



ORIGINS: A Platform for Research Discovery

October 2024

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Professor Desiree Silva, Co-Director

A HEALTHY START for a Better Future

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The Kids Research Institute Australia acknowledges Aboriginal and Torres Strait Islander people as the Traditional Custodians on 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.



Non-communicable Diseases (NCDs) pre-programmed early in life

DEVELOPMENTAL EXPOSURES

Nutrition
Microbes
Pollutants



A significant component of risk for these NCDs are programmed early in life



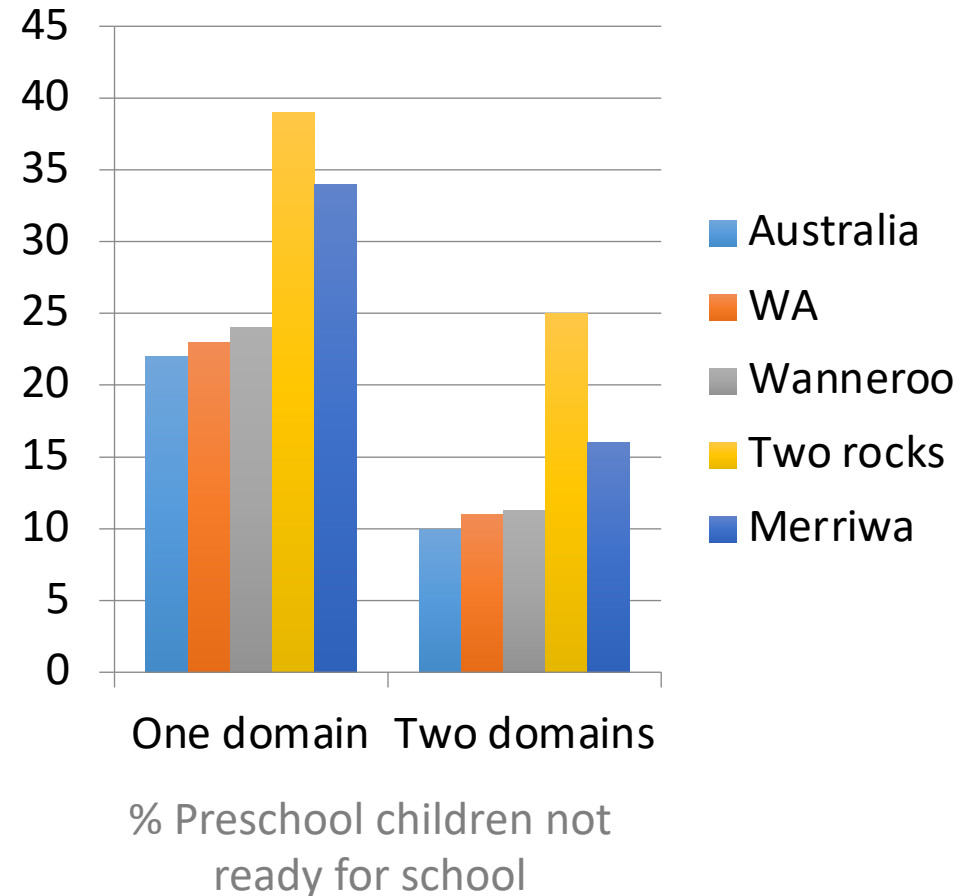
The basis of 'DOHaD' a health discipline (Developmental Origins of Health and Disease)

Why we started ORIGINS

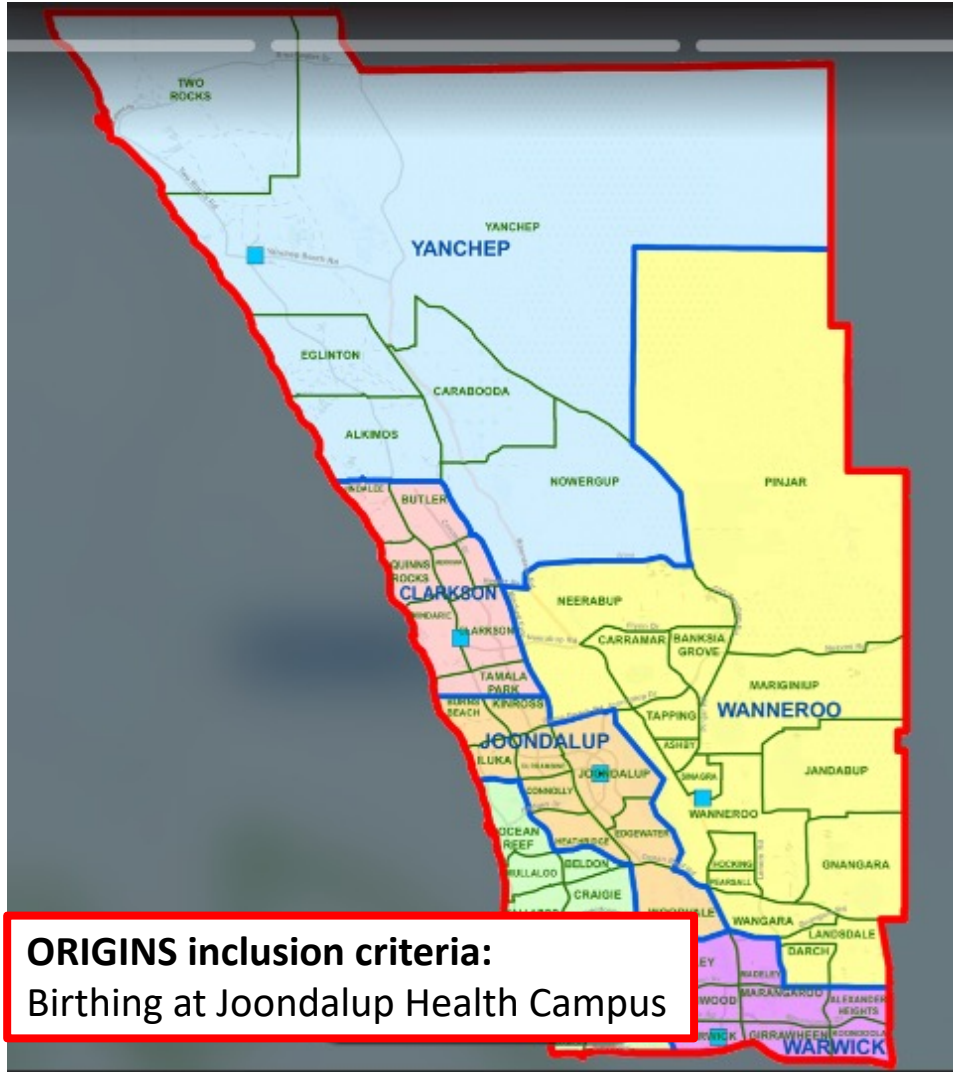
Joondalup-Wanneroo is one of the fastest growing regions in Australia

Also, one of the high-risk areas:

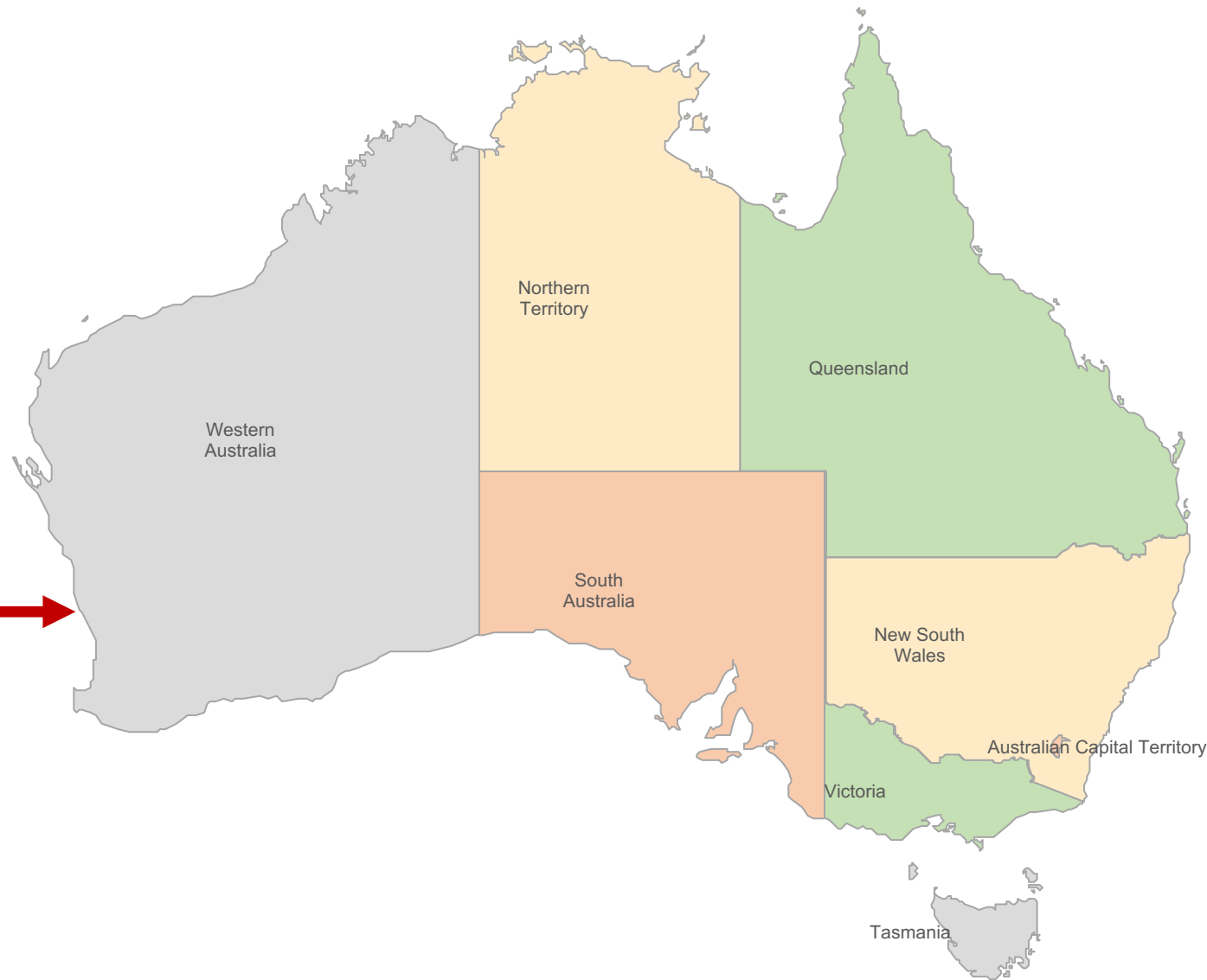
- School readiness: Poor performance compared with national averages
- High rates of developmental disorders, isolation, mental ill health, obesity and chronic disease

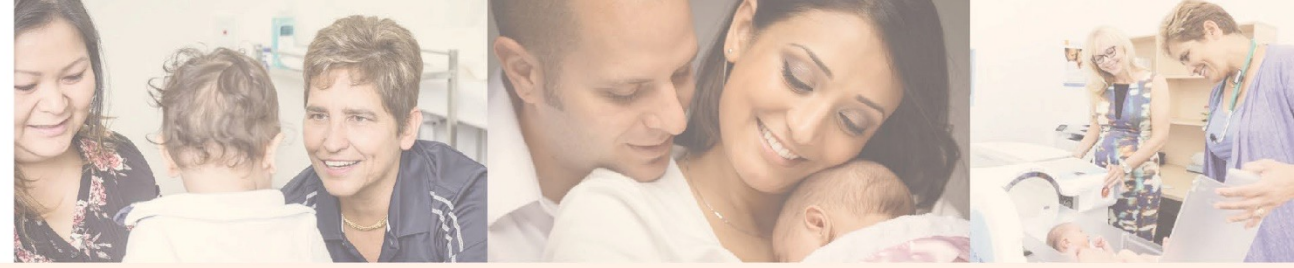


ORIGINS location



ORIGINS inclusion criteria:
Birthing at Joondalup Health Campus





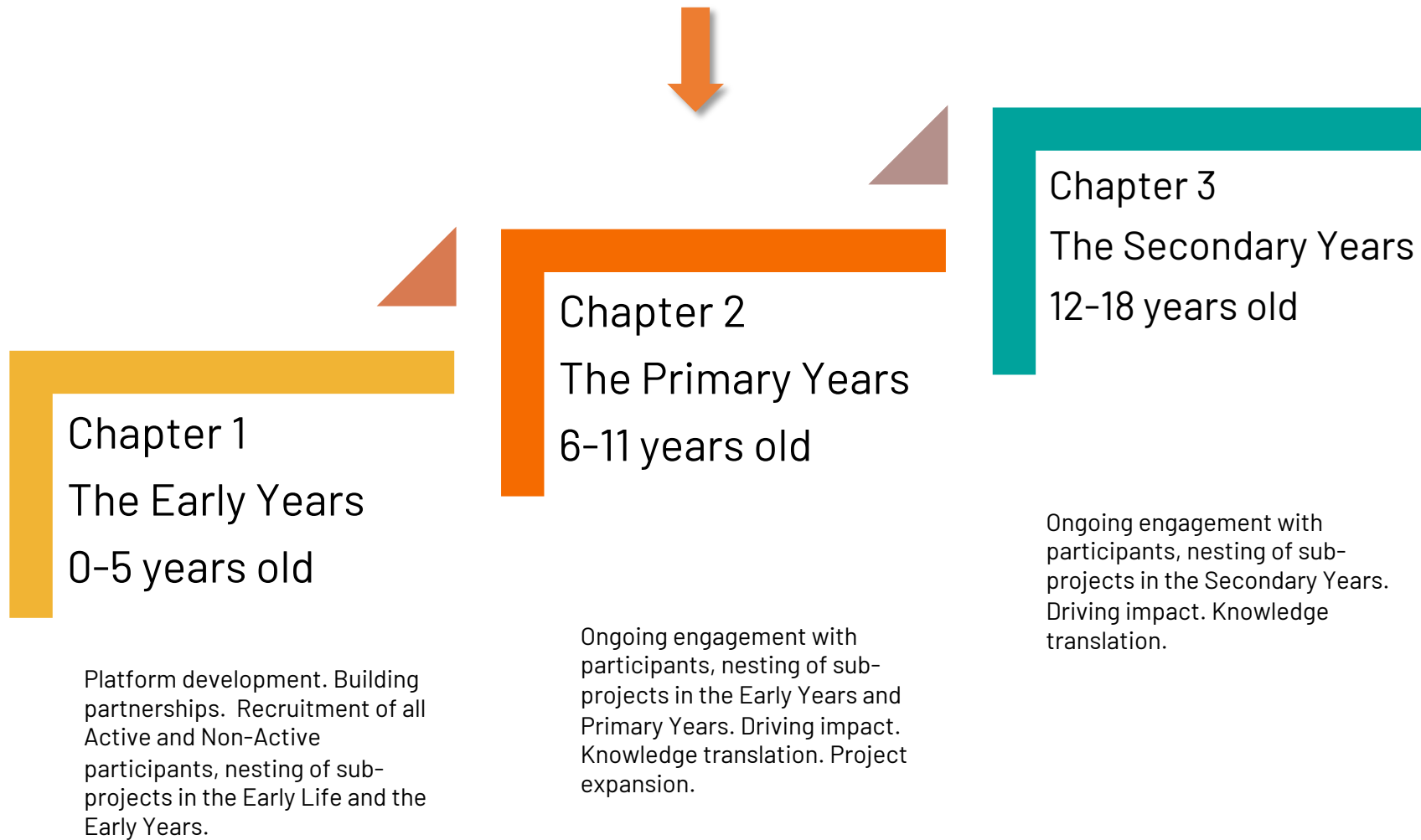
The goal of ORIGINS is to reduce the rising epidemic of non-communicable diseases through 'a healthy start to life'

ORIGINS is a community-based intervention birth cohort in Western Australia, of 10,000 families, following their progress over the first five years of life, and beyond.

We aim to:

- Build an extensive **Biobank** and **Databank Platform to enable world-class research discovery**
- Enable **nested sub-projects for researchers** (observational studies, clinical trials, community-based programs)
- Provide **early identification** and **timely intervention - 'real-time' feedback**
- **Integrate** medical education, research and clinical care at the hospital and in the community
- **Collaborate** closely with state, national and international cohort studies

ORIGINS | Chapters





What information is collected?



ORIGINS | Participation Levels

Active participants:

- Attend clinical assessments
- Contribute biological samples
- Complete online questionnaires
- Allow access to their routine hospital data collections and data linkage from WA and Australian Government Data
- Option to join sub-projects, based on eligibility.

We have recruited **4,000** active participants

Non-active participants:

- Consent for ORIGINS to access their routine hospital data collections and data linkage from WA and Australian Government Data
- The Biobank can access and store biological samples collected as part of routine care
- Can be contacted for sub-projects

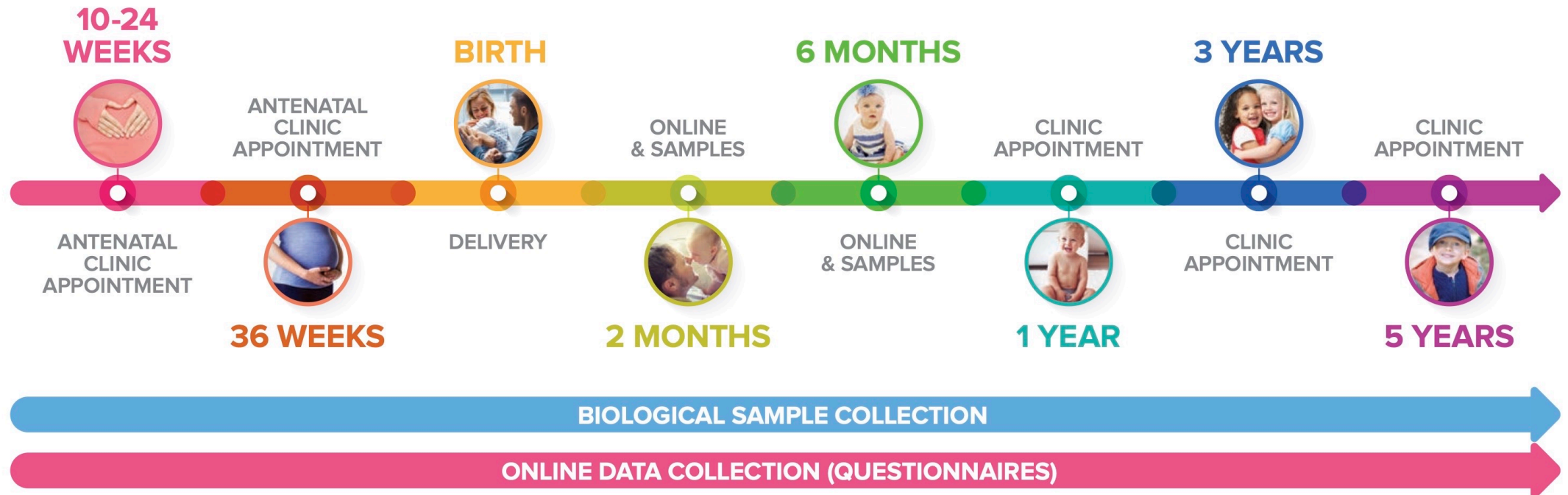
We have recruited **6,135** non-active participants



ORIGINS TIMEPOINTS

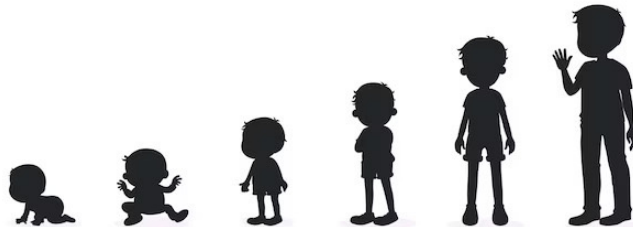
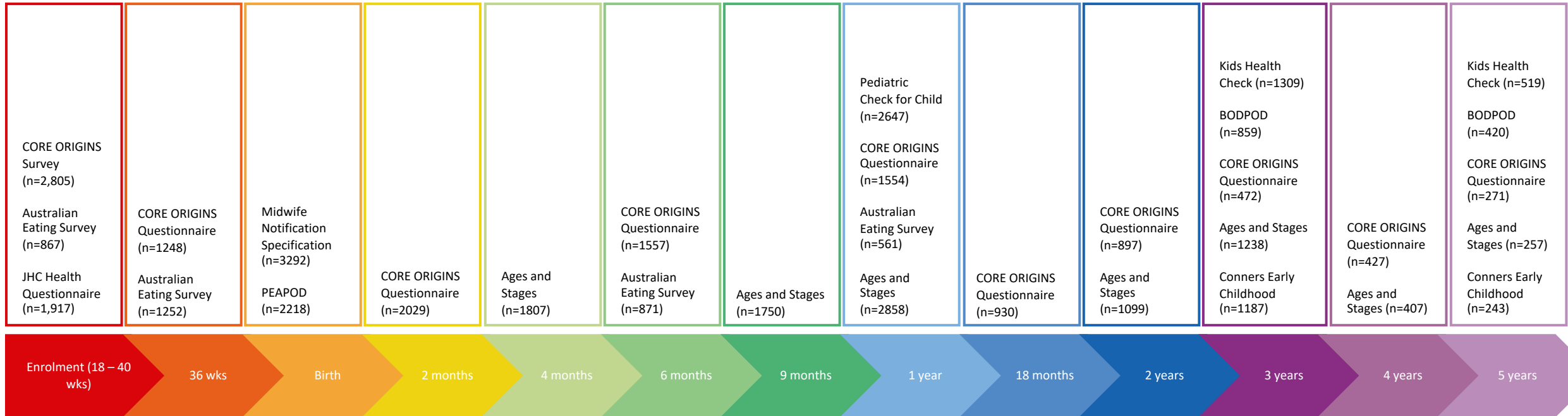
The ORIGINS Project is collecting data from multiple sources from the mother, infant (and father/partner) at multiple timepoints from gestation through to five years of age.

Active ORIGINS participants:



ORIGINS Data Collections

ORIGINS Data Timeline



DISCOVER • PREVENT • CURE



ORIGINS | Domains

Growth & Development

Breastfeeding
Characteristics of pregnancy & birth
Child sleep
Diagnostic equipment
Early developmental milestones
MNS data

Medical, Biological & Genetic

Allergies
Biological samples
Immunisations
Infectious disease
Maternal sleep
Medical conditions or problems
Multiomics
Oral health, hearing, vision.
Service utilisation

Biopsychosocial & Cognitive

Emotional wellbeing
Language & literacy development
NAPLAN data linkage
Neurodevelopmental delay
Psychological distress
School readiness
Social, parenting competence
Temperament

Lifestyle, Environment & Nutrition

Community
Connectedness
Green space & activities
Lifestyle & environment
Media & internet
Physical & play activities
Sun exposure


Demographics

Education
Employment
Ethnicity
Household structure
Income
Languages spoken
SEIFA





ORIGINS Biobank Collections













Samples used for research
*as of April 2024

 **8,808**

+ 559 reserved,
pending
release

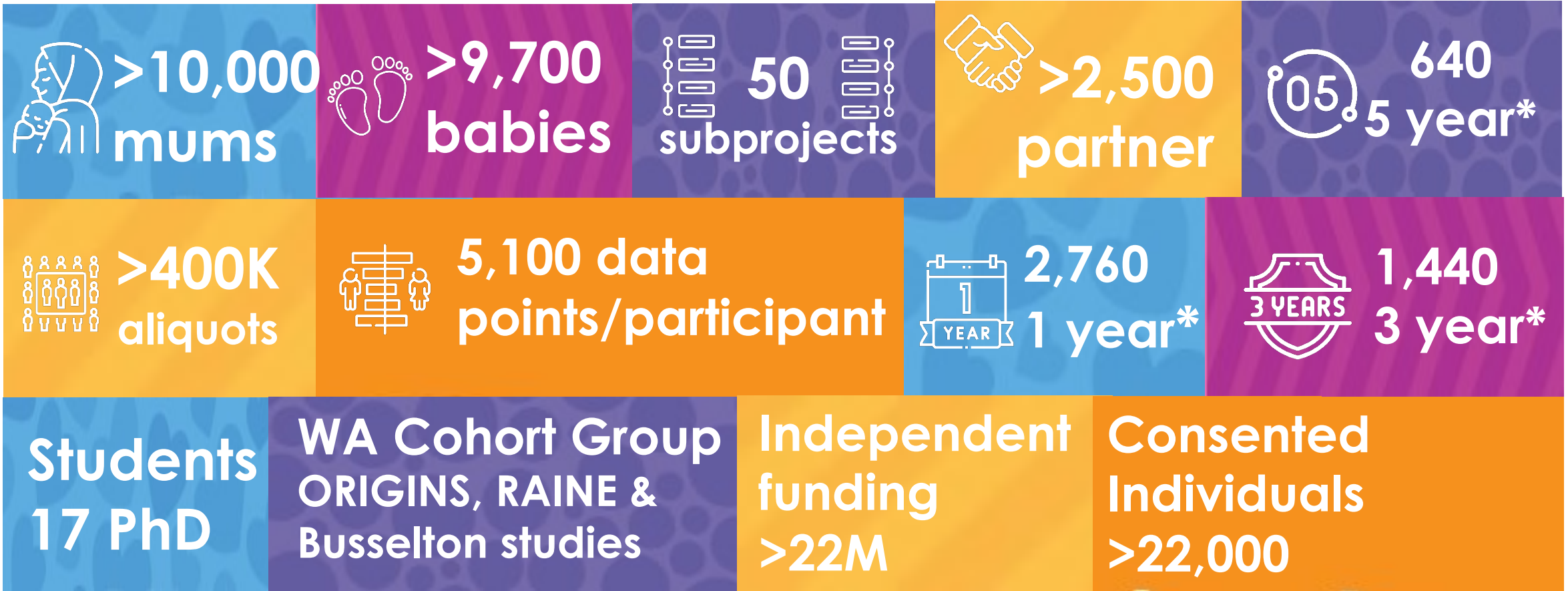
 **1,810**

 **3,200**

<p>ANTENATAL PERIOD Up to 3x timepoints</p>	 	<p>6439 Maternal Bloods 1054 Paternal Bloods</p>		<p>6621 Maternal biological collections (stool, urine, hair, buccal, saliva, dust) 1275 Paternal biological collections (hair, buccal, saliva)</p>	
<p>BIRTH</p>	 	<p>2550 Cord bloods 3023 Cord gases 753 Guthrie cards</p>		<p>2925 biological collections (meconium, colostrum)</p>	<p>1897 Placentas</p>
<p>EARLY POSTNATAL 2 months, 6 months</p>	 	<p>660 Child Bloods (from a small subset of families)</p>		<p>3773 Maternal biological collections (stool, urine, breast milk,) 3856 Child biological collections (stool, urine)</p>	
<p>EARLY CHILDHOOD 1, 3 and 5 Years</p>	 	<p>1856 Child bloods</p>		<p>2478 Maternal biological collections (breast milk, hair, buccal, saliva, dust) 3718 Child biological collections (stool, urine, buccal, saliva)</p>	

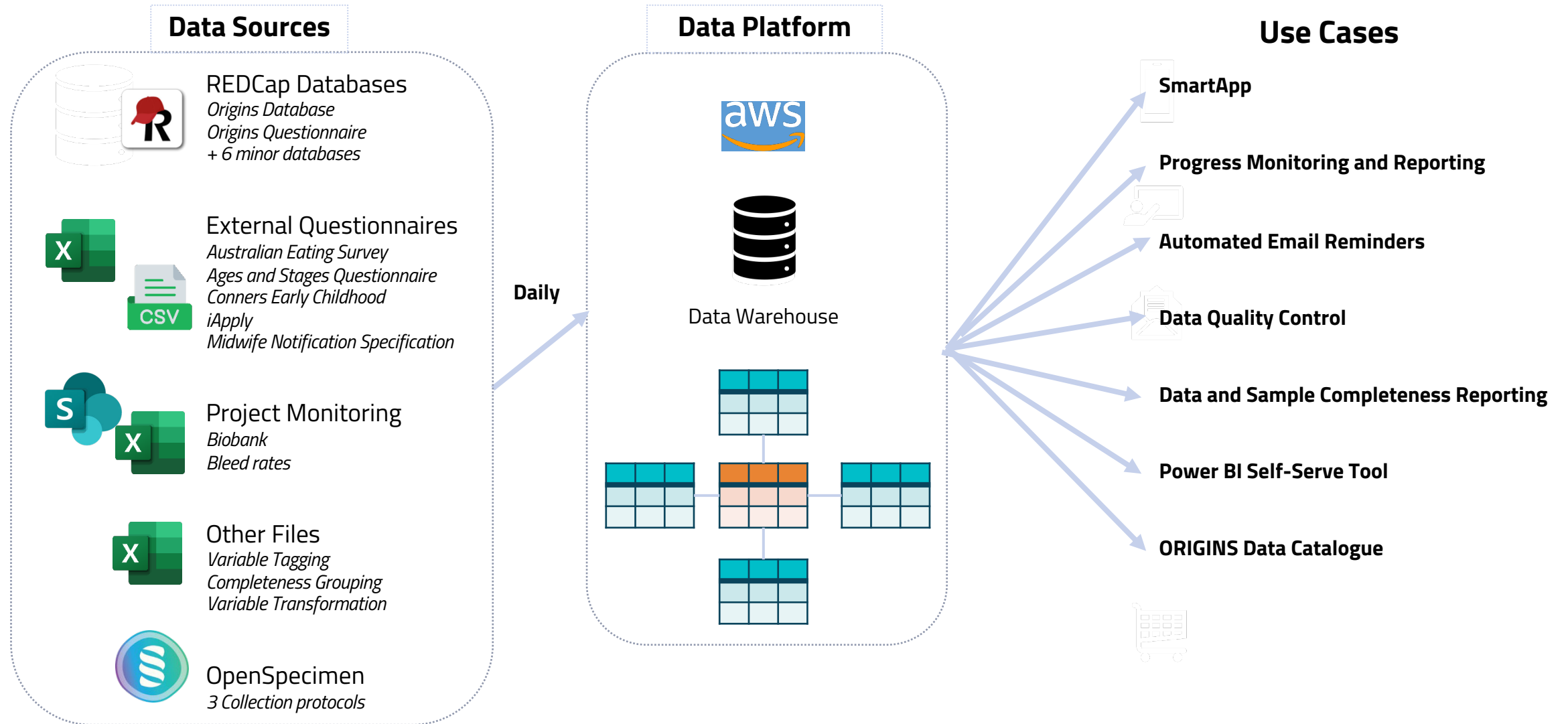
ril 2024- currently split into 401,584 individual tubes across 13 freezers + liquid nitrogen.

ORIGINS Research Platform since 2017



- Active* participants: 4,000
- Non-Active participants: 6,135

ORIGINS Integrated Data Platform (Data and Sample Visualisation)



ORIGINS | Data Catalogue



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Discover our Data Catalogue

Visit our Data Catalogue to discover the extensive DataBank and BioBank information on offer.

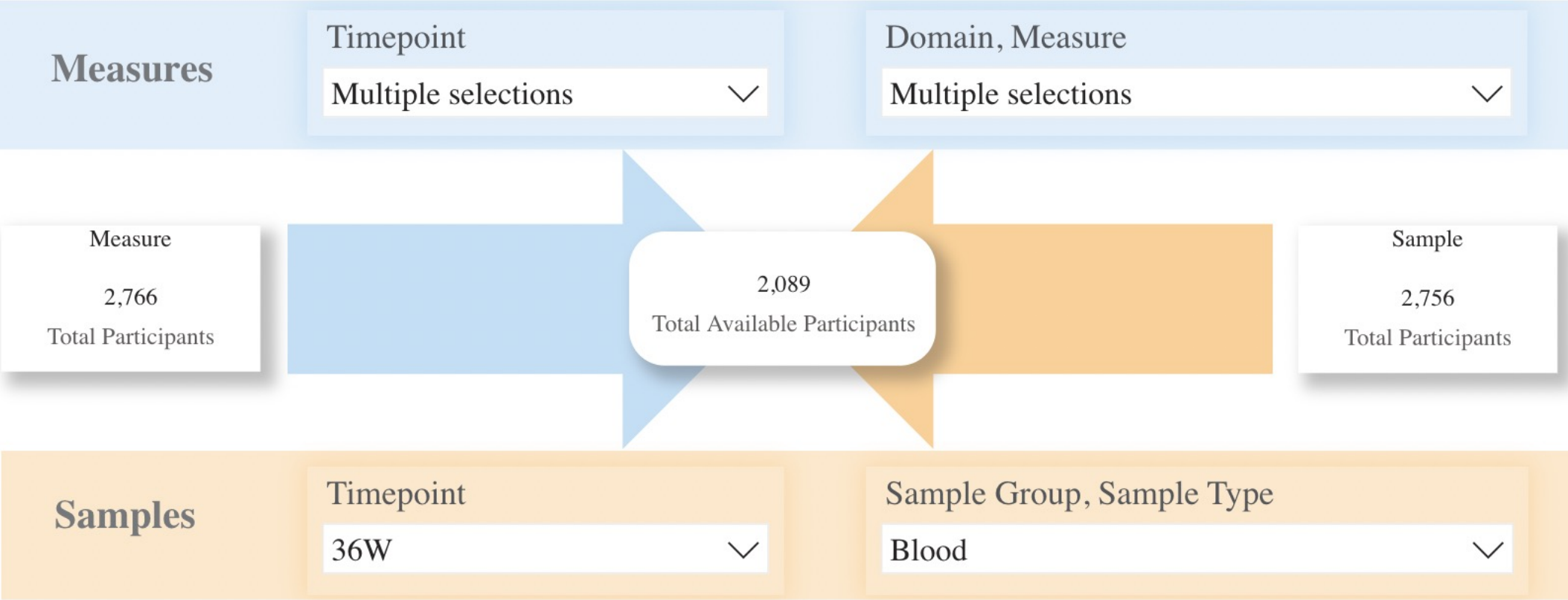
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Advanced Search

This advanced filter allows you to get a cross section of participants based on two filters: 1. Measures 2. Samples. Filter by Measure and the total number of participants will appear in the Measure box based on your selection. Filter by Samples and the total number of participants will appear in the Samples box based on your selection. The Total Available Participants in the center of the visual represents the participants that contain data for both filter criteria.

Clear Filters





ORIGINS cohort profile



Skin Prick Testing



Allergens	One Year Old N= 2,488	Three-Year-Old N= 1,126	Five-Year-Old N= 483
% with one abnormal allergen test	16%	19%	42%
Egg	9%	2%	1.5%
Milk	3%	1%	0.5%
Peanuts	5%	2%	2%
Rye	1%	6%	20%
House dust mite	2.2%	13%	20%

Concerns at 3 and 5 years old



CONCERNS	3 YEARS - % ABNORMAL	5 YEARS - % ABNORMAL
Body Mass Index >75 th percentile	35	31
Sugar Cereals* 2-4 times/week (everyday)	47 (14)	53 (17)
FERRITIN level low <20mgm/L (<10)	45 (9)	35 (5)
Abnormal Sleep Patterns (severe)	38 (17)	36 (16)
Screen use almost daily	63	66
Time in Nature <10hrs/week (<5hr/week)	-	56 (33)

*Food Frequency Questionnaire

Child Mental Health at 3 and 5 years old

MENTAL HEALTH*	3 YEARS- % ABNORMAL (very severe)	5 YEARS- % ABNORMAL (very severe)
Living in household with mental illness	29	32
Anxiety	45 (14)	31 (15)
Aggressive/defiant	36 (15)	35 (17)
Emotional lability	37 (15)	29 (21)
Inattention/hyperactivity	22 (7)	28 (12)
Atypical social behaviours	22 (6)	20 (9)

*Early Conners Questionnaire

? Impact of highly processed foods, environmental pollutants, technology use, nature deficit

Filters

Month

All

Referrals AVG %

AVG 3 Year

14%

3 Year Paediatric Referrals (Last 12 Months)

	October 2023	November 2023	December 2023	January 2024	February 2024	March 2024	April 2024	May 2024	June 2024	July 2024	August 2024	September 2024
Appointments Completed	29	47	16	15	31	40	21	35	34	29	40	27
Child Referrals Total	0	1	0	0	1	0	0	2	1	0	2	0
Referrals Percentage	0%	2%	0%	0%	3%	0%	0%	6%	3%	0%	5%	0%
General Paediatrician	0	1	0	0	0	0	0	2	0	0	0	0
Immunologist	0	0	0	0	0	0	0	0	0	0	0	0
Gastroenterologist	0	0	0	0	0	0	0	0	0	0	0	0
Ophthalmologist	0	0	0	0	0	0	0	0	0	0	0	0
Neurologist	0	0	0	0	0	0	0	0	0	0	0	0
ENT	0	0	0	0	0	0	0	0	0	0	0	0
Child Development Service	0	0	0	0	0	0	0	2	0	0	1	0
Dermatologist	0	0	0	0	0	0	0	0	0	0	0	0
Speech Pathologist Private	0	0	0	0	0	0	0	1	0	0	0	0
Occupational Therapist Private	0	0	0	0	1	0	0	0	1	0	2	0
Physiotherapist Private	0	0	0	0	0	0	0	0	0	0	0	0
Dietitian	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0



ORIGINS Sub-projects



ORIGINS | Sub-projects

ORIGINS is a research platform designed for utilization by approved sub-projects.

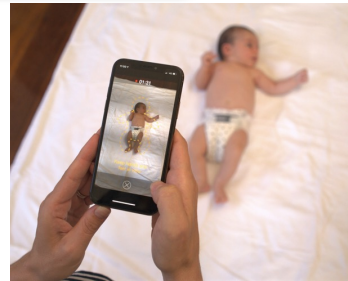
Sub-projects can:

- Nest studies (observational, interventional etc) within the cohort
- Access data including from analysed biological samples
- Analyse biological samples
- Collect new data and biological samples

Also...

- Some funding is in place to support the core ORIGINS processes and maintain the databank and biobank.
- Sub projects bring their own funding for admin, data access and/or biobank access or analysis.

**50+ nested sub-projects
within ORIGINS**



ORIGINS Subprojects: An Interventional Cohort N= 50



Brain & Behaviour



Allergy, Inflammation & Immunity



Growth & Development



Oral Health



Nutrition & Metabolism



Environment & Lifestyle



Parenting



Microbiome

- Cognitive development
- Healthy microbiome
- Emotional wellbeing & mental health
- Weight gain
- Nature connectedness
- Respiratory problems
- Nutrition
- School readiness
- Family functioning during COVID-19
- Fathering project
- Dental care
- Physical activity & screen use
- Breastfeeding
- Allergy prevention

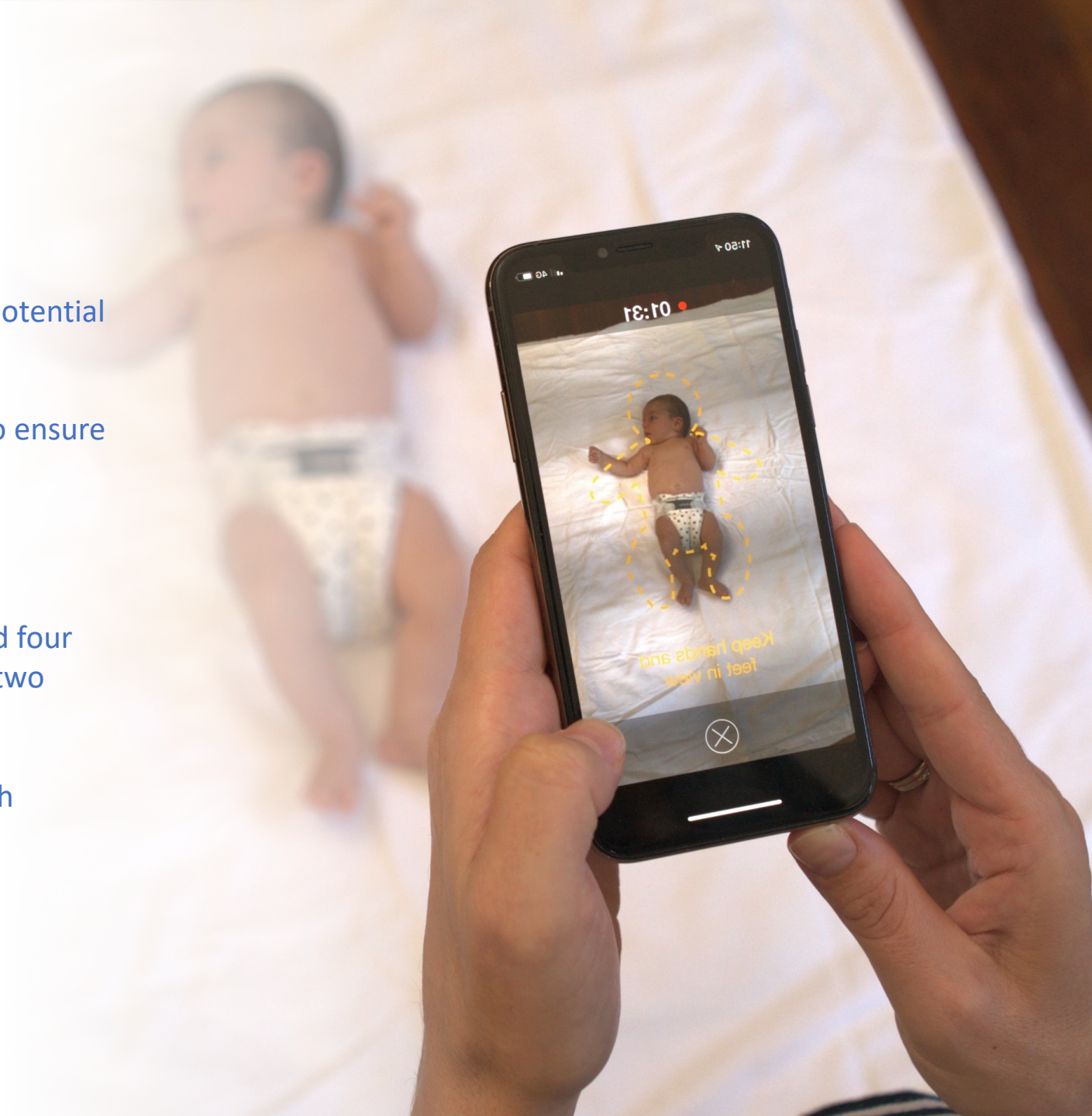


- Develop **machine learning** tools to identify babies with potential learning difficulties and provide very early intervention.
- Identify all children with cerebral palsy by four months to ensure **early intervention**.

Recruitment n = 2,200 from the ORIGINS cohort

- 3,000 babies will have four videos taken at two weeks and four months of age, as well as neurocognitive assessments at two years and at five years
- Is general movement at two weeks of age associated with cognitive development at two years and five years?

A/Prof Jane Valentine
Prof Catherine Elliott



Testosterone And Language in Kids (TALK)

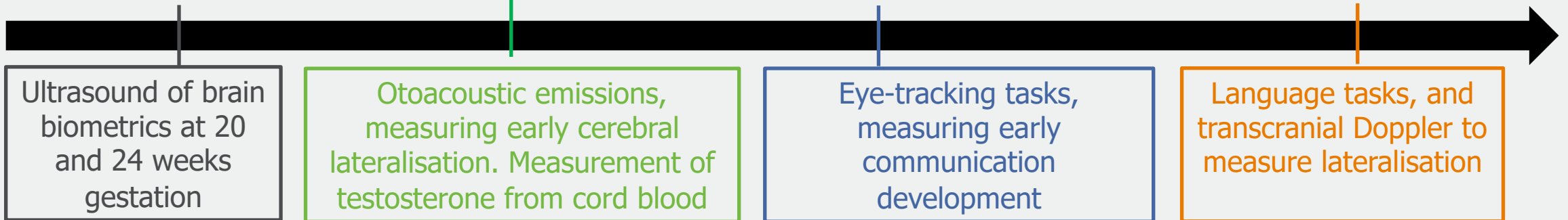
Understand language development and markers for neurodevelopmental disorders

Prof Andrew Whitehouse

Recruitment completed for N=500



Age



Nutrition in Early Life: Allergy prevention

Dr Debbie Palmer
Prof Susan Prescott

Recruitment completed



SYMBA RCT: Maternal prebiotics from 20wk gestation to 6 months of breastfeeding. Follow-up to 1 year

PrEggNut RCT: Maternal egg and peanuts from birth to 6 months of breastfeeding. Follow-up to 9 months.

Cashew RCT: Infants eating cashew nut spread from 6-12 months of age. Follow-up to 1 year of age.

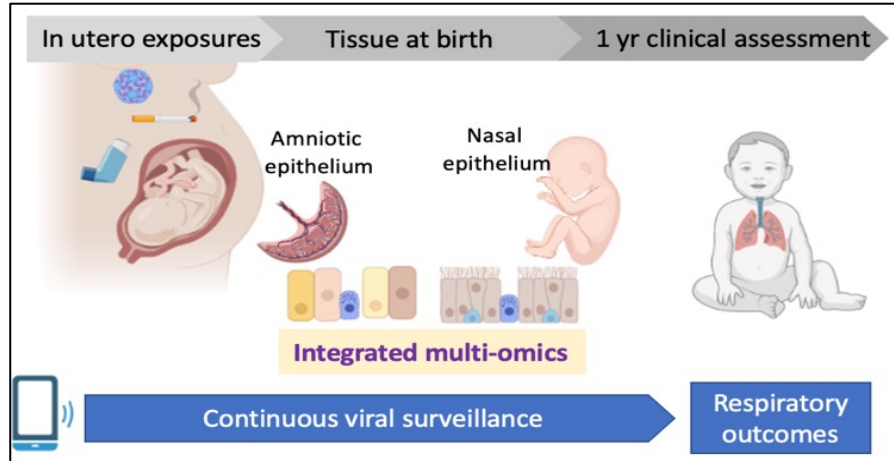
One family member with allergies
(652 women)

Two family members with allergies
(64 women)

Any infants
(141 infants)



Clinical trial investigating associations between early-life gene signatures in nasal epithelia and airways disease



Recruitment completed
N= 400

Studying the importance of the cells lining the airways in the nose and lungs at birth to help to understand the development of early-life airway conditions.

VISION

Identify biomarkers and pathways to prevent or halt respiratory disease development.

Dr Thomas Losifidis
Prof Steve Stick
Dr Liz Starceвич



Screen ORIGINS

- Understand the impact of parental and early childhood electronic use

Detailed information from the ORIGINS cohort n = 2,500

- Family device use and attachment
- Electronic use and how it impacts:
 - Child Development - ASQ outcomes
 - Mental health – Early Conners, other measures
 - Posture, obesity
 - Myopia
 - Social functioning
 - Autistic features

Prof Leon Straker
Dr Rebecca Hood



CARE DAD Study: Flourishing in Fatherhood

VISION

- Improving physical and mental health of fathers (real time feed back)
- Better understanding of the impact of father's health on their offspring
- Advocate for Non-Birthing Partner Health Check
- Pilot a diet intervention for fathers

Recruitment completed for N=500

Prof Bu Yep





ORIGINS Community Wellbeing Project - ongoing

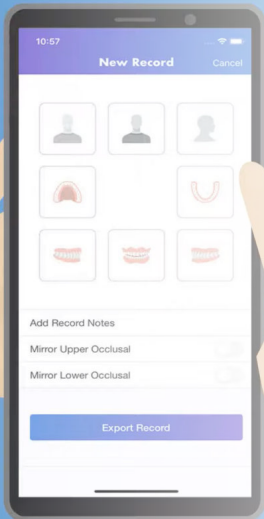
1. Assess **perceived stress and wellbeing** in the ORIGINS families during the COVID-19 pandemic.
2. COVID-19 vaccine hesitance
3. Effects of long-Covid
4. Tracking ORIGINS families before and during the pandemic as it changes

Dr Lisa Gibson



Feasibility of tele-dental screening in pre-schoolers to improve access to dental care during COVID-19

- Global dental caries in preschool children is **around 48%**
- Limited service access
- **42 parents** in ORIGINS cohort used a smart dental app to take photos of their preschool children's teeth
- **25% identified** having early dental caries and referred on for services. (>90% good quality photos & 95% specificity by 2 reviewers)



Dr Somayyeh Azimi

Nature Play and Grow

- **Preschool Intervention to improve** nature connectedness, environmental stewardship, healthy eating and managing electronics
- Pilot completed
- Collaborative project with Nature Play WA
- Seeking funding for a larger study in conjunction with local councils

Dr Lisa Gibson
Professor Desiree Silva



Wellbeing in the Perinatal Period

- Studies to determine:
 - Engagement in minimal contact online wellbeing training programs for perinatal women.
 - Perceived differences between the type of mindfulness-based training.
 - A further study is exploring **biomarkers of psychological distress** using hair and plasma samples taken antenatally and postnatally.
- This research contributes to the understanding of population-based interventions that can be provided as **simple, scalable, cost-effective and home-based activities in pregnancy.**

Dr Jacqueline Davis, Professor Susan Prescott



The Flourishing ORIGINS Child

- This project seeks to understand and define 'flourishing' from different stakeholder viewpoints and to co-design this program of research, so that the community is part of the research from beginning to end.
- Broad stakeholder consultation into what determines 'flourishing' in early childhood.
- Investigating measures of flourishing in the early years to test in the ORIGINS cohort.

Dr Jacqueline Davis



What's next for ORIGINS?



The ORIGINS Platform: Chapter 2 Primary School Years (2024- 2028)



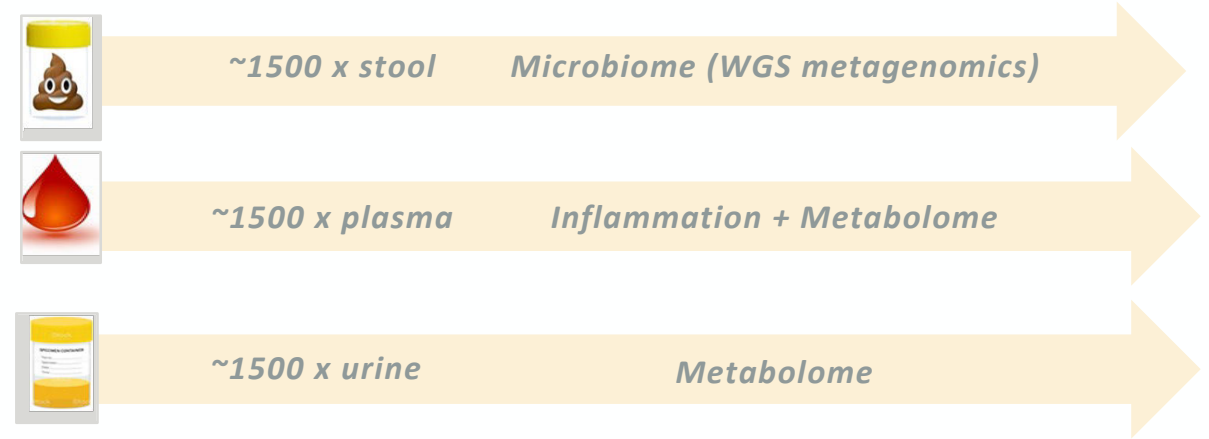
- Complete 1, 3 & 5 year checks
- Plan and commence primary school checks
- Data linkage - state and commonwealth
- Analyse biological samples to digitize the collections
- Test “stacked” interventions with the cohort

Outcome and impact: Discovery & Innovation

ORIGINS Sample Analysis

Longitudinal sample sets from mother-child dyads at three ORIGINS timepoints:

- Maternal (36wk gestation) x 500
- Child (1yr) x 500
- Child (3yr) x 500



Candidate selection:

COMPLETE
Review availability across entire cohort

Eligible mother-child dyad's based on consent status
N = 3859 children

COMPLETE
Select candidates on sample, then data availability (also considering complementary prior sample analyses)

V1 Candidates
N = 735 children (from 715 pregnancies)

COMPLETE
Review and enrichment Round 1

Review V1 candidates with Biometrics team for cohort representativeness.
V2.1 candidates locked in.
N = 841 children (from 821 pregnancies)

IN PROGRESS
Review and enrichment Round 2

Reviewing V2.1 candidates with Biometrics team for child health outcomes and phenotypes.
Expectation is that we may add further participants with notable phenotypes, even if limited samples available.

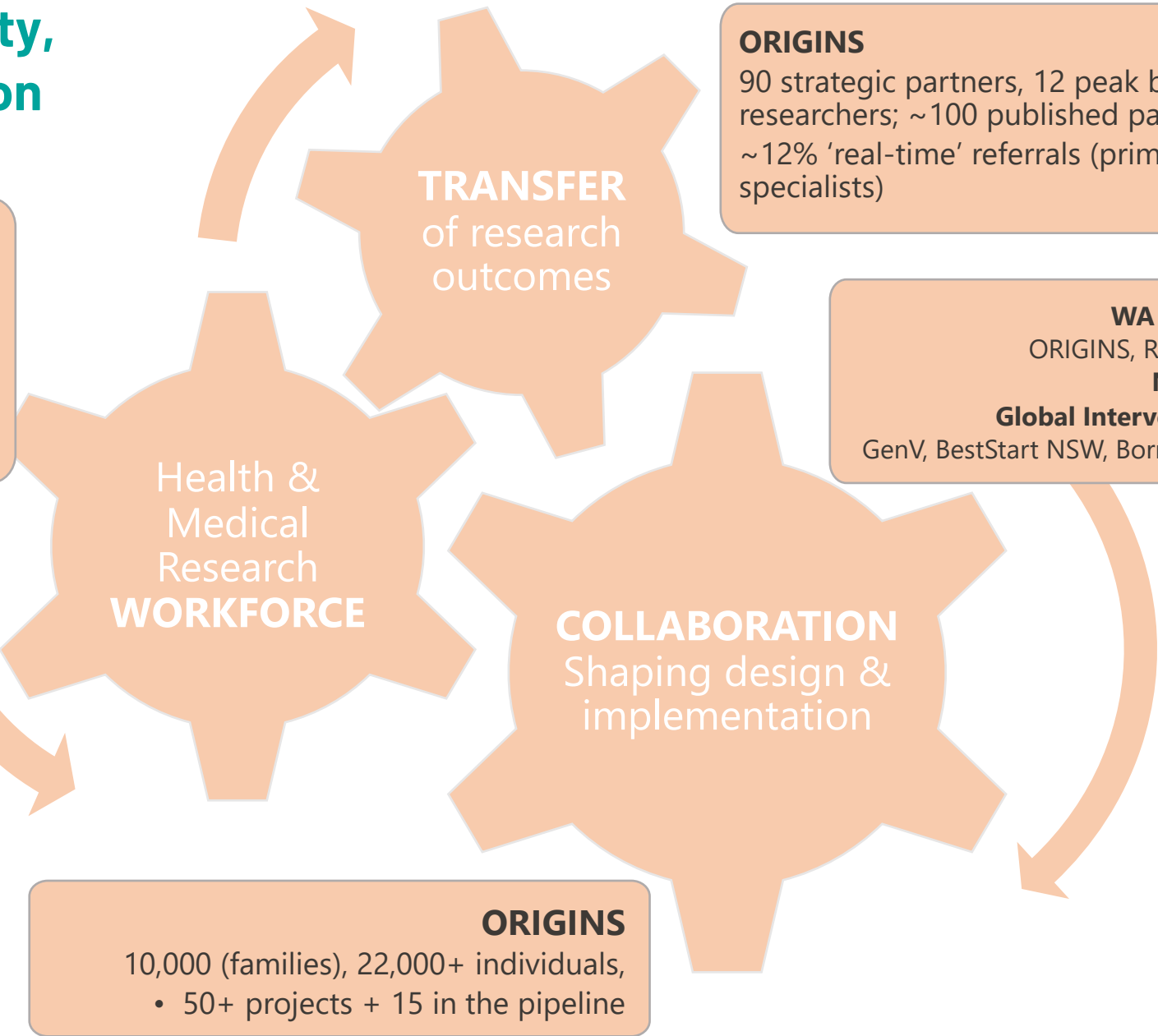
The Primary School Years

- **6- and 7-year online questionnaires**
 - Commence in 2024
 - Domains include: Lifestyle behaviours, emotional wellbeing, physical health & medical conditions, family functioning, nature exposure
- **Primary School face-to-face follow-up**
 - Commence testing in 2025 with 8 year olds
 - Domains include:
 - Lifestyle behaviours (nutrition, exercise, diet, screen time, nature exposure, body composition)
 - Mental health, Quality of life
 - Respiratory functioning, Allergies, Environmental exposure
 - Literacy and language.
 - Questionnaires to be completed by parent, as well as child self-report and teacher report
 - Possible sub-project domains:
 - Bullying/social relationships
 - Vision assessment
 - Oral health
 - Skin barrier
 - Body image/disordered eating
 - Gender identity

Building Research Capacity, Collaboration & Translation since 2017

ORIGINS - FUNDING
Core funding \$28 million
Independent indirect grant funding \$22 million **which represents a significant return on original investment**
Total value of ORIGINS = \$50+ million

ORIGINS
17 PhD, 9 postdocs, 29 undergrads, 10 medical doctors



ORIGINS
90 strategic partners, 12 peak bodies, 700 researchers; ~100 published papers;
~12% 'real-time' referrals (primary care, specialists)

WA Cohort Network
ORIGINS, RAINE & Busselton
National Cohorts
Global Interventional Cohorts
GenV, BestStart NSW, Born in Bradford (UK)

ORIGINS
10,000 (families), 22,000+ individuals,
• 50+ projects + 15 in the pipeline



ORIGINS| A Rich Asset for the Future

ORIGINS is a rich asset for the future that can embed new research opportunities in the primary school years. Considering the increasing burden of NCDs, we will help to disentangle the origins of health and disease and assist in identifying protective factors over the lifecourse.



Questions and collaborations

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