

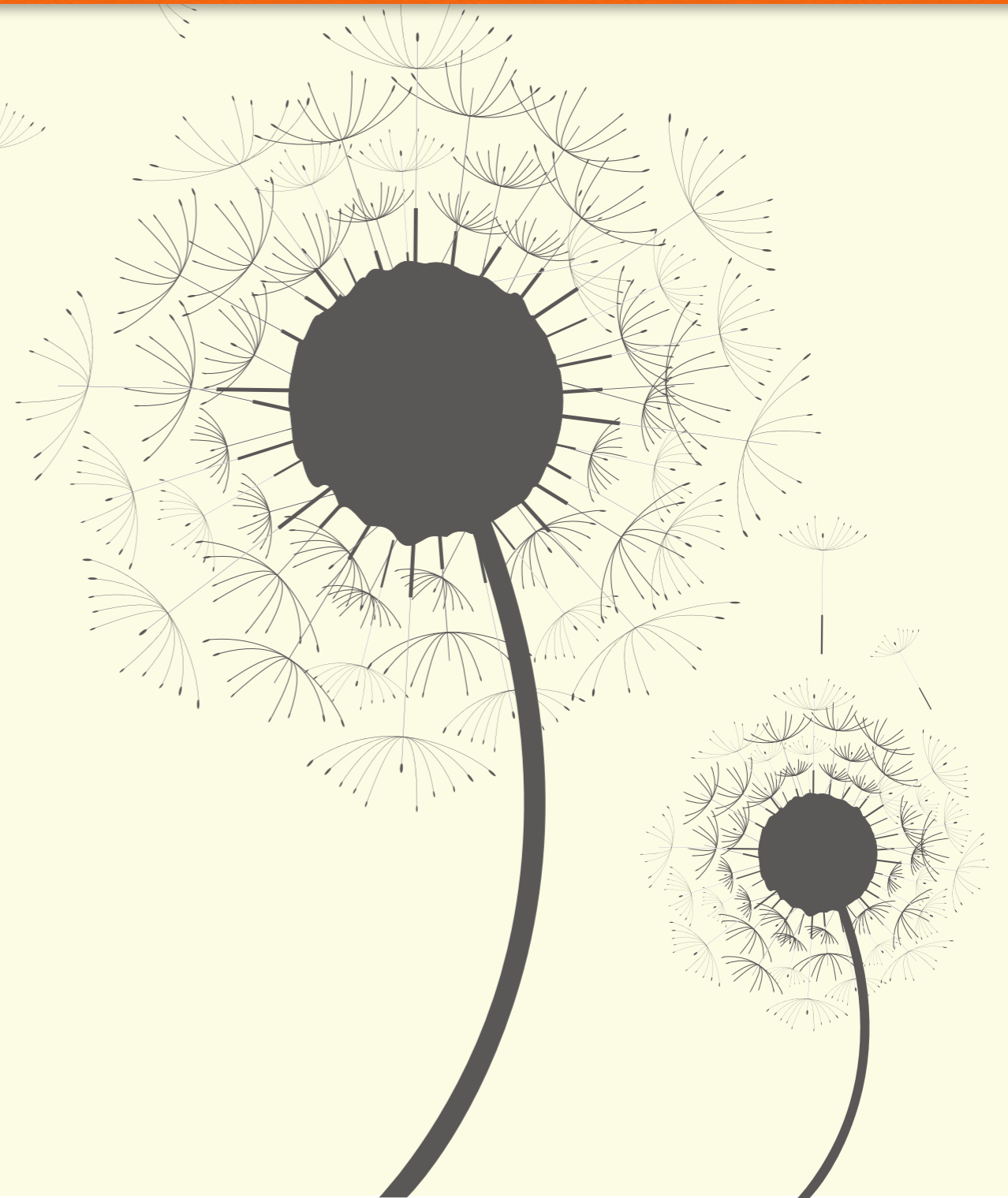
Better Evidence for a Better Start

The 'science within': what matters for child outcomes in the early years



The 'science within'

In order to give children a better start in life we think it is important to begin with the science. This helps us understand how children develop and what affects their development, and gives us a better sense of what we need to do and why. Here we pull together the evidence from various fields to illustrate how adversity in a child's home and wider environment translates into poorer outcomes in the areas of nutrition, language and social and emotional development. In doing so, this co-called 'science within' framework provides pointers to diverse activities that could promote positive outcomes for children from conception to 3 years.



Introduction

One of the most important foundations for building caring, productive and healthy families and communities is the nurturing of children in early life. For this reason, helping children get a better start is both good for them and good for all of us. The Big Lottery 'A Better Start' programme is concerned with the period from conception to three years of age. It aims to improve the nutrition, social and emotional development and language of young children living in disadvantaged communities.

So, how can we achieve the best start in life for every child? We need to begin with the science because this helps us understand how children develop and the factors that affect their development. Science gives us a better sense of what we need to do and why. We have pulled together evidence from a number of fields, highlighting what we now know about the key influences on a child's early development, how this takes place, and the areas where we can make a difference. We call this framework 'the science within'.

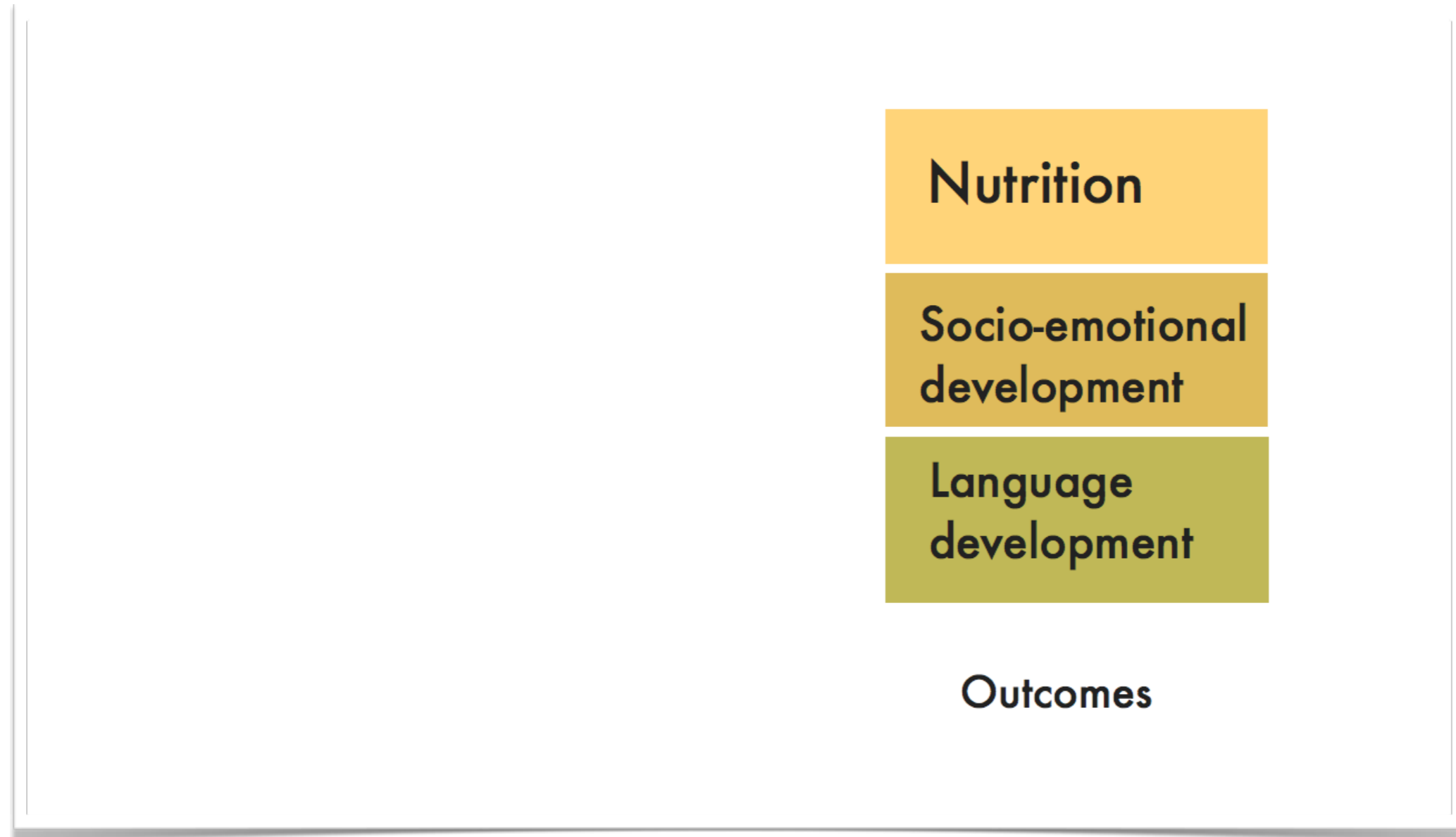
There are a few things to remember when using it. First, the real world is complex and less predictable than the framework may imply. Second, while there is clear evidence

about the factors in early life that are associated with later outcomes for children, none are deterministic: predicting outcomes in children is an inexact science. Third, it is early days for some aspects of the science we have drawn on. The science will continue to develop and change, so we will share our learning with you as new evidence emerges.

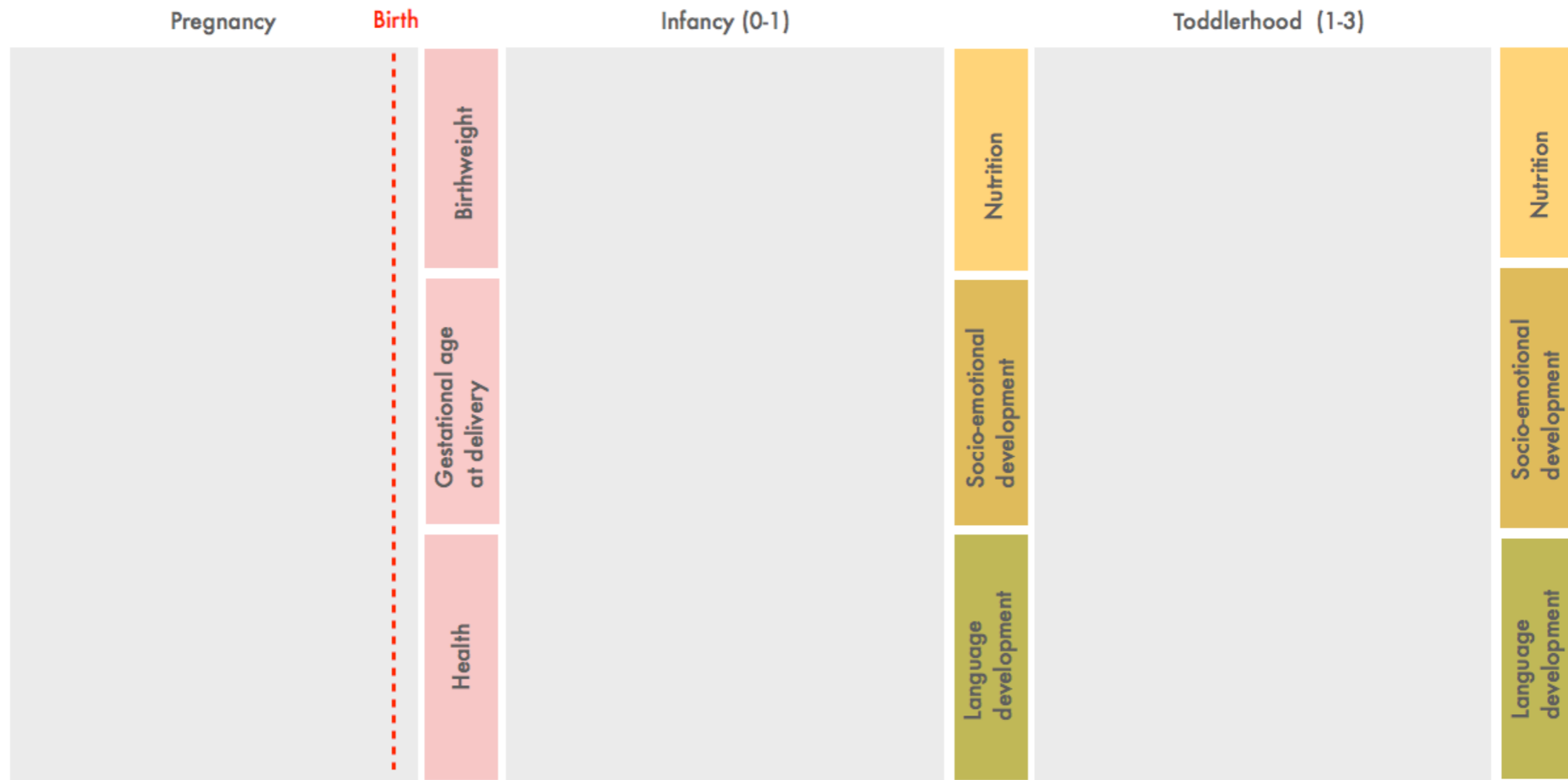
Before we describe the science we should briefly tell you about some of our basic assumptions. Humans are instinctively motivated to care for and protect their young and promote their future well-being. This motivation is heightened during pregnancy and when a child is at his or her most dependent in early life. But sometimes it can be missing or frustrated as a result of internal (e.g. mental health) or external (e.g. poverty) factors. We need to connect with the deep motivation of parents and help to activate it where has become deactivated. This requires a broad view: it really does take a village to raise a child.

Next we provide an outline of the science within, followed by a more detailed description.

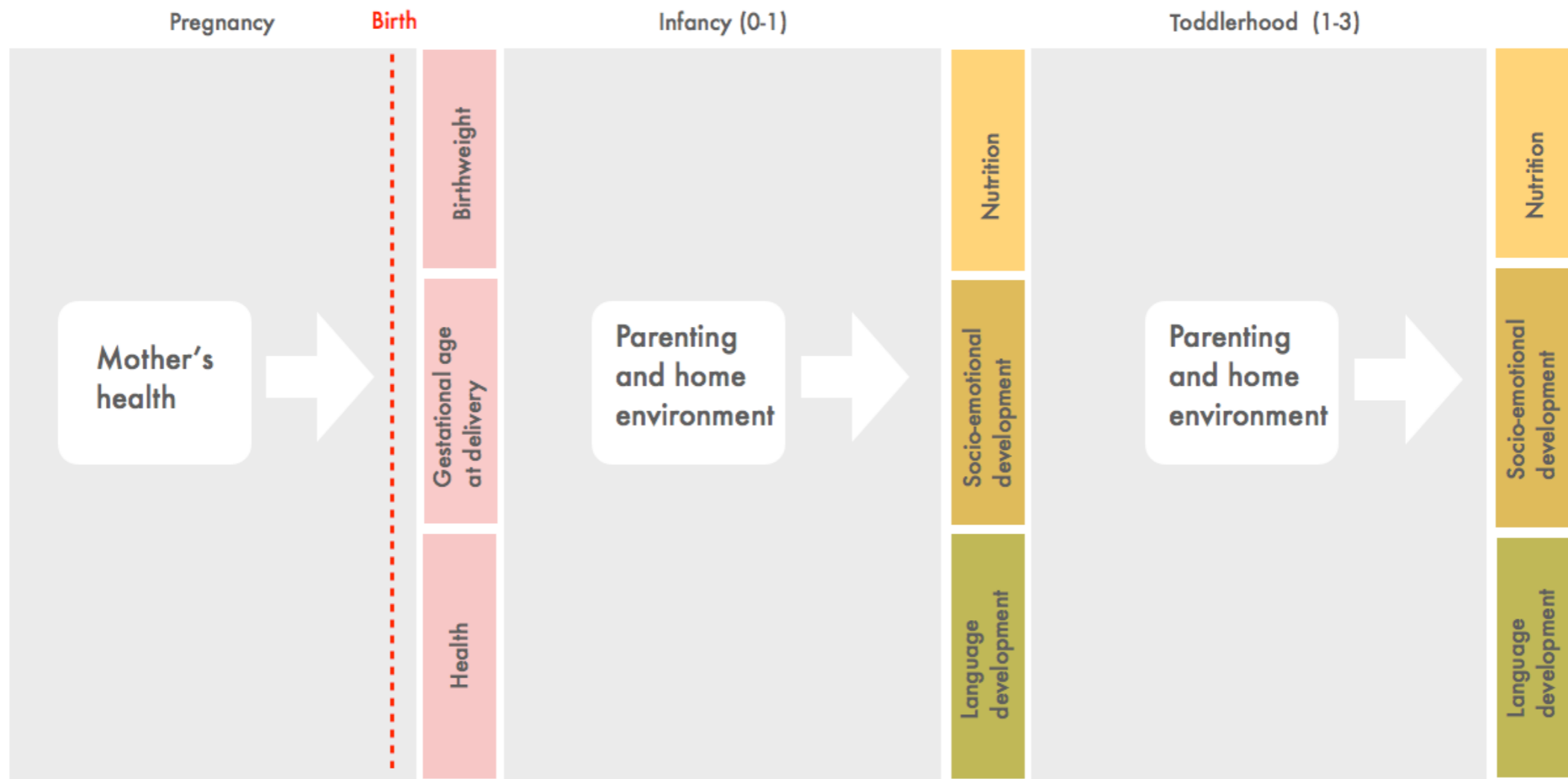
An outline of the framework



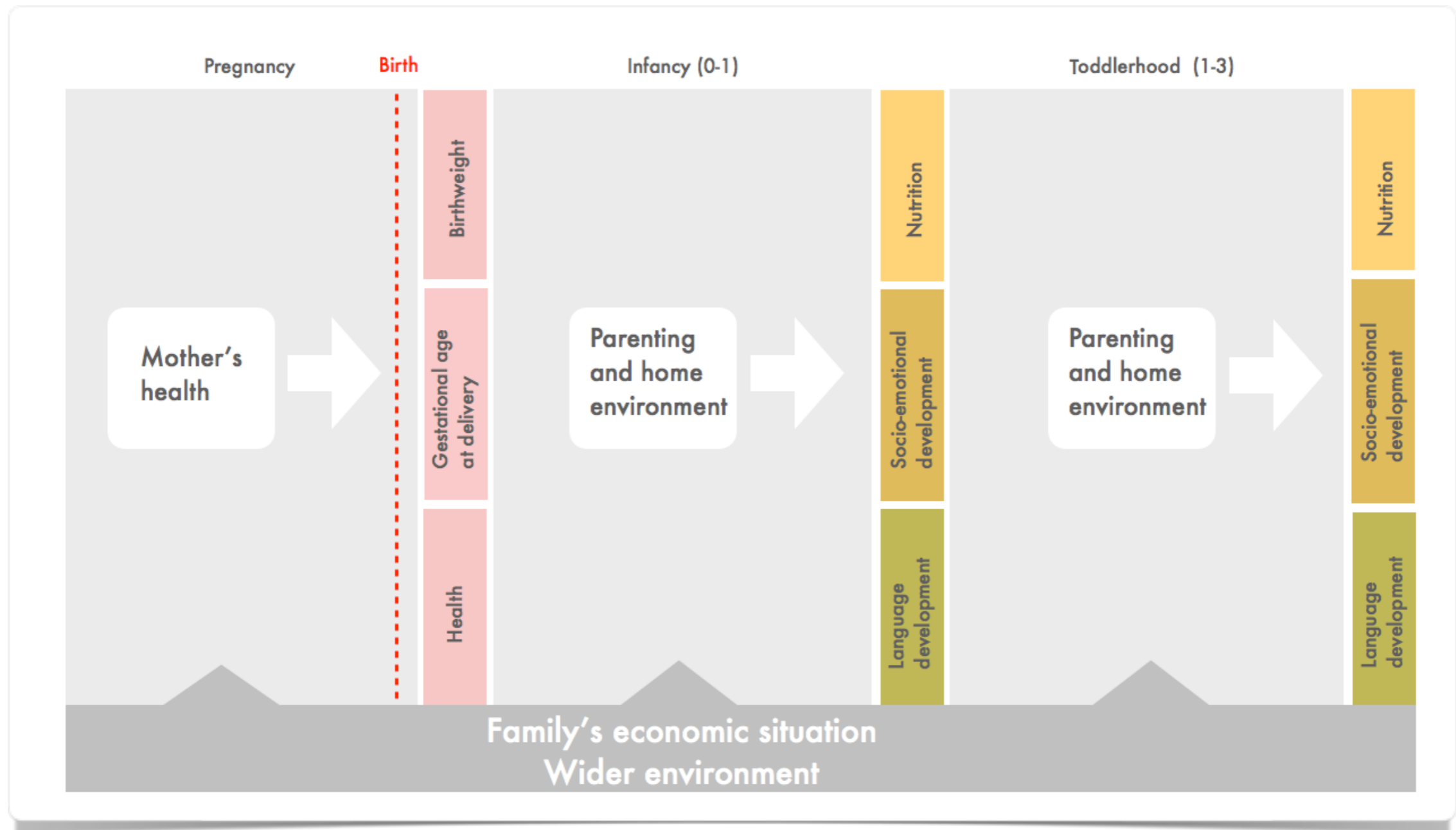
Let's start with what we want for children from pregnancy to age three. *A Better Start* aims to improve their nutrition, social and emotional development and language. By improving these outcomes for children, we will improve their life chances.



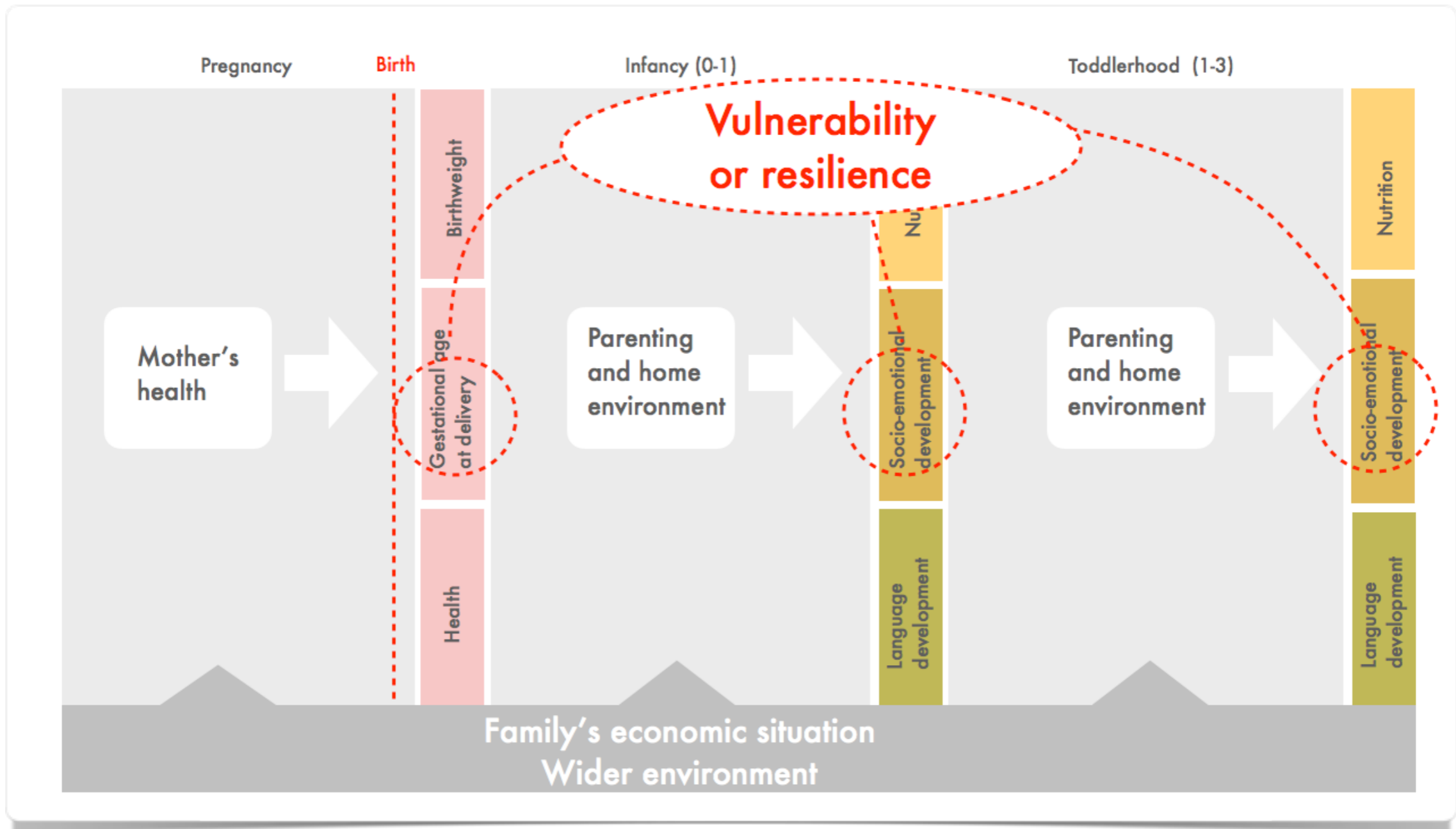
Pregnancy and the first few years of life are critical for optimising children's later development. Pregnancy involves significant programming of the foetus, and human infants are born with very immature brains that develop rapidly during the first three years of life as a result of environmental input. Birth is what connects these two phases, and naturally also shapes the child's development.



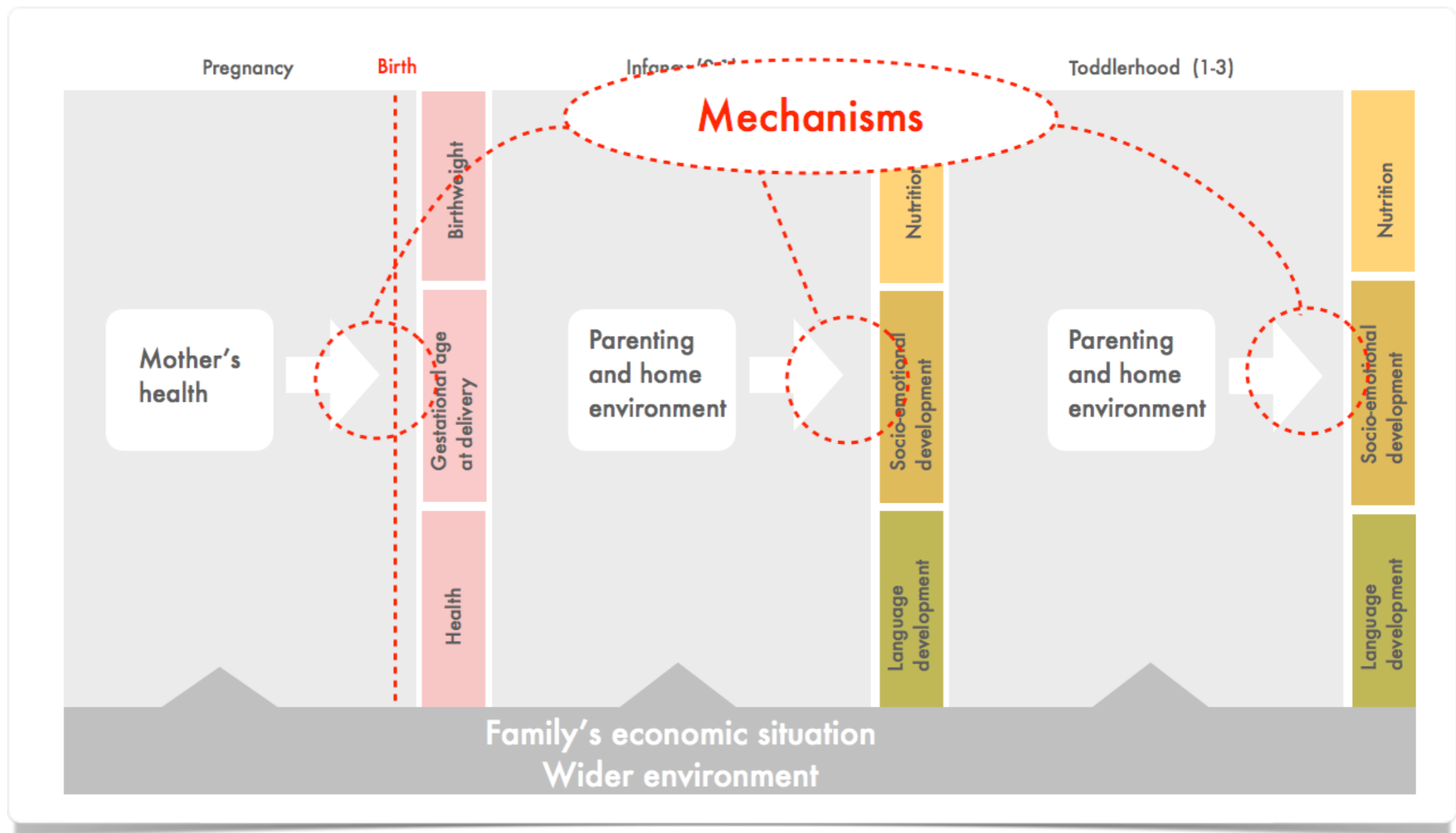
During these periods many factors have an influence on children's development. Parents and families are at the heart of the process. Maternal health during pregnancy, and the home environment and parenting in infancy and toddlerhood, are critical.



But the family's economic situation is important too, as is their wider physical environment, and the networks and structures that surround them.

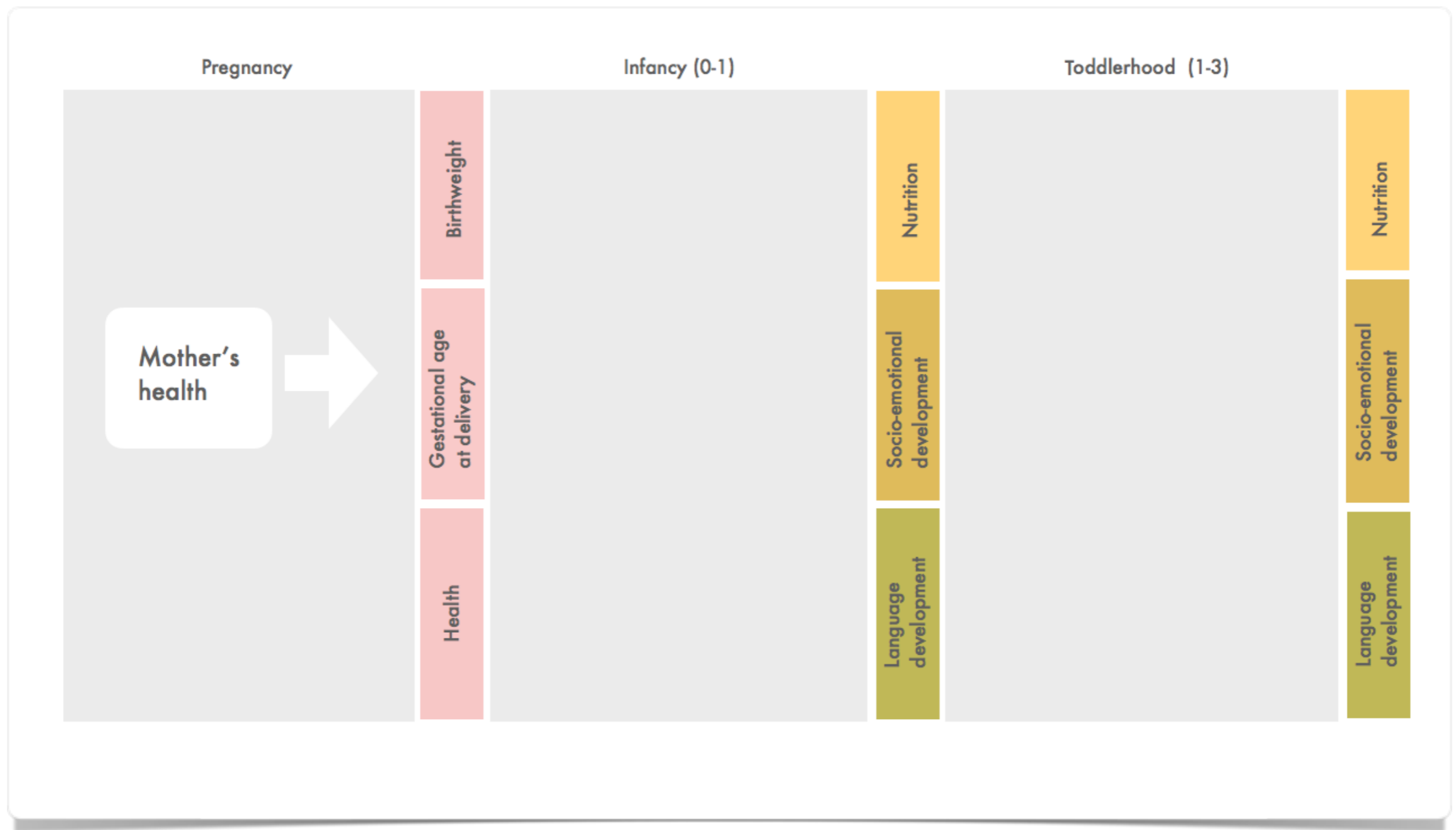


Of course, children respond to the same set of risks in different ways. Age, gender and temperament play a part, as does gene-environment interaction.



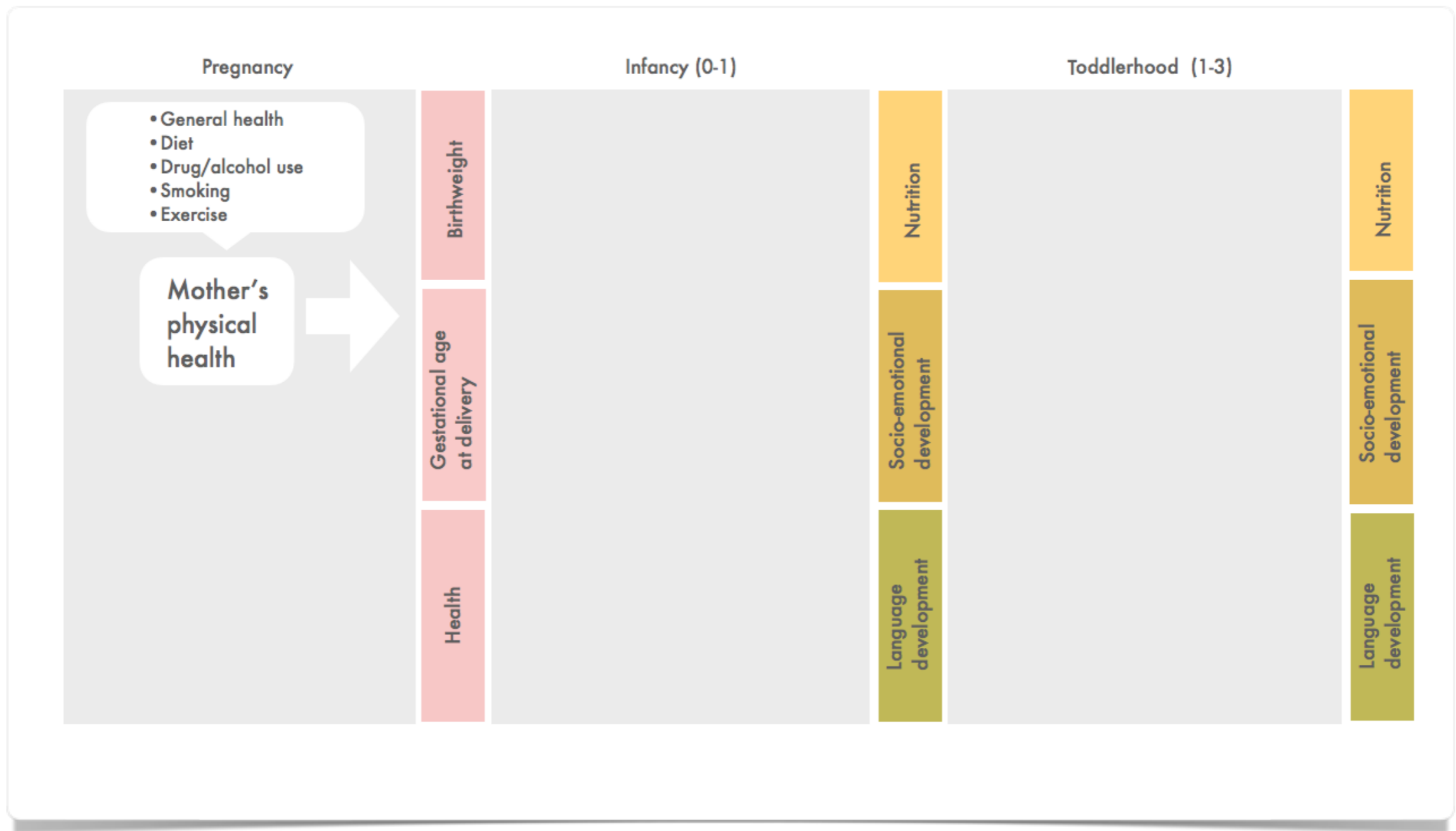
Knowledge about how risk and resilience get into the body is also developing fast. The biological embedding of experiences during sensitive developmental periods affects the architecture and functioning of the brain and other organs, which in turn affects how children respond to stress. Further, our genes can be turned on and off as a result of environmental factors, including parenting.

We hope you find this framework useful in your journey to identify activities that will give every child the best start in life. We now describe it in more detail.



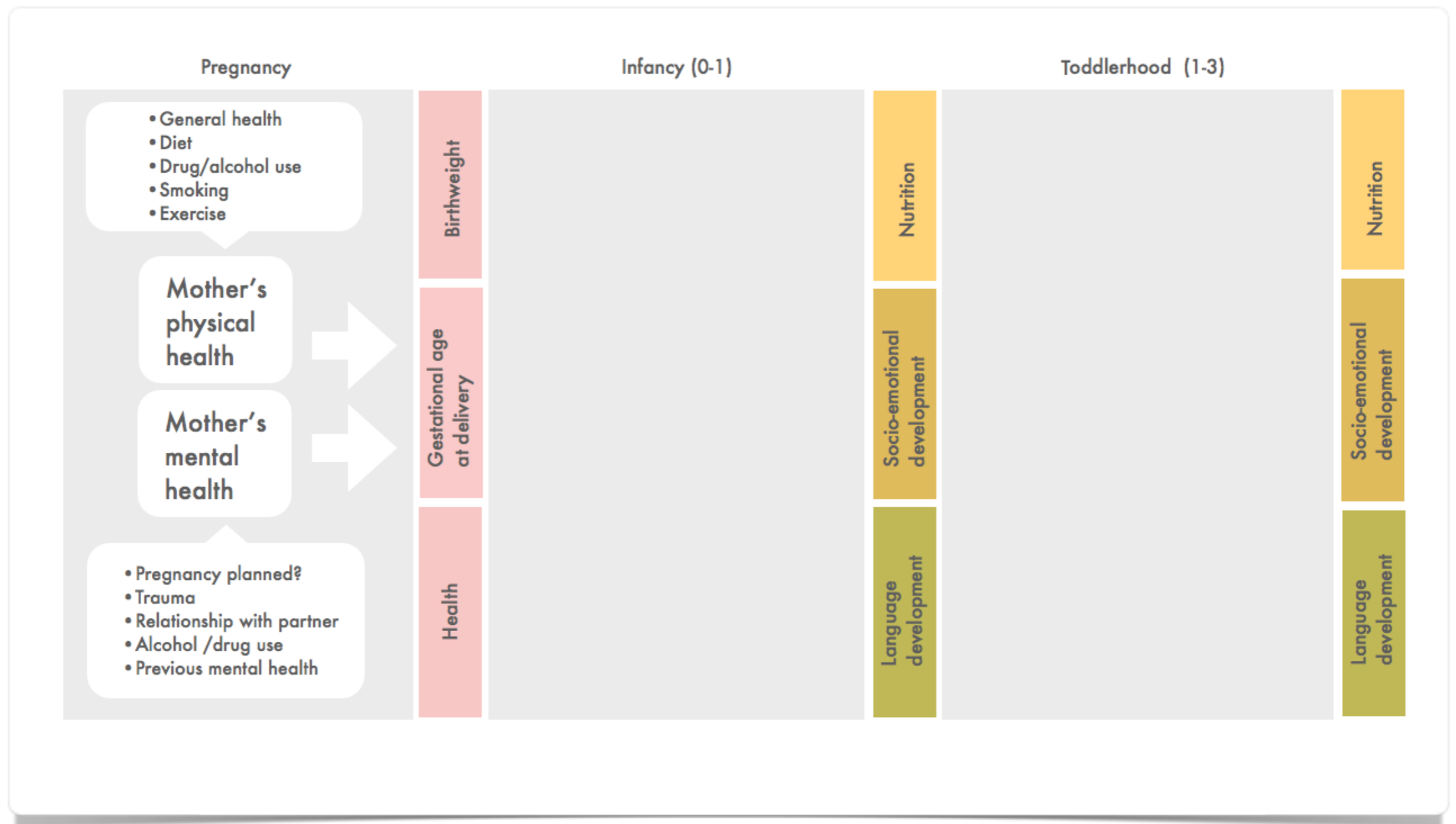
Maternal health in pregnancy

During pregnancy the foetus is uniquely vulnerable because rapid cellular division is taking place. The environment in the womb is affected by the mother's physical and mental health and behaviour, which in turn can affect the cellular growth and development of the brain and other organs, with lifelong effects (positive and negative) on the developing child's physical and mental health, learning and behaviour.



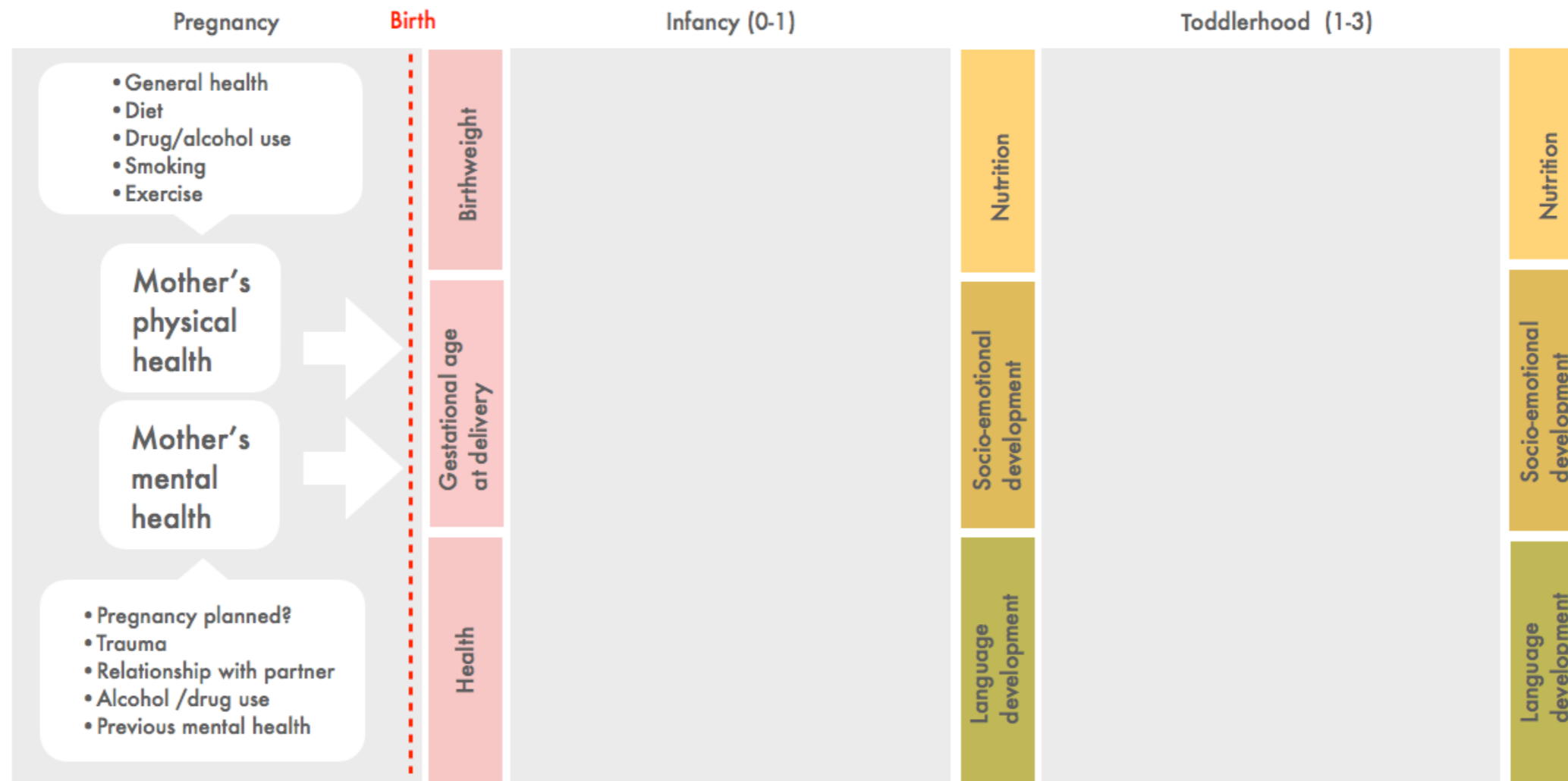
Maternal physical health

The *physical health* of mothers can affect the development of the foetus and is important in preventing a child being born prematurely and /or with a low birth weight. Important aspects of this include general health, nutrition, exercise and exposure of the foetus to toxins (e.g. tobacco, alcohol and other drugs).



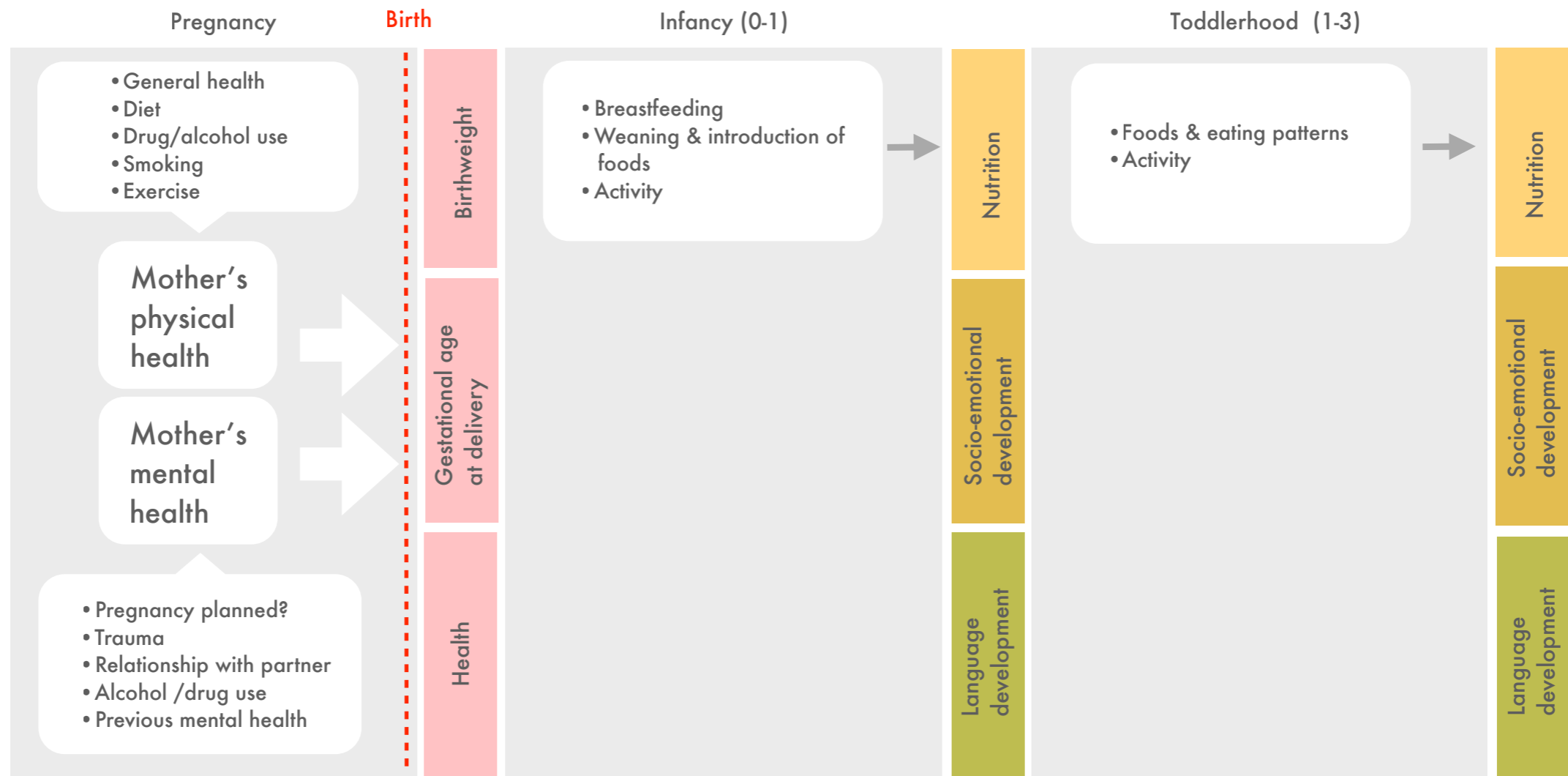
Maternal mental health

During pregnancy a significant number of women experience common mental health problems, such as anxiety and depression. This can affect the developing foetus in relation to their activity, growth and brain development. A mother's mental health is affected by a range of factors, such as whether the pregnancy was planned, whether she has unresolved trauma, whether she is experiencing domestic violence and whether she misuses alcohol/substances.



Birth

The majority of women with uncomplicated pregnancies are fit and healthy and have the potential to give birth normally with healthy newborns as the expected outcome. However, childbirth is an inherently risky activity. Maternal complications include obstructed labour and vaginal birth injury, while foetal complications include infections and being born pre-term. Although most women in the UK have safe and satisfying birth experiences, 2-9% experience Post Traumatic Stress Disorder (PTSD). This relates to factors such as anxiety and depression, preterm delivery, and feeling disempowered and dissatisfied during the birth process. Consequences include isolation from partner and family, difficulties with breastfeeding and impaired bonding with the baby. Impaired bonding can affect the infant's biological responses to stress and their learning behaviours and social skills, and may partly explain biological and behavioural problems in adulthood.

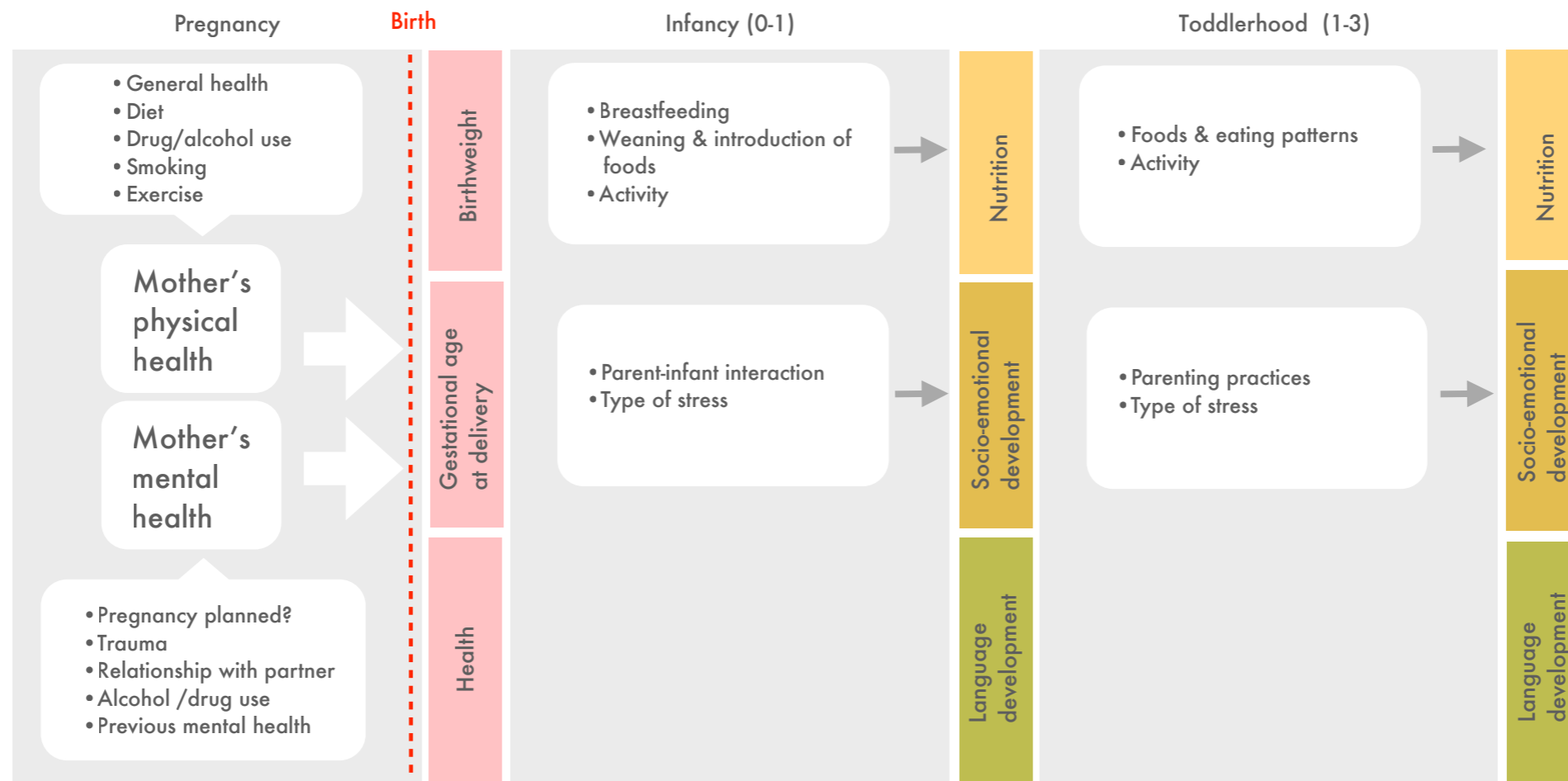


Parenting and the home environment in the early years

Human babies are born very immature, and are highly dependent on their caregivers and their immediate physical and emotional environment.

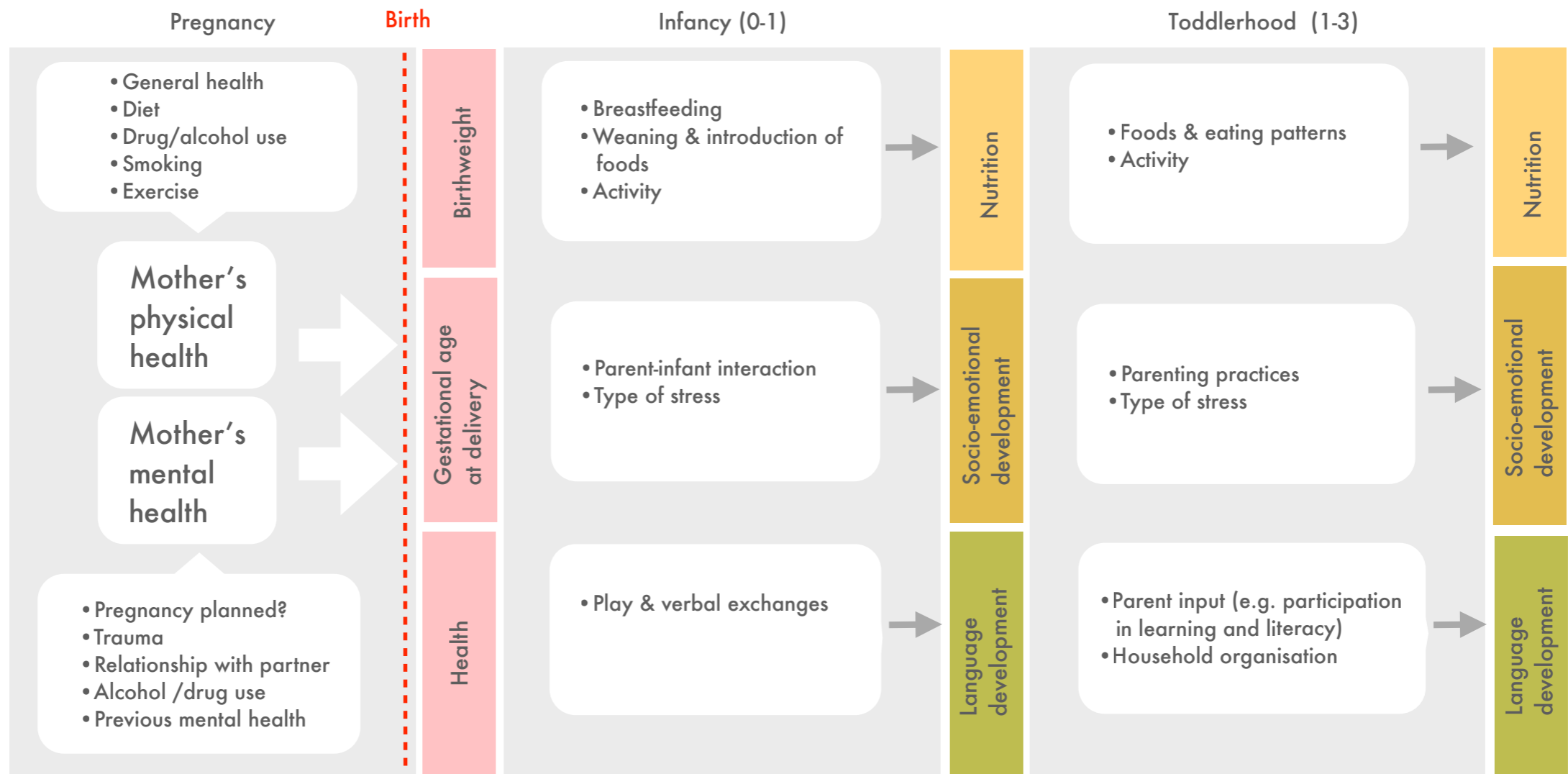
Nutrition

As regards nutrition, breastfeeding is the optimal method of feeding babies because it aids mother-child bonding, protects them against a range of later problems, such as asthma and obesity, and is associated with higher IQ. Parental feeding in infancy and toddlerhood influences later eating patterns and whether the child consumes appropriate foods. Family activity during this period also influences later child activity levels.



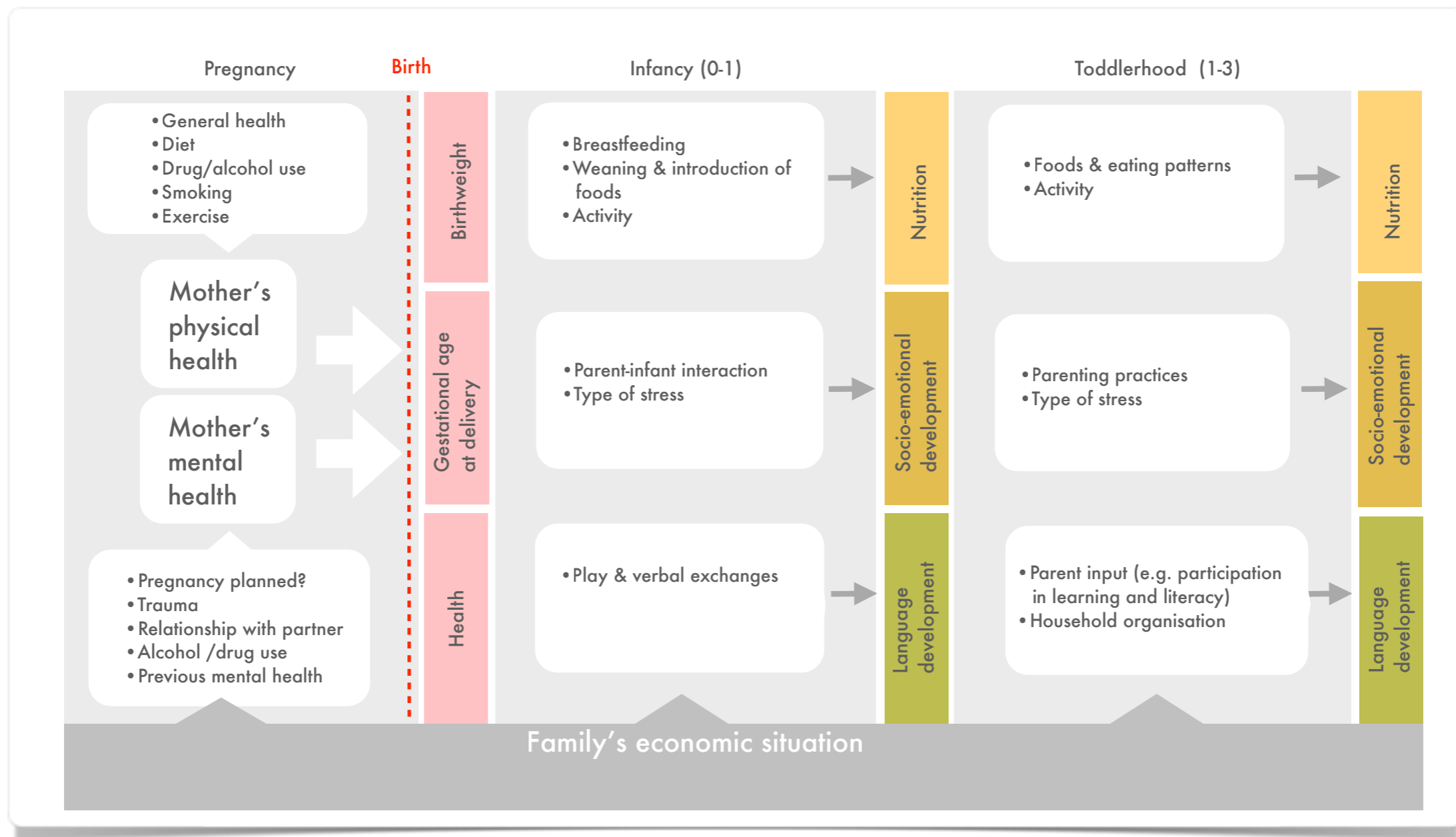
Social and emotional development

In relation to social and emotional development, a key task of infancy and early childhood is learning how to begin to regulate one's emotions. Children who have a good capacity for this are much less likely to develop emotional and behavioural problems. Parents who are consistently responsive to their child's distress help their children to become 'securely' attached, and these children learn how to regulate their emotions. In contrast, children who experience parenting during the first two years of life that frightens rather than comforts them are at significant risk of developing a 'disorganised' attachment, which severely compromises their long-term well-being. Infants also experience a range of sources of stress. 'Positive stress' can help children to develop healthy stress response systems. But 'toxic stress' leads to changed brain architecture and reduced thresholds for stress, with potential long-term harmful consequences for behaviour, learning and health. It occurs as a result of various factors, such as recurrent abuse. Parenting practices, including discipline and monitoring and supervision also affect behaviour and later functioning.



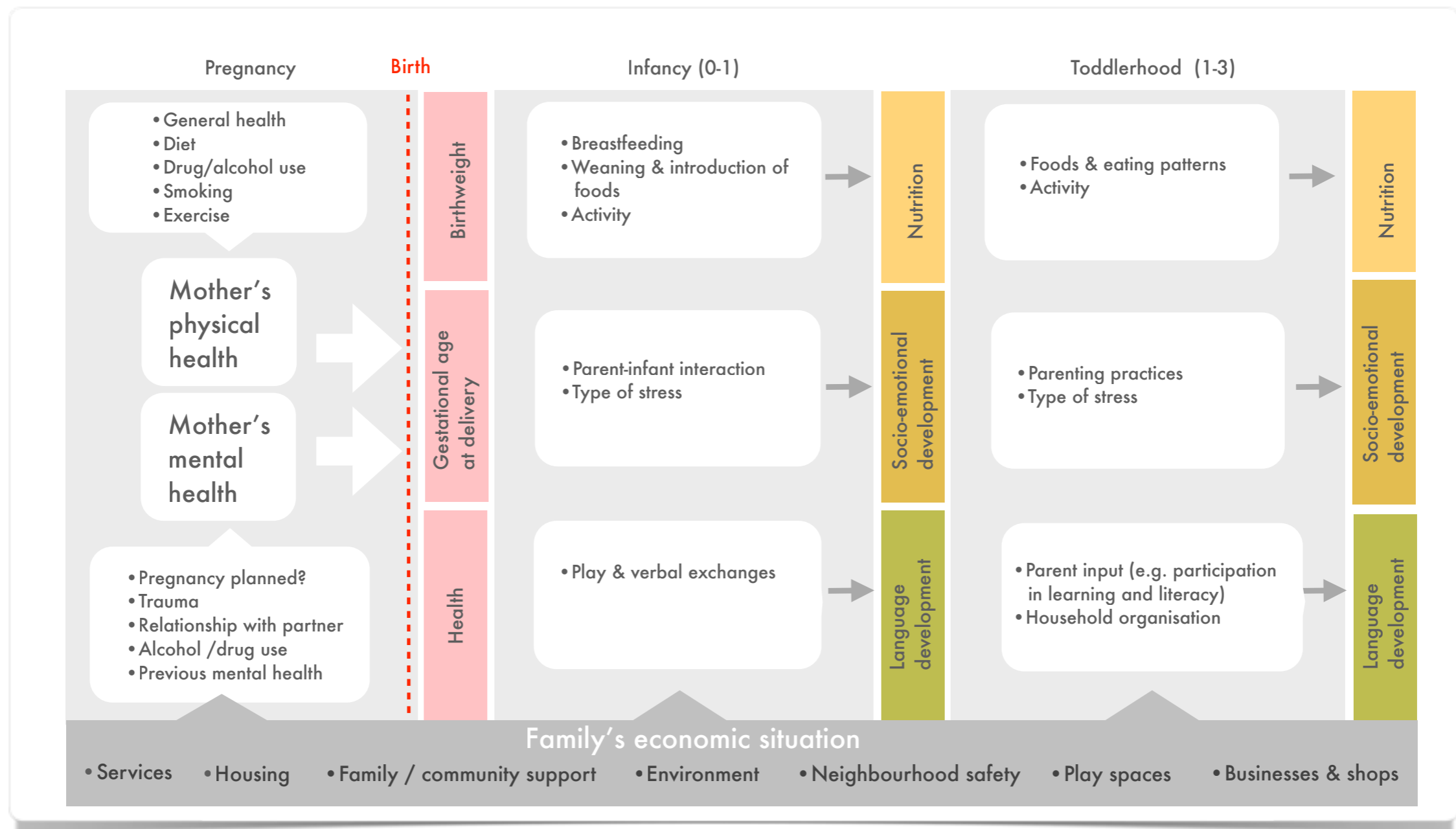
Language development

In terms of language and learning, in infancy attachment security is associated with better learning outcomes because it gives the child a secure base from which to explore the world. Play with babies, which involves verbal exchanges, also lays the foundation for later, more complex verbal interaction. In toddlerhood, engagement and verbal stimulation by parents continues to contribute to language development. Household chaos also affects children's ability to express and understand language at 36 months, which can have a long-term impact on cognitive development and the child's ability to interact positively with peers.



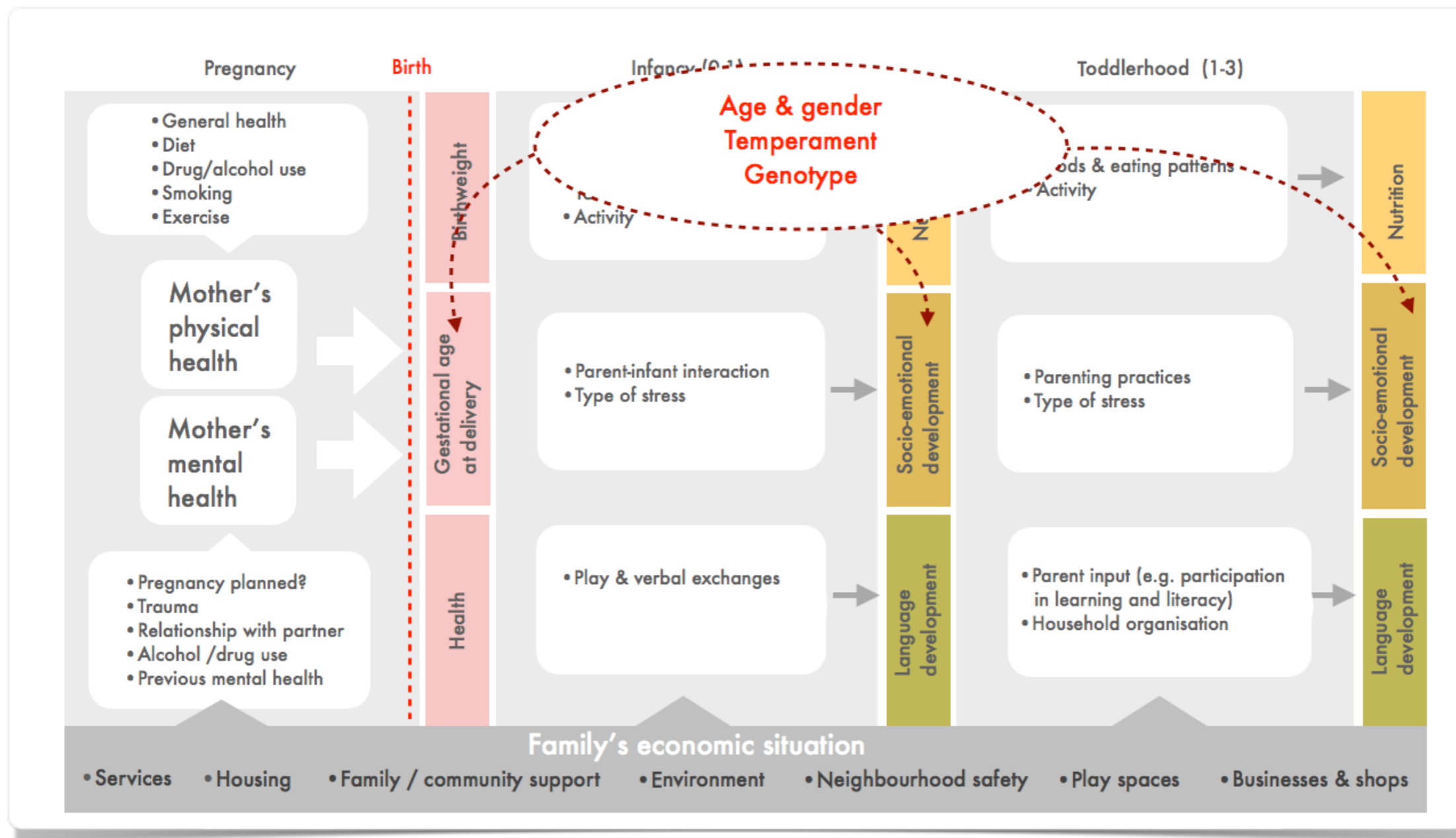
The family's economic situation

So far we have focused on the impact of parents and parenting on infants and toddlers, but other factors also influence their development. There is a strong association between the economic situation of families and children's nutrition, social-emotional development and language: children from poorer backgrounds tend to do worse than those who are better-off. For example, babies from poor families are less likely to be breastfed and, as they become toddlers, more likely to have lower nutritional status. They are more likely to start primary school with lower social and emotional skills than their peers, and to have lower school readiness and vocabulary skills aged three than their better-off counterparts. A family's economic situation has direct effects on children's well-being, for example through housing and life-chances, but it also has indirect effects, by influencing how a parent is able to parent their children (e.g. what they feed them and how they interact with them).



The wider environment

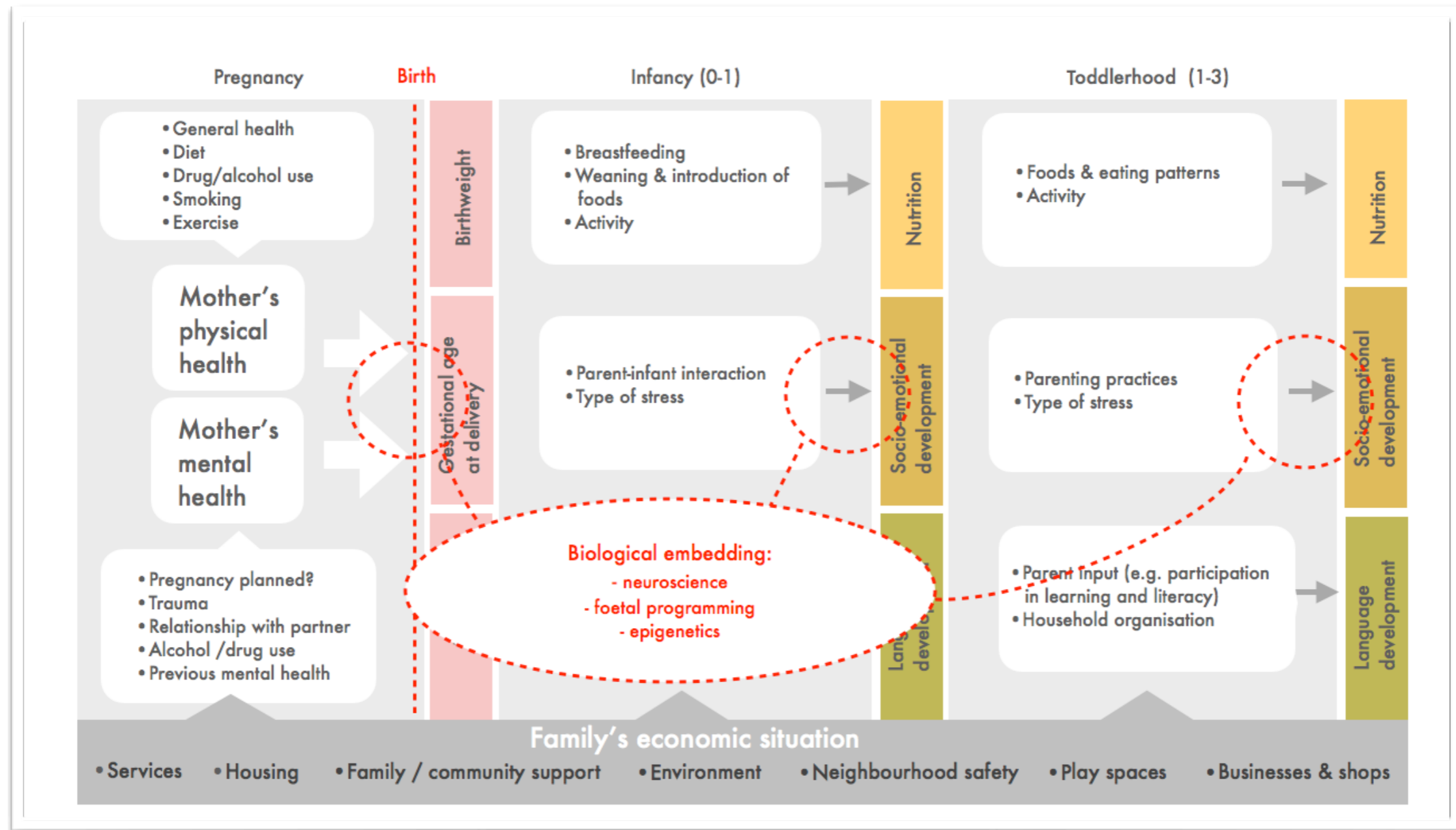
The physical environment of families, and the social networks, facilities and institutions that surround them, can affect children directly or indirectly (via parents) and be supportive or harmful. For example, parks and playgrounds help encourage children to exercise and make friends, whereas pollution, violence and a lack of support and facilities can make raising young children harder and even threaten their development.



Vulnerability and resilience

Of course, some children are affected more by adversity than their peers. Age, gender and temperament are all important. For example, boys are more severely affected by maternal postnatal depression, and younger children are less able to deal with stress. Some children appear naturally easy going and sociable, whereas others can be anxious and inhibited. Children may also be genetically predisposed to resilience or adverse outcomes.

Key mechanisms for how risk and resilience get into the body



So, how do risk and resilience get into the body?

A key mechanism is the *biological embedding* of experiences during pregnancy and the first years of life.

Neuroscience

In these periods the brain develops rapidly, and neural pathways that are not used get pruned. This process affects all other organs and systems, both physical and emotional. For example, the thermostat for the stress response is set during this important period. Children who are exposed to 'toxic stress' have stress systems that are easily triggered by low-level stress in later childhood, and have difficulty in dampening down their stress response. These children are much more likely to experience emotional and behavioural difficulties and do less well at school.

Foetal programming

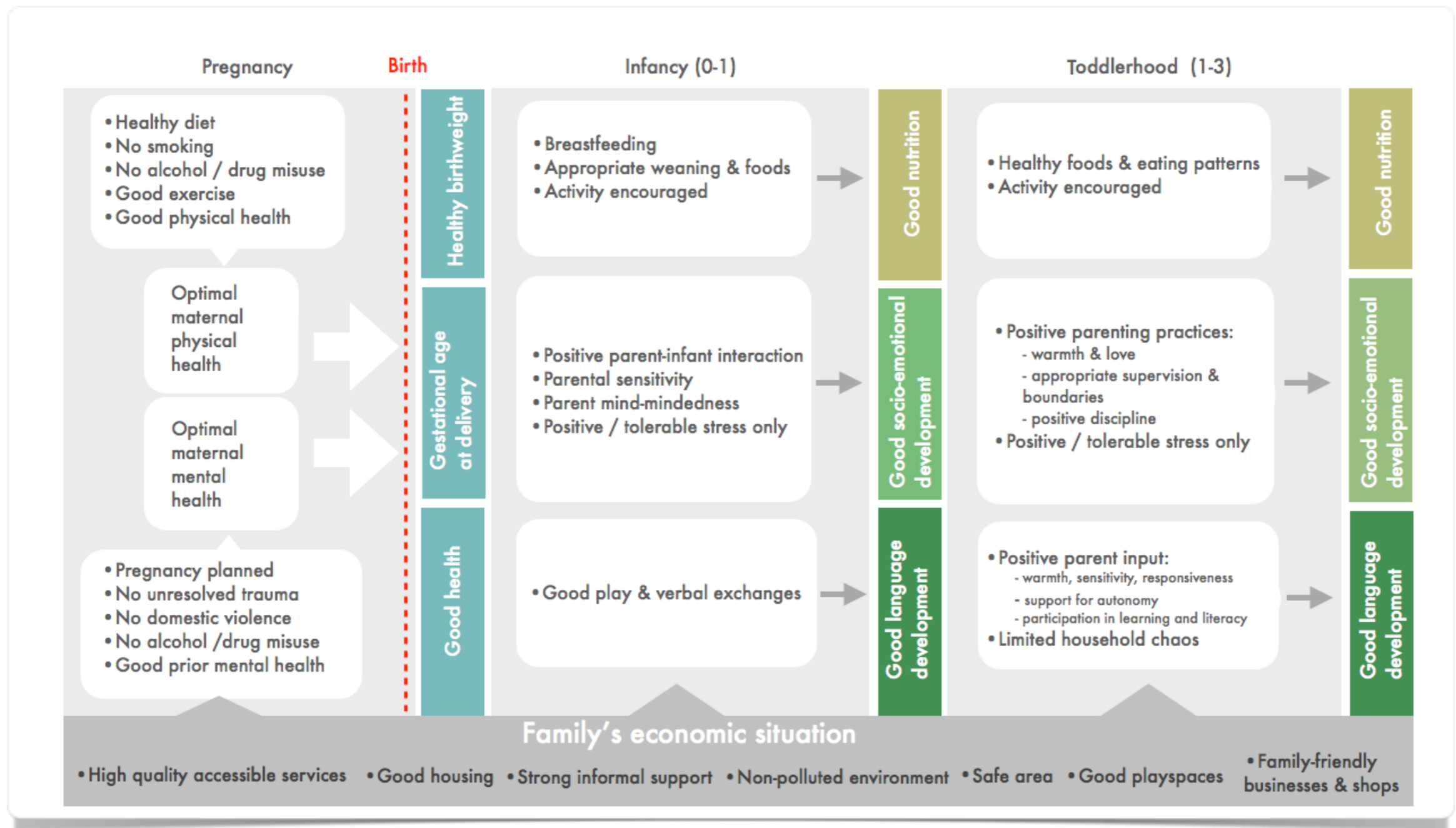
One mechanism through which biological embedding operates is 'foetal programming'. So, for example, maternal factors such as age, nutritional status, alcohol use, smoking

and prenatal care can affect the ability of the foetus to get sufficient nourishment to develop normally, and low birthweight babies have smaller body growth and organs due to the reduced number and size of the cells and low oxygen levels. The foetus thereby adjusts its metabolism and other physiological processes according to conditions in the womb in preparation for the world it will be born into.

Epigenetics

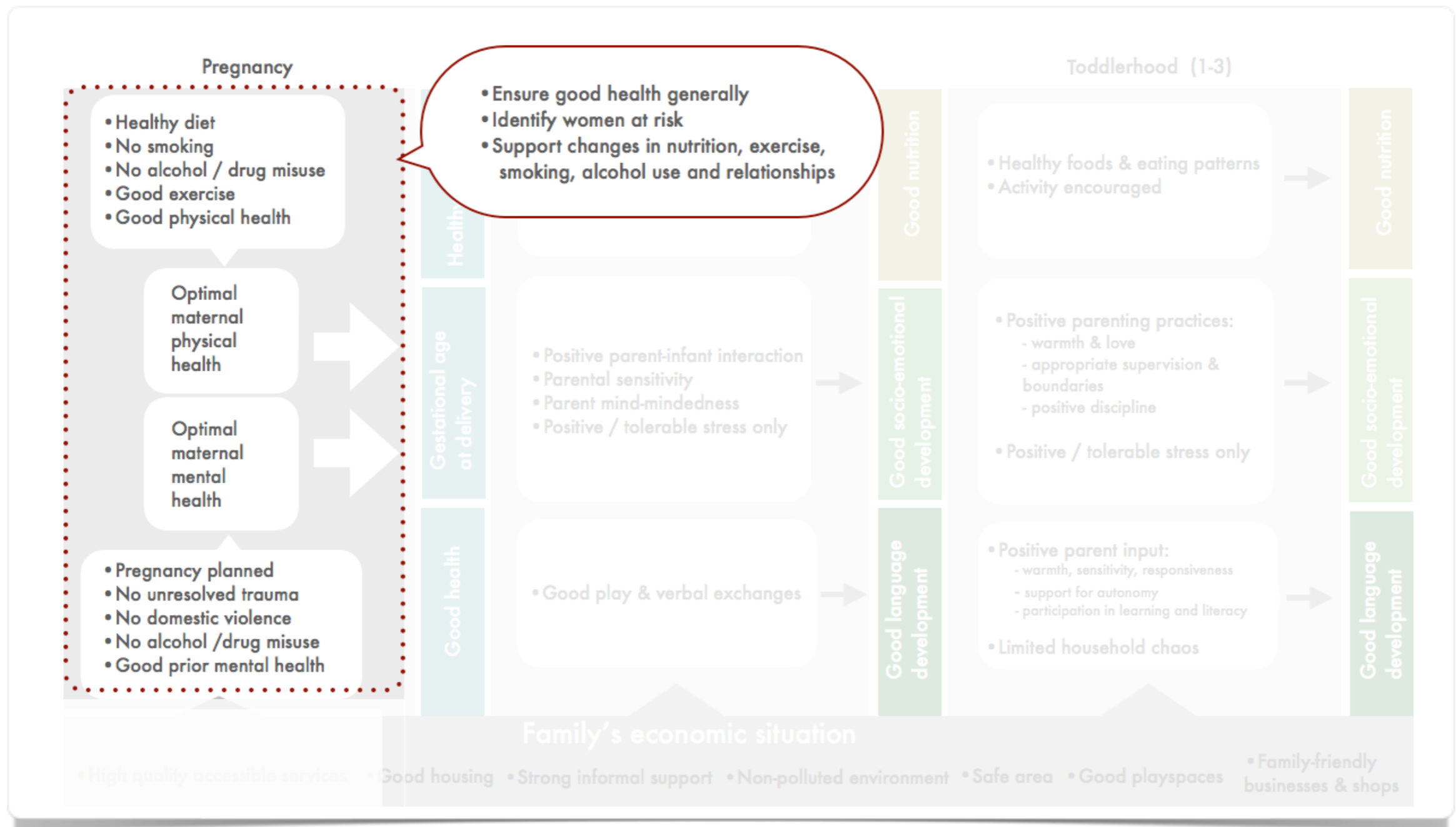
Genes alone do not determine development. Rather, an individual's environment changes how certain genes are expressed. Positive and negative experiences leave a chemical 'signature' on the genes. Among the factors that modify an individual's epigenome (the software to the structural genome's hardware) are poverty, nutritional status, exposure to toxins and drugs, and the experiences

of interacting with varied environments. Thus, detrimental factors in utero, such as maternal alcohol and drug misuse, can affect child development at a genetic level (see 'foetal programming' above). In contrast, positive social-emotional support of children reduces the likelihood of negative epigenetic modifications that increase the risk of later physical and mental health impairments. Some epigenetic changes last a lifetime, but others are much more temporary, and some can be reversed.



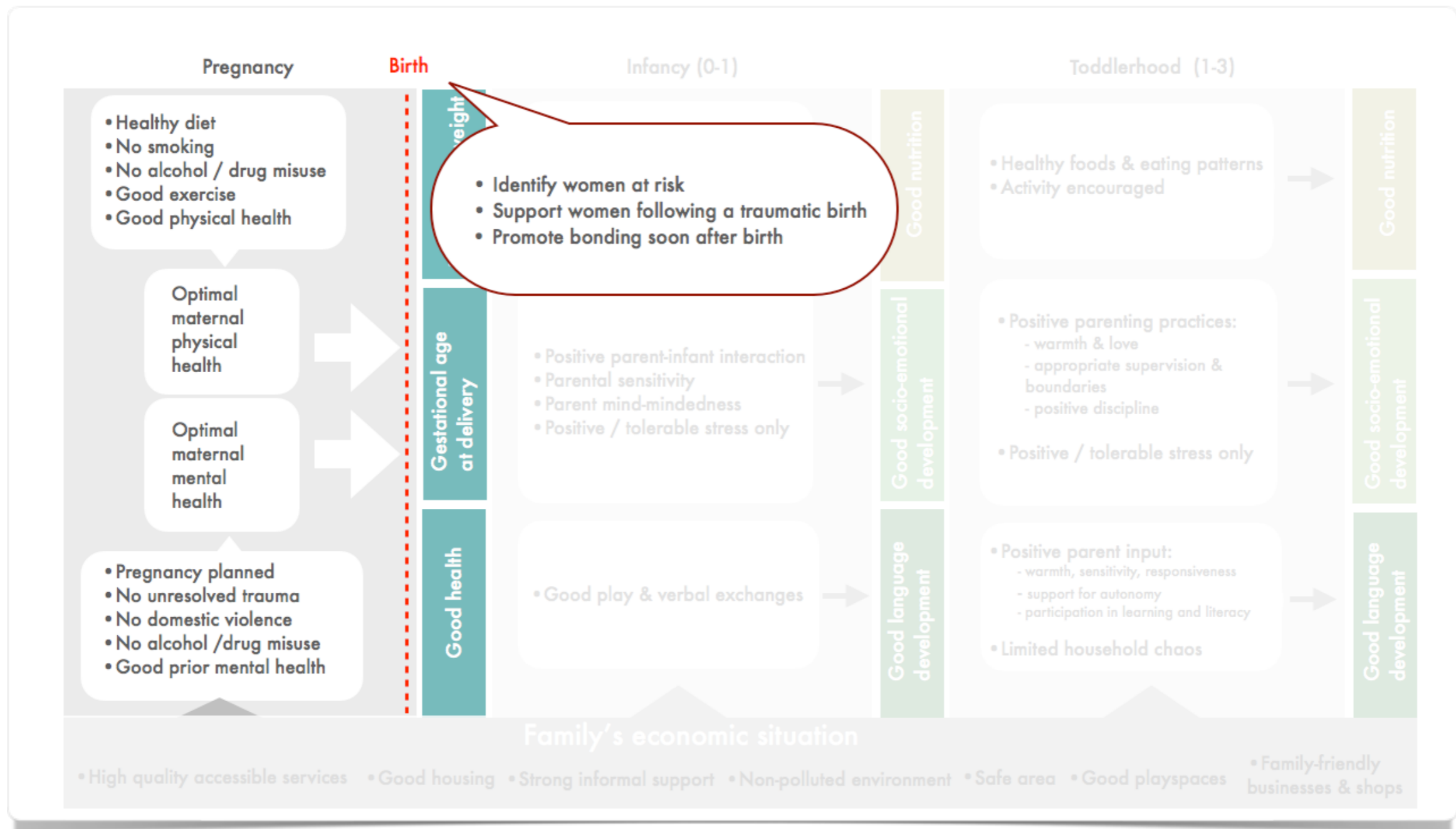
Implications for activities to improve outcomes

If we pull together everything we have summarised, we have a vision for what a better start for children looks like. From here, we can begin to identify what we need to do. Here we share a few examples (we stress that this list is far from exhaustive). You will see that there are lots of options in terms of both the focus of activity (maternal health, parenting, a family's economic situation at least adequate, the wider environment) and the type of activity (policy, programmes, practices, processes, quality improvement, and population-level interventions). Moreover, those activities might be evidence-based, meaning that they have been tested and found effective, or science-based, referring to innovations that are rooted in the best-available evidence but yet to meet that standard in terms of evaluation quality and impact.



So, in relation to *maternal health*, there is value in:

- Policies to ensure good health amongst child-bearing women generally
- Processes to identify women who are at risk of physical and mental health problems
- Programmes that engage pregnant women early in pregnancy, or before, and support them to make changes in their nutrition, exercise, smoking, alcohol / drug use and relationships



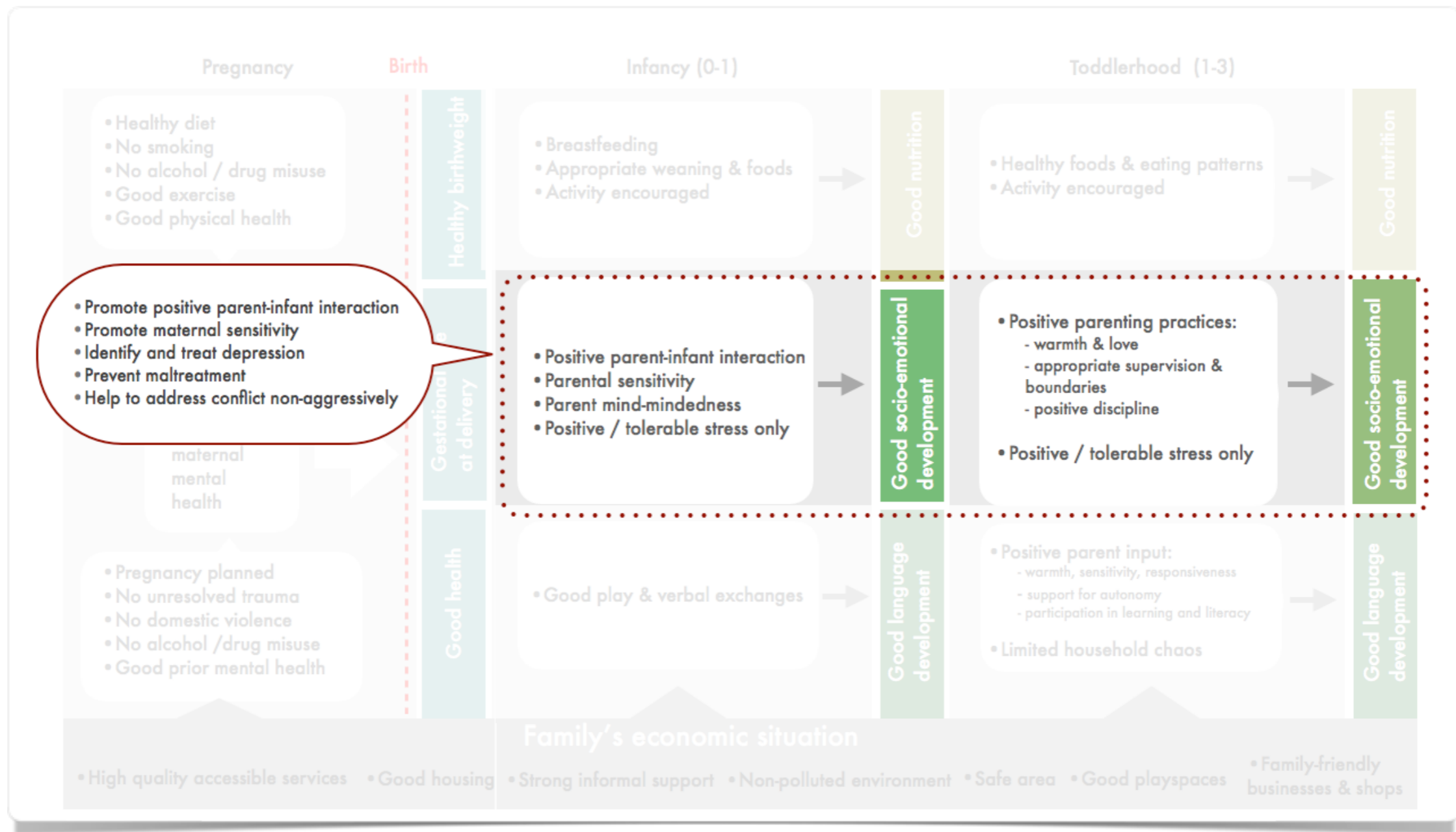
In relation to *birth*, there is value in:

- Processes to identify women who are at high risk of having, or have had, a traumatic birth, and practices that provide them with extra support during and / or after delivery
- Processes to identify women who are likely to experience problems with bonding, and practices that promote bonding and sensitive parenting soon after the birth.



In relation to *nutrition*, there is value in:

- Programmes and practices that help to increase breastfeeding, appropriate weaning and foods, healthy eating patterns and children's physical activity levels.



In relation to *parent-infant interaction*, there is value in:

- Processes to identify parents or parents-to-be who are likely to have difficulties establishing secure attachment with their children, and programmes and practices to promote their parental sensitivity and mind-mindedness.

In relation to *positive parenting practices*, there is value in:

- Processes to identify families where there is poor parenting, and programmes and practices that help to improve parenting practices.

In relation to *minimising toxic stress* there is value in:

- Quality improvement to ensure more effective and timely decision-making in relation to children experiencing maltreatment.
- Processes to identify parental depression, and intervention to address this.
- Public health type interventions to help parents address conflict non-aggressively.



In relation to *language development*, there is value in:

- Programmes and practices that help to improve parents' verbal stimulation and early learning practices with their infants/ toddlers
- Programmes and practices that help to reduce household chaos



In relation to families' *wider environment*, there is value in:

- Policies to reduce young children's exposure to pollution
- Policies to prevent homelessness and overcrowding and to ensure that the built environment promotes a sense of safety and interaction among community members
- Policies, programmes and practices that build social capital and collective efficacy
- Quality improvement to ensure that childcare providers follow best practice
- Policies that encourage shops and businesses to support family life.

In relation to families' *economic situation*, there is value in:

- Policies to ameliorate the impact of poverty
- Programmes to support employment and education



And of course, one activity might seek to address more than one area: for example, to improve expectant mothers' health and then help them with their finances and parenting once the baby is born.

This concludes our review of the 'science within', and this is the framework that we will use as the basis for our review of 'what works'.

Better Evidence for a Better Start



For more information, please visit
www.betterstart.dartington.org.uk