

THE ORIGINS PROJECT: ANNUAL PERFORMANCE REPORT 2019

REPORTING PERIOD
JULY 2018 – JUNE 2019

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originsproject.telethonkids.org.au





LIST OF ABBREVIATIONS

ABNA	Australasian Biospecimen Network Association
ACCYPN	Australian College of Children & Young People's Nurses
ACE	Antenatal Colostrum Expression
ADAPTS	Antibiotics Dysbiosis and Probiotic Trial in Infants
ARC	Australian Research Council
ASCIA	Australasian Society of Clinical Immunology and Allergy
CAHS	Child and Adolescent Health Service
CHN	Child Health Nurse
CoLab	Collaborate for Kids at Telethon Kids Institute
DASS	Depression Anxiety & Stress Scale
DOHaD	Developmental Origins of Health and Disease
FIFO	Fly in fly out
Gen V	Generation Victoria
GPs	General Practitioners
ISBER	International Society for Biological and Environmental Repositories
JHC	Joondalup Health Campus
LIMS	Laboratory Information Management System
MD	Doctor of Medicine
MCRI	Murdoch Children's Research Institute
MFFF	Medical Research Future Fund

NCDs	Non-communicable diseases
NHMRC	National Health and Medical Research Council
ORBIT	Onset of severe RSV bronchiolitis due to identified maternal or environmental viral transmission
PLAN	Pregnancy Lifestyle, Activity, Nutrition
PPC	Perth Pregnancy Centre
PTSD	Post Traumatic Stress Disorder
RART Grant	Medical Research Future Fund Rapid Applied Research Translation Grant
RCT	Randomised Controlled Trial
RIGs	Research Interest Groups
TALK	Testosterone and Language in Kids Study
TEWL	Transepidermal Water Loss
TKI	Telethon Kids Institute
TUMS	The Water Quality and Microbiome Study
UTI	Urinary Tract Infection
WAHTN	Western Australian Health Translation Network
WASEY	Wanneroo And Surrounds Early Years Network
WINDOWS	WA Infant Developmental Wellness Study

ACKNOWLEDGEMENTS

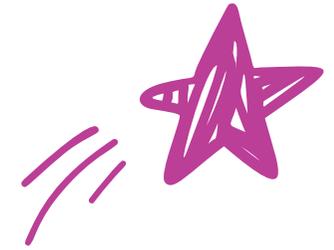
We gratefully acknowledge that The ORIGINS Project is funded by the Paul Ramsay Foundation and the Commonwealth Government of Australia – via Telethon – and supported by the partnership of the Telethon Kids Institute and Joondalup Health Campus.

We gratefully appreciate the artwork for The ORIGINS Project provided by Dr Susan Prescott. Susan is a passionate advocate for social change and adopts, or for adopting a holistic approach to life. As an artist she communicates these ideas, not only through the knowledge base of science, but also through the inspiration of art.



The ORIGINS Project acknowledges the Aboriginal and Torres Strait Islander people as the Traditional Custodians of the land and waters of Australia. We also acknowledge the Nyoongar Wadjuk, Yawuru, Kariyarra and Kurna Elders, their people and their land upon which the Institute is located and seek their wisdom in our work to improve the health and development of all children.

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OVERVIEW



The largest study of its kind in Australia, The ORIGINS Project (“ORIGINS”) is a partnership between Telethon Kids Institute and the Joondalup Health Campus, aimed at reducing the rising epidemic of non-communicable diseases (NCDs) by providing a healthy start to life.



ORIGINS researchers are collecting detailed information about babies and their families to understand more about how the early environment influences the risk of diseases and the optimal time for interventions for early detection and prevention.

At its core, ORIGINS aims to improve the health and quality of life of the next generation through improved pathways to optimise the early environment and reduce adversity. This dynamic, interactive community-based project provides novel research capacity, productivity, collaboration and translational impact for future generations. Additionally, it is anticipated to have flow on benefits for community engagement, cohesion and purpose. ORIGINS will provide a sentinel example for tailored replication in other communities around the world as part of interconnected grass root strategies to improve planetary health.

ORIGINS will create comprehensive data and biobanks for 10,000 families over the period of antenatal care, to 5 years of age. This project will utilise new science and technologies to collect and analyse the data and specimens to answer a range of critical research questions.

So far in excess of 4,000 participants have been recruited, which includes over 2,000 mothers, 700 fathers and more than 1,500 ORIGINS babies. Of those, almost 500 have attended their one-year clinic appointment. Unique among other pregnancy cohort studies, ORIGINS includes fathers participating in the research. The project has ensured active community involvement, holding numerous events bringing study participants and community members together with paediatricians and health nurses to monitor and discuss childhood health and development.

The ORIGINS Project is a catalyst for change, intervening as soon as anomalies are detected

by referring participant families to appropriate community and health services. Not only does the project provide a framework for new discoveries, it is also a facilitator of collaboration across disciplines, sectors and communities. The potential for manifold benefits are endless.

This *Annual Performance Report* outlines the progress made and deliverables achieved during the reporting period 1st July 2018 to 30th June 2019. It includes key achievements; key challenges across the Project; and identifies opportunities for 2019-20.

“ So far in excess of 4,000 participants have been recruited, which include over 2,000 mothers, 700 fathers and more than 1,500 ORIGINS babies. ”

HIGHLIGHTS FOR THE YEAR



More than **750** local, national and international researchers, clinicians and consumers involved

More than **3,000,000** data points collected from participant samples and questionnaires

Embedded research into clinical care at JHC

More than **3,500** blood draws which equates to over **50,000** blood aliquots

Approximately 3,700 stools have been collected which equates to around 11,000 tubes of stool samples in the freezers

Wide media coverage – more than **30** media items with an audience reach of more than **two million** people

12 Sub projects have been launched off the main project, looking at multiple aspects of child and family health and development

13 active ORIGINS Research Interest Groups (RIGs) have been launched, to facilitate collaboration, provide expertise, develop nested Sub projects, and support students. There are over 150 RIG members, with 10 to 46 members in each RIG. Members include researchers, clinicians, community members, service providers and educators

Researchers have presented at more than **30** conferences and community events

ORIGINS Forum held in August 2018 attracted more than **160** attendees, generating collaborative ideas for future ORIGINS Project research and Sub projects

Annual Family Fun event attracted almost **200** attendees





25 research papers have been published linked to data and knowledge within the project



ORIGINS collaboration and advocacy with Joondalup Health Campus (JHC) for employment of Aboriginal Liaison Officers to make JHC a 'safe place' for Aboriginal women and families to birth



Research translation to change in practice and policy, including fresh food in the vending machines at JHC that has **reduced sugar consumption by 1.2 tons over 11 months**



109 real-time feedback to participant families and referral to health and other support services for immediate care



A book chapter called 'The ORIGINS Project' was published in the international book Pre-emptive Medicine: Public Health Aspects of Developmental Origins of Health and Disease



2019-2020 OPPORTUNITIES



- In collaboration with the Institute, develop an 'Omics Platform and data integration system.
- ORIGINS will look to increase the diversity of the cohort by targeting **disadvantaged and vulnerable** groups in identified geographical regions of high need.
- WA Child Research Fund 2019 will provide **grants to project** proposals that utilise established, previously funded Projects including ORIGINS as a key WA Project.
- Deliver a **Priority Setting Workshop** with consumers and other key stakeholders.
- **2020 ORIGINS Forum** to be held in August next year to showcase ORIGINS research.
- Build research capacity and opportunity within the Project, by awarding a series of **ORIGINS PhD scholarships**.



Co-Director Prof Susan Prescott won the Independent Book Publishers 2018 Gold Medal in the health category for her book Secret Life. She was also a finalist in Forward Review's Indie Book of the Year



The Giving our Children the Best Start Symposium with Dr Michael Mosley was held in June 2019, with over 130 attendees





FROM THE ORIGINS DIRECTORS

As the first phase of The ORIGINS Project ends, we are excited and delighted in all that has been achieved in the last year and we look forward to Phase 2 of the Project.



It is remarkable that already we have over 4,000 individuals participating in ORIGINS – mums, dads and babies. Over 2,000 families have consented to be part of this incredible project at varying levels of engagement. We are enormously grateful to all our participants who give up their precious time to be part of long-term research.

The ORIGINS Project is growing organically to be a hub for new and different research questions that have global significance. We are witnessing a paradigm shift away from traditional medical models to more holistic care, encompassing physical, mental and environmental wellbeing. Projects within ORIGINS will explore the impact of nature, exposure to sunlight and increased time spent in natural environments. A move from treatment to prevention can be seen in the development of interventions such as stress reduction for mums and the impact of dads or partners' wellbeing. The influence of parents simply learning to proactively engage with their newborns could change childhood trajectories. The power of ORIGINS will be in the collection and curation of data through our core and Sub project data captured via online portals, face-to-face clinics, diagnostic tests, sample collections and interviews. The magnitude of ORIGINS data will provide a 'big data' platform for investigations using new

technologies such as machine learning and artificial intelligence to predict and provide personalised care solutions.

We are starting to witness the impact of ORIGINS on our local communities and are working closely with both the Cities of Joondalup and Wanneroo. As a local project, we anticipate local families will be the beneficiaries of our research discovery. It is estimated that children under five years of age will be the largest demographic group in the Wanneroo area until 2026 with an expected growth rate of 8.2% (ie almost 25,000 infants). We continue to build this visionary project as it progresses into Phase Two; over the next few years we will work hard to reach out to vulnerable people within our communities, to ensure that ORIGINS is an accessible and equitable opportunity for all birthing families.

Our reputation and influence are growing on the national and international stage. We are steadily building an extensive collaborative network with researchers across many diverse fields from Oceania, Asia, North America, Africa and Europe. There is already strong interest in ORIGINS as both a collaborative partner and as a model example for other centres to emulate.

We wish to acknowledge the support of the Telethon Kids Institute and Joondalup Health Campus, in particular the CEOs – Kempton Cowan (JHC) and Jonathan Carapetis (TKI) - of both organisation who have been instrumental in our work. It is only with their backing that ORIGINS has evolved. We have been so fortunate to have such enthusiastic support from many researchers and institutions locally, nationally and internationally. Additionally, we continue to be hugely grateful to our funders, the Paul Ramsay Foundation and the Commonwealth of Australia.

Importantly, we whole heartedly thank everyone in the ORIGINS Team based at Joondalup Health Campus and Telethon Kids Institute. This not only includes our Project staff, but also those who provide indirect support including researchers, clinical champions, volunteers, students, service providers and community groups. ORIGINS could not exist without you.

Professor Susan Prescott
Professor Desiree Silva



AIMS OF ORIGINS?

1

Improve the health of the next generation through optimising the early environment (on all levels); early identification and timely intervention

2

Develop an extensive Biobank and Databank (Research Platform)

3

Make change: harmonised nested interventions clinical trials community based programs

4

Real time feed back: to participants and health systems

5

Utilise new Technology Platforms for Personalised Medicine: examine complex biological interactions (P4 'Omics) to relations to bio-psycho-social determinants

6

To integrate medical education, research and clinical care at the hospital

7

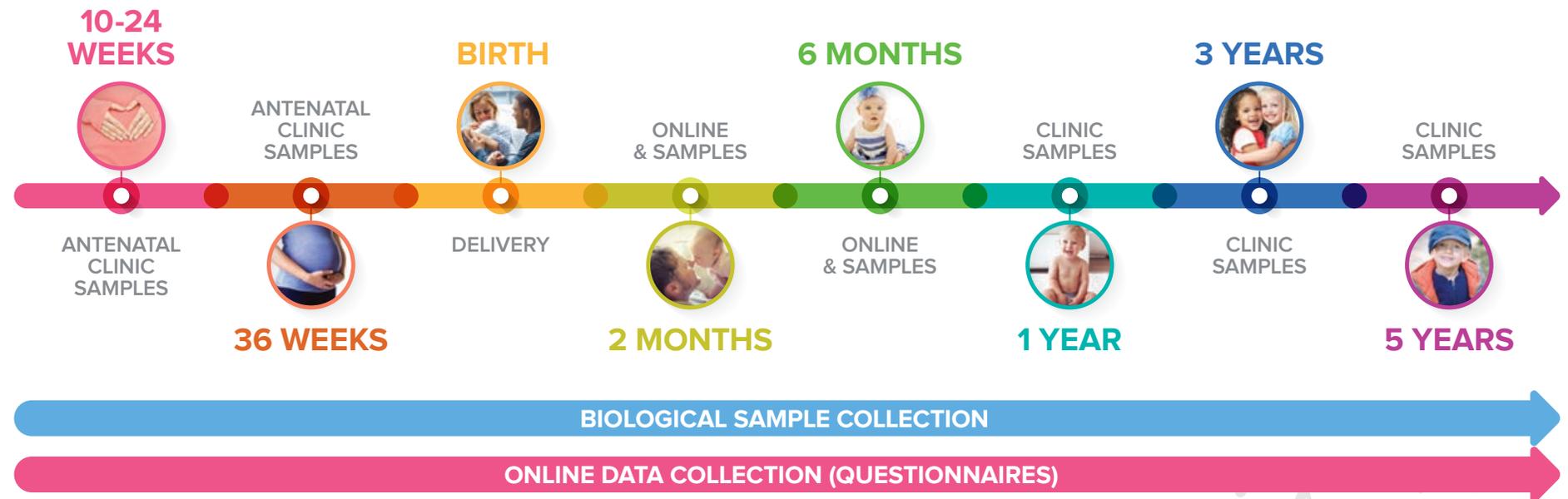
To collaborate closely with other national and international cohort studies



THE ORIGINS DATA COLLECTION

The ORIGINS Project is collecting data from multiple sources from the mother, infant (and father) at several timepoints from gestation through to 5 years of age.

Figure 1: Data collection time points



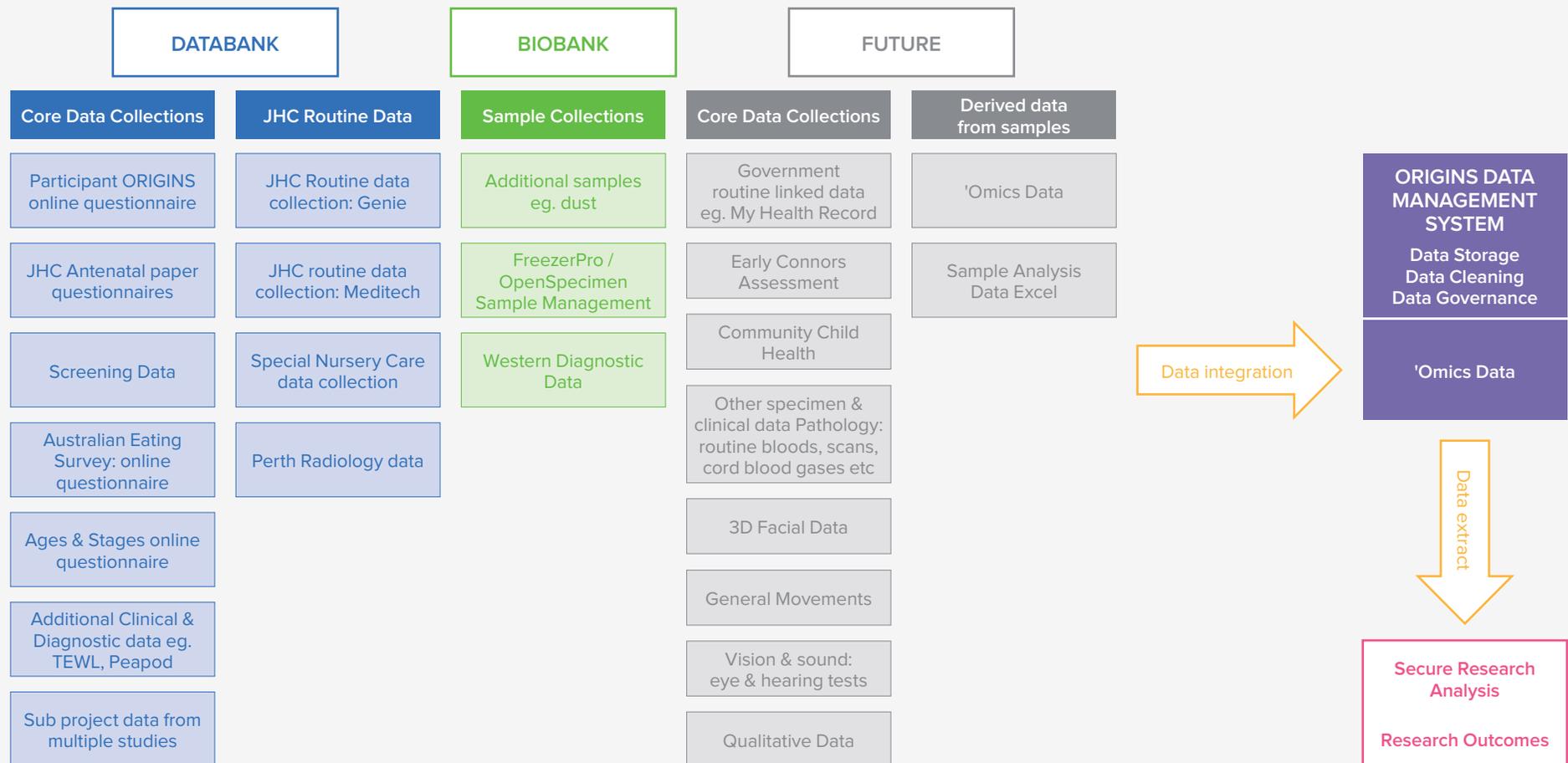




ORIGINS DATA SOURCES

The ORIGINS Project collects data from multiple sources including ORIGINS specific data collections and existing routinely collected data through the hospital and health service providers. The Project plans to integrate future data collections from additional sources, including 3D facial imaging, vision and sound tests. Data derived from samples ('Omics data such as metabolomics, transcriptomics, proteomics) and microbiome analyses will need external supercomputing storage capabilities. All data will be linked through unique identifiers in order to track individual participants as well as family units.

Figure 2: ORIGINS Data Sources: current and future



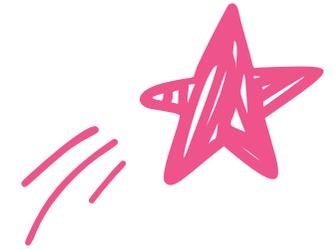


THE ORIGINS PROJECT VISION & STRATEGY

The ORIGINS Project aims to explore novel perspectives on promoting ‘a healthy start to life’ to build the foundations for a happy and healthy pathway into adulthood. The project provides a framework for strategic long-term research capacity with global application. During 2018-2019, we revisited the project Vision and Strategic Imperatives to clarify and unify our ongoing purpose.



THE VISION AND STRATEGY WERE DEVELOPED IN CONSULTATION WITH STAKEHOLDERS, INCLUDING CONSUMER REPRESENTATIVES AND AGREED AS FOLLOWS.



The ORIGINS Project VISION

Happy people building healthy communities across the planet that empower us to realise our **potential**.

STRATEGIC IMPERATIVES

- Build a dynamic research platform to enable global health transformation (capacity).
- Provide responsive feedback to families and the community to facilitate change now (action).
- Collaborate globally and locally to extend our impact and reach (connectivity).
- Apply new technologies to accelerate and amplify change (creativity and ingenuity).
- Nurture and share a legacy that inspires global change, growth, sustainability and scalability (love, joy and awe).

PROJECT IMPLEMENTATION

The ORIGINS Team must be adaptive, agile and responsive to the changing needs of the Project. As such, we have separated implementation into five phases. Each phase has a central focus which will shift and adapt as the project grows. This Report marks the end of Phase 1 ‘*engagement and establishment*’; as Phase 2 commences ‘*strengthening the foundations*’ we will seek to increase the diversity of engagement, refine our processes and continue to build partnerships.

Figure 3: ORIGINS Phases of Implementation





PARTICIPANT RECRUITMENT & RETENTION

ORIGINS is an observational and interventional pregnancy cohort study. Pregnant women (and the father of their baby and/or partner) are recruited with informed consent early in their pregnancy to collect detailed environmental and psychosocial data using questionnaire data, medical records, diagnostic tools and biological samples.



The data collected from participants forms the ORIGINS research platform (biobank and databank) and will be available to researchers to assess how early life exposures influence a child's growth, development and health (including neurodevelopment, evidence of allergies, infections, and other medical and mental health conditions). The families will initially be followed up until the child is five years of age. Our aim is to recruit 5,000 'Active' participants (undertaking deep sampling at specific time points), plus 5,000 'Non-Active' participants that includes all routinely collected hospital data, opportunistic samples and linkage to government and non-government databases.

KEY ACTIVITIES IN REPORTING PERIOD

The target of the ORIGINS Recruitment team is to recruit and retain participants. In total, the ORIGINS Project has recruited **2,153** participants (pregnant women) to June 2019. This is in line with our project targets of 2,496 by end of June 2019 of projected recruitment numbers. Additionally, the total number of ORIGINS babies is **1,579** and **698** ORIGINS participant fathers. At the end of June 2019, there are **791** participants involved in one or more Sub projects (approximately 60% of the 'Active' cohort). This provides a robust source of participants for ongoing data collection and participation in research projects.

Table 1: Participant Recruitment & Follow-up

RECRUITMENT & FOLLOW UP NUMBERS	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN'	TOTAL IN REPORTING PERIOD	PROJECT CUMULATIVE TOTAL
Participants Enrolled (A)*	39	53	42	45	57	35	35	40	55	44	65	52	562	1,428
Participants Enrolled (NA)**	42	19	24	34	34	8	11	20	40	23	33	23	311	725
Total participants recruited													2,153	
Babies consented	70	68	71	86	68	38	50	17	56	54	58	61	697	1,641
Total babies consented													1,579	
Fathers Enrolled (A)	35	12	23	26	38	12	31	35	38	44	66	30	384	728
Total fathers recruited													728	
One-year infant*** appointments	25	23	25	29	36	23	40	39	45	38	45	22	390	466

*Active (deep sampling) participants.

**Non-Active (routine data only) participants.

***One-year infant includes children between 12-18 months, therefore the cumulative total of one-year infant appointments will increase in future reporting periods as babies reach the 12-18-month mark.



PARTICIPANT RECRUITMENT & RETENTION IN THE REPORTING PERIOD

- Recruitment rates have been lower than anticipated during the reporting period due to multiple factors including staffing resources and increased provision of community antenatal care. For example, Perth Pregnancy Centre now manages 30% of antenatal care in the community until 36 weeks gestation.
- Time and resources for ORIGINS staff to recruit participants into increasing number of Sub projects is currently under consideration so we can strategically manage the demand.
- Many participants are involved in more than one Sub project; of the 1,428 current Active participants, 791 are involved in one or more Sub project/s (58%).
- Of those participants involved in the SYMBA Sub project (N=372), 56% are also participating in TALK and 25% have partners involved in the CARE Dads Sub project.

KEY STRATEGIES IMPLEMENTED TO RECRUIT AND RETAIN PARTICIPANTS

- In consideration of potential participant burden, we have streamlined communications, sampling and questionnaire time points across core ORIGINS and Sub projects.
- Implemented two-month follow up phone calls with participants to enhance sample collection and continued engagement with the project.
- Reviewed and updated processes for booking appointments.
- Recruited a dedicated staff member to recruit participants (mothers and fathers) within the Antenatal Clinic and on the JHC birthing ward.
- Increased efficiencies, for example introduced the practice of emailing the Participant Information Booklet to participants who expressed interest to participate.
- Delivered information on ORIGINS at General Practitioners (GPs) education sessions.
- Introduced further incentives, such as a participant monthly prize draw.

OPPORTUNITIES IDENTIFIED FOR THE NEXT 12 MONTHS

- Improved data management with the implementation of a comprehensive Data Management System.
- ORIGINS has established a formal Agreement to recruit participants through the Perth Pregnancy Centre (PPC) which is an independent community midwifery service; we anticipate increases in ORIGINS recruitment numbers as a direct result of this.
- Targeted JHC engagement and promotion, such as a video in the Antenatal clinic and TVs in rooms publicising ORIGINS.
- Investigate implementation of E-Screening & E-Consent to reduce manual paper processes.
- Investigate implementation of an online booking system for appointments online/outside of working hours.
- Undertake engagement with local General Practitioners (GPs) who refer patients to JHC to deliver or provide shared care to their pregnant patients.
- Undertake engagement with local pharmacies who see participants during or prior to their pregnancy.
- All correspondence to GPs from the obstetric and paediatric departments will have a promotional link to the ORIGINS website and GP educational video.





A FAMILY JOURNEY: THE JHC BIRTHING POPULATION

Joondalup Health Campus has been tracking antenatal patients since 2015 to understand their demographic and epidemiological profile. Survey data is collected from mothers and fathers as part of routine hospital care. ORIGINS participant data is captured within this dataset which includes a total of approximately 8,000 fathers and 6,000 mothers (see Appendix 6 for further information).

SNAPSHOT OF JHC ANTENATAL PATIENT PROFILES

FATHERS

- Fathers age ranged from 16.2 to 68.2 years with a mean age of 32.7 years.
- 19% of fathers were smokers, 67% drank alcohol and 1.7% used drugs.
- 13.9% of fathers were FIFO workers.
- Hay fever was the most prevalent medical condition (5.4%), followed by asthma (3.4%).
- Chlamydia was the most prevalent infection, with 5.8% of fathers reporting a doctor confirmed a Chlamydia infection at some point in their life.
- Anxiety disorders (5.2%) was the most reported mental health condition (confirmed by a doctor) followed by major depression (2.0%).

MOTHERS

- Mothers age ranged from 16.5 to 50.0 years with a mean age of 30.4 years.
- 5.4% of mothers were smokers, 9.3% drank alcohol and 0.4% used drugs.
- Asthma was the most prevalent medical condition (8.4%), followed by hay fever (7.8%).
- Unplanned pregnancies were reported by 35.1% of mothers.
- 19.5% of mothers reported bleeding during their pregnancy, with 17.1% consulting a doctor and 3.6% admitted to hospital.
- 89.3% of mothers planned to breastfeed in hospital.
- Urinary tract infections were reported by 22.6% of mothers, and thrush reported by 16.4%.
- Chlamydia was the most prevalent infection, with 9.0% of mothers reporting a doctor confirmed a Chlamydia infection at some point in their life.
- Anxiety disorders (12.7%) was the most reported mental health condition (confirmed by a doctor) followed by major depression (5.5%).





ORIGINS BIOBANK

The ORIGINS Biobank is collecting multiple samples from participant families at 10 timepoints over 10 years. The Biobank currently contains approximately 120,000 samples and this will continue to grow to an estimated 1,000,000 individual samples by 2027. The samples and derived data from 'Omics analyses is likely to be one of the largest collections in Australia and is receiving national and international interest.

KEY ACTIVITIES IN REPORTING PERIOD

- Overall, the Biobank continues to collect antenatal samples at high rates, around 80% of all samples.
- Rates of birth sample collections are relatively steady (around 70%), which is close to the 75% we are aiming to achieve. Cord gas bloods are a valuable sample that is now collected routinely.
- Success in extraction of blood from one-year old infants has improved mainly due to staff upskilling.
- ORIGINS liquid nitrogen and laboratory facilities are now state of the art and fully support the project's needs.
- Centralisation of the Biobank was completed in June 2019 when all -80 freezers were moved to a centralised Freezer facility. This will optimise storage logistics and significantly ease workflows.
- Quality Control procedures are underway, and we have confirmed several sample types to be of high quality, with more to be investigated in coming months. Sample limitations are also being investigated and will guide appropriate use of samples in the future.
- An ORIGINS Biobank Governance Committee was established to oversee and advise on the processes, quality standards and risks of the ORIGINS Biobank. Representatives are leaders in biobanking and sample analyses. Meetings were held in July (2018), October (2018) and March (2019).
- A supportive and strong relationship continues to be developed and nurtured between the Biobank and our collaborators at Western Diagnostics to mutual benefits. Western Diagnostics has recently donated a diagnostic blood analyser to the Telethon Kids Institute, which will improve our ability to accurately analyse research data.
- A relationship has been established with the Australasian Biospecimen Network Association

(the ORIGINS Biobank Manager is a committee representative). The 2020 ABNA conference will be held in Perth next year.

- A relationship with the Western Australian Health Translation Network (WAHTN) and the growing initiatives around centralised biobanking has been established through the trial implementation of the Open Specimen software.

KEY CHALLENGES AND STRATEGIES TO ADDRESS THEM

- Achieving and maintaining high rates of quality cord blood collection is an ongoing challenge and requires continual training and monitoring of clinical staff. We issue newsletters, attend JHC hospital in-services, and interact with the clinical staff at all opportunities to optimise engagement and compliance.
- Achieving high rates of postnatal samples collected in the home is challenging as maternal motivation is often low. To counteract this, we are trialling several incentives and increasing engagement with participants to better understand barriers to sample compliance. A trial of courier home collections showed some promise and a plan is in place to make this a regular service.
- As data management has been difficult with increasing complexity, a new Laboratory Information Management System (LIMS) was purchased at the end of 2018 to improve sample tracking. The software (OpenSpecimen) customisation and legacy data migration is currently in progress and expected to be complete by August 2019. This process is complex and has been somewhat slower than anticipated but is progressing satisfactorily.

OPPORTUNITIES IDENTIFIED FOR THE NEXT 12 MONTHS

- Implementation of OpenSpecimen will increase the efficiency, reporting capabilities and profile of the Biobank significantly, enhancing the system both internally and externally.
- Several Sub projects involving biological analysis are nearing completion and scientific publications are likely soon.
- The Biobank is involved in Institute initiatives to develop multi-omic analysis of small samples, which is hoped to lead to funding opportunities to support centralised large-data generation within ORIGINS.
- The Biobank will continue to expand on the ABNA relationship to develop connections with the international biobanking community through the larger International Society for Biological and Environmental Repositories (ISBER).
- The ORIGINS Biobank is in discussion with the Pawsey Supercomputing Centre at Curtin University, which could provide a solution for hosting and managing the large volumes of data that will be developed from ORIGINS' biological sample analysis.
- Integrating data collected by the Child Health Nurse, which includes Ages & Stages questionnaire on Non-Active Participants.



ORIGINS DATABANK

ORIGINS is collecting substantial data, in the form of administrative, physiological, biological and clinical data from the mother, father and child. Much of this data is collected at numerous time points to track development and change. A critical element of data management is the ability to link the numerous data sets. The aim is to recruit 10,000 participants (pregnant women) – 5,000 deep sampling and 5,000 linked data – as well as additional participant data from the infants and fathers. The potential richness of information from the curation of this comprehensive, longitudinal databank collection is immense.



KEY ACTIVITIES IN REPORTING PERIOD

- The volume of information in the ORIGINS Databank is growing at a rapid rate and we need to reconfigure the Databank to ensure all data can be integrated and mapped across multiple systems, then delivered to researchers in a timely, secure and efficient manner.
- Approximately 5,000 online questionnaires were completed over the reporting period, including the ORIGINS core questionnaires, Australian Eating Survey and Ages & Stages questionnaires.
- Since Project inception, 1,530 Australian Eating Surveys have been completed. Approximately 3,000 Ages & Stages Surveys have been completed in this reporting period at several timepoints.
- Extensive additional data were collected through hospital systems: this includes all routinely collected hospital data for the mother, newborn and further neonatal data for high needs babies.
- Participants complete online questionnaires at a range of timepoints with compliance rates highest (70%) during the antenatal period at (20 weeks gestation).
- During the year, we reviewed and refined communication messages, documents and engagement strategies with participants to prompt completion. For example, regular text reminders, phone calls at two months postnatally, and the use of participant materials such as ORIGINS fridge magnets.

KEY CHALLENGES AND STRATEGIES TO ADDRESS THEM

- Monitoring compliance rates indicates there are several timepoints that participants find challenging, most notably the first six months postnatally; several strategies are in place to address this including ceasing data collection at four months postnatally, and reducing the number of questionnaire items.
- The most significant plan is to change the online system to enable a more user-friendly front-end, improved user interface via smartphones and other devices, and increased back-end functionality, to give staff participant management tools that allow tracking and support. This transition to the new system should be completed by August 2019.
- Staffing changes in the ORIGINS Databank team has resulted in a review of our current resources and assessment of future needs to ensure the team has the appropriate skills and expertise required.
- The Databank has been collaborating with GenV on the future use of harmonised data fields and consistent ontology across the cohort studies.

OPPORTUNITIES IDENTIFIED FOR THE NEXT 12 MONTHS

- Scoping and tender process for an ORIGINS IT end-to-end solution – single enterprise system.
- Engagement of an ORIGINS Biostatistician so we can refine data collection, clean and analyse ORIGINS data.
- The establishment of more automated and streamlined project reporting using existing data.
- Setup of a local data repository to store, integrate and consolidate research data for delivery.
- Continued collaboration with other cohort studies to harmonise data collection across platforms.
- Integration of systems to ensure Sub project data is delivered back in to the ORIGINS research platform.
- Plans to undertake a vision assessment for ORIGINS children at 3 and 5 years of age, in partnership with the Lions Eye Institute.





PROJECT MANAGEMENT & GOVERNANCE

A Governance Framework has been developed for ORIGINS to meet governance, compliance and ethics requirements. This Framework outlines guiding principles for ORIGINS, provides a well-defined governance structure with roles and responsibilities clearly outlined, in addition to setting expectations and parameters for decision making, management, reporting, scope and approval of nested Sub projects. Consumer and community representation is incorporated into the ORIGINS Governance Framework and structure to ensure that the community is fully engaged and informed about ORIGINS.

KEY ACTIVITIES IN REPORTING PERIOD

- The **ORIGINS Project Executive Group**, which includes senior representatives from JHC (CEO and COO) and TKI (CEO and COO) as well as the ORIGINS Directorate and senior management team, met four times during this reporting period.
- The **ORIGINS Scientific Committee** includes researchers from a range of academic institutions; clinicians from JHC and the Perth Children's Hospital; director of ORIGINS Project Partners, such as Western Diagnostic Pathology; and community representatives, including from the City of Wanneroo. The Scientific Committee oversees and approves ORIGINS Sub projects; provides input into the rigour of data and biological sample collections; and facilitates research collaboration and engagement with ORIGINS. This committee met three times during this reporting period.
- A **Risk Management Plan** with associated Risk Register was developed for the Project. The Risk Register is updated and reviewed at each Project Management Group meeting and at the Executive Group meetings.
- A separate ORIGINS **Finance & Risk Group** was established in April 2019, which includes senior representatives from JHC (CEO and COO) and TKI (COO) as well as the ORIGINS Directorate, Program Manager and the ORIGINS TKI Finance

Business Partner. The purpose of this group is to review the controls, finances and risks of The ORIGINS Project on a regular basis to summarise and report to the Executive Group. Following the initial meeting in April, this group will meet quarterly to coincide with quarterly reporting and the Executive Group meetings.

- A **Program Logic and Evaluation Framework** was developed for the Project. The end of this reporting period coincides with the end of our 'First phase – Engagement and Establishment' of the Project Program Logic (refer to Figure 3).
- An **ORIGINS 'Eco initiatives'** working group (the Green Team) was formed and had two meetings in 2019 and actioned a number of initiatives specifically relating to recycling and reuse; use of more environmentally friendly materials and equipment; environmental messaging; and 'greening' the work environment.
- **'ORIGINS Project Values and Principles'** were developed. Further to this, in April 2019, a facilitated ORIGINS Operational Planning Session and a Strategic Planning Session were held. Within these sessions the participants reflected on, and updated, the strategic statements: vision; purpose; identity/beliefs; strategic imperatives; and key messages of the project.

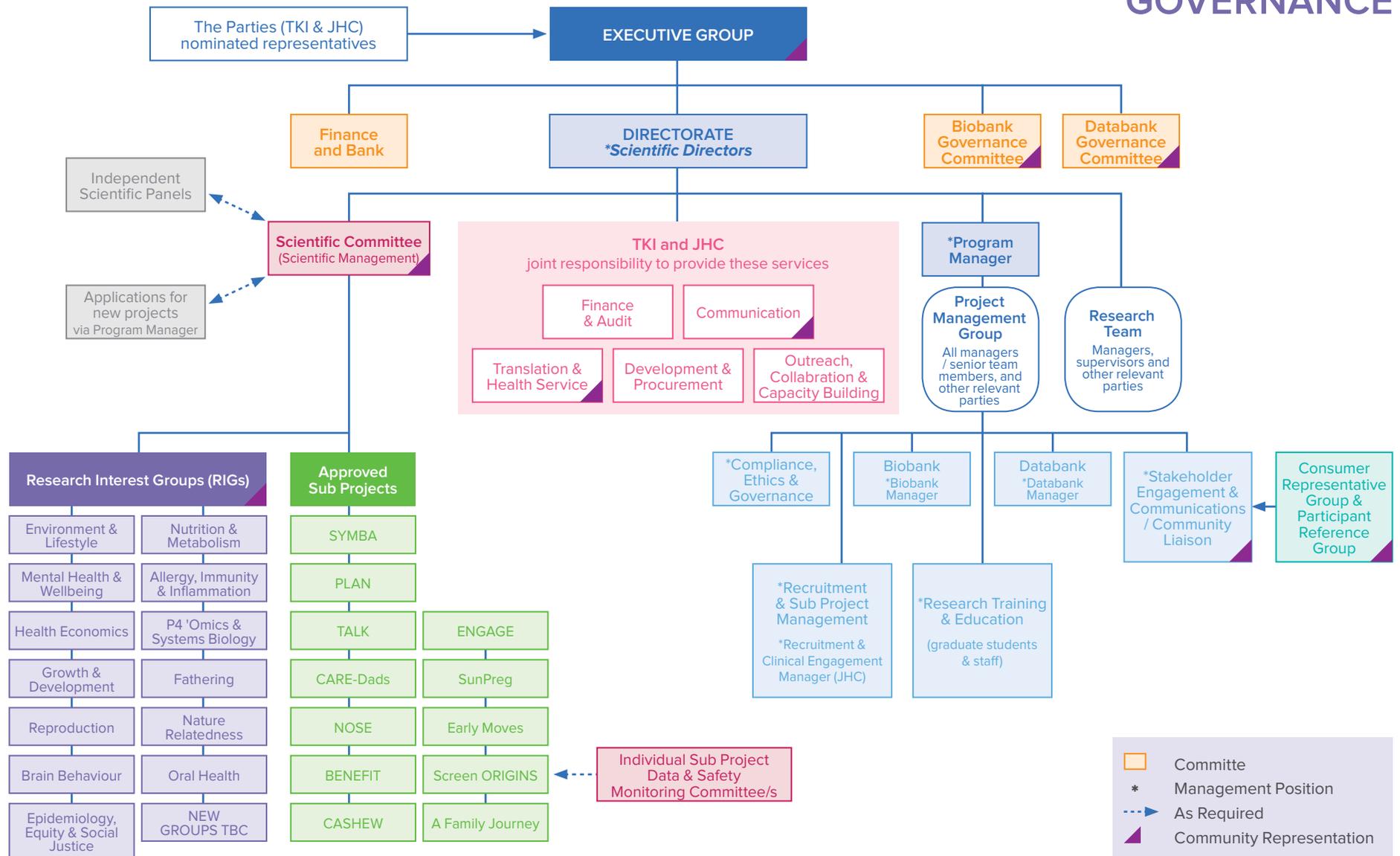
- Thirteen **ORIGINS Research Interest Groups (RIGs)** are currently active, which facilitate collaboration, provide expertise, develop nested Sub projects, and support students across a range of areas.
- There are over 150 RIG members, with each RIG having between 10 and 46 members. Some members participate in several RIGs. The RIG members include researchers, clinicians, community members, service providers and educators.
- There were 20 RIG meetings held within this reporting period.





Figure 4: ORIGINS Governance Structure

THE ORIGINS PROJECT: GOVERNANCE





ORIGINS RESEARCH & SUB PROJECTS

As well as facilitating strategic long-term research capacity, ORIGINS is a pipeline for short-term productivity through a series of clinical trials, early interventions, mechanistic studies, and targeted research questions to improve maternal and paternal health, and the early environment of the child.



During this reporting period there were twelve approved Sub projects active within ORIGINS, including Randomised Controlled Trials (e.g. SYMBA) and observational studies (e.g. TALK). Refer to Appendix 1 for further information on each Sub project.



Table 2: Current & Completed ORIGINS Sub projects

CURRENT & COMPLETED SUB PROJECTS	TYPE	IMPACT	STATUS AT 30 JUNE 2019 (N)	GRANT VALUE
PLAN (Pilot study)	Randomised Controlled Trial	Overweight & obesity (mother and child)	Completed (57)	\$24,821 (TKI Research Focus Area Seed Grant 2014)
A Family's Journey at JHC	Observational	JHC mother and father profiling	Ongoing	In kind (JHC)
Screen ORIGINS (quantitative & qualitative)	Observational	Technology use (family)	Ongoing	\$6,100 (Curtin School of Physiotherapy and Exercise Science Early research Grant; Curtin PhD Candidate Research Support Fund)
SYMBA	Randomised Controlled Trial	Allergies	Ongoing (385/652)	\$1,681,512.40 for 2016-2020 (NHMRC Project grant 2015) \$200,000 (Telethon Perth Children's Hospital Research Fund 2014)
TALK	Observational	Language development and autism	Ongoing (486/500)	\$415,000 (ARC 2015)
CARE Dads	Observational	Cardiovascular and mental health of fathers	Ongoing (350/1000)	In kind \$10,000 contribution (current NHMRC application)
NOSE (Pilot study of AERIAL)	Observational	Asthma risk	Ongoing (40)	Under AERIAL funding
BENEFIT	Randomised Controlled Trial	Allergies (breastfeeding and infant tolerance for nuts and eggs)	Ongoing (69/108)	\$68,616 (2017-2019) (The Financial Markets Foundation for Children) \$110,290 (2018-2019) (Telethon Perth Children's Hospital Research Fund)
Cashew	Randomised Controlled Trial	Allergies (cashews)	Ongoing (109/192)	\$50,000 (2018-2019) (Australian Food Allergy Foundation)
PrEggNut	Randomised Controlled Trial	Allergies (eggs and peanuts)	Ongoing (14/200-300)	\$200,000 (2019-2022) (NHMRC Project Grant)
Engage (Pilot)	Single arm intervention trial	Parenting education	Ongoing (14/14)	\$615,000 (2019-22)
TOTAL VALUE				3,381,339.40

Additionally, during this reporting period, a further 14 new Sub projects have been approved or are undergoing approval by the ORIGINS Scientific Committee and Project Management Group to be nested within ORIGINS. Some are due to commence in the coming months, while others are awaiting either ethics approval and/or funding success.

PLANNED SUB PROJECTS (IN THE NEXT 12 MONTHS)

Table 3: ORIGINS Sub projects in the Pipeline

APPROVED SUB PROJECTS IN THE PIPELINE	TYPE	IMPACT	STATUS AT 30 JUNE 2019	GRANT VALUE
Facing the ORIGINS of health and disease	Observational	3D face scanning (infant)	Awaiting ethics approval; to commence August 2019	In kind & grant application
Early Moves	Observational	Motor and cognitive developmental assessment	To commence October 2019	\$446,773 (2019-2020) (Perth Children's Hospital Foundation) \$242,919 (2020-2021) (CP Alliance)
Helping mums to breastfeed – before their babies are born	Randomised Controlled Trial	Breastfeeding	Awaiting ethics approval	
Origins of neuro-developmental risk and resilience	Observational	Neurodevelopmental trajectories	To commence August 2019	\$35,000 2019-2021
SunPreg	Observational	Benefits of sunlight exposure	To commence later 2019	
TUMS: water quality and the microbiome study	Randomised Controlled Trial	Microbiome	To commence August 2019	\$100,000
AERIAL	Observational	Respiratory disease, asthma & Broncholiths	Awaiting results of NOSE (Pilot study) prior to commencing	\$1,942,791/5years
WINDOWS	Observational	Personalised medicine	Awaiting funding and ethics approval	-
Diabetes during pregnancy and subsequent child development	Observational	Physical, mental & developmental	Awaiting ethics approval	-
Nature Play and Grow (Pilot)	Intervention	Health promotion	Awaiting funding and ethics approval	-
Antibiotics Dysbiosis and Probiotic Trial in Infants (ADAPTS)	Randomised Controlled Trial	Microbiome	To commence July 2019	\$111,700 (2019-2020)
Mums Minds Matter (Pilot)	Randomised Controlled Trial	Antenatal stress and wellbeing	To commence October 2019	\$15,000 2019-2020
Embedding E-Health (PLAN) into routine clinical practice pathways to provide a healthy start to life	Intervention	Overweight & obesity (mother and child)	To commence September 2019	\$250,000 over 2 years
Mediterranean Diet & Gut Microbiome Analysis	Observational	Diet, microbiome & mental health	To commence November 2019	48,500
TOTAL VALUE				3,192,683



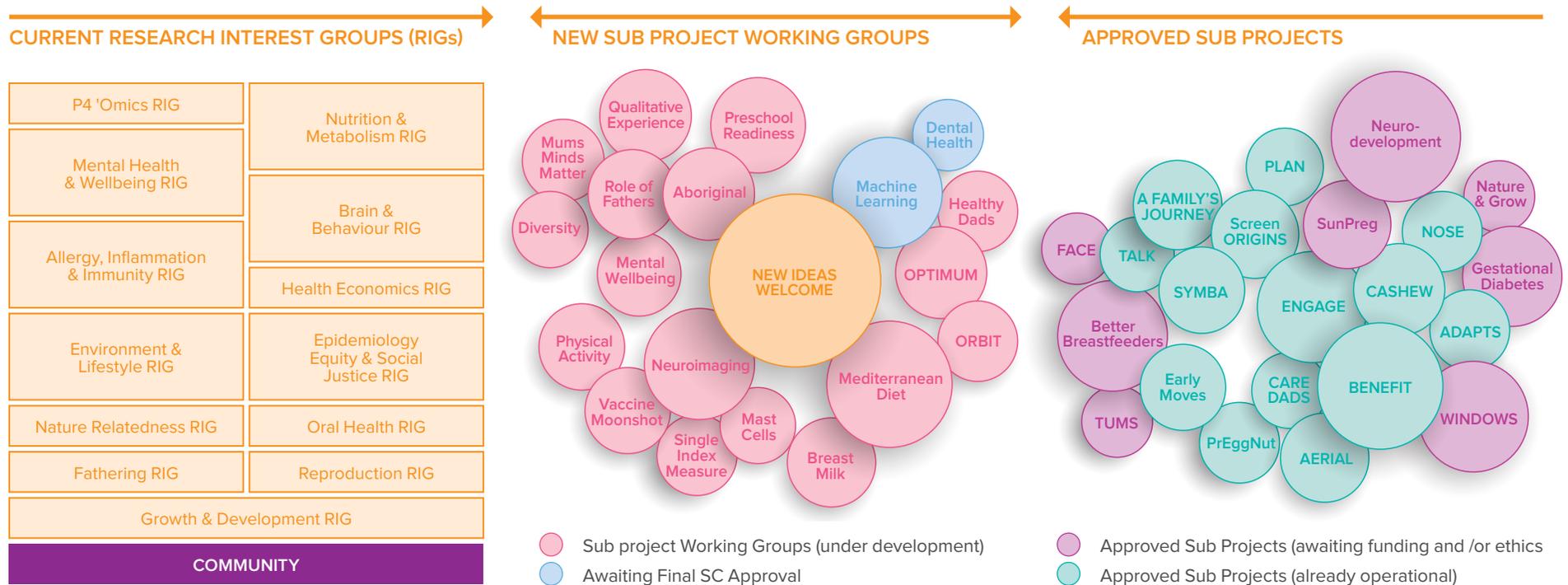
There are at least 20 further Sub projects still under development and have not yet received ORIGINS Scientific Committee and Project Management Group approval. However, some have been given provisional approval for funding application submissions (refer to Appendix 2).

RETURN ON INVESTMENT

The ORIGINS Project infrastructure has been a catalyst for nested Sub projects, exceeding initial expectations. To date the Project has attracted grant funding in excess of \$3 million (as outlined in Table 2 above), with an additional committed grant funding in the region of \$3.5 million (Table 3). This represents an outstanding return on investment in the ORIGINS Project, at the rate of an estimated 1:1 return on annual investment of \$2.6 million a year.

Additionally, the Project has attracted other forms of investment. During 2018-19, \$65,000 was contributed from WA Health Translation Network to the ORIGINS Biobank to test the suitability of Open Specimen (Laboratory Information Management Software) for future centralised biobanking initiatives in WA.

Figure 5: Current and Future ORIGINS Research



ORIGINS RESEARCH DISSEMINATION



During the reporting period, The ORIGINS Project increased awareness of the project at a range of national and international events. This included publication of papers, oral and poster presentations, and invited presentations. Representatives of ORIGINS were also invited to Education events at a variety of institutions and collaborator meetings. See Appendix 3 for a complete list.

EVENTS, CONFERENCES AND SYMPOSIUMS CONVENED

- An **ORIGINS Forum** was held in August 2018, with over 160 attendees (including researchers, clinicians, community members, funders, staff and other interested stakeholders), to generate collaborative ideas for future ORIGINS Project research and Sub projects.
- An ORIGINS Project volunteer, student recognition and thank you event was held at the end of 2018.
- The ORIGINS Project Operational Planning Day, with all ORIGINS Project staff (April 2019).

- The ORIGINS Project Strategic Planning Day, with members of The ORIGINS Project Executive Group and Project Management group members, (April 2019).
- The **inVIVO Planetary Health 8th Annual Conference** was organised by Susan Prescott and held in Detroit in May 2019.

The **Giving our Children the Best Start Symposium** was organised and held on 13 June 2019, with over 130 attendees (including attendees from the Child and Adolescent Health Service; Joondalup Health Campus; and Telethon Kids Institute; community service providers; and collaborators from various institutions and universities), to showcase The ORIGINS Project and some of the Sub projects nested within the Project.

RESEARCH COMMUNICATIONS & ENGAGEMENT

- To improve communication between Research Interest Group members and groups, including members who are external to the Telethon Kids Institute, an accessible digital 'team site' was developed for Research Interest Group members.

PLANS FOR THE NEXT 12 MONTHS

- Focused workshops will be held to build capacity in Sub projects and Research Interest Groups.
- The ORIGINS 2020 Forum will be held to share and build research capacity within ORIGINS.

TRANSLATION OF RESEARCH TO PRACTICE & POLICY CHANGES

As well as enabling strategic long-term research capacity, ORIGINS is a ‘responsive’ system with ‘real-time’ feedback to parents and their children, and translation to clinical and diagnostic services. While we facilitate immediate action when necessary, we also encourage long-range thinking and advocate strategies that might not necessarily have immediate impact but have long-term benefits for individuals and the community.

KEY ACTIVITIES IN REPORTING PERIOD

- ORIGINS collaboration and advocacy with JHC for employment of Aboriginal Liaison Officers within the hospital, to help make it a ‘safe place’ for Aboriginal women and families to birth at the hospital.
- Real-time feedback and referral to appropriate services for participants – mother, father and child - for a range of issues including developmental, allergies, psychosocial needs, and others.
- During this reporting period, the project team detected 109 potential issues and referred to appropriate specialist services including GPs, specialists and allied health or community support services.
- Engagement with staff and clinicians at JHC eventuated in a policy change to supply fresh

food in all vending machines. Fresh food vending machines have reduced sugar consumption by 1.2 tons over 11 months.

- Impact of ORIGINS Sub projects:
 - **PLAN:** Based on the results of a pilot study within ORIGINS investigating whether a lifestyle intervention in early pregnancy can reduce offspring adiposity, a translational grant has been awarded to the researchers. The team are expanding PLAN to roll out the smartphone web-based application to all pregnant women who attend JHC at any time during pregnancy. The user acceptability testing phase of the App will occur in July 2019.
 - **CARE Dads:** A questionnaire assessing stress, depression and anxiety was introduced for

fathers in October 2018. Since then, 18 fathers have been referred to their GP to access psychological services, and a further 10 were identified with severe or very severe levels of low mood/anxiety/stress and were referred to JHC psychiatry.

- **TALK study:** Approximately 185 hearing tests have been completed, with Earbus Newborn Hearing Screeners with 170 follow-ups completed (6 to 9-month-old time point).
- **BENEFIT:** One third of the mothers in the BENEFIT study have received Lactation Consultant assistance to establish and support breastfeeding, which was funded by the sub study grant.



STAKEHOLDER & COMMUNITY ENGAGEMENT

ORIGINS is a community project with global implications where community collaboration is essential. Strong stakeholder management and engagement is paramount to securing 'buy in' at every level of ORIGINS. We have generated extensive relationships with a range of stakeholders and community groups, and continue to work in collaboration for mutual long-term benefit.

Photo Courtesy of Chris Walsh, Medical Forum, July 2019



ACTIVITIES DURING THE REPORTING PERIOD

- ORIGINS collaborated with a broad range of stakeholders during the year. We have strong links with 18 research groups / academic institutions, 16 service provider organisations and 10 community groups.
- During the reporting period there were a range of stakeholder and community activities and events to promote and engage The ORIGINS Project; these included:
 - ORIGINS booth at the Telethon Beneficiaries Expo at the Telethon Weekend.

- Establishment of ongoing monthly Coffee and Connect sessions for ORIGINS families.
- Participant Tour of the Telethon Kids Institute Labs to experience sample processing.
- Project focus group with current participants.
- Establishment of quarterly e-newsletters to participants and internal staff and collaborators.
- Regular media in a range of formats including radio, television, online forums and community newspapers (see Appendix 5).

See Appendix 4 for additional stakeholder activities for 2018-19.

STAKEHOLDER ENGAGEMENT FOR THE NEXT 12 MONTHS

- WA Department of Health – Child Health Nurse (CHN) to attend each of the monthly Coffee and Connect sessions. It is anticipated this will lead to additional opportunities to engage with CHNs.
- Hold a Fathers' Coffee and Connect session in late August to celebrate Father's Day.
- Develop and implement a questionnaire for capturing participants' experience of being involved in ORIGINS.
- Develop and implement a questionnaire for capturing researcher and collaborator experience of being involved in ORIGINS.
- Engage hard to reach groups in a community setting, which includes music and art therapy and health literacy, with subspecialist outreach services.

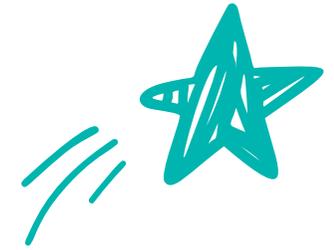
ORIGINS KEY COLLABORATORS & PARTNERS



TELETHON
KIDS
INSTITUTE
Discover. Prevent. Cure.



ORIGINS STAFF, VOLUNTEERS & STUDENTS



Key to ORIGINS are the staff, volunteers and students. They are the drivers of the project, led by the Project Directors and senior management team. The ORIGINS Project team members demonstrate strong passion and commitment generated from the belief in ORIGINS and what we may achieve together.

ACTIVITIES DURING THE REPORTING PERIOD

- There are approximately 30 staff working within The ORIGINS Project, many of whom work in a part-time capacity and some who work within the core ORIGINS Project and specifically with ORIGINS Sub projects. The ORIGINS Team is comprised of a range of staff with different skill sets and expertise.
- An on-site Manager based at JHC was appointed to manage the Recruitment Team and strengthen links with clinicians in the hospital.
- Staff undertook a range of training opportunities during the year as well as attendance at relevant conferences (see Appendix 4).

PLANS FOR THE NEXT 12-MONTHS

- Identified need to increase staffing resources in some areas of the project; in particular within the Databank Team and to support the integration of Sub projects.
- Initiate a Staff Wellness Challenge.

STUDENTS AND VOLUNTEERS

- 7 MD (Doctor of Medicine) Students:
5 completions; 2 in progress.
- 4 PhD students in progress.
- 9 volunteers.





PROJECT OPPORTUNITIES

Operationally, as a project, we need to constantly review and refine our processes to ensure we enhance project design and reach to the community. We strive to make project implementation improvements as an iterative process.





PLANS FOR THE NEXT 12 MONTHS

- Focus on increasing the diversity of the families involved in ORIGINS (including targeted engagement with vulnerable and hard to reach families).
- Develop and implement a protocol for capturing participants' experience of being involved in ORIGINS.
- Priority setting workshop with consumers and other key stakeholders. The objective of this is to determine preferences and research priorities in partnership with the community.
- Develop collaborative grant applications for new Sub projects.
- Create ORIGINS PhD scholarships' for postgraduate research capacity building.
- Establish an ORIGINS Translation Working Group.
- Incorporate the 'Voice of Young People'; we will be working with the City of Wanneroo to link in with youth advocates and youth consumer representatives.
- Engage with key stakeholders in Liverpool NSW to set up a sister ORIGINS project.
- Continue collaboration with other birth cohort studies nationally and internationally.



PARTICIPANTS' FEEDBACK

“ Thank you for the twelve month appointment this morning. It was great to talk to the Paediatrician about any concerns we have and the free allergy testing was very informative. Timothy and Lachlan enjoyed playing and being centre of attention! ”





A BABY ENGAGEMENT STUDY

“I have a son with Autism and I have been paranoid that my daughter has some traits where she wasn’t engaging well with me and had poor eye contact. I was keen to find someone who would listen to me and understand my concerns. Both my husband and myself maybe on the spectrum but were never diagnosed as having Autism. Both our families have a very strong history of multiple mental health conditions and I certainly have a lot of anxiety.”

“I was referred by my Paediatrician onto a study called the Engage Study. I was not eligible for this study but was happy to help with piloting the programme that they were developing. It is a programme of ten sessions where I learnt to interact better to interact with my daughter amongst a number of other benefits. I have had three sessions so far and I find that my daughter is making much better eye contact, enjoying her company more and also it has taught me some skills to help my autistic son engage better.”

“I am looking forward to learning more as the programme progresses, but I am very grateful I have had the opportunity to contribute to this project in some way.”

COFFEE AND CONNECT

“Hi ORIGINS team, I just wanted to say thank you so much for a lovely catch up today, I felt really special. Your lovely staff are amazing and I always look forward to these catch ups it’s nice to be around such lovely people.”

“Thankyou”, Candace (May 2019)

“Hi, Just wanted to say how much my wife and I enjoyed bringing our grandchildren Timothy and Lachlan to the centre yesterday. We found it very well run and the toys were great for the children to play with. The staff were very friendly and showed a real interest in the boys.”

“Well done and many thanks”, Barrie and Lorraine (April 2019)



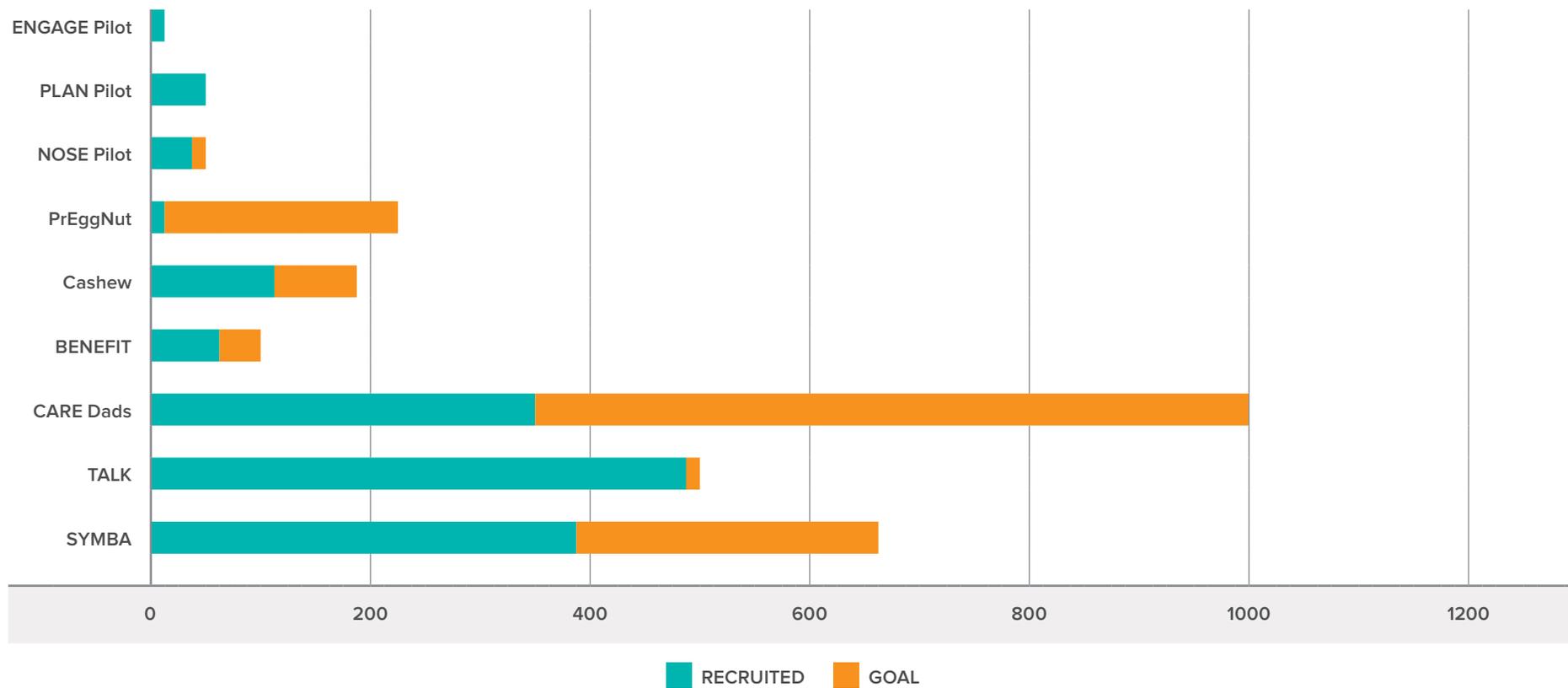
The work ORIGINS does is going to be life changing! Insight into where our samples go and the process they go through highlights how much work goes into just a few minutes of sample taking. The team on all levels in different areas are doing a fantastic job. It is very exciting to know that one day when the results are released, we know that we helped make that difference. Keep up the amazing work you are doing we are all encouraging you from the sides

- Jonathan, Hannah
+ Tobias



APPENDIX 1: ORIGINS SUB-PROJECTS

CURRENT SUB PROJECTS JUNE 2019



ORIGINS “LIVE” SUB PROJECTS:

1. The PLAN Project: Pregnancy Lifestyle Activity and Nutrition (PLAN) (TKI Research Focus Area Seed Grant funding)

The pilot study for the PLAN RCT tested whether a lifestyle intervention in early pregnancy can reduce offspring adiposity. Taking advantage of the growing advancements in medical technology, this project used smartphone web-based applications to deliver diet, physical activity and wellbeing advice to women in early pregnancy (over the course of 6-20 weeks gestation) to optimize their gestational weight gain (weight gain during the course of the pregnancy) within the recommended medical guidelines.

2. A Family’s Journey at JHC (In-kind support)

This project aims to analyse data routinely collected at the Joondalup Health Campus (JHC) to better understand the demographics of all pregnant women, their partners and their newborn, and their journey at JHC from pregnancy to early childhood. It is anticipated that this will provide a better understanding of the care provided, and enable improvements to routine care at JHC. Analyses of the routinely collected data will also provide useful data for researchers wishing to apply for grants, which may eventually result in Sub projects within the ORIGINS Project.

An extract of the data from this project has been used to prepare a manuscript, ‘Adverse pregnancy and neonatal outcomes associated with elevated maternal and paternal body mass index (BMI): a single-centre retrospective cohort study’.

3. Screens ORIGINS Project (quantitative and qualitative) (Curtin School of Physiotherapy and Exercise Science Early Researcher Grant; Curtin PhD Candidate Research Support Fund funding)

The Screen ORIGINS Sub project aims to understand family screen technology use, particularly mobile touchscreen devices (i.e. tablet computers and smartphones), including what influences family screen technology use and potential implications of it for child health and development. This study plans to use data routinely collected as part of The ORIGINS Project via web-questionnaire (the quantitative component), as well as invite a subset of around 30 ORIGINS participant families at different stages (before birth, between 6 and 12 months post-birth, 2, 3 and 5 years post-birth) to provide further in-depth information on their perspectives and practices related to screen technology use in interviews (the qualitative component). The qualitative aspect of this project is planned to commence in July – August 2019.

4. SYMBA (NHMRC and Telethon Perth Children’s Hospital Research Fund funding)

The aim of the SYMBA Study is to examine if a high fibre prebiotic supplement, taken during pregnancy and while breastfeeding, will reduce the risk of allergic disease in children by improving the balance of ‘healthy bacteria’ in the gut. This could also have potential benefits to other aspects of health, growth and development. The aim is to recruit 652 pregnant women at Joondalup Health Campus. The participant will be randomly assigned to a group which will either be a prebiotic powder or a placebo which is a carbohydrate. They will take this powder once a day with food or drink from 20 weeks gestation until their baby is 6 months. They will not know which powder they are on until the very end of the study. This study is looking for families that have a history of allergic disease as they are more likely to have children with allergies. Recruitment is now over halfway, and 128 1-year olds have been seen (83% completion rate).

5. Testosterone and Language in Kids (TALK) Study (ARC funding)

The TALK study is looking at understanding how testosterone exposure in the womb may relate to brain growth before birth and also language development after birth. What we know is that the development of language is complex and there is evidence showing its relationship with a wide range of positive outcomes later in life. The information collected will help us better understand how children acquire language and how we can support children who have difficulties learning language. Our aim is to collect detailed information from those who decide to take part from 18 weeks pregnancy until their child is three years of age. The recruitment goal (of 500 participants) is likely to be met within the next month. To date, 167 children have been seen for the 6-9m follow-up assessment.





6. CARE Dads (Cardiovascular Risk Evaluation in Expectant Fathers)

The ORIGINS Project is centred on “a healthy start for a better future.” We want to understand and improve the health of the parents as well as their children. The aim of the CARE-Dads Study is to assess the health of expectant Dads by providing a health check-up. Dads play an important role within the family as their involvement in child-rearing enhances the health of their children. Studies have shown that a father’s involvement in his child’s life can be associated with positive child outcomes. A healthy dad is an important part of a nurturing early environment. Dads are seen antenatally and when their child is 1 year of age. A full health report is provided at both time points. Their mental health is also assessed by means of the DASS-21.

7. NOSE pilot study for The Airway Epithelium Respiratory Illnesses and Allergy (AERIAL) Study (NHMRC funding)

AERIAL will investigate the consequences of vulnerable respiratory epithelium at birth. The study will look at epithelial cells in the nose to determine any gene signature patterns which may predict the development of wheeze, allergy and asthma later in childhood. The plan is to start recruitment for AERIAL (400 in total) in August 2019. Participants will need to undertake daily temperature checks with their child and data will be collected via an app. AERIAL has been developed from the pilot NOSE ORIGINS project. This pilot assessed whether the study team could obtain enough epithelial cells from a nasal sample at birth to see the gene patterns of interest.

8. Breastfeeding and Eating Nuts and Eggs For Infant Tolerance (BENEFIT) Trial (The Financial Markets Foundation for Children; and Telethon Perth Children’s Hospital Research Fund funding)

The aim of the BENEFIT Trial is to answer the question of whether the amount of eggs and peanuts a mother eats during breastfeeding has an influence on her baby’s food allergy development. By 1 year of age, 10% (1 in every 10) babies will develop a food allergy. We now know that regular consumption of allergenic foods, like egg and peanut can help to reduce food allergies. However, this is too late for some babies, who have an allergic reaction to a food the first time they eat it after commencing solids. We think that breastfeeding could be the ideal opportunity to prevent food allergy prior to solid food introduction. We know that the food proteins in allergenic foods, like egg and peanut, can be detected in breast milk so we need to understand whether more or less eggs and peanuts eaten by a breastfeeding mother will help to reduce the risk of her baby developing food allergies. Lactation consultant support is offered to women who are part of this Sub project.

9. The Cashew Study (Australian Food Allergy Foundation Funding)

The aim of this study is to pilot regular cashew nut spread intakes by infants and determine dosage recommendations prior to a larger multi-centre randomised controlled trial. Recent Australian research has found that approximately one in twenty school students have a current food allergy. Amongst 10-14-year old’s, peanut and tree nut allergies account for most of these. Cashew nut allergy is the most common of the tree nut allergies in adolescents. The 2016 revised Australasian Society of Clinical Immunology and Allergy (ASCI) infant feeding and allergy prevention guidelines recommend: all infants should be given allergenic foods including peanut butter, cooked egg, dairy and wheat in the first year of life. However, there is no specific mention of tree nut foods, like cashew nut spread. This is because we still need to establish evidence of the effect of regularly eating tree nuts or tree nut spreads in early childhood as a tree nut allergy prevention strategy. 54 infants have now been seen for their 1 year Cashew assessment.

10. The PrEggNut Study (PrEggNut) – Maternal diet rich in eggs and peanuts to reduce food allergies: a randomised controlled trial (NHMRC funded)

Recently, babies have been found to be at risk of developing a food allergy even before they start eating solid foods. Researchers have discovered that baby immune responses can be improved by mothers eating more eggs during the first weeks of breastfeeding. Undertaking this research trial to determine whether mothers regularly eating more eggs and peanuts during pregnancy and breastfeeding will reduce food allergies in their babies. This study is recruiting 300 mother-child pairs from Joondalup Health Campus who are ORIGINS project participants.

11. The Engage Study: discovering and delighting in your baby (Angela Wright Bennett Foundation funding)

A pilot study of a behavioural intervention for increasing the quality of parent-baby social interactions in the first six months of life. The Engage Study commenced recruitment in April 2019 and 14 families were recruited into the Study. The full RCT is planned to commence in 2020 (150 families). The study involves two parent education sessions during the pregnancy period, and then up to 10 sessions with the parent and baby after the baby is born.



ORIGINS SUB-PROJECTS PLANNED IN THE NEXT 12 MONTHS

1. Facing the ORIGINS of Health and Disease

This project will capture 3D facial reference data on a healthy population. The plan is for photos to be taken at the 1, 3 and 5-year appointments by ORIGINS Staff.

2. Early Moves (Perth Children's Hospital Foundation; and CP Alliance funding)

The study will recruit ORIGINS participants (both active and non-active) at birth. An Early Moves research team member will visit them on the ward and take a short video of their baby and explain how to install the free 'Early Moves' app on their phone. Participants are then asked to take a short (3 minute) video of their baby at several timepoints. The team are interested in biomarkers for early identification of babies at risk of motor and cognitive impairment. The project will provide early interventional support for children identified with potential cognitive impairment.

3. Helping mums to breastfeed – before their babies are born

Despite almost all Australian women initiating breastfeeding, formula is commonly given over the hospital stay. By three months one third of new mothers have ceased breastfeeding altogether. Many mothers introduce formula due to a perception of poor milk supply, when in fact less than 5% of mothers are at risk of this problem. This study proposes to explore a novel intervention to determine the feasibility of teaching pregnant women ACE (from 37 weeks gestation) using an online link to an instructional video. This will be compared to ACE instruction from a midwife, along with a control group. If successful, this project will provide the platform for routinely teaching ACE using an easy method that can readily be incorporated into routine antenatal practice.

4. Origins of neuro-developmental risk and resilience

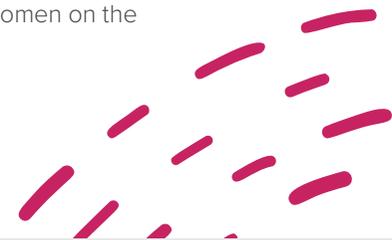
This research will examine neurodevelopmental trajectories in the first two years of life among infants in the ORIGINS cohort. The primary aims of the research are twofold: (1) to analyse whether different "classes" of neurodevelopmental trajectories emerge in the first two years of life (e.g. normal, delayed, very delayed); (2) to examine child, family and social risk factors as predictors of infant neurodevelopmental trajectories. Findings from this research have the potential to inform earlier detection of infants at risk of neurodevelopmental delay or disorder using a developmental screener already in routine use in community health settings (the ASQ-3), as well as to identify novel biological and behavioural markers of impairment.

5. SunPreg

Determining the associations of sun exposure in early life on the development of non-communicable diseases. With our sunny climate throughout the year, safe and regular exposure to sunlight may be an inexpensive way to limit the development of NCDs. Findings from The SunPreg Study will inform future trials of safe sun exposure. The results will also be key in translation activities to develop better sun exposure policies with the Cancer Council (WA) that provide advice to pregnant women on the right balance of sun protection and exposure.

6. The Water Study (TUMS)

This study will examine if chlorine exposure is safe for microorganisms that colonise the gut and if gut dysbiosis lead to chronic disease. Proposed RCT to understand the effects of chlorinated drinking water on the development of the microbiome in infants.



7. AERIAL (NHMRC funded)

AERIAL will investigate the consequences of vulnerable respiratory epithelium at birth. The study will look at epithelial cells in the nose to determine any gene signature patterns which may predict the development of wheeze, allergy and asthma later in childhood. The plan is to start recruitment for AERIAL (400 in total) in August 2019. Participants will need to undertake daily temperature checks with their child and data will be collected via an app.

8. WINDOWS (WA Infant Developmental Wellness Study)

WINDOWS will generate personal data clouds for WA infants that predict disease transitions. The WINDOWS database will represent the most detailed and comprehensive phenotypic and molecular assessment of a population of infants in the world. Home visits during vaccine responses and infections over several timepoints within The ORIGINS Project.

9. Diabetes during pregnancy and subsequent child development

Risk for developmental delay in children is regarded as an interaction of genetic potential and environmental factors. Several hypotheses have been generated about the association between intrauterine environment and subsequent child development, but conclusions are yet to be reached. The aim of this study is to track a large participant cohort from prenatal life to three years of age to examine the association between exposure to maternal diabetes in utero and subsequent development in the offspring. This project is an observational study and all measures are currently used by ORIGINS. This is a 3 year follow up study.

10. Nature Play and Grow (Pilot)

There is evidence to suggest that time spent in nature is associated with better health and well-being in children. This study will assess whether connecting families to nature has a positive influence on physical activity, diet, sleep and emotional well-being in young children. Findings from this pilot study will inform a future randomised controlled trial (RCT) of the intervention. The results will also be key in developing evidence-based recommendations for caregivers regarding the promotion of healthy lifestyles in children through connectedness to nature.

11. ADAPTS (Funded by the Ramsay Research Institute)

ADAPTS is a novel research study involving full term infants who are exposed to antibiotics in the neonatal unit at JHC. It is well known that antibiotics exposure in neonates, at a time when the normal development of gut flora occurs, impacts on their long-term health. ADAPTS uses supplemental probiotics to promote the normal development of gut flora and plans to study its effect on short term outcomes such as infantile colic, maternal mental health, as well as long term immune responses in infants. ADAPTS plans to recruit 70 patients from the neonatal unit at JHC and follow them up for a year.

12. Mums Minds Matter (Pilot)

This project aims to pilot a protocol for a randomized controlled trial which will compare three 8-week intervention conditions (one mindfulness-based training program, one self-compassion-based training program, and one relaxation intervention) and measure effects on symptoms of maternal distress (symptoms of stress, anxiety, and depression) during pregnancy, as well as maternal self-compassion, mindfulness, and emotion regulation. All intervention conditions will be minimal contact, meaning that participants will use online and printed resources at home to practice mindfulness, self-compassion, or the relaxation condition. Participants in all three conditions will receive a phone-call once a week to ask them how their practice is going and encourage them to complete a brief weekly assessment of practice and wellbeing.

13. Embedding E-Health (PLAN) into routine clinical practice pathways to provide a healthy start to life (MRFF Project Grant)

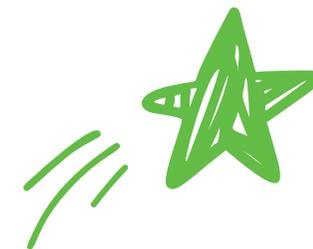
This is an extension of the PLAN pilot study. The team are expanding this to roll out the smartphone web-based application to all pregnant women at any time during pregnancy who are attending at Joondalup Health Campus. The user acceptability testing phase of the app will occur in July 2019.



APPENDIX 2: PROJECTS IN THE PIPELINE AND GRANT SUBMISSIONS

SUB PROJECTS UNDER DEVELOPMENT

SUB PROJECTS IN THE PIPELINE	TYPE	IMPACT	AT 30 JUNE 2019
Personalised, machine learning based prediction of asthma and allergies in WA	Observational	Asthma and allergies	Awaiting SC and PM approval; ethics approval; and funding
Telehealth-based Parental Dental Health Education by Community Child Health Nurses in the Prevention of Early Childhood Caries in the ORIGINS community (pilot)	Randomised Controlled Trial	Dental health (infants)	Awaiting SC and PM approval; ethics approval; and funding
Mediterranean diet in pregnancy	Observational	Diet, microbiome and mental health (mums and infants)	Awaiting SC and PM approval; and ethics approval
Preschool readiness in the ORIGINS cohort	Observational	Early development and mental health	Awaiting ethics approval
Gateway to allergy prevention: Promoting an immunomodulatory breastmilk profile with maternal prebiotic supplementation	Observational	Allergy prevention	Awaiting SC and PM approval; ethics approval; and funding
BROLGA: an Aboriginal ORIGINS cohort study	Observational	Aboriginal engagement	Awaiting SC and PM approval; ethics approval; and funding
Onset of severe RSV bronchiolitis due to identified maternal or environmental viral transmission (ORBIT)	Observational	Respiratory	Awaiting SC and PM approval; ethics approval; and funding
Healthy Dads	Intervention	Fathers' health	Awaiting SC and PM approval; ethics approval; and funding
Embedding E-Health (PLAN) into routine clinical practice pathways to provide a healthy start to life	Intervention	Overweight and obesity (mums and infants)	Awaiting ethics approval
Identifying the impact of pre and postnatal maternal health and environment on longitudinal infant neurodevelopment	Observational	Neurodevelopmental	Awaiting SC and PM approval; ethics approval; and funding
An intervention to enhance mental well-being from pregnancy to infancy and early childhood	Randomised Controlled Trial	Mental health & wellbeing (family)	Awaiting SC and PM approval; and ethics approval
OPTIMUM Study	Randomised Controlled Trial		Awaiting SC and PM approval; and ethics approval
Experience of being involved in ORIGINS	Observational (qualitative)	Stakeholder engagement	Requires further development
A longitudinal study of family physical activity and young children's physical activity, play and development	Observational	Physical activity (family)	Requires further development
Circulating mast cells in allergy	Observational	Allergy	Requires further development
Bridging the Gap: Improving the health and well-being outcomes of families experiencing disadvantage	Intervention	Mental and physical health and wellbeing: vulnerable families	Requires SC and PM approval; ethics approval; and funding
Australian Vaccine Moonshot	Intervention	Immunisations / personalised medicine	Awaiting SC and PM approval; ethics approval; and funding
The role of fathers in predicting and improving child health and developmental outcomes			Requires further development



GRANT SUBMISSIONS

WA Child Research Fund (notifications due August 2019)

- Water Quality and Microbiome Study (TUMS): Domestic drinking water quality and the infant gut microbiome.
- Nature Play & Grow: A pilot study of a family-based intervention to improve child health and well-being.
- Is greater smartphone and tablet computer use by parents and children linked with poorer functioning and developmental outcomes in young children?
- Neurodevelopmental Disease Risk & Resilience.
- A culturally responsive initiative to develop a prospective longitudinal Aboriginal maternal-infant cohort study modelled on ORIGINS at the Joondalup Health Campus (JHC).
- SunPreg Study.
- Personalised Machine Learning.
- Feasibility - Early Moves.
- Gateway to allergy prevention: Promoting an immunomodulatory breastmilk profile with maternal prebiotic supplementation.

- Telehealth-based Parental Dental Health Education by Community Child Health Nurses in the Prevention of Early Childhood Caries in the ORIGINS Community: A Pilot Randomised Control Trial.
- Helping new mums to be better breastfeeders – before their babies are even born.

NHMRC Clinical Trials and Cohort Studies Grants (notifications due November 2019)

- BROLGA: A culturally responsive prospective longitudinal Aboriginal maternal-infant cohort study.
- Healthy Dads in The ORIGINS Project: a community intervention cohort study to investigate the health of expectant fathers and how this impacts on outcomes in their offspring.
- Early Moves: A cohort study to identify a very early biomarker of cognitive impairment.
- What are the consequences for child development and parental well-being following referral of at-risk infants and toddlers to early intervention services?
- The forgotten multitude: A non-English speaking child and family cohort study.

NHMRC Ideas Grants (notifications due November 2019)

- More than coughing and sneezing – determining the clinical impact of in utero exposure to RSV.
- Online Oral Health Education Program for Primary Caregivers for the Prevention of Early Childhood Caries: a Feasibility and Acceptability Study.

Genomics Health Futures Mission -Flagships – Pathogen Genomics Grant (notifications due August 2019)

- Unlocking the mechanisms behind RSV persistence – the key to a successful vaccine and future therapies.



APPENDIX 3: RESEARCH DISSEMINATION

PAPERS AND PUBLICATIONS (2018/19)

1. A book chapter, 'The ORIGINS Project' was published in the book "Pre-emptive Medicine: Public Health Aspects of Developmental Origins of Health and Disease" as an eBook in December 2018 (<https://link.springer.com/book/10.1007/978-981-13-2194-8>) and in print in March 2019.
2. Rae-Chi Huang, Desiree Silva, Lawrie Beilin, Cliff Neppe, Katherine E. Mackie, Emma Roffey, Lisa Y Gibson, Nina D'Vaz, Hayley Christian, Christopher M Reid, Susan Prescott. Feasibility of conducting an early pregnancy diet and lifestyle E-Health intervention: the PLAN (Pregnancy Lifestyle Activity Nutrition) project. *Journal DOHaD* under revision.
3. David Martino. The Effects of Chlorinated Drinking Water on the Assembly of the Intestinal Microbiome. *Challenges* 2019, 10(1), 10.
4. R. Pretorius, SL Prescott, DJ Palmer. Taking a prebiotic approach to early immunomodulation for allergy prevention. *Expert Review of Clinical Immunology*. 2018 Jan;14(1):43-51 PMID: 29183179.
5. M Gay, PT Koleva, C Slupsky, E du Toit, M Eggesbo, CC Johnson, G Wegienka, N Shimojo, D Campbell, SL Prescott, D Munblit, DT Geddes, AL Kozyrskyj and inVIVO LactoActive Study Investigators. Worldwide Variation in Human Milk Metabolome: Indicators of Breast Physiology and Maternal Lifestyle? *Nutrients* 2018, 10(9), 1151; PMID: 30420587.
6. Rachelle A Pretorius, Marie Bodinier, Susan L Prescott and Debra J Palmer. Maternal fibre dietary intakes during pregnancy and infant allergic disease. *Allergy* (submitted June 2019).
7. Susan L. Prescott, Anita L. Kozyrskyj, Alan C. Logan, Dianne E. Campbell. Seventh Annual Conference of inVIVO Planetary Health on Transforming Life: Unify Personal, Public, and Planetary Health. *Challenges* 2018, 9(2), 36 **we had several abstracts in this.
8. David Martino, Rym Ben-Othman, Danny Harbeson and Anthony Bosco. Multiomics and Systems Biology Are Needed to Unravel the Complex Origins of Chronic Disease. *Challenges* 2019, 10(1), 23.
9. Susan L. Prescott and Alan C. Logan. Narrative Medicine Meets Planetary Health: Mindsets Matter in the Anthropocene. *Challenges* 2019, 10(1), 17.
10. David H. Nelson, Susan L. Prescott, Alan C. Logan and Jeffrey S. Bland. Clinical Ecology—Transforming 21st-Century Medicine with Planetary Health in Mind. *Challenges* 2019, 10(1), 15.
11. The Canmore Declaration: Statement of Principles for Planetary Health Susan L. Prescott, Alan C. Logan, Glenn Albrecht, Dianne E. Campbell, Julian Crane, Ashlee Cunsolo, John W. Holloway, Anita L. Kozyrskyj, Christopher A. Lowry, John Penders, Nicole Redvers, Harald Renz, Jakob Stokholm, Cecilie Svanes and Ganesa Wegienka, on Behalf of inVIVO Planetary Health, of the Worldwide Universities Network (WUN), *Challenges* 2018, 9(2), 31.
12. Susan L Prescott, Alan C. Logan, Ganesa Wegienka, D Katz Dysbiotic Drift and Biopsychosocial Medicine: How the Microbiome Links Personal, Public and Planetary Health. *Biopsychosocial Medicine* 2018; 12: 7.
13. Susan L. Prescott, Alan C. Logan A New Reality: Human Evolution for a Sustainable Future. By Jonas Salk, MD, and Jonathan Salk, MD, *Challenges* 2018, 9, 29; doi:10.3390/challe9020029.
14. Alan C. Logan, Susan L Prescott, Tari Haahtela, David Katz. The importance of the exposome and allostatic load in the planetary health paradigm. *J Physiol Anthropol* 2018 37(1): 15.
15. Susan L. Prescott, Alan C. Logan, David L. Katz. Golden Age of Medicine 2.0: Lifestyle Medicine and Planetary Health Prioritized. *Journal Lifestyle Medicine* (submitted).
16. Jenmalm, M.C. SL Prescott. The intestinal microbiota and the child's immune system. In *Infant and Child Microbiota in Health and Disease: A Practical Handbook*. Eds: Eric Claassen and Pamela Browne. Wageningen Academic Publisher, Wageningen, the Netherlands. 2016.

17. Prescott SL, Pearson G, Snook J30, Cunsolo A . On Hume and planetary health. *Lancet*. 2018 Aug 25;392(10148):634-635. PMID: 30152341.
18. Susan Prescott and Louise Reiche. Skin Microbiome and its Role in Skin Barrier Dysfunction and Atopic Dermatitis. *Research Review Educational Series*. 2018, page 1-4.
19. Susan L Prescott, Alan C. Logan. Planetary Health: From the Wellspring of Holistic Medicine to Personal and Public Health Imperative. *Explore*. PMID: 30316687.
20. Rachele A Pretorius, Marie Bodinier, Susan L Prescott and Debra J Palmer. Maternal fibre dietary intakes during pregnancy and infant allergic disease. In preparation.
21. Srinivas Jois R, Neurodevelopmental outcome of late-preterm infants: A pragmatic review, *Aust J Gen Pract*. 2018 Nov;47(11):776-781.
22. Neurodevelopmental complications of late-preterm infants: Published in *O and G magazine: A special issue on prematurity (publications by RANZCOG)*. Vol 21. No 1. Autumn 2019.
23. Neurodevelopmental outcomes of very preterm infants: *Aust J Gen Pract*. January 2019.
24. McIntosh, W., Maybery, M., Dunlop, P., Newnham, J., Keelan, J., & Whitehouse, A (2018). Fetal head circumference growth trajectory is associated with postnatal expressive and receptive language outcomes: A prospective, longitudinal cohort study. *The Raine Study Annual Scientific Meeting*, Perth.

POSTER PRESENTATIONS

- Four poster presentations at the 2018 Developmental Origins DOHaD ANZ conference in Sydney (July 2018):
 - *“The ORIGINS Project: What’s New and Different about this Next Generation Birth Cohort?”* (Erika Hagemann).
 - *“The ORIGINS Project: Using ‘Big Data’ in a Community Project to Answer Global Health Issues”* (Jacqueline Davis).
 - *“Changes in risk and characteristics of two birthing cohorts in Western Australia, three decades apart”* (Lauren Fisher, Lauren Nguyen and Catherine Nguyen).
 - *“The ORIGINS Project: Community Engagement & Collaboration”* (Lisa Gibson).

ORAL PRESENTATIONS

- At the 2018 WA Child Health Symposium:
 - *“The ORIGINS Project: Involving consumers in a longitudinal cohort study”* (Lisa Gibson).
 - *“From challenges to opportunities: a new vision of health for the 21st century”* (Susan Prescott).
- At the Tourette Syndrome Annual National Conference: (22-23 June 2019).
 - *“ADHD and Tourette Syndrome – interaction and comorbidity”* (Desiree Silva).
- At the Giving our Children the Best Start Symposium: (13 June 2019).
 - *“Clever Guts – The Impact of the Microbiome”* (Michael Mosley).
 - *“Parenting Matters Online”* (Clare Bailey).
 - *“The ORIGINS Project”* (Desiree Silva).
 - *“Prebiotics and Allergy Prevention”* (Debbie Palmer).
 - *“Nature Connectedness: Promoting health and wellbeing in young children”* (Lisa Gibson).
 - *“Screen ORIGINS: Screen use and health issues for young children”* (Leon Straker).
 - *“PLAN: Pregnancy Lifestyle Activity and Nutrition”* (Rae-Chi Huang).
 - *“The WA INfant DevelOpmental Wellness Study (WINDOWS)”* (Anthony Bosco).
 - *“Early Moves”* (Jane Valentine).



INVITED PRESENTATIONS (INCLUSION OF THE ORIGINS PROJECT AT ALL SESSIONS)

- Keynote speaker: American Society for Nutrition (ASN), Global scientific Conference on Nutrition June 7 – 11, 2019 Baltimore, USA (Susan Prescott).
- Invited Lecture: Worldwide Universities Network May 21-23, Dublin, Ireland (Susan Prescott).
- Invited speaker: ESPGHAN Annual Meeting (June 4-7, Glasgow, Scotland) (Susan Prescott).
- Congress Chair: 2019 inVIVO Planetary Health (May 15-17, Detroit, Michigan, USA) (Susan Prescott).
- Invited speaker: Doctors for the Environment Australia, Hobart, Tasmania April 2019 (Susan Prescott).
- Invited speaker: Salk Institute Symposium on Biological Complexity Jan 22-24, 2019 (in conjunction with the journal Science and the Ipsen Foundation) at the Salk Institute in La Jolla, California (Susan Prescott).
- Invited speaker: CMI International Microbiome Conference, being held at the Robert Paine Scripps Forum for Science at Scripps Institution of Oceanography in San Diego February 27-28, 2019 (Susan Prescott).
- Invited speaker: KEYSTONE Series. Origins of Allergic Disease: Microbial, Epithelial and Immune Interactions March 24–27, 2019 Granlibakken Tahoe, Tahoe City, California, USA, California (Susan Prescott).
- Invited speaker: the Clinical Insights Neuroscience weekend meeting “Uncovering the Hidden Issues”, Melbourne (1-2 June 2019).
 - “Potential Biomarkers and opportunities for early intervention for Neurodevelopmental Disorders: The ORIGINS intervention birth cohort” (Desiree Silva).
- Keynote speaker: the Health RoundTable, Perth (29 May 2019).
 - “E-Brain: How Nature is Being Replaced by Screen Time” (Desiree Silva).
- Invited speaker: 35th Longitudinal Cohort Symposium, Finland.
 - “The ORIGINS Project” (Desiree Silva).
- Invited speaker: Centre for Urban Responses to Environmental Stressors, Detroit.
 - “The interconnections between the microbiome, personal and planetary health: The imperative for ecological solutions” (Susan Prescott).
- Invited speaker: Australian Research Council Lifecourse Centre Research Meeting, Perth.
 - “The ORIGINS Project ” (Erika Hagemann).
- Invited speaker: The Childhood Summit, Brisbane (March 2019).
 - “The ORIGINS Project – Understanding the implications of the early environment for children’s long-term health and wellbeing ” (Desiree Silva).
- Invited speaker: The Australian College of Children & Young People’s Nurses (ACCYPN), Perth (May 2019).
 - “Nature Play & Grow: Nature connectedness as a way to improve child health and well-being” (Lisa Gibson).
- Invited speaker: WA Biobanking, WAHTN, Perth.
 - “The ORIGINS Project Biobank” (Jacqueline Davis).

PRESENTATIONS AT EDUCATION EVENTS AND COLLABORATOR MEETINGS

- Invited to present to the WA Child and Adolescent Community Health Executive Group.
 - Update of ORIGINS and Opportunities to Collaborate.
- Invited to present at the University of Notre Dame, Fremantle, Western Australia.
- Invited to present at the “Every Woman” GP ALM Education event, Joondalup Health Campus, Western Australia.
- With the Mayor of Wanneroo, March 2019.
- To WA Primary Health Alliance.

- Perth Pregnancy Centre (Community Antenatal Provider).
- GP Education Evening.
- ORIGINS project update. Paediatric Education Day, Nov 20th 2018.
- Invited-to-present-Busselton Health Study Board presentation: Dec 7th 2018.
- Community Child Health Nurse presentation, Sept 2019, Update on ORIGINS and general movement disorder.

STUDENT PROJECTS

- Two individual Doctor of Medicine and one group of three Doctor of Medicine Students completed their research scholarly activity with ORIGINS. The student projects were:
 - *“Environmental and lifestyle changes in the antenatal population over the past three decades: A comparative study utilising Raine Study and Joondalup Health Campus birth cohort data”.*
 - *“Examining subfertility and its treatment in a population-based cohort of pregnant women”.*
 - *“Adverse pregnancy and neonatal outcomes associated with elevated maternal and paternal body mass index”.*

EVENTS, CONFERENCES AND SYMPOSIUMS CONVENED

- An ORIGINS Forum was held in August 2018, with over 160 attendees (including researchers, clinicians, community members, funders, staff and other interested stakeholders), to generate collaborative ideas for future ORIGINS Project research and Sub projects.
- An ORIGINS Project volunteer and student recognition and thank you event was held at the end of 2018.
- The ORIGINS Project Operational Planning Day, with all ORIGINS Project staff, April 2019.
- The ORIGINS Project Strategic Planning Day, with members of The ORIGINS Project Executive Group and Project Management group members, April 2019.
- The inVIVO Planetary Health 8th Annual Conference was organised by Susan Prescott and held in Detroit in May 2019.
- The Giving our Children the Best Start Symposium was organised and held on 13 June 2019, with over 130 attendees (including attendees from the Child and Adolescent Health Service; Joondalup Health Campus; and Telethon Kids Institute; community service providers; and collaborators from various institutions and universities), to showcase The ORIGINS Project and some of the Sub projects nested within the Project.

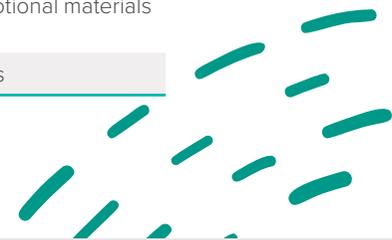
ORIGINS TRAINING AND PROFESSIONAL DEVELOPMENT: STAFF

- Training provided for ORIGINS team members, including:
 - *Aboriginal Cultural Training at JHC.*
 - *Mental Health Awareness Training at TKI.*
 - *ASCIa E-training on Anaphylaxis; Food allergy prevention; Eczema.*
 - *Good Clinical Practice Training and Accreditation.*
 - *TKI Anti-bullying and harassment training.*
 - *Leadership Series at TKI.*
 - *Discover training at TKI.*
 - *First aid training.*
 - *Phlebotomy training.*
 - *Epi pen practical training.*
- Staff conference and symposia attendance
 - *2018 Developmental Origins DOHaD ANZ.*
 - *2018 WA Child Health Symposium.*
 - *2019 Perinatal and Infant Mental Health Symposium.*
 - *2019 Childhood Summit (Brisbane, March 2019).*
 - *Australian College of Children & Young People’s Nurses (ACCYPN) clinical supper.*
 - *InVIVO Planetary Health 8th Annual Conference.*
 - *Giving our Children the Best Start Symposium.*



APPENDIX 4: KEY STAKEHOLDER ACTIVITIES

ACTIVITY	TARGET AUDIENCE	TYPE OF ACTIVITY
Local Collaborations <ul style="list-style-type: none"> • CoLab – Collaborate for Kids at Telethon Kids Institute • The Raine Study – University of Western Australia 	Researchers	Meetings & networking
National collaborations <ul style="list-style-type: none"> • Increased GenV engagement (MCRI) • University of New South Wales collaboration – potential development of an east-coast ORIGINS • University of Newcastle – potential application for a Centre for Research Excellence 	Researchers	Meetings & networking
International collaborations ORIGINS has engaged with over 500 researchers from around the world from countries within Europe, Scandinavia, Asia, North and South America, Africa and Oceania (a full list can be provided on enquiry).	Researchers	Meetings & networking
Presentation to the Australian College of Children & Young People’s Nurses (ACCYPN) clinical supper (<i>“Nature Play & Grow: Nature connectedness as a way to improve child health and well-being”</i>); including an overview of The ORIGINS Project)	Clinicians	Presentation
Attendance and presentation at the inVIVO Planetary Health annual conference in Detroit USA (<i>“Promoting pro-environmental and pro-social mindsets: how young can we start?”</i>); Including an update on The ORIGINS Project)	International researchers	Presentation & networking
ORIGINS/Child and Adolescent Health Service (CAHS) collaborative event with guest speakers Michael and Clare Mosley. Event also included presentations by six ORIGINS Sub Projects (see photos)	Researchers, clinicians, service providers, consumers	Presentation & networking
ORIGINS lab tour with current participants and community reference group members (See feedback and photos below)	ORIGINS Participants and consumer representatives	Site tour
Participant & Consumer Reference Groups	Community representatives	Meetings / online reviews
Family engagement: 1 and 2-year birthday cards, ORIGINS Grow pots, ORIGINS Bags, ORIGINS Baby bibs, ORIGINS Sample / Questionnaire reminder fridge magnets	Participant families	Promotional materials
ORIGINS promotional video for GPs and midwives	Health Professionals	Videos





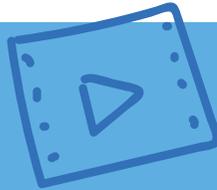
ACTIVITY	TARGET AUDIENCE	TYPE OF ACTIVITY
“ORIGINS Participant Testimonial Video” featuring current participants	Participants & researchers	Video
JHC Annual Learning Module for GPs (65 GPs in attendance)	GPs	Presentation
Media coverage <ul style="list-style-type: none"> Ten ORIGINS related columns in the community newspaper (Wanneroo/Joondalup Times) Five ORIGINS related articles in The West Australian newspaper and one in the Sunday Times One article related to ORIGINS in the Medical Forum WA Medical Forum article 	Community & researchers	Print media
Media coverage <ul style="list-style-type: none"> Two radio segments featuring The ORIGINS Project Two Channel 7 stories featuring The ORIGINS Project 	Community	Television media
Online presence <ul style="list-style-type: none"> ORIGINS ran 29 stories through Facebook and had a total reach of 131,000 hits during the reporting period. ORIGINS has a comprehensive website targeted at participants, researchers and other stakeholder: https://originsproject.telethonkids.org.au/ 	Community	Social media
Quarterly e-newsletters to participants and collaborators	Participants & collaborators	E-newsletter
Meeting and presentation to Mayor of City of Wanneroo	Local government	Presentation
Participation in and regular attendance at the Wanneroo and Surrounds Early Years Network meetings	Service providers	Networking
Launch of the JHC staff champions	JHC clinicians & staff	Lunch event
Volunteer and student recognition and thank you event was held at the end of 2018.	Volunteers & students	Morning tea event



APPENDIX 5: VIDEO LINKS & MEDIA STORIES

VIDEOS DEVELOPED BY THE ORIGINS PROJECT

Over the course of the year, The ORIGINS Project has developed a number of videos for our various stakeholders. These videos can be viewed using the links to the right.



ORIGINS Midwives (long version):	https://youtu.be/j8jNtMg7Mv4
ORIGINS Midwives (short version):	https://youtu.be/gFuLPOS8_Lc
GP video link:	https://youtu.be/W-0XoykHAio
Participant Testimonial video	https://vimeo.com/285083861
Video from the Family Event	https://www.youtube.com/watch?v=s310PJHFZT8&feature=youtu.be

ORIGINS MEDIA COVERAGE 2018-2019

DATE	MEDIUM	OUTLET	STORY	LINK
18 Jan 2018	Print	Joondalup Weekender	Language development: milestones are a guide	https://www.pressreader.com/australia/joondalup-weekender/20180118/281616715779407
21 April	TV	Ch 9 Today News	Technology and nature connectedness	https://www.facebook.com/iwakeupwithtoday/videos/1984150124952976/UzpfSTE50TI1MDYwOTQxMT0xMDE1NTc0ODI5NTUyNDQxMg/
22 April 2018	Online	Perth Now	Perth kids' exposure to technology under microscope	https://www.perthnow.com.au/news/health/perth-kids-exposure-to-technology-under-microscope-ng-b88812503z
22 April 2018	Online	Perth Now	WA \$26 million ORIGINS Project to unravel child health mysteries	https://www.perthnow.com.au/news/health/wa-26-million-origins-project-to-unravel-child-health-mysteries-ng-b88804790z
23 April 2018	Online	Perth Now	Multimillion-dollar Origins Project recruits 1000th family for global health study	https://www.perthnow.com.au/news/health/multimillion-dollar-origins-project-recruits-1000th-family-for-global-health-study-ng-b88815302z
2 May	Online/ Print	The West - Science on the Swan liftout	Early origins	https://pressreader.com/@NewChannel2650044/csb_4rx88KRVJKxuZ-dtgoFnCIZNT9A6rHKPxHU0CDInHZc
2 May	Online/ Print	The West - Science on the Swan liftout	Desiree Silva named WA rising Star	https://scienceontheswan.thewest.com.au/2018/
16 May	Print	The West health section	Good gut	

DATE	MEDIUM	OUTLET	STORY	LINK
19 June	Online/ Print	Joondalup Times	More than 5300 babies delivered at Joondalup Private Hospital in first five years	https://www.communitynews.com.au/joondalup-times/news/more-than-5300-babies-delivered-at-joondalup-private-hospital-in-first-five-years/
July	Radio	Joondalup Community Radio	Origins update	Interview with Desiree Silva
1 Sept	Print	The West - lift out	Back to nature	https://thewest.com.au/lifestyle/health-wellbeing/loss-of-connection-with-nature-could-impact-a-childs-health-ng-b88922157z
1 Sept	Print	The West - lift out	Autism study helping kids reach their full potential	https://thewest.com.au/lifestyle/health-wellbeing/reaching-their-full-potential-ng-b88926392z
1 Sept	Print	The West - lift out	ORIGINS researchers investigating gut health's link to allergies	https://thewest.com.au/lifestyle/health-wellbeing/researchers-to-investigate-gut-healths-link-to-allergies-ng-b88962898z
6 Sept	Print	Joondalup Weekender	How do I know if my child has a weight issue?	https://www.communitynews.com.au/joondalup-times/news/telethon-kids-institute-psychologist-parents-need-to-weigh-up-options/
19 Sept	Print	Joondalup Weekender	Medicine during pregnancy	https://www.communitynews.com.au/joondalup-times/news/what-medicine-can-i-safely-use-during-pregnancy/
3 October	Print	Joondalup Times	Healthy lunchbox tips	https://www.communitynews.com.au/joondalup-times/news/telethon-kids-institute-joondalup-health-campus-what-makes-a-healthy-school-luncbox/
16 October	TV	Ch 7 News - promo ad	Feature on The ORIGINS Project in the lead up to Telethon	https://originsproject.telethonkids.org.au/news/the-origins-project-on-ch-7-news/
17 October	TV	Ch 7 News	Feature on The ORIGINS Project in the lead up to Telethon	https://originsproject.telethonkids.org.au/news/the-origins-project-on-ch-7-news/
24 October	Print	Joondalup Times	Parents be alert but not alarmed	https://www.communitynews.com.au/joondalup-times/news/telethon-kids-institute-joondalup-health-campus-parents-be-alert-but-not-alarmed-over-your-childs-development/
30 Oct	Radio	ABC Focus	Handy hints to help kids self-manage their screen time:	Interview with Desiree Silva https://www.abc.net.au/radio/perth/programs/focus/getting-kids-off-screens/10447426
7 Nov	Print	Joondalup Times	JHC and ORIGINS at Wadjak Northside Social Emotional Wellbeing Expo	https://www.communitynews.com.au/joondalup-times/news/jhc-promotes-family-health-at-wadjak-northside-social-emotional-wellbeing-expo-in-balga/
18 November	Print	The Sunday Times	Shock spike in severe allergic reactions sending more Perth children to hospital (includes feature on Preggnut)	https://www.perthnow.com.au/news/health/shock-spike-in-severe-allergic-reactions-sending-more-perth-children-to-hospital-ng-b881016434z



APPENDIX 5: VIDEO LINKS & MEDIA STORIES

ORIGINS MEDIA COVERAGE 2018-2019

DATE	MEDIUM	OUTLET	STORY	LINK
22 November	Print	Joondalup Times	When babies won't stop crying – infantile colic	https://www.communitynews.com.au/joondalup-times/news/telethon-kids-institute-joondalup-health-campus-when-babies-wont-stop-crying-infantile-colic/
6 Dec 2018	Print	Joondalup Times	Cow's milk protein allergies on rise in kids	https://www.communitynews.com.au/joondalup-times/lifestyle/telethon-kids-institute-joondalup-health-campus-cows-milk-protein-allergies-on-rise-in-kids/
1 Feb 2019	Print	Joondalup Times	What to eat and drink during pregnancy	https://www.communitynews.com.au/joondalup-times/news/telethon-kids-institute-joondalup-health-campus-what-to-eat-and-drink-during-pregnancy/
19 Feb 2019	Print	The Advocate - Community News	Hong Kong researcher highlights importance of nature for children during Joondalup Health Campus visit	https://www.communitynews.com.au/the-advocate/news/hong-kong-researcher-highlights-importance-of-nature-for-children-during-joondalup-health-campus-visit/
1 March 2019	Print	The West	When Food Attacks	https://thewest.com.au/lifestyle/health-wellbeing/when-food-attacks-ng-b881070384z
15 March 2019	Online	24 Australia	Signs To Put A Smile On Parents Faces - Developmental Milestones	http://www.24australia.xyz/lifestyle/signs-to-put-a-smile-on-parents-faces/152580-news
29 March 2019	Print	The West	Telethon: Tech use impact on child health probed in Origins study	https://thewest.com.au/news/telethon/telethon-the-screen-savers-ng-b881146782z
13 June 2019	Print	Medical Forum WA	Gut health - feature on Michael Mosley around DOHaD symposium	



APPENDIX 6: JHC FATHERS & MOTHERS HEALTH QUESTIONNAIRES

TABLE 1: MOTHERS AND FATHERS QUESTIONNAIRE

	MOTHER N=6018	FATHER N=7999
	mean (SD)	mean (SD)
Age (yrs)	30.4 (5.0)	32.7 (6.1)
	range	range
	16.5 to 50.0	16.2 to 68.2
Lifestyle¹	n (%)	n (%)
Smoke	326 (5.4%)	1520 (19.0%)
Drink Alcohol	567 (9.3%)	5367 (67.1%)
Use Drugs	21 (0.4%)	135 (1.7%)
Own mother smoked whilst pregnant	Yes 750 (12.3%) Don't know 432 (7.1%)	788 (9.9%) 766 (9.6%)
Fly-In / Fly-Out worker	65 (1.1%)	1114 (13.9%)
Medical Condition (current)		
Asthma	272 (4.5%)	268 (3.4%)
Hay fever	468 (7.7%)	430 (5.4%)
Migraine	252 (4.1%)	80 (1.0%)
Eczema	226 (3.7%)	128 (1.6%)
Thyroid disease	124 (2.0%)	16 (0.2%)
Bowel problems	111 (1.8%)	37 (0.5%)
Dermatitis	126 (2.1%)	80 (1.0%)



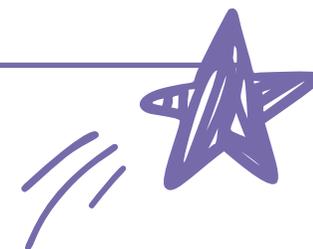
APPENDIX 6: CONTINUED

TABLE 1: MOTHERS AND FATHERS QUESTIONNAIRE

	MOTHER N=6018	FATHER N=7999
Hypertension/high blood pressure	38 (0.6%)	79 (1.0%)
High cholesterol	28 (0.5%)	97 (1.2%)
Diabetes Type I	13 (0.2%)	0.46 (0.7%)
Diabetes Type II	27 (0.4%)	59 (0.7%)
Other conditions confirmed by doctor (ever)		
UTI	1377 (22.6%)	207 (2.6%)
Thrush	1000 (16.4%)	133 (1.7%)
Anaemia	565 (9.3%)	41 (0.5%)
Herpes	194 (3.2%)	178 (2.2%)
Shingles	129 (2.1%)	185 (2.3%)
Infections confirmed by a doctor		
Chlamydia	545 (9.0%)	464 (5.8%)
Genital warts	107 (1.8%)	107 (1.3%)
Genital herpes	188 (3.1%)	116 (1.5%)
Mental health conditions confirmed by a doctor		
Anxiety disorder	772 (12.7%)	416 (5.2%)
Major depression	332 (5.5%)	156 (2.0%)
PTSD	132 (2.2%)	92 (1.2%)
Eating disorder	76 (1.3%)	12 (0.2%)
Bipolar disorder	38 (0.6%)	45 (0.6%)
Addiction disorder	42 (0.7%)	92 (1.2%)



TABLE 2: MATERNAL QUESTIONNAIRE



	MOTHER N=6018 N (%)
Social	
Current partner is the biological father	5857 (96.3%)
Parents are related	124 (2.0%)
Marital Status	
Married	3710 (61.0%)
Not married, living with partner opposite sex	1947 (32.0%)
Not married, living with partner same sex	30 (0.5%)
Single	255 (4.2%)
Separated	64 (1.1%)
Divorced	25 (0.4%)
Widowed	1 (0.0%)
Pregnancy	
2132 (35.1%)	
Unplanned pregnancy	1185 (19.5%)
Bleeding during pregnancy	2132 (35.1%)
Fertility	
274 (4.5%)	
Any form of fertility treatment	274 (4.5%)
Breastfeeding	
Previously breastfed	Yes 2926 (58.3%)
	No - 1st child 1061 (17.5%)
Plans to breastfeed in hospital	5427 (89.3%)





COVER ARTWORK BY PROFESSOR SUSAN PRESCOTT

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