

We are all Brain Builders

What we should know & What we should do



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Thriving Queensland Kids **Partnership**



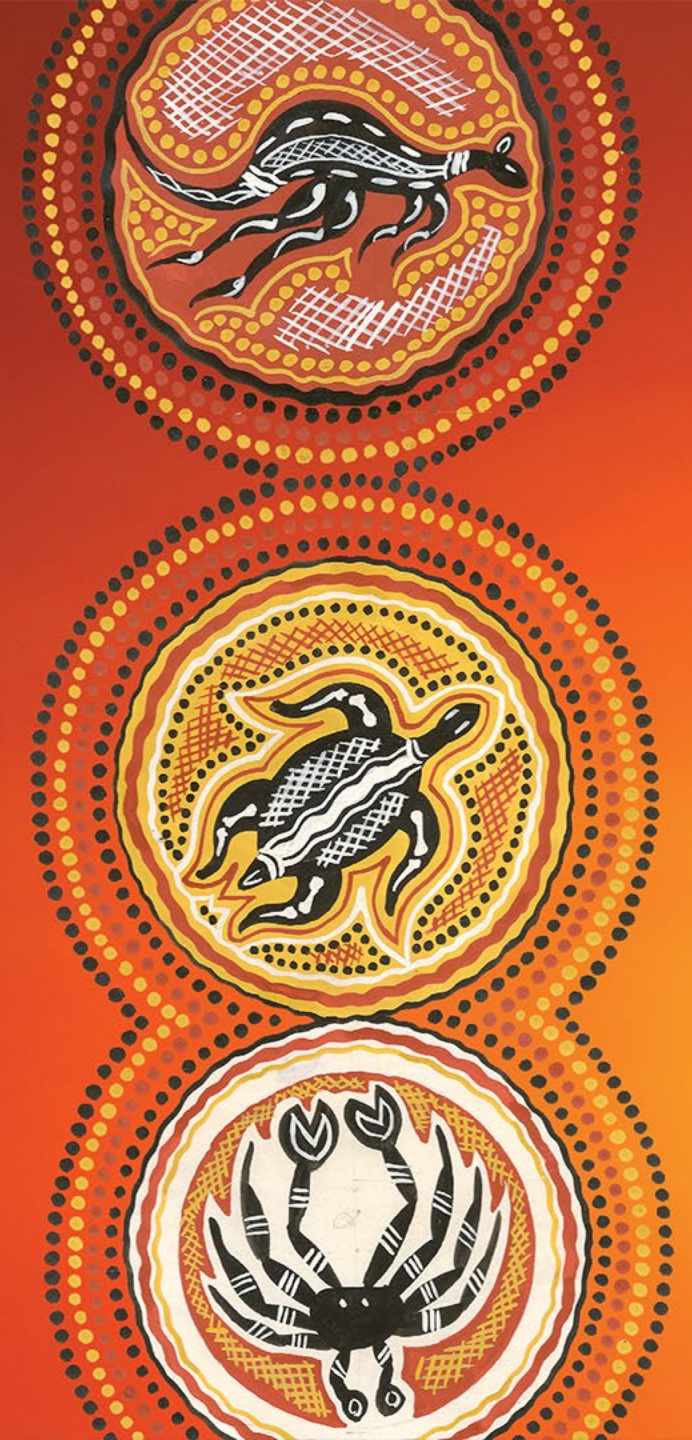
If you want to go fast, go alone
If you want to go far, go together

African Proverb

The University of the Sunshine Coast acknowledges the Traditional Custodians of the land on which its campuses sit. We recognise and pay respect to Elders past, present and emerging.

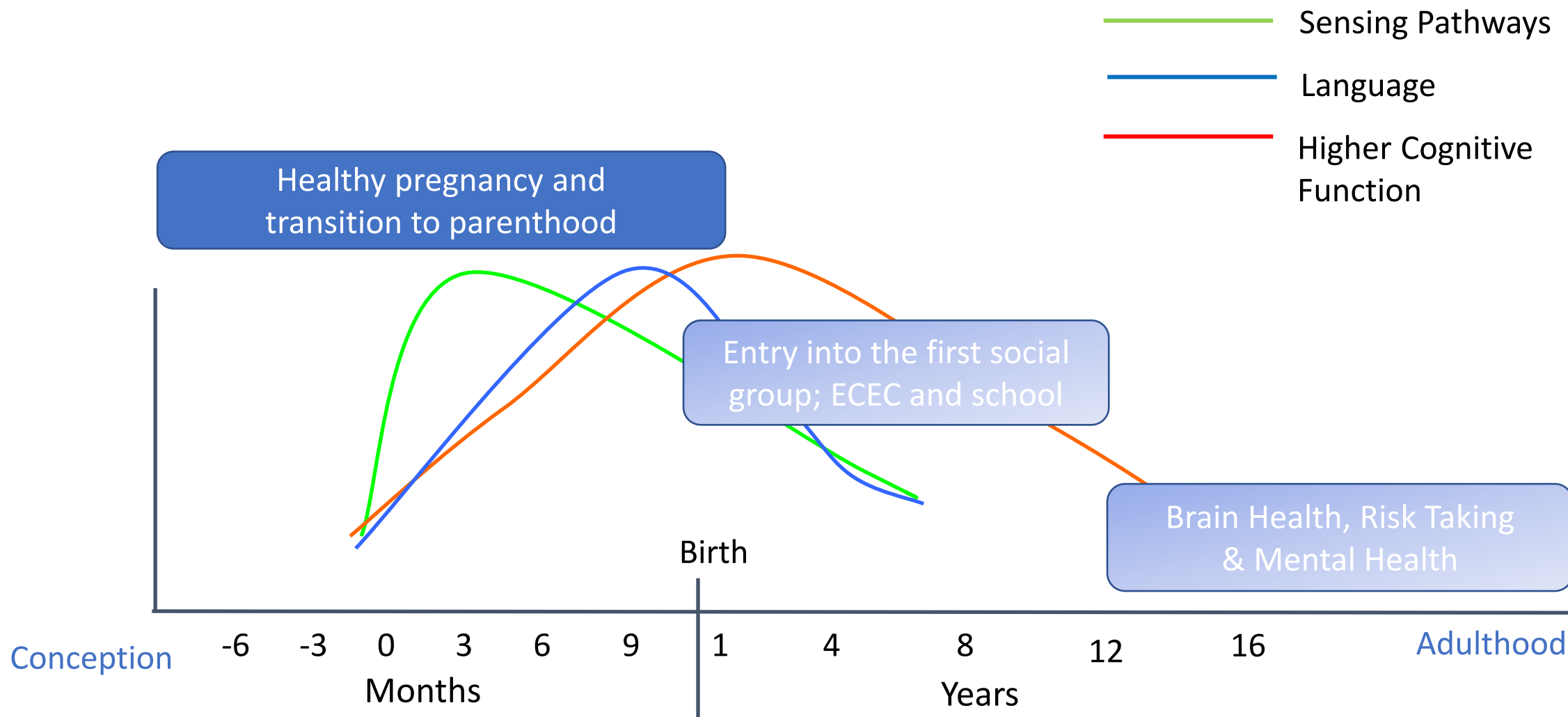


Image provided courtesy of Lynne Stuart



***What are the
3 most important discoveries
from neuroscience
that we should all know about?***





Human Brain Development : Synapse Formation C-16 years

C. Nelson, *From Neurons to Neighbourhoods*, 2000.

The First 2000 Days: An Opportunity of a Lifetime

- The First 2000 Days: period from pre-conception through to 5 years.
- Perinatal: pregnancy and first year following pregnancy or birth (Commonwealth of Australia, 2023)
- Experiences across the First 2000 Days have consequences for health and wellbeing across the lifespan, for multiple generations
- Focus on key priorities within the First 2000 days that have ***the greatest preventive*** impact on overall health outcomes throughout a lifetime, will provide significant benefit in terms of:
 - ✓ the health and potential of our community
 - ✓ our health system sustainability
 - ✓ equity of health care access and outcomes



Development & Shaping the Brain

- Marvel of biological engineering
- Newborn baby: estimated complement of **100 billion neurons**
- Rate of growth: *mean of 250,000 nerve cells per minute throughout pregnancy*
- At Birth: 25% of adult brain volume
- Brain doubles in size in first year of life

Implication: most critical period

Human infants are reliant upon, and shaped by, the environment they grow within and the care they receive



FIGURE 6.1.

Ackerman, 1992. Discovering the Brain, NICHD

Pregnancy and Transition to Parenthood



The three things we should know:

1. Healthy, supported pregnancies grow healthier, happier brains
2. The Microbiome Matters
3. Care for Kids by Caring for Parents

Healthy, supported pregnancies grow healthier, happier brains

Period of intense change: environments influence brain development

- **Rapid fetal neurodevelopment:** nutrition, stress, toxins impact
- **Maternal brain plasticity & adaptation:** preparation for responding to infant
- **Hormonal changes:** influence mood, memory & stress responses; can affect memory & cognitive function
- **Stress and Anxiety:** hormones can cross placenta influencing long-term neurological development
- **Parental Brain Changes:** partners undergo neural changes that prepare for parenthood
- **Bonding and Attachment:** Oxytocin plays crucial role
- **Postpartum Depression:** hormones, genetics & social support influence brain activity & connectivity

(Davis and Narayan, 2021)

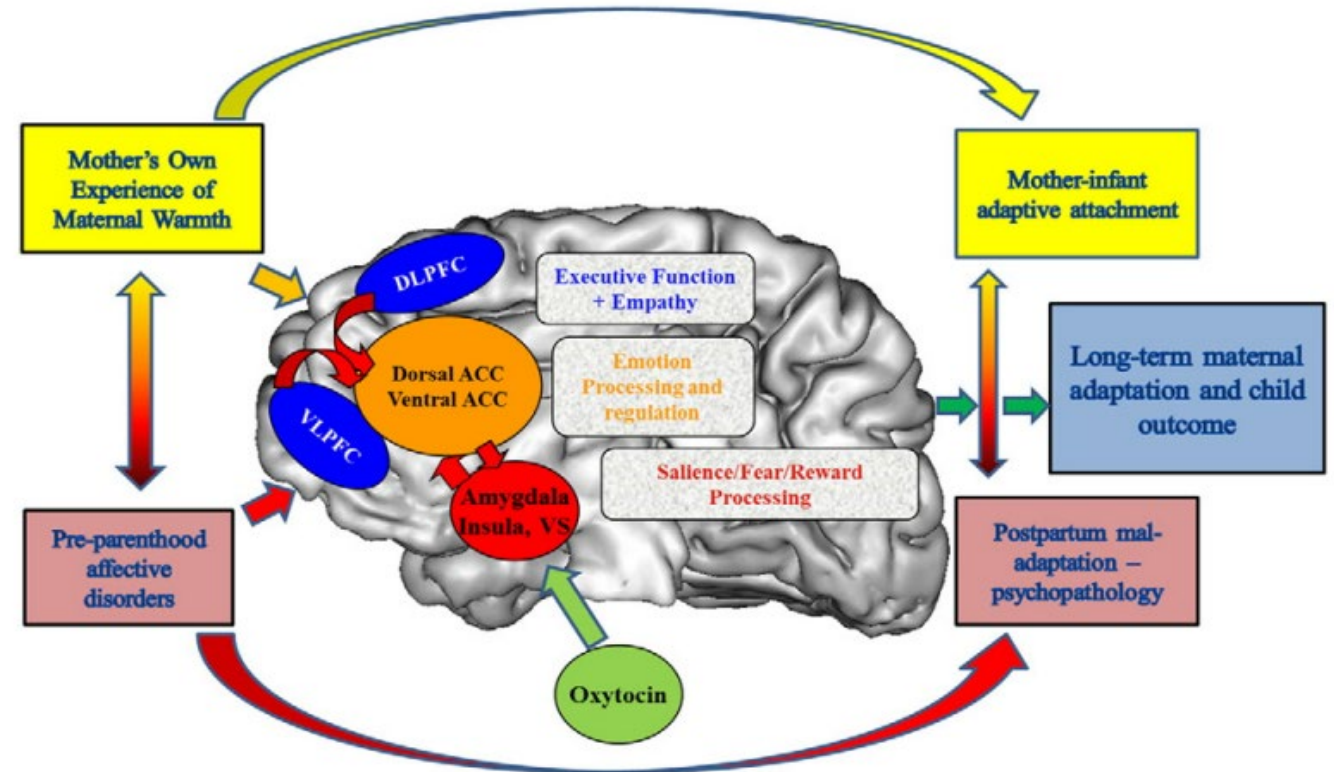


Healthy, supported pregnancies grow healthier, happier brains

Maternal brain changes prepare for motherhood

- Maternal brain areas affected by pregnancy are not random
- Medial prefrontal cortex & temporal lobe: related to socio-cognitive processes and emotional perception
- Neuroanatomy of maternal brain and the reward system (basal ganglia)
- Mediated by sex steroid hormones and corticosteroids

Checkko et al 2022



- Early life factors e.g. parental warmth and previous mental health/stress/childhood adversity affect plastic brain circuits – regulate maternal affective regulation capacity & outcomes

Kim et al (2016), p114

Healthy, supported pregnancies grow healthier, happier brains

Elevated stress during pregnancy increases risk for maternal anxiety & mood disorders with implications for fetal & infant development

- Hypothalamic-pituitary-adrenocortical (HPA) axis: stress responsive system in maintaining homeostasis
- Reduced HPA axis & maternal psychological response to stress during pregnancy: likely normative & protective for mother-baby dyad
- Elevated exposure to stressors → preterm birth, maternal anxiety & mood disorders, postpartum depression
- Maternal neural & behavioural sensitivity to infants: Increased by oxytocin, reduced by stress (Kim et al 2016, Davis & Narayan, 2020)
- Exposure to childhood adversity/stress may result in abnormal dvlp of oxytocin system in offspring (intergenerational effect)



(Kim et al 2016, Davis & Narayan, 2020)

CALL TO ACTION:

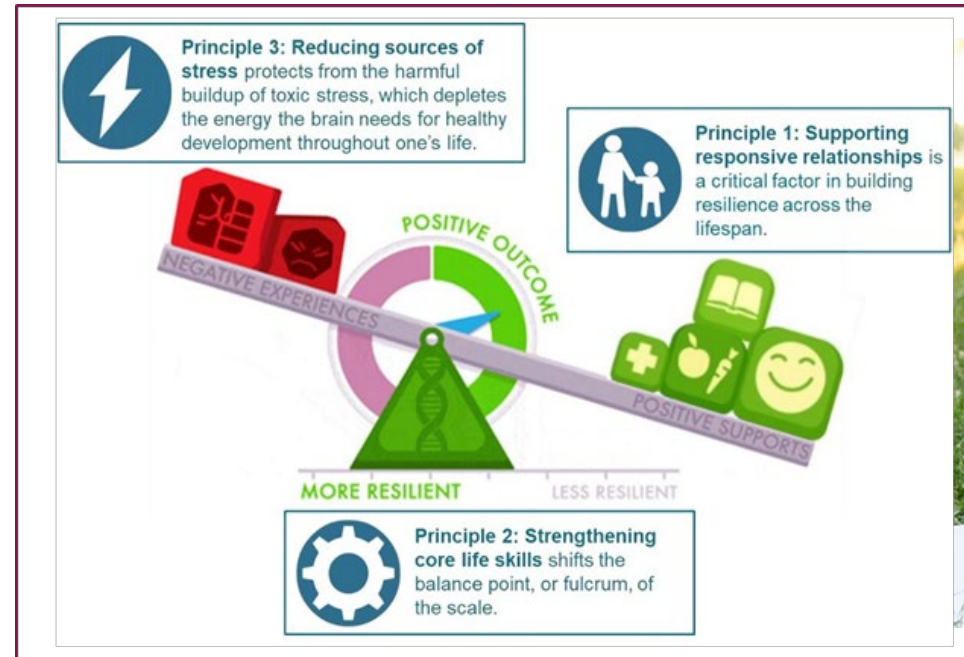
Healthy, supported pregnancies grow Healthier, happier brains

Create healthy environment for normal maternal biology

- **Reduce stress**
- Optimal nutrition
- Sleep and rest
- Social support & connection
- Address perinatal mental health early

Reduce exposure to toxins

- Tobacco, alcohol and other substances
- environmental toxins



Continuity of care models, First Nations Birthing on Country & Respectful Maternity Care models = better birth outcomes for mothers and babies

The Microbiome Matters - Why

- Gut microbiome: critical role in immune system & infection defence
- Brain-Gut microbiome interactions: programmed in first 3 years of life; modulated through life (diet, medications, stress)
- Healthy gut function interlinked with normal central nervous system (CNS) function.
- Gut microbiome linked to CNS disorders: anxiety, depressive disorders, schizophrenia, & autism
- First 1000 Days: birth – first years:
 - critically important for the highly dynamic maturation of the infant gut microbiome

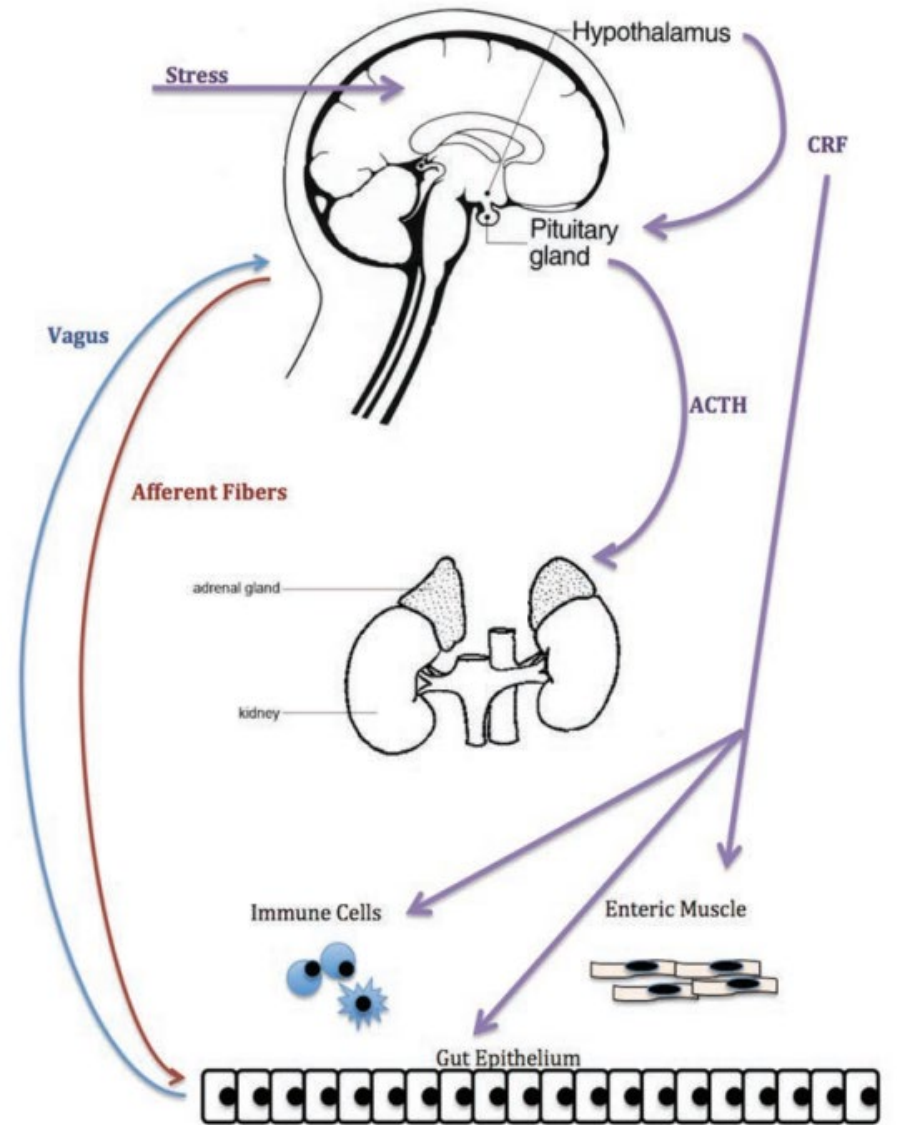


Figure 1. The gut-brain axis pathway. Image created by Megan Clapp and Emily Wilen.

The Microbiome Matters: Critical time points

- Nutrition, Dental Care & antibiotic use in pregnancy
- Mode of Birth Matters : Vaginal birth vs Caesarean birth with administration of antibiotics
- Skin to Skin
- Breastfeeding & timing of introduction of solid food

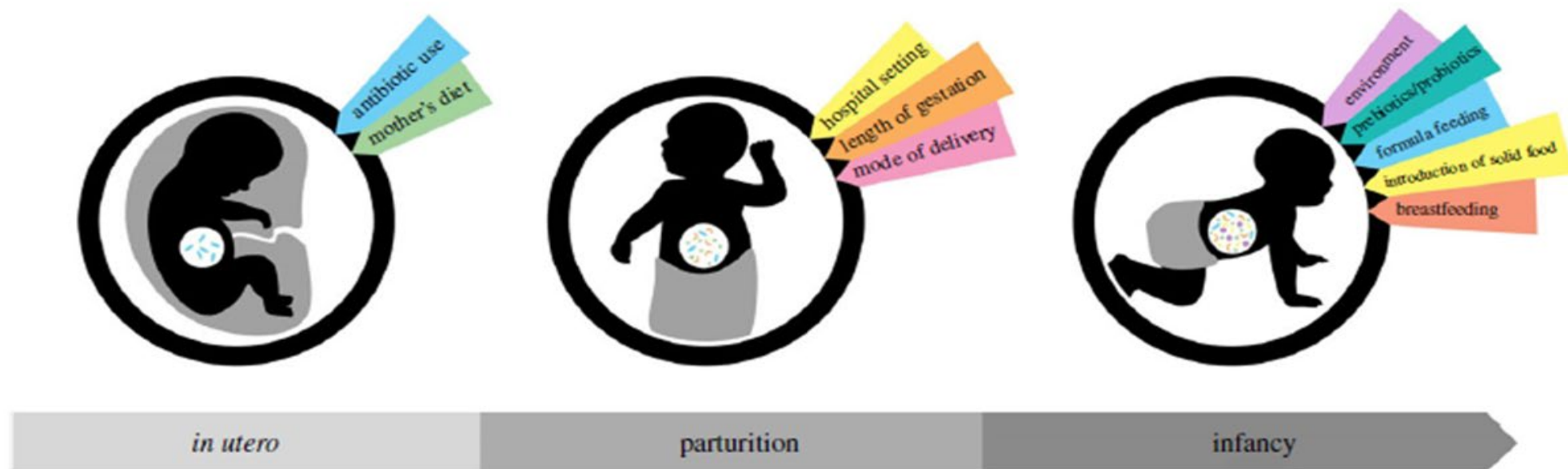


Figure 1. Stages and associated factors that modulate the microbiome early in life.

Moore and Townsend, 2019

CALL TO ACTION: The Microbiome Matters

Establishing a successful partnership between host, microbiota & immune system

ANC:

- Maternal nutrition & dental care for priority groups
- Reduce Stress
- Explore experiences/knowledge of birth and breastfeeding

Birth

- Spontaneous vaginal birth wherever possible
- C-Sections: Public health issue (32% Australia, higher in private pts) justification of higher C/S; Clamp cord before antibiotic admin
- Reduce augmentation using synthetic oxytocin – not the same
- Skin to skin immediately post birth (don't remove to weigh/wash)

Breastfeeding Support

- Early & sustained breastfeeding support
- Access to human milk (every tertiary hospital should have a milk bank or access to human milk)

Windows of opportunity for long term immune health

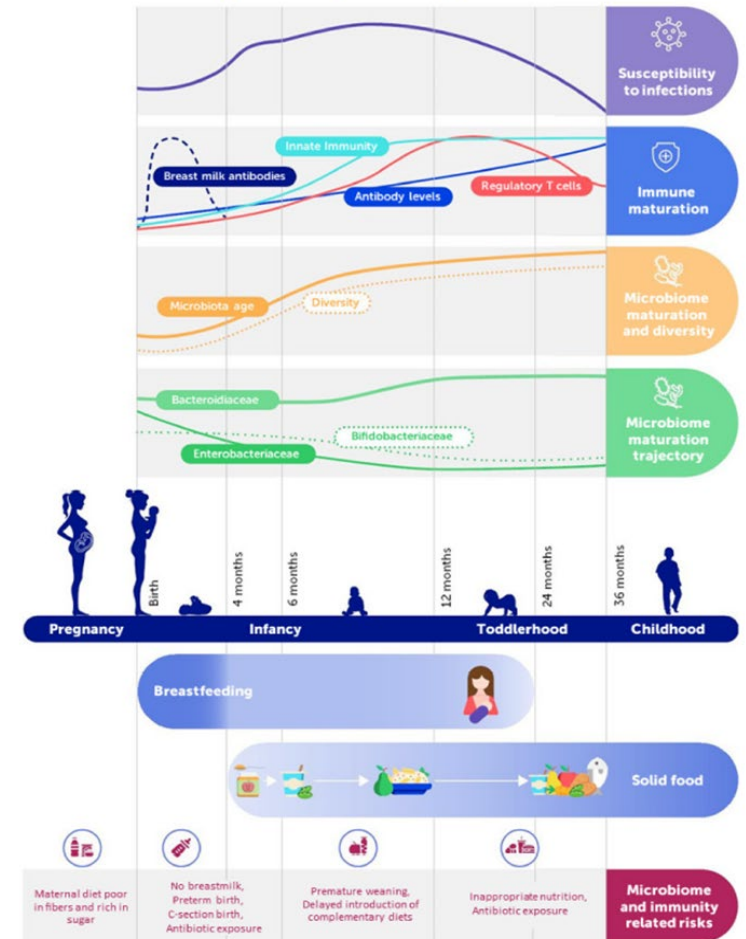


Figure 1. Schematic representation of the early life gut microbiome and immune development dynamics with feeding recommendations and major risk factors.

Continuity of care models, Birthing on Country Models = better outcomes

Care for Children by Caring for their Parents: create environments for Oodles of endogenous Oxytocin

- Infant-Caregiver bond & interactions have neurobiological basis

3 Core Concepts in Early Development

- Experiences build brain architecture
- Serve & return interactions shape brain circuitry
- Toxic Stress Derails Healthy Development



CALL TO ACTION

Care for Children by Caring for their Parents

- Raise awareness of critical importance in investment in early years
- Practical social supports to reduce parental stress
- Parent support which is co-designed and includes:
 - Infant behavioural cues and needs
 - Realistic expectations for infant and toddler sleep
 - Considers the Dyad, not one individual at the expense of the other: Supports parent-infant closeness and attachment
 - Early and sustained support for BF
 - Early and sustained support for perinatal mental health concerns
 - Evidenced based interventions to reduce impact of smoking, alcohol and substance use



*Moderated Peer Support to provide evidence-based information

CALL TO ACTION

Care for Children by Caring for their Parents

Framing of messages for Pregnancy and Prenatal Period

- Make it about benefits of support in pregnancy
- Show its society's job to support pregnant women and families
- Offer concrete solutions that reinforce society's role

How to Tell the Core Story of Early Childhood

A Short Guide



Pregnancy and Transition to Parenthood



The three things we should know:

1. Healthy, supported pregnancies grow healthier, happier brains
2. The Microbiome Matters
 - Mode of Birth Matters & Breastfeeding builds better brains
3. Care for Children by Caring for Parents
 - Early Experiences matter
 - Create environments for Oodles of endogenous Oxytocin



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Illustrations : unless otherwise noted are via UniSC Adobe Stock license: <https://stock.adobe.com/au/Library/>

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