data that links pollution exposure estimates with health service utilisation data in children exposed to the mine fire in the years following the fire.	strong links with community and government stakeholders.
PHPC	Environmental Health Research Group Assoc Prof Fay Johnston Fay.Johnston @utas.edu.au Dr Amanda Wheeler Amanda.Wheeler @utas.edu.au	The health impacts of residential wood smoke emissions on indoor air quality.	Evidence of reductions in both respiratory and cardiovascular health are emerging as a result of exposure to wood smoke emissions. Preliminary research by the team have suggested portable air cleaners can reduce exposure to wood smoke emissions in residences. The PhD project will evaluate the effectiveness of air cleaners in a range of homes to reduce the health effects of wood smoke emissions.	A background in epidemiology or public health. Strong skills in statistics. An interest in health communication and health policy is an asset.
PHPC	Dr Kylie Smith K.J.Smith@utas.edu.au	What influences the sale of healthy foods in Tasmanian primary school canteens?	Schools have continuous and intensive contact with children during an important time in the development of health behaviours. A fundamental component of the school setting is the school canteen, which can contribute a substantial proportion of children's daily nutrition in addition to influencing their perception of healthy eating. In Tasmania, the canteen accreditation program uses a traffic light system to classify food and beverages as Green (healthy), Amber (choose carefully) or Red (not recommended) based on their nutritional properties. It is not known what factors (eg proportion of healthy items on the menu, price, principal support, canteen facilities) have the greatest influence on the sale of healthy foods. This project aims to: 1) identify the factors associated with the sale of healthy foods in Tasmanian primary school canteens. 2) test how effective different methods are at increasing the sale of healthy foods. This project is in collaboration with the Tasmanian School Canteen Association and dietitians from the Department of Health and Human Services.	Epidemiology, public health. The student will be required to visit school canteens to collect the sales data therefore excellent communication skills and a driver's license are essential.

PHPC	Professor Wendy Oddy Wendy.Oddy@utas.edu.au	Infant feeding and long-term outcomes.	A large body of literature suggests that early infant feeding has long-term impacts on adult health outcomes. Using data from the West Australian Pregnancy Cohort Study followed from before birth to now 26 years. In this project the candidate will examine the impact of early infant feeding (breastfeeding, formula feeding) on long-term cardio-metabolic outcomes including anthropometry data collected throughout childhood, adolescence and into young adulthood.	
PHPC	Wendy.Oddy@utas.edu.au	Omega 3 fatty acids and inflammation	We have previously shown pathways to inflammation through nutrition. In this project, the candidate will examine the role of fatty acids that potentially leads to a suite of inflammatory markers such as hs-CRP, cytokine biomarkers and leptin. The range of dietary intake of omega 3 and 6 fatty acids collected at 3 time-points (ages 14, 17 and 20 years), as well as erythrocyte fatty acids collected at these same time-points will be applied in this project. Data collected within the West Australian Pregnancy Cohort Study are available for these analyses. Other studies based at the Menzies Institute for Medical Research may be used to answer some of the research questions.	
PHPC	Wendy.Oddy@utas.edu.au	Nutritional pathways to adiposity, inflammation and depression.	Any other topic related to dietary intake or nutritional influence on health and disease.	
PHPC	Professor Bruce Taylor Bruce.Taylor@ utas.edu.au	Genetic and environmental factors involved in the onset and progression of MS	To establish how known and novel MS risk factors are associated with the onset and progression of MS, and how these factors interact to increase risk	

PHPC	Bruce.Taylor@ utas.edu.au	The role of vitamin D, ultraviolet radiation and latitude in the progression of MS	To establish how these factors act in increasing the risk of MS and how they influence the progression of MS.	
PHPC	Professor Andrew Palmer Andrew.palmer@utas.edu.au	Health Economics in Bariatric Surgery	Major gaps exist in our knowledge of the long term impact of morbid obesity on quality of life and costs. We are currently collecting from a cohort of approximately 400 patients who enrol for bariatric surgery in Tasmania. Specific PhD tasks 1.Analyze prospective costs collected using data linkage 2. Analyze the impact of bariatric surgery on quality of life 3. Compare sensitivity, concurrent and convergent validity of quality of life instruments in morbidly obese patients both pre-and post-bariatric surgery 4. Develop a health economics model of the long term consequences of bariatric surgery, quantifying impact on CVD and other important complication rates, life expectancy, quality-adjusted life expectancy, total lifetime costs, and incremental cost-effectiveness of bariatric surgery versus no surgery.	Epidemiological/ Analytical background desirable. Clinical background would be suitable.
PHPC	Andrew.palmer@utas.edu.au	Health Economics in Multiple Sclerosis	You will be part of the Multiple Sclerosis Flagship Team analysing all aspects of the health economic impact of MS, including quality of life, costs, employment and productivity, simulation model development and identification of optimal instruments to measure health utility in MS	One or more of the following: public health, epidemiology, economics, medicine, paramedicine, statistics
PHPC	Prof Mark Nelson Mark.nelson@utas.edu.au	Investigating Healthy Ageing through post hoc analyses within the ASPREE data set.	ASPREE was a randomised controlled trial of aspirin vs. placebo in healthy ageing conducted in Australia and the US between 2010 and 2017 and published in 3 articles in the NEJM in 2018. The opportunity now exists to answer important clinical and public health questions by further analysis of the data set.	Epidemiology, public health, medicine

PHPC	Assoc Prof Ingrid van der Mei Ingrid.vanderMei@utas.edu.au	Examining early retirement in the Australian Multiple Sclerosis Longitudinal Study	Data analysis project that aims to examine which factors are associated with early retirement and change in employment status in people with Multiple Sclerosis, a chronic disabling disease.	Health economics and/or statistics and/or epidemiology
PHPC	Ingrid.vanderMei@utas. edu.au	Can diet reduce the progression of Multiple Sclerosis	Data analysis project which aims to examine which dietary factors are associated with the progression of Multiple Sclerosis using factor analysis	Biochemistry, nutrition, biostatistics, health science, public health
PHPC	Ingrid.vanderMei@utas. edu.au	Comorbidities in Multiple Sclerosis	Data analysis projects available around comorbidities and MS (e.g. influence on disability, quality of life, and burden of disease) using different high quality datasets.	
PHPC	Ingrid.vander Mei@utas.edu.au	Developing a Cognitive Behavioural Intervention for people with MS in the workforce: The MS WorkSmart Program	Assist with the development of this intervention, analyse different sets of data (qualitative or quantitative) and create publications.	Psychology, epidemiology, public health, qualitative analysis
PHPC	Ingrid.vanderMei@utas.edu.au	Physical activity and MS: What should we advise patients?	Systematically review the physical activity and MS literature, develop a physical activity toolkit for people with MS based on the latest international evidence.	Sports science, allied health, public health, implementation science.
PHPC	Professor Peter Dargaville Tanya.OByrne@utas.edu.au	Minimally- invasive surfactant therapy in preterm infants on CPAP	Studies are based at MCRI in Melbourne, and would depend on NHMRC funding	

PHPC	Peter Dargaville Tanya.OByrne@utas.edu.au	Studies of non-invasive respiratory support in the preterm model of the pre-term infant		Health science, medicine, public health, biostatistics
PHPC	Peter Dargaville Tanya.OByrne@utas.edu.au	Studies of non-invasive respiratory support in the preterm model of the pre-term infant		Health science, medicine, public health, biostatistics
PHPC	Dr Verity Cleland verity.cleland@utas.edu.au	Environment & policy interventions to increase physical activity	Much cross-sectional evidence highlights the role that environments play in promoting physical activity. But limited intervention research has examined how, where and when policy and environmental interventions to increase physical activity are most effective and cost-effective, and their potential for scale-up. This PhD project will evaluate the effectiveness, cost-effectiveness and scalability potential of a number of natural and quasi-experiments to create environments that better support physical activity. It may involve either or both quantitative and qualitative research methods, and will have a strong focus on the translation of findings into policy and practice.	Public health, health promotion/sciences, epidemiology, psychology, planning, economics, sports science/human movement
PHPC	Dr Verity Cleland verity.cleland@utas.edu.au	Understanding & promoting physical activity in rural settings	Rural adults are less active and have poorer health outcomes than urban adults. This PhD project will aim to understand the reasons for these inequities and explore strategies to increase physical activity in rural areas. It may involve either or both quantitative and qualitative research methods and will have a strong focus on the translation of findings into policy and practice.	Public health, health promotion/sciences, epidemiology, psychology, planning, demography, sports science/human movement
PHPC	Dr Feitong Wu and Dr Costan Magnussen Feitong.Wu@utas.edu.au	Youth and adulthood cardiometabolic factors with bone microarchitecture in adulthood	Cardiometabolic factors have been associated with bone health in adults but whether these factors in childhood and their change from childhood to adulthood play a role in bone development in adulthood is under-studied. Using 27-yr follow-up data from a large cohort study (the Cardiovascular Risk in Young Finns Study), this project	Medicine, epidemiology, biostatistics, or public health

			aims to examine the association of youth and adulthood cardiometabolic factors (e.g., BMI and blood pressure) with adulthood bone microarchitecture in adulthood. Findings from this project are likely to put new insights into the importance of preventing cardiometabolic risk factors at an early stage of life for optimising bone health in adulthood.	
PHPC	leigh.blizzard@utas.edu.au	Chronic disease benchmarking in Tasmania	The first phase of the proposed work involves the use of hospital separation and clinical costing data to estimate, and monitor trends in, the prevalence of hospital-treated chronic disease (HTCD) in Tasmania. The second phase involves estimation of within-hospital resource use by HTCD patients with an eventual goal of determining levels and costs of avoidable hospitalisations and complications and developing methodology to monitor trends and evaluate interventions.	
PHPC	leigh.blizzard@utas.edu.au	Power calculations and sample size determination	An important component of the design of a project is the determination of the appropriate number of subjects to be included in the study. A number of simple approaches exist, and there are a plethora of websites that provide free or subscription-based calculators. Even for essentially the same design, the estimation method differs according to the test statistic proposed and the distributional assumptions made. Additionally, there are a surprising number of applications for which no simple approach is available. One example is linear regression. Sophisticated data simulations with existing or artificial data may be required in those circumstances. The proposed work will compare the performance of alternative estimation methods and provide published resources and web-based calculators in respect of applications in which existing approaches are deficient or lacking.	

PHPC	leigh.blizzard@utas.edu.au	Analysis of missing data	Statistical analyses with missing data raise issues of great importance. Many techniques have already been developed, and many more will be forthcoming, to handle missing data. Understanding these techniques, and developing new ones where existing approaches are too limited or circumscribed to be reliable, is of great importance to researchers at the Menzies Institute for Medical Research. One of the major research platforms at the Institute is the Childhood Determinants of Adult Disease (CDAH) cohort. The eligible subjects for this cohort are the 8,484 participants in the Australian Schools Health and Fitness Survey of 1985. Some of them have participated in follow-ups during 2004–06 (CDAH1) and 2009-10 (CDAH2), and 2017 (CDAH3). There are substantial numbers of eligible subjects who have not participated at one or more of the follows-up or will not participate at the next follow-up. Making best use of the data collected from participants requires assessment of missing data mechanisms and determination of the best ways of handling the missing data.	
PHPC	leigh.blizzard@utas.edu.au	Analysis of physical activity data	In many applications, analysts are confronted with data that are mal-distributed or implausible. In measurement of physical activity by self-report, for example, the data are typically zero-inflated and right-skewed and some respondents will have reported an implausibly large number of hours of activity. Similar problems arise in the measurement by self-report of diet, cigarette smoking and alcohol consumption. A variety of ad hoc approaches have been used (for example, by truncating total hours of physical activity per day to a maximum of 16 hours). These ad hoc methods are rarely tested in any systematic manner. Primarily using physical activity data from a variety of sources, the proposed work will assess the sensitivity of estimates to the particular assumptions made in data handling and analysis.	
PHPC	leigh.blizzard@utas.edu.au	Implementation of the Petersen-Deddens re-parametrization	In work completed, software has been developed to implement the re-parametrization method in Stata and R. There is much still to do:	

		method for the log binomial model	1. the software needs to be further developed to allow for the advanced features expected of the Stata and R statistical packages; 2. the software needs to be fully documented including help files; 3. the accuracy of the estimated coefficients needs to be verified, and the choice of the most appropriate variance estimator needs to be determined, by simulation; 4. the performance of the method must be compared with that of alternative "work-around" methods to verify its superiority over approximate methods; 5. at least one manuscript reporting the results of this work needs to be completed.	
PHPC	leigh.blizzard@utas.edu.au	Investigation of starting values for the log binomial model	We have discovered that there is a second source of numerical difficulties in fitting the log binomial model. Neither the method of calculating starting values that is used in SAS, nor the method that is used in Stata and previously in R, guarantees that the initial values are admissible for a probability model (ie lie between zero and one). The most recent version of R checks whether the default initial values are admissible and requires the user to supply improved starting values if they are not. This issue is important because it seems that mainstream statistical package cannot iterative to a solution inside the parameter space if the starting values are outside of it. The frequency with which this occurs is unknown, and there is no comparison of methods of calculating starting values in the published literature.	
PHPC	leigh.blizzard@utas.edu.au	A mixed model extension of the log binomial model and the Peterson-Deddens method of estimating it.	A mixed model formulation of the LBM is required to enable it to be applied to correlated response data. Correlated response data includes measures of clusters of related subjects and within-subject data with repeated measures of the same individuals. This type of data is common in epidemiological studies. The random effects will allow random intercepts and random slopes, and the grouping structure of the data may consist of multiple levels of nested groups. The overall error distribution of the linear mixed model will be assumed to be Gaussian, and heteroskedasticity and correlations within lowest-level groups will be modelled also. Extensive data simulations will be undertaken to	

			check the performance of the proposed models in terms of bias, mean squared error and confidence interval coverage, and estimation of real world datasets will be undertaken to check the practical utility of the method. It will be a natural extension to apply the Petersen-Deddens re-parametrization method to estimate the fixed coefficients of the random effects log binomial model.	
PHPC	leigh.blizzard@utas.edu.au	Numerical stability in the estimation of the log multinomial model	Blizzard and Hosmer (2007) proposed an extension to estimate the risk and relative of nominal outcomes with more than two attributes. The termed it the “log multinomial regression model” (LnMM). The LnMM offer a practical solution to the problem of obtaining adjusted estimates of risk and relative risk in the multinomial setting. The numerical stability of the LnMM has not been studies, however. It is not known currently whether the estimation of the LnMM is subject to numerical instability, and whether the reparameterization method of Petersen and Deddens (2010) can be extended to this model if it is. Because of the similarity of the characteristics of the LBM and LnMM, there is reason to expect that the numerical strategy used in the Petersen-Deddens approach will be applicable to the LnMM. The aim of this project is to investigate the sources of instability in estimation of the LnMM, and to propose an adaption of the Petersen-Deddens method if instability is found.	
PHPC	leigh.blizzard@utas.edu.au	Numerical stability in the estimation of the ordered log-link models	Three ordered log-link models have been proposed (Blizzard et al, 2013). They are the adjacent categories model, the continuation ratio model, and the proportional risk model. They are estimated by fitting a log multinomial model subject to (different sets of) constraints on the values of its coefficients. Just as the LnMM inherits potential for numerical instability from the LBM, the ordinal log-link models could be subject to the same problems of non-convergence that bedevil the LBM. The aim of this project is to investigate this issue and, if numerical instability is a problem, to determine whether it is possible to estimate the models using an adaption of the re-parametrization method of Petersen and Deddens.	

PHPC	leigh.blizzard@utas.edu.au	Goodness-of-fit tests for the log multinomial model	Risk and relative risk estimates for nominal outcomes with more than two attributes can be obtained from the log multinomial model. Having fitted a model, however, it is critical to assess whether a fitted model adequately represents the data. Goodness-of-fit measures have been developed for multinomial logistic regression. It is not known whether and in what circumstances the goodness-of-fit tests for the multinomial logistic model can be applied to the multinomial log-link model. The aim of this project is to study the application to the log multinomial model of easily derived and computed extensions of binary logistic regression goodness-of-fit tests for the multinomial logistic regression model. The sampling distributions of the test statistics will be examined via simulation.	
CRHD	leigh.blizzard@utas.edu.au	Goodness-of-fit tests for the ordinal log-link models	Each of the ordinal log-link models is log multinomial model estimated subject to constraints on the values of its coefficients. Three equivalent large-sample methods are available to assess whether the constraints result in significant loss of model fit. Each has an asymptotic distribution that is chi-squared with degrees of freedom equal to the number of additional constraints imposed. However, there is no overall goodness-of-fit test available for the ordinal log-link models, and no statistical theory consolidating the contributions of the overall fit of the models and the loss of fit due to the constraints. The aim of this project is to develop methodology to assess the fit of the ordinal log-link models.	
ND/BI	Assoc Prof Kaylene Young Kaylene.young@utas.edu.au	Protocadherins – a tipping point between the healthy brain and brain cancer	Protocadherins are a large family of proteins that are highly expressed by brain cells, including glial cells, and dysregulation of protocadherins is associated with the development of glioblastoma. However, until we understand how protocadherins influence glial cell function in the healthy brain it is not possible to determine how they contribute to tumour development or to target them therapeutically. This project uses a combination of cell culture and shRNA gene knockdown approaches alongside cre-lox transgenic mice, CRISPR/Cas9 gene editing and confocal microscopy to investigate the role of protocadherins in glial and cancer biology.	

ND/BI	Kaylene.young@utas.edu.au	Studying rare genetic variants to understand Multiple Sclerosis pathology	Multiple sclerosis is a complex disease and while many risk factors have been identified, the signalling pathways that initiate multiple sclerosis are unknown. By performing whole genome sequencing of families with a high incidence of multiple sclerosis, we have identified rare genetic variants that may cause multiple sclerosis in these families. By studying these genes in the laboratory we hope to identify the signalling pathways that are dysregulated and lead to the development of multiple sclerosis. This project uses a combination of induced pluripotent stem cell (iPSC) culture, electrophysiology, immunocytochemistry and CRISPR/Cas9 gene editing to study the function of each gene and genetic variant identified in the family genetic studies, to determine if and how these variants cause multiple sclerosis.	
ND/BI	Kaylene.young@utas.edu.au	Do oligodendrocytes die from oxidative damage in neurodegenerative disease?	Oxidative damage is apparent in the central nervous system (CNS) of people with neurotrauma, Alzheimer's Disease (AD), multiple sclerosis (MS), and a range of other neurodegenerative conditions. Myelinating oligodendrocytes are best known for promoting the rapid conduction of action potentials in the CNS, however they also provide essential metabolic support to neurons at the axon-myelin interface, making them critical for healthy CNS function. Oligodendrocyte loss and / or dysfunction is a feature of neurotrauma, neurodegenerative and, of course, demyelinating disease. This project will use cre-lox transgenic mice, 3D transmission electron microscopy, histology and confocal microscopy to determine whether oligodendrocyte DNA damage and abnormal cell cycle re-entry result in oligodendrocyte death, myelin loss, the decompaction of myelin supported by surviving oligodendrocytes, and ultimately axonal degeneration and functional loss.	
ND/BI	Kaylene.young@utas.edu.au	Do the nodes of Ranvier change with experience?	We have shown that interventions that change brain activity are associated with changes in node of Ranvier structure. This project will use RNA sequencing, genetic deletion and overexpression, histology and confocal microscopy to determine how this structure can remain plastic throughout life.	

ND/BI	Dr Owen Marshall owen.marshall@utas.edu.au	Investigating epigenetic changes during Alzheimer's Disease progression	Although there are many different causes of dementia, epigenetic changes in the chromatin of neurons have recently been implicated in the progression of a number of neurodegenerative diseases, including Alzheimer's Disease. We have developed a powerful new technique for profiling genome-wide chromatin changes in the brain, using the fruit fly as a model organism. We will apply this technique to specific populations of neurons at both early and late stages of disease progression. The epigenetic changes we observe will help identify candidate genes and chromatin factors that play a role in Alzheimer's Disease.	This project will involve basic molecular biology (PCR, restriction digests, DNA extraction) and confocal microscopy, together with next-generation sequencing and bioinformatic analysis.
CGI	Prof Joanne Dickinson Jo.Dickinson@ut as.edu.au Prof Kathryn Burdon kathryn.burdon@ utas.edu.au Dr Jac Charlesworth jac.charlesworth @utas.edu.au Dr Liesel Fitzgerald liesel.fitzgerald@ utas.edu.au	Elucidation of the genetic and epigenetic drivers of complex disease using established familial and/or case control human genetic resources	To identify key contributors to complex disease risk and disease progression through the study of large families with a dense aggregation of disease and/or case/control genetic resources ascertained on the disease of interest.* *This is a general overview of a range of projects available in complex diseases including cancer and eye disease.	Molecular biological techniques, cell biology and biostatistical/bioinformatic expertise
CGI	Prof Heinrich Korner Heinrich.Korner @utas.edu.au	TNF in alternative ve rsus inflammatory activation; A comparisonbetween mouse andhuman macrophage s in inflammatory models	TNF has a central, non-redundant role in macrophage differentiation and in the perpetuation of the host-protective inflammatory phenotype. Our results demonstrate that the proinflammatory TNF- TNFR1 signalling pathway directs the differentiation of monocytes towards inflammatory macrophages (M1) by repressing the development of alternatively activated (M2) macrophages. Failure to suppress the alternative pathway results in the co-expression of the M2 enzyme Arg1 and the M1-associated enzyme inducible or type 2 nitric oxide (NO) synthase (iNOS or NOS2). The enzymes are metabolic competitors.	

			To explore the breadth of this new concept it needs to be investigated if TLR activation can overrule the role of TNF and if human macrophages respond in a comparable way when TNF is blocked.	
CGI	Heinrich.Korner@utas.edu.au	Do MS-associated genetic changes in Vitamin D metabolism affect the function of T cells	To bring genetic polymorphisms and biological phenotype into a context.	Immunology, biostatistics
CGI	Professor Alex Hewitt alex.hewitt@utas.edu.au	Predicting Cellular Function from Structure: artificial intelligence meets cell painting	This project aims to combine the methods of cell painting for cell morphology profiling, single cell RNA-seq for expression profiling as well as CRISPR/Cas screens to define and characterise the molecular pathways involved in cellular homeostasis. Skills required could range from computer programming (such as R/python/perl) or basic cell culture methods.	
CGI	Professor Alex Hewitt alex.hewitt@utas.edu.au	Dissecting the mechanisms of haematopoiesis	This project will use stem cell culture, flow cytometry and single cell RNA-seq to functionally characterise novel genetic drivers for the variation in erythrocyte gene expression. Skills required involve basic cell culture methods.	
CGI	Dr Guei-Sheung Liu gueisheung.liu@utas.edu.au	Construction of A Single-cell Transcriptomics Atlas for Diabetic Retinopathy	Diabetic retinopathy (DR) is an increasingly common global clinical and public health concern. Whilst there has been considerable progress in understanding the key pathogenetic mechanisms involved in the development of late-stage DR. In this project, we will aim to construct a comprehensive transcriptomics atlas using single-cell RNA sequencing (scRNA-Seq) to profile gene expression patterns across thousands of individual cells in the retina of controlled animal models of DR. Single-cell analysis can reveal cell type-specific changes and identify previously unrecognized roles for certain cell types in the early pathogenesis of DR. A more comprehensive understanding of the overall pattern of change has the potential to reveal novel therapeutic targets.	

CGI	Dr Guei-Sheung Liu gueisheung.liu@utas.edu.au	Utility of CRISPR/Cas-based Gene Therapy for Preventing Neovascular Blindness	Excessive growth of blood vessels in the eye causes loss of vision and can only be treated with painful and frequent injections into the eye, which might be dangerous in the long-term. A new, CRISPR/Cas-based gene therapy may be used as a more effect, safer and less-invasive therapeutic alternative to conventional drug injections for management of these forms of vision loss. This therapy has potential to revolutionise the current ophthalmic care of age-related macular degeneration and diabetic retinopathy.	
CGI	Dr Guei-Sheung Liu gueisheung.liu@utas.edu.au	Targeting Dysregulated miRNAs to Stop the Growth of Blood Vessels in Diabetic Eyes	Vision loss from diabetic retinopathy is a global clinical and public health concern, significantly impacting the quality of life of patients. Whilst therapies such as anti-VEGF (antibody-based medications) have been a breakthrough in the management of vision-threatening stages of diabetic retinopathy, significant irreversible retinal damage can already have occurred by this stage. Here we seek support to develop the novel therapeutic strategies targeting critical gene regulator (microRNAs, short non-coding RNAs), that combat the earliest pathological cascades that predispose to blindness in those with diabetes. Success in this project will provide the impetus to pursue novel treatments that target the earliest pathological steps in the development of diabetic retinopathy. This has important implications for preventing vision loss in a substantial number of people at risk from diabetic retinopathy.	
MSK	Prof Graeme Jones G.Jones@utas.edu.au	Tbone study- bone development in children from birth to age 25 years		Medicine, epidemiology/biostatistics, and/or public health

MSK	G.Jones@utas.edu.au	TASOAC study 10 year study of osteoarthritis, osteoporosis, falls, vitamin D and bone architecture		Medicine, epidemiology/biostatistics, and/or public health
MSK	Prof Changhai Ding changhai.ding@utas.edu.au	Biomakers in osteoarthritis	The project, based on vitamin D trial and Osteoarthritis Initiative Study, will examine if MRI-detected markers and blood biomarkers are associated with knee osteoarthritic changes.	
MSK	Assoc Prof Dawn Aitken dawn.aitken@utas.edu.au	Improving our understanding about osteoarthritis, developing new therapeutic treatments and informing strategies that optimise patient care (with an emphasis on the role of exercise in disease management)	Dr Aitken leads a program of research which aims to develop a better understanding of osteoarthritis and identify and test new treatments. She is also interested in the role of exercise in the management of osteoarthritis and improving the conservative (non-surgical) management of the disease. Depending on the student's interest and background a number of projects are available which include: • Long-term cohort studies which use MRI scanning to gain a better understanding of the development and progression of osteoarthritis; • Long-term cohort studies examining the relationship between physical activity and osteoarthritis; • Randomised controlled trials examining new therapeutic treatments for musculoskeletal pain; • Randomised controlled trials examining exercise as a treatment for osteoarthritis; • Research which examines why the conservative management of osteoarthritis is so poor in Australia, performing systematic reviews, meta-analyses and qualitative research methods.	Students from a number of backgrounds are welcome including medical and health sciences, epidemiology, biostatistics, allied health, and public health. Strong writing and statistical skills are desirable.