The economic impact of using integrative medicine

Addressing the current burden of Preterm births in the UK – how an integrative, personalised approach changes pregnancy outcomes and reduces short and long term healthcare costs.

Chris Moore
CEO, Nordic Group

Leslie Stone, MD
CoFounder – Growbaby Health

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Nordic Group

Chris Moore - CEO Nordic Group

30 years of running healthcare companies.

Co-Founder and CEO of Nordic Group, a cluster of organizations committed to changing the global healthcare narrative.

Nordic Group began in 1997 with the establishment of Nordic Laboratories, Europe's first fully-focused functional medicine laboratory. In 2002, Nordic Clinic was born, growing into a network of seven clinics across Europe.

Over the years, the Group's influence has extended to various innovative companies, including Nordic Health, dnalife, Resistomap, Dsruptive, Thermocheck, and Functional Future.

I have a passionate belief in the importance of addressing the biochemical individuality of each person. Our model incorporates genetics and biochemical markers to optimize health, paving the way for more personalised and effective healthcare solutions.

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Addressing the current burden of Preterm births in the UK

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2021	2022
624,828	605,479

Sources: Parliamentary Committee on Preterm Births / ONS

Total UK births

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2021	2022	
624,828	605,479	Total UK births
7.6%	7.9%	Percentage of preterm births

Sources: Parliamentary Committee on Preterm Births / ONS

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624,828	605,479	Total UK births
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47,487	47,832	No of preterm births

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47,487	47,832	No of preterm births
£3.4bn	£3.425bn	Cost of preterm birth to the NHS in England and Wales (est)
£71,598	£71,598	Average cost per preterm birth

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Hands up who....

Hands up who....

Works with maternal health?

Hands up who....

Works within the NHS?

Hands up who....

Is a healthcare researcher?

Hands up who....

Is involved in shaping Healthcare Policy?

Addressing the current burden of Preterm births in the UK

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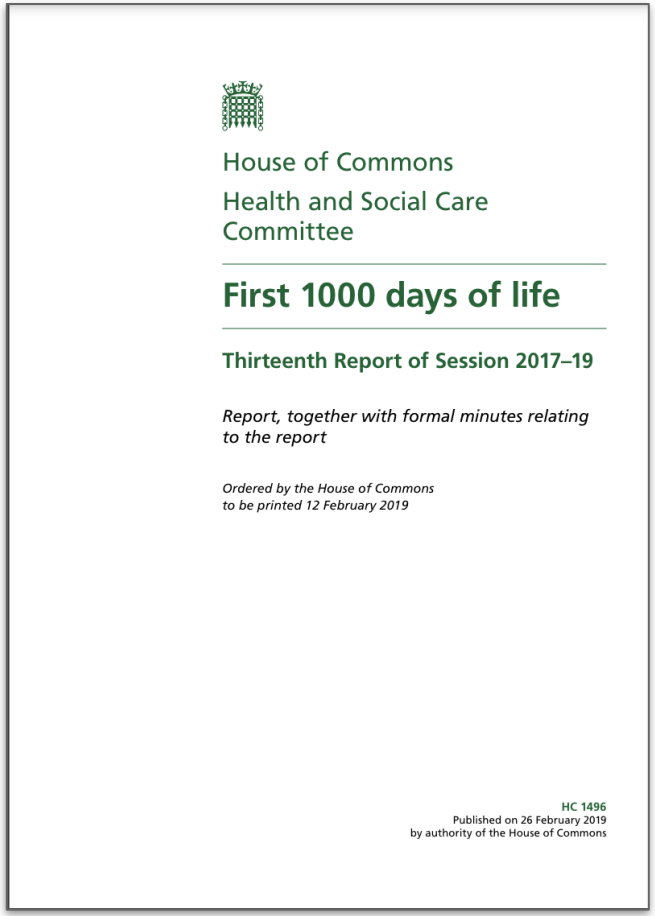
The first 1000 days of life are critical

"The first 1000 days of life, from conception to age 2, is a critical phase during which the foundations of a child's development are laid. If a child's body and brain develop well then, their life chances are improved. Exposure to stresses or adversity during this period can result in a child's development falling behind their peers"

(Health and Social Care Committee, 2019)



House of Commons
Health and Social Care Committee

First 1000 days of life

Thirteenth Report of Session 2017–19

Report, together with formal minutes relating to the report

Ordered by the House of Commons to be printed 12 February 2019

HC 1496
Published on 26 February 2019
by authority of the House of Commons

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“Preterm birth is the single biggest cause of neonatal mortality and morbidity in the UK.”

(NICE Guidance on Preterm Labour and Birth)

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Parliamentary Committee on Preterm Births

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New committee activity in 2024 Contents

Preterm birth

38. Baroness Bertin proposed a special inquiry committee to consider the prevention of preterm birth.

the longer term finan

vices, education services, and the family involved in

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Parliamentary Committee on Preterm Births

There are “significant financial costs surrounding preterm births, both for interventions in the short term, and the longer term financial impacts on health services, education services, and the family involved in caring for a baby born preterm”

Preterm birth

38. Baroness Bertin proposed a special inquiry committee to consider the prevention of preterm birth.

Background

39. The World Health Organisation (WHO) defines preterm birth as babies born prior to the completion of 37 weeks of pregnancy.[33]

40. From 37 weeks a pregnancy is considered full-term. If a baby is born at about 24 weeks of pregnancy it is possible for them to survive. Moderate to late preterm babies have a higher survival rate compared to babies who are extremely or very preterm. The National Institute for Health and Care Excellence (NICE) guidance on preterm labour and birth sets out that "Preterm birth is the single biggest cause of neonatal mortality and morbidity in the UK."[34]

41. Birth characteristics data for England and Wales, showed that 7.6% of live births were preterm in 2021.[35] This is an increase from 7.4% in 2020; however, this is lower than the preterm birth rate of 7.8% in 2019. Preterm live birth percentage rates vary significantly for different ethnic groups. The cost of preterm birth to the NHS in England and Wales is estimated to be £3.4 billion per year.[36]

42. Babies may be born preterm as a result of spontaneous preterm labour, or due to a medical need to have a preterm birth to protect the mother or baby. The causes of spontaneous preterm labour can be indicated by certain risk factors, but for many preterm births the cause is unknown. The WHO has concluded that "more research is needed to determine the causes and mechanisms of preterm birth."[37]

Long term impact of preterm birth

43. Babies born preterm may have positive health outcomes; however, being born preterm increases the risk of disability or long-term health conditions. Research collated by Tommy's, a pregnancy charity in the UK, found that one in 10 of all babies born prematurely would have a permanent disability, such as lung disease, cerebral palsy, blindness or deafness.[38] The NICE guidance states that the "major long-term consequence of prematurity is neurodevelopmental disability."[39] The National Maternity Safety Strategy has noted that there are "significant financial costs surrounding pre-term births, both for interventions in the short term, and the longer term financial impacts on health services, education services, and the family involved in caring for a baby born pre-term."[40]

Preterm birth in policy

44. In November 2015, the National Maternity Safety Ambition was launched to reduce the rates of stillbirths, neonatal and maternal death and brain injuries that occur during or shortly after birth by half from 2010 to 2030. The ambition did not initially include preterm births.

45. In November 2017, the refreshed National Maternity Safety Strategy brought forward the ambition to halve the rates of stillbirths, neonatal and maternal deaths and brain injuries that occur during or shortly after birth to 2025. The strategy added an ambition to reduce the rate of preterm birth from 8% to 6% by 2025.[41] At the time the ambition was set, in England and Wales the preterm birth rate was 7.9%.

46. The first Women's Health Strategy for England was published in 2022.[42] The strategy sets out a 10 year plan to improve women's healthcare. The strategy does not include a focus on preterm birth, but pregnancy is a key area and the strategy does reference the Signs of Life project which provides guidance on assessing signs of life in extremely preterm births. The strategy also established the Maternity Disparities Taskforce to address disparities faced, and improve access to maternity care received, by those from ethnic minority backgrounds and those from deprived areas.

47. The most recent maternity care policy was published by NHS England in March 2023, setting out its three year delivery plan for maternity and neonatal services.[43] The plan commits to update the Saving Babies Lives Care Bundle.

48. In July 2023, the Government announced the establishment of the maternity and neonatal care national oversight group which will consider the work being carried out across a range of programmes to improve maternity and neonatal care and to implement a joined-up approach.[44]

Mechanisms to reduce preterm birth

49. The Saving Babies Lives Care Bundle has been available in English maternity units since 2016.[45] The Bundle provides national guidance for providers and commissioners on reducing early neonatal deaths or still births. An evaluation produced by the University of Manchester in July 2018 found that stillbirths fell by a fifth in maternity units where the Bundle guidance had been implemented.[46] In March 2019 a revised version of the Bundle was launched to include additional information on preterm birth.[47]

50. As many preterm births are asymptomatic some argue screening could help to reduce preterm births, however this is not currently recommended. As noted in the proposal, antenatal screening is not recommended for preterm birth. The last screening reviews took place in 2015 and 2020, with the next review anticipated to be completed in 2023/24. The possible screening tests can involve measuring the length of the cervix, taking a vaginal swab to assess levels of fetal fibronectin, which at higher levels could indicate increased risk of preterm birth. There could also be a further test for bacterial vaginosis. The review found that "the available evidence remains insufficient to support a programme of routinely screening all pregnant women for risk of preterm birth and related neonatal and maternal outcomes".[48] The review also concluded that the treatment for women identified as being at increased risk through screening is not certain to reduce the risk of preterm birth.

51. Technology has also been utilised to try and prevent preterm birth. Teams at Guys' and St Thomas' and King's College London developed the app, QUIPP, to assist maternity staff with identifying pregnancies which are most likely to result in preterm birth. A study was conducted on the use of the app and found that it was an effective tool and it is now recommended for use by NHS England.[49] Tommy's is also working on The Tommy's Pathway, a digital tool to support the reduction of stillbirth and preterm birth. The Pathway is intended to support healthcare staff in determining which women are most at risk of preterm birth.[50] The tool has received £1.8 million in funding from the National Institute for Health and Care Research and will be trialled across 26 NHS maternity units over 36 months across the UK, with national rollout anticipated in 2026/27.

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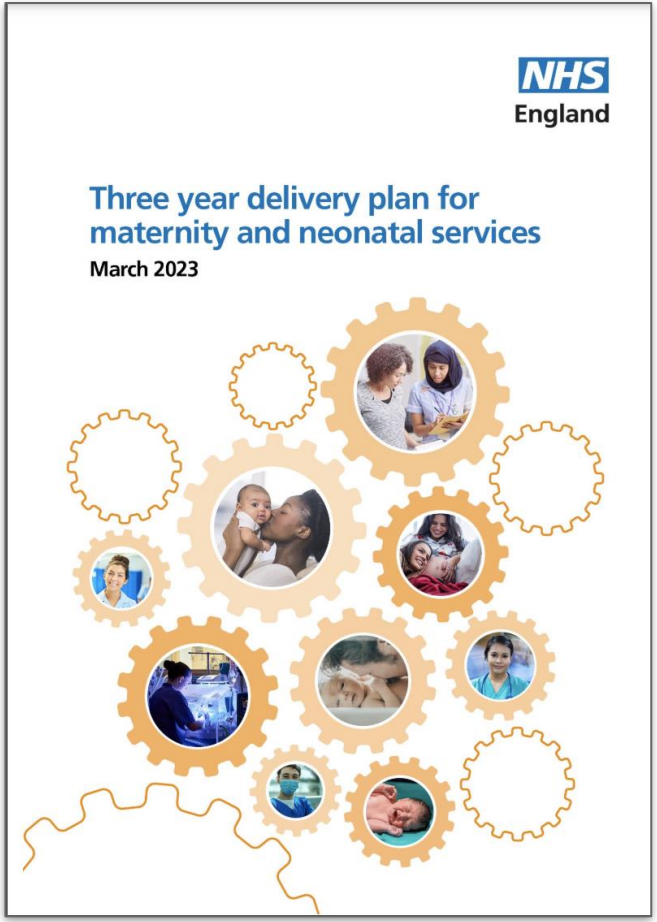
Parliamentary Committee on Preterm Births

In November 2017, the refreshed National Maternity Safety Strategy brought forward the ambition to halve the rates of stillbirths, neonatal and maternal deaths and brain injuries that occur during or shortly after birth to 2025. The strategy added an ambition to reduce the rate of preterm birth from 8% to 6% by 2025. At the time the ambition was set, in England and Wales the preterm birth rate was 7.9%.

The Committee also commissioned an independent panel to conduct an evaluation of the Government's health care commitments. The panel found that the progress towards commitments on preterm birth required improvement as "little to no progress has been made on reducing rates of ... preterm birth" and they "anticipate the need for renewed efforts if the target to reduce preterm births to 6% by 2025 is to be met."



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Despite the commitment to a 6% target in the National Maternity Safety strategy there is upward trend in preterm births

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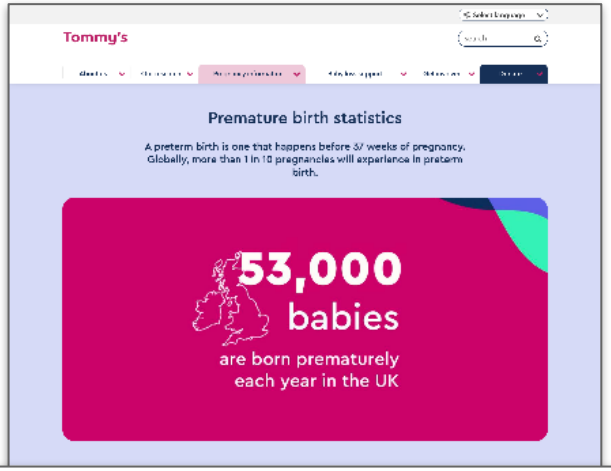
An upward trend in preterm births

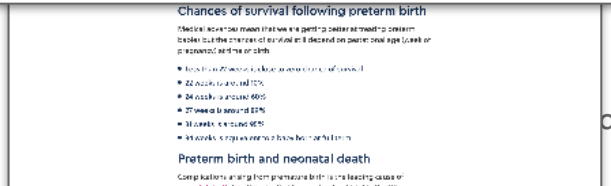
Tommy's is the largest UK charity researching the causes and prevention of pregnancy complications, miscarriage, stillbirth and premature birth.

After a downward trend in preterm births their statistics show a shift back towards percentage increase.



General UK premature birth statistics

- Across the UK, there were around 53,000 babies born prematurely in 2021.
- In England and Wales in 2021, 7.6% of births were preterm.
- This is an increase from 7.4% in 2020, ending three consecutive years on a decrease in the percentage of preterm live births.



(Premature Birth Statistics | Tommy's, n.d.),

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Preterm births are driven by a range of factors

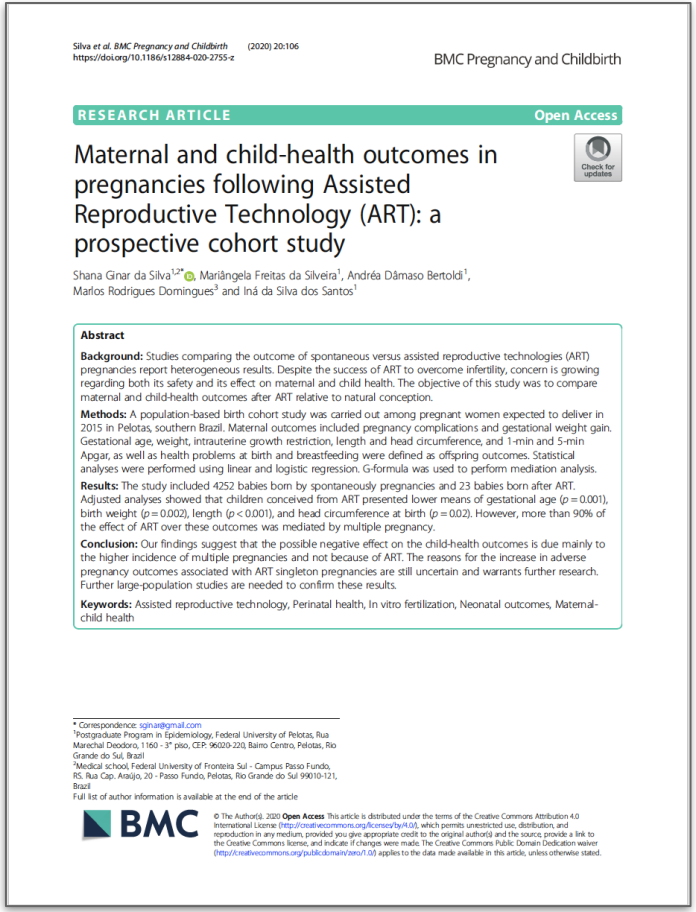
Key drivers of the upward trend in preterm births:

- Increasing maternal age (Birth Characteristics in England and Wales - Office for National Statistics, n.d.)
- Higher rates of multiple pregnancies due to the rise in assisted reproductive technologies (Da Silva et al., 2020).

Other risk factors are:

- Infections
- Chronic conditions of the mother (hypertension, diabetes, periodontal disease and obesity)
- Lifestyle factors (smoking and alcohol abuse and poor nutritional status) (Song et al., 2023),
- Lower socioeconomic status (SES) leading to higher stress
- Lower education level and limited access to prenatal care(Thomson et al., 2021)

Preterm birth (PTB) is also considered idiopathic but genetic variation also plays a role.



Silva et al. BMC Pregnancy and Childbirth (2020) 20:106
https://doi.org/10.1186/s12884-020-2755-z

BMC Pregnancy and Childbirth

RESEARCH ARTICLE Open Access

Maternal and child-health outcomes in pregnancies following Assisted Reproductive Technology (ART): a prospective cohort study

Shana Ginar da Silva[1,2*], Mariângela Freitas da Silveira[1], Andréa Dâmaso Bertoldi[1], Marlos Rodrigues Domingues[3] and Iná da Silva dos Santos[1]

Abstract

Background: Studies comparing the outcome of spontaneous versus assisted reproductive technologies (ART) pregnancies report heterogeneous results. Despite the success of ART to overcome infertility, concern is growing regarding both its safety and its effect on maternal and child health. The objective of this study was to compare maternal and child-health outcomes after ART relative to natural conception.

Methods: A population-based birth cohort study was carried out among pregnant women expected to deliver in 2015 in Pelotas, southern Brazil. Maternal outcomes included pregnancy complications and gestational weight gain. Gestational age, weight, intrauterine growth restriction, length and head circumference, and 1-min and 5-min Apgar, as well as health problems at birth and breastfeeding were defined as offspring outcomes. Statistical analyses were performed using linear and logistic regression. G-formula was used to perform mediation analysis.

Results: The study included 4252 babies born by spontaneously pregnancies and 23 babies born after ART. Adjusted analyses showed that children conceived from ART presented lower means of gestational age ($p = 0.001$), birth weight ($p = 0.002$), length ($p < 0.001$), and head circumference at birth ($p = 0.02$). However, more than 90% of the effect of ART over these outcomes was mediated by multiple pregnancy.

Conclusion: Our findings suggest that the possible negative effect on the child-health outcomes is due mainly to the higher incidence of multiple pregnancies and not because of ART. The reasons for the increase in adverse pregnancy outcomes associated with ART singleton pregnancies are still uncertain and warrants further research. Further large-population studies are needed to confirm these results.

Keywords: Assisted reproductive technology, Perinatal health, In vitro fertilization, Neonatal outcomes, Maternal-child health

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Full list of author information is available at the end of the article

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Preterm births have short and long term impacts on the child

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Transgenerational health: 1000 days & long-term impact

Sources: Hack M, Klein NK, Taylor HG. Long-term developmental outcomes of low birth weight infants. Future Child. 1995 Spring;5(1):176-96. PMID: 7543353. Spracklen CN, Wallace RB, Sealy-Jefferson S, Robinson JG, Freudenheim JL, Wellons MF, Saftlas AF, Snetselaar LG, Manson JE, Hou L, Qi L, Chlebowski RT, Ryckman KK. Birth weight and subsequent risk of cancer. Cancer Epidemiol. 2014 Oct;38(5):538-43. doi: 10.1016/j.canep.2014.07.004. Epub 2014 Aug 3. PMID: 25096278; PMCID: PMC4188724. https://www.who.int/data/nutrition/nlis/info/low-birth-weight#:~:text=It%20contributes%20to%20a%20range,to%20die%20than%20heavier%20infants

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Leslie Stone, MD - Co-Founder of GrowBaby® Health

Experience: Board Certified in Family Practice Medicine, Fellowship in Surgical Obstetrics, Family Practice Obstetrician, Institute for Functional Medicine Certified.

- Clinical Family Practice Owner for over 35 years
- Delivering well-over 5,000 babies since 1983

Education: Undergraduate Degree, Washington State University, Medical School, University of Washington School of Medicine, OB Internship, OHSU, Family Practice Residency, UCLA, OB Fellowship, UCLA

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Developmental Programming of Health & Disease (DOHaD)

Preterm Birth (PIH/PEC)

In utero events predict risk for generational function or dysfunction across all physiologic systems

Delivery/Feeding Method/Food Introduction Timing & the First 1000-2000+ Days

PIH: Pregnancy Induced Hypertension/PEC: Preeclampsia/PTB: Preterm Birth/GDM: Gestational Diabetes Mellitus/BMI: Body Mass Index/EGWG: Excessive Gestational Weight Gain

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Preterm Birth (PTB)

7.9% & increasing...

- AMA
- increased IVF
- Multifactorial

Leading cause of neonatal death = complications of PTB

- Long term: HTN, cardiac dysfunction, (chronic) obstructive pulmonary disorder (COPD), increased blood glucose, increased mental health disorders including ADHD, increased PTB in subsequent generations.

Luu, T. M., Rehman Mian, M. O., & Nuyt, A. M. (2017). Long-Term Impact of Preterm Birth: Neurodevelopmental and Physical Health Outcomes. *Clinics in Perinatology*, *44*(2), 305–314. https://doi.org/10.1016/J.CLP.2017.01.003

Small for Gestational Age (SGA)

2.6% in 2020 increasing to 2.9% in 2021 across all regions

Associated with highest short & long-term health vulnerability across the lifespan

- Short-term: Lower verbal, spatial, and numerical test scores in childhood.
- Long-term: Dyslipidemias, hypertension, unfavorable body fat distribution, non-insulin dependent diabetes mellitus.

2021 Birth Characteristics in England & Wales, Office for National Statistics, n.d.

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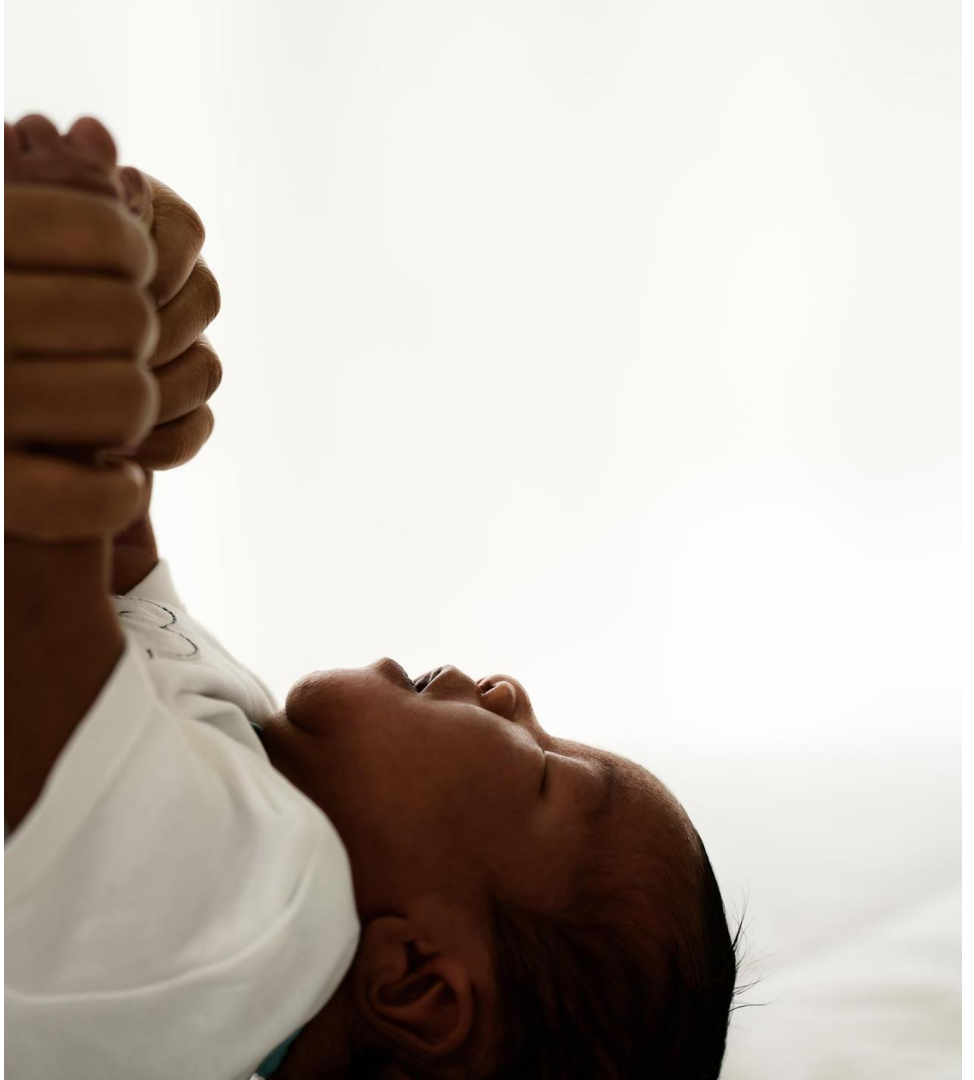
Large for Gestational Age (LGA)

23.8%

- Maternal Obesity (avg. 31%) is a stronger predictor of an LGA infant than maternal hyperglycemia.
- Long-term: predictor of obesity in adulthood, higher risk of hypertension, type 2 diabetes mellitus (T2DM), cardiovascular disease, and certain forms of cancer later in life

1: National Pregnancy in Diabetes Audit 2021, published 12 Oct 2023



Gestational Diabetes Mellitus (GDM)

5% - 20+% (?)

Screening challenges - a ¼ of high-risk women - not screened for GDM or received little or no clinical management after diagnosis.

Short-Term: GDM assoc. with four-fold increased risk of late stillbirth.

Long-Term: Approximately ½ of all women with a history of GDM go on to develop T2DM within five to ten years after delivery. A previous diagnosis of GDM carries a lifetime risk of progression to T2DM of up to 60%.

National Pregnancy in Diabetes Audit 2021 & 2022, for England and Wales, Hospital and Community Health Services, Hospital Trusts, NHS Trusts, published 12 Oct 2023.
International Diabetes Federation, UK 10th Ed. 2021 -Diabetes Report 2000-2045 https://diabetesatlas.org/data/en/country/209/gb.html
UK Health Security Agency - https://ukhsa.blog.gov.uk/2021/03/04/patterns-and-trends-in-excess-weight-among-adults-in-england/ - Caroline

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Hypertensive Disorders of Pregnancy (HDP)

Preeclampsia – 3.5%

- 4X increased death rate in 2022 compared to 2020.

HDP - up to 10% of pregnancies

- Short & Long-term Outcomes: Increased rate of maternal morbidities - seizures, stroke, kidney injury, increased SGA and PTB <34 weeks, and increased perinatal deaths

https://action-on-preeclampsia
D Farrar; bmc pregnancychildbirth.biomedcontrol.com 2020

Select Nutrient & Gene Variant Analysis in a Targeted Diet & Lifestyle Intervention & Preterm Birth (SNGLI-PTB)

Clinical Trials ID NCT 05436119

1. **Reverse** rising maternal & neonatal adverse outcomes
2. **Target** populations at greatest risk
3. **Reduce** medical economic impact
4. **Build** Resilience

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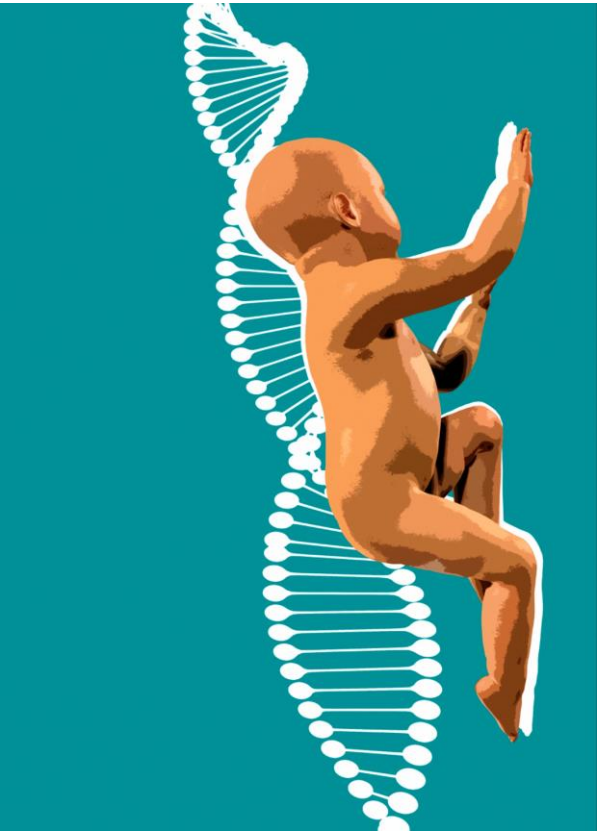
GrowBaby® Program Tools & Integrations



Trimester/Trimester Nutrition Support

- Virtual Interface (Text, Phone, Telehealth)

Prenatal Formulation

- Prenatal Packet
- Women's Probiotic

Unique Assessment + Routine Labs: 1st, 3rd, and Postpartum

- Zinc
- 25-OH D
- Iron Studies
- Carnitine: Free, total and acyl
- Omega-3 Fatty Acid Testing (serum & breastmilk)

Genomics (DNALife GrowBaby Test)

- Targeted & Specific

Clinical Integration & Education Tools

- OB Clinical Support for parallel care

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Outcome	GrowBaby® UK Impact	Long-term health associations - decreasing the risk for generations
Preterm Birth (PTB)	**4X less likely**	Perinatal mortality, long-term morbidity, developmental issues, coronary heart disease in males, elevated blood pressure in females, & atherogenic lipids in males, F1 generation PTB recurrence.
Small for Gestational Age (SGA)	**2X less likely**	Dyslipidemias, hypertension, unfavorable body fat distribution, non-insulin dependent diabetes mellitus & lower verbal, spatial, and numerical test scores in childhood.
Hypertensive Disorders of Pregnancy (HDP)	**10X less likely (HDP) & 21X less likely (PEC)**	Increased rate of maternal morbidities: seizures, stroke, kidney injury, increased SGA and PTB <34 weeks, and increased perinatal deaths. 14% of all maternal deaths are from pregnancy-induced hypertension. Rates of chronic hypertension two to five years after affected pregnancies are 50% following early-onset preeclampsia, 39% following gestational hypertension, and 25% following late onset preeclampsia.
Gestational Diabetes Mellitus (GDM)	**10X-41X less likely**	Maternal type 2 diabetes (T2DM) & possible adverse cardiometabolic outcomes in the offspring. Approximately half of women with a history of GDM go on to develop T2DM within five to ten years after delivery. A previous diagnosis of GDM carries a lifetime risk of progression to T2DM of up to 60%.
Large for Gestational Age (LGA)	**6X less likely**	Being born LGA is a predictor of obesity in adulthood. High birth weight (LGA) is also associated with higher risk of hypertension, type 2 diabetes mellitus (T2DM), cardiovascular disease, and certain forms of cancer later in life.

UK GrowBaby® Savings Model

Outcomes	Current UK Cost/Annum	Savings* with GrowBaby® /Annum
Preterm Birth	£3.53B	£2.64B
Small for Gestational Age	£49M	£24M
Gestational Diabetes Mellitus	£201M £804M	£181M -£784M
TOTAL:	£3.78B - £4.38B	£2.84B - £3.44B

Reliable GBP (£) cost per outcome is scarce for HDP, PEC and LGA
**Projected Gross Savings*

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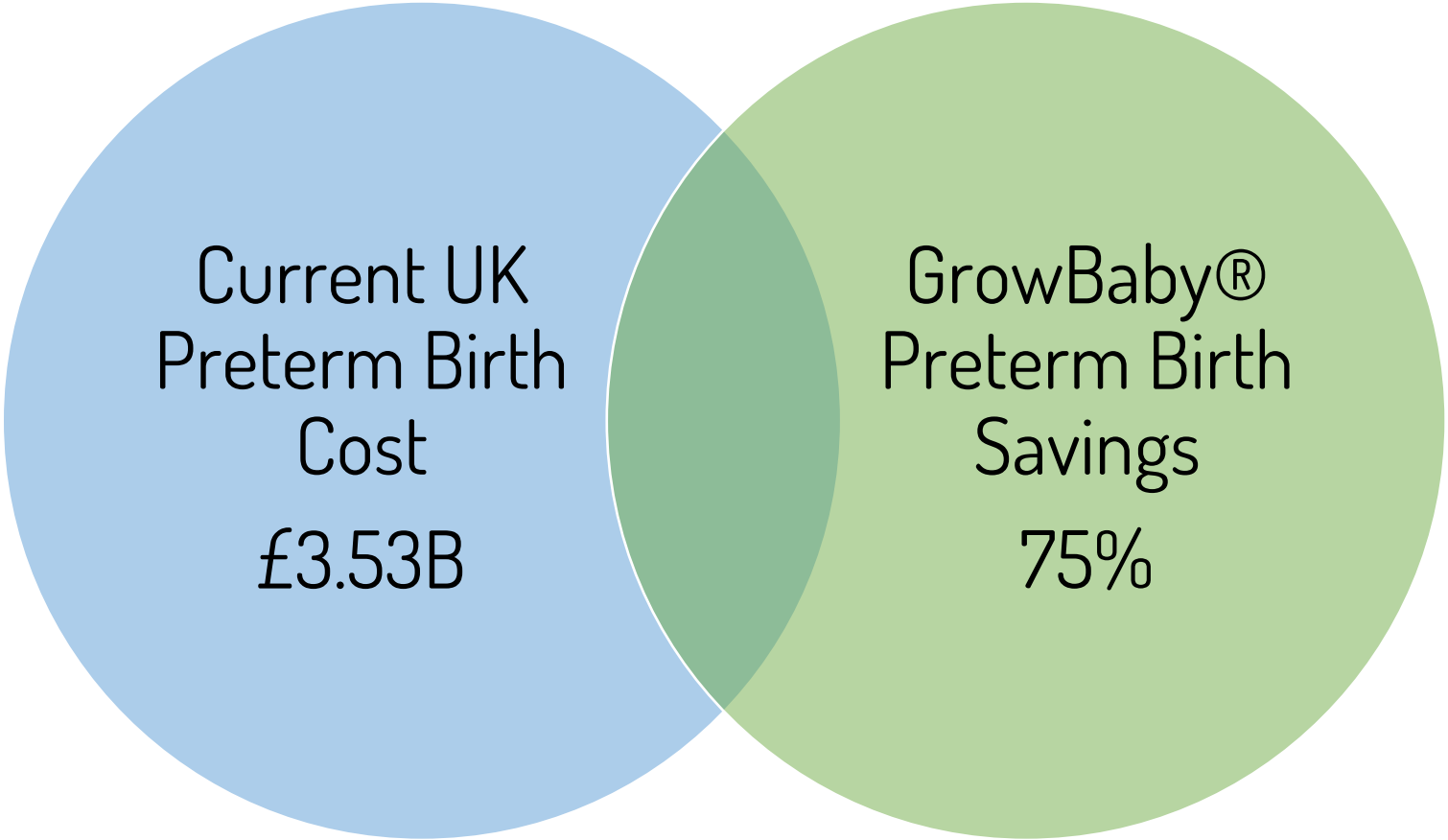

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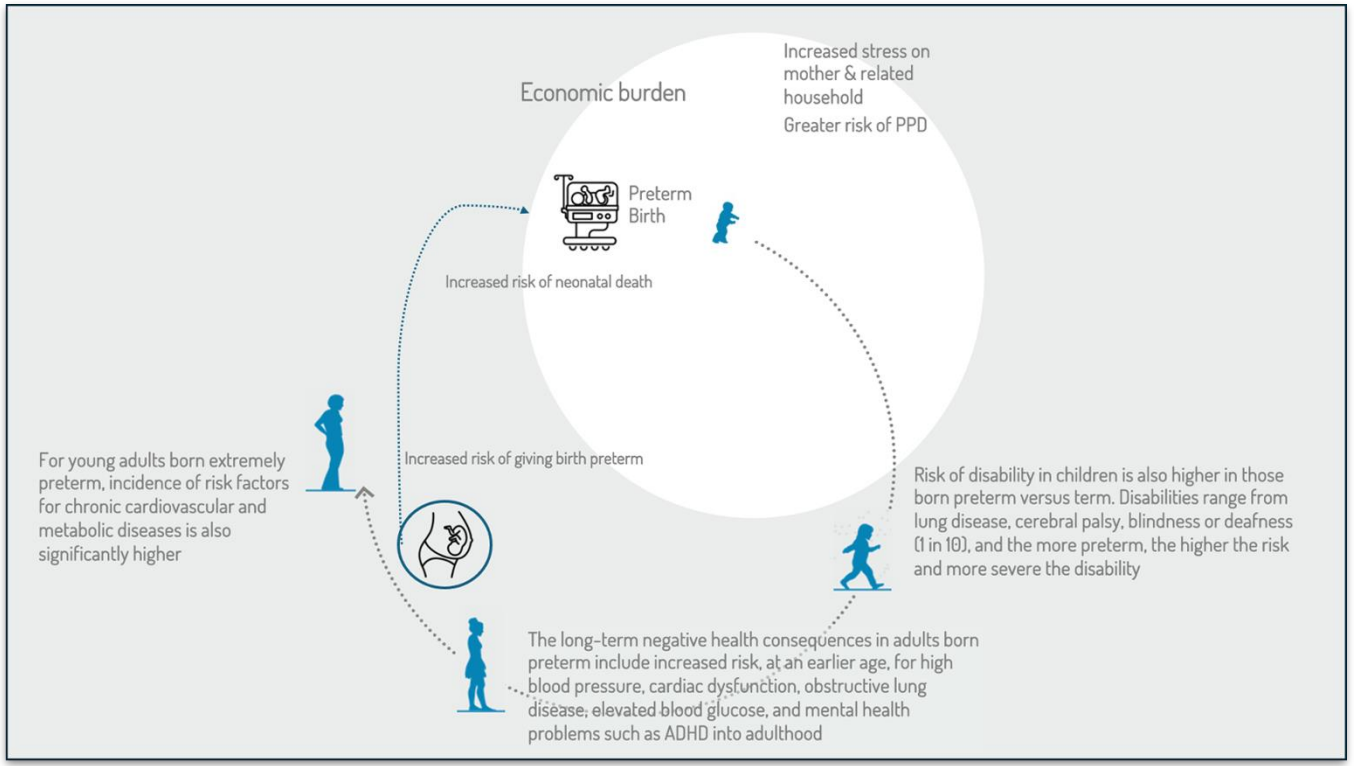
Transgenerational health: 1000 days & long-term impact



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Preterm births have economic impacts

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Short and long term economic impacts

Based on data for 28,154 very preterm babies (27+0 and 31+6 weeks of gestation), the annual total costs of neonatal care were estimated to be £262 million between 2014 and 2018, with 96% of costs attributable to routine daily care provided by hospital units. (Yang et al., 2023)

Open access Original research

BMJ Paediatrics Open

Neonatal health care costs of very preterm babies in England: a retrospective analysis of a national birth cohort

Miaoqing Yang,[1,2] Helen Campbell,[1] Thillagavathie Pillay,[3,4] Elaine M Boyle,[5] Neena Modi,[6] Oliver Rivero-Arias[1]

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► Additional supplemental material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/bmjpo-2022-001818).

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ABSTRACT

Objectives Babies born between 27^{+0} and 31^{+6} weeks of gestation represent the largest group of very preterm babies requiring National Health Service (NHS) care; however, up-to-date, cost figures for the UK are not currently available. This study estimates neonatal costs to hospital discharge for this group of very preterm babies in England.

Design Retrospective analysis of resource use data recorded within the National Neonatal Research Database.

Setting Neonatal units in England.

Patients Babies born between 27^{+0} and 31^{+6} weeks of gestation in England and discharged from a neonatal unit between 2014 and 2018.

Main outcome measures Days receiving different levels of neonatal care were costed, along with other specialised clinical activities. Mean resource use and costs per baby are presented by gestational age at birth, along with total costs for the cohort.

Results Based on data for 28 154 very preterm babies, the annual total costs of neonatal care were estimated to be £262 million, with 96% of costs attributable to routine daily care provided by units. The mean (SD) total cost per baby of this routine care varied by gestational age at birth; £75 594 (£34 874) at 27 weeks as compared with £27 401 (£14 947) at 31 weeks.

Conclusions Neonatal healthcare costs for very preterm babies vary substantially by gestational age at birth. The findings presented here are a useful resource to stakeholders including NHS managers, clinicians, researchers and policymakers.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Existing cost estimates for very preterm care in England are now over a decade old and may not reflect modern care practices.

WHAT THIS STUDY ADDS

⇒ This study has generated current cost estimates at the level of the individual baby and for the cohort as a whole in England and confirmed the previously reported inverse relationship between healthcare costs and gestational age at birth.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The outputs from this work provide a valuable resource for research assessing the economic implications of interventions to prevent preterm birth, the provision of care for preterm babies, as well as helping inform National Health Service resource allocation decisions.

INTRODUCTION

Babies born between 27^{+0} and 31^{+6} weeks of gestation (hereafter called 'born at 27–31 weeks') represent the largest group of very preterm babies requiring National Health Service (NHS) care.[1] These babies also account for about 12% of all viable preterm babies born in England and usually require admission to a neonatal unit.[1]

Previous work in the UK and elsewhere has attempted to estimate the healthcare and societal cost of preterm birth.[2–7] However, there is marked variability in reported cost estimates, due to differences in study perspectives, included babies, data sources and methods used to assign costs. A number of studies have reported cost estimates associated with the initial period of hospitalisation for babies born at 27–31 weeks.[2 3 6] While these studies have shown the costs of neonatal care for very preterm babies to be inversely related to gestational age at birth, estimates for the UK are now over a decade old and there is a need for new analyses. As part of the OPTImising neonatal service provision for PREterM babies born between 27 and 31 weeks gestation in England (OPTI-PREM) suite of studies aimed at optimising neonatal service provision for very preterm babies in England, we conducted a retrospective cohort study to describe the levels of neonatal care, key specialist procedures and healthcare costs attributable to the management of these babies.[1] The analysis makes use of healthcare resource use data routinely collated within the National

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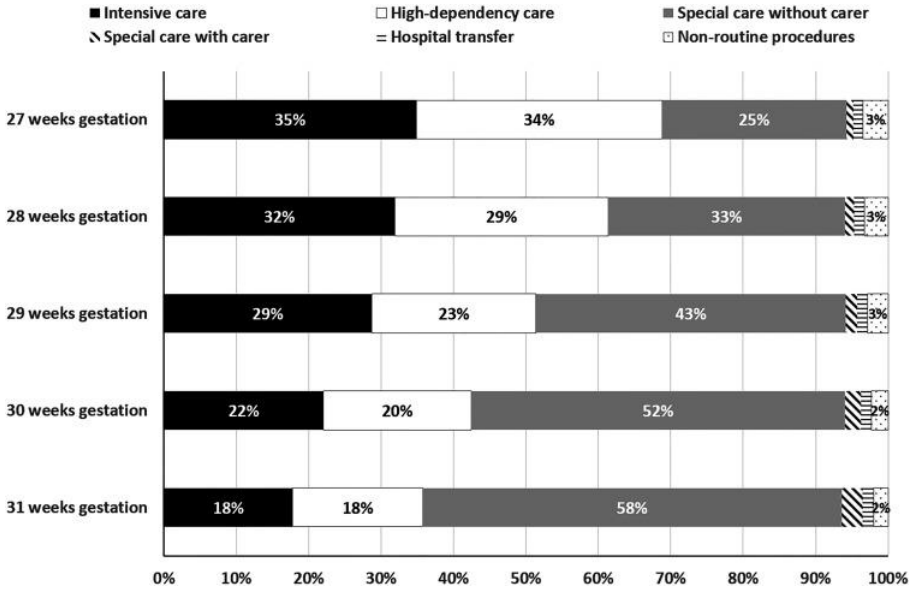
Short and long term economic impacts

Hua et al. (2023) measured hospital admission costs from birth to age 8 years, estimated by gestational age at birth (<28, 28-29, 30-31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41 and 42 weeks). Birth admission and subsequent admission hospital costs decreased with increasing gestational age at birth. Differences in hospital admission costs between gestational age groups diminished with increasing age, particularly after the first 2 years following birth.

Higher hospital admission costs were incurred in children born extremely preterm and very preterm during the eighth year of life compared with children born at 40 weeks. Children born extremely preterm had the highest 8-year cumulative hospital admission costs per child at £80 559 (95% CI £79 238 to £82 019), a large proportion of which was incurred during the first year after birth at £71 997 (95% CI £70 866 to £73 097) (Hua et al., 2023).



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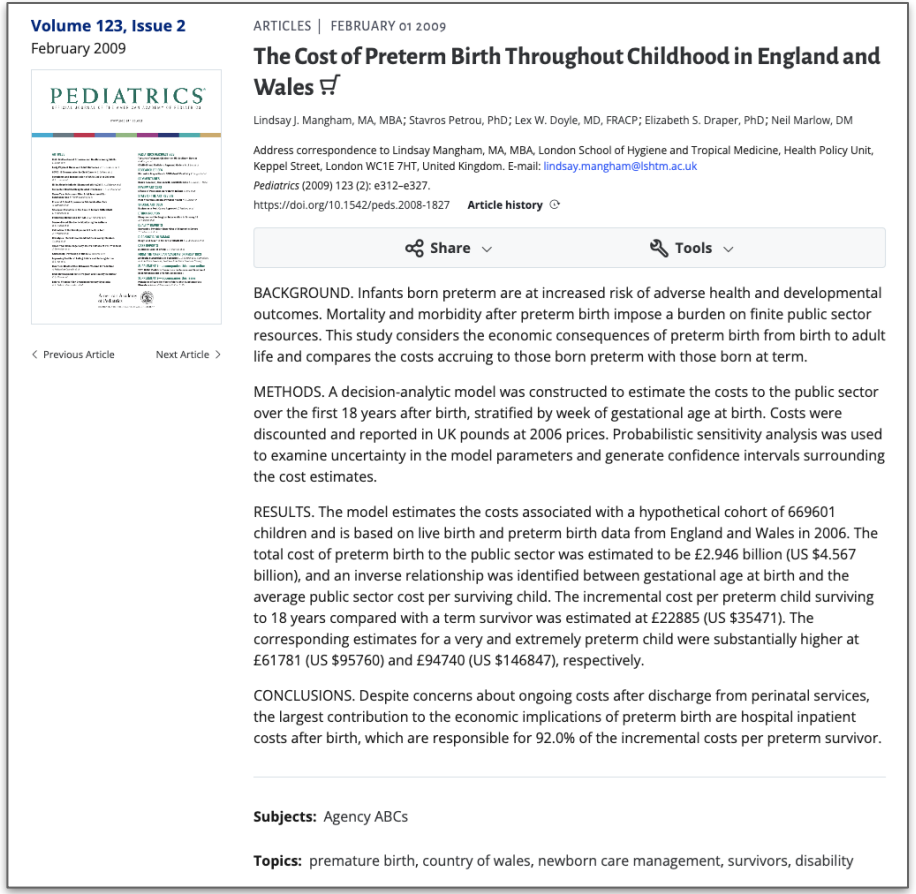
Short and long term economic impacts

Mangham et al (2009) estimated costs using a model with a hypothetical cohort of 669,601 children which was based on live birth and preterm birth data from England and Wales in 2006. This model estimated the total cost of preterm birth to the public sector at £2.946 billion. Using this model, an inverse relationship was found between gestational age at birth and the average public sector cost per surviving child. I.e. The incremental cost per preterm child surviving to 18 years compared with a term survivor was estimated at £22,885. The corresponding estimates for a very and extremely preterm child were substantially higher at £61781 and £94740, respectively.



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PEDIATRICS

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The Cost of Preterm Birth Throughout Childhood in England and Wales

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BACKGROUND. Infants born preterm are at increased risk of adverse health and developmental outcomes. Mortality and morbidity after preterm birth impose a burden on finite public sector resources. This study considers the economic consequences of preterm birth from birth to adult life and compares the costs accruing to those born preterm with those born at term.

METHODS. A decision-analytic model was constructed to estimate the costs to the public sector over the first 18 years after birth, stratified by week of gestational age at birth. Costs were discounted and reported in UK pounds at 2006 prices. Probabilistic sensitivity analysis was used to examine uncertainty in the model parameters and generate confidence intervals surrounding the cost estimates.

RESULTS. The model estimates the costs associated with a hypothetical cohort of 669601 children and is based on live birth and preterm birth data from England and Wales in 2006. The total cost of preterm birth to the public sector was estimated to be £2.946 billion (US $4.567 billion), and an inverse relationship was identified between gestational age at birth and the average public sector cost per surviving child. The incremental cost per preterm child surviving to 18 years compared with a term survivor was estimated at £22885 (US $35471). The corresponding estimates for a very and extremely preterm child were substantially higher at £61781 (US $95760) and £94740 (US $146847), respectively.

CONCLUSIONS. Despite concerns about ongoing costs after discharge from perinatal services, the largest contribution to the economic implications of preterm birth are hospital inpatient costs after birth, which are responsible for 92.0% of the incremental costs per preterm survivor.

Subjects: Agency ABCs

Topics: premature birth, country of wales, newborn care management, survivors, disability

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How can we improve outcomes?

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The current view on screening:

The Parliamentary Review into Preterm Births found: “The evidence remains insufficient to support a programme of routinely screening all pregnant women for risk of preterm birth.”

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This was based on screening for Fetal Fibronectin and Bacterial Vaginosis.

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A more effective screening solution?

Using genetic testing as the foundation of personalised nutrition plans could be a more effective an alternative

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Nutrition and lifestyle impact natal outcomes

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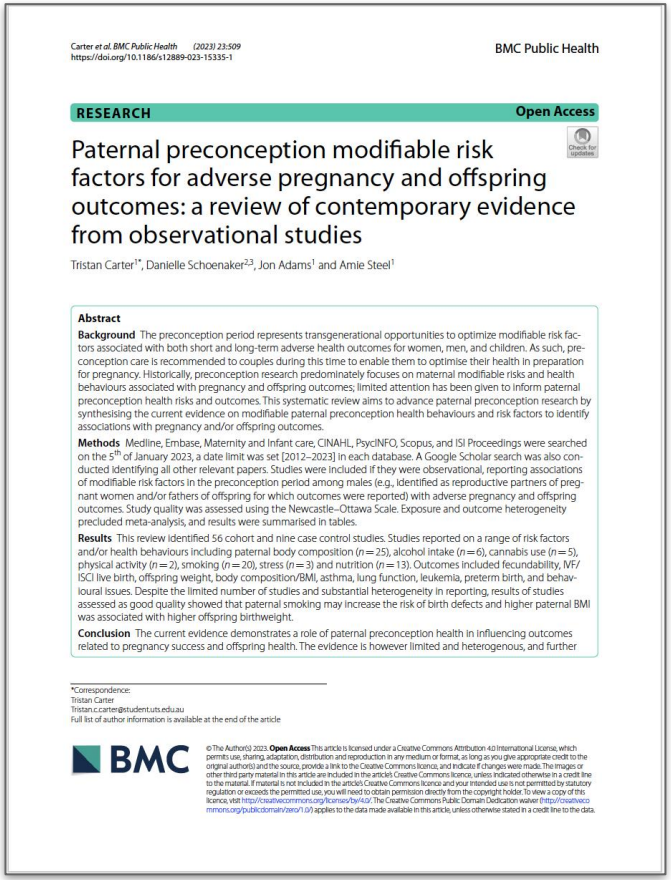
Nutrition and lifestyle impact natal outcomes

Maternal and paternal dietary intake and environmental exposures, preconception, play an important role in fertility, pregnancy and offspring outcomes (Carter et al., 2023; Genuis & Genuis, 2016).

Maternal diet and environmental exposures throughout the perinatal time-period are integral to positive birth outcomes and transgenerational health (Aiken et al., 2016)



Carter et al. BMC Public Health (2023) 23:509
https://doi.org/10.1186/s12889-023-15335-1

BMC Public Health

RESEARCH Open Access

Paternal preconception modifiable risk factors for adverse pregnancy and offspring outcomes: a review of contemporary evidence from observational studies

Tristan Carter[1*], Danielle Schoenaker[2,3], Jon Adams[1] and Amie Steel[1]

Abstract

Background The preconception period represents transgenerational opportunities to optimize modifiable risk factors associated with both short and long-term adverse health outcomes for women, men, and children. As such, preconception care is recommended to couples during this time to enable them to optimise their health in preparation for pregnancy. Historically, preconception research predominately focuses on maternal modifiable risks and health behaviours associated with pregnancy and offspring outcomes; limited attention has been given to inform paternal preconception health risks and outcomes. This systematic review aims to advance paternal preconception research by synthesising the current evidence on modifiable paternal preconception health behaviours and risk factors to identify associations with pregnancy and/or offspring outcomes.

Methods Medline, Embase, Maternity and Infant care, CINAHL, PsycINFO, Scopus, and ISI Proceedings were searched on the 5th of January 2023, a date limit was set [2012–2023] in each database. A Google Scholar search was also conducted identifying all other relevant papers. Studies were included if they were observational, reporting associations of modifiable risk factors in the preconception period among males (e.g., identified as reproductive partners of pregnant women and/or fathers of offspring for which outcomes were reported) with adverse pregnancy and offspring outcomes. Study quality was assessed using the Newcastle–Ottawa Scale. Exposure and outcome heterogeneity precluded meta-analysis, and results were summarised in tables.

Results This review identified 56 cohort and nine case control studies. Studies reported on a range of risk factors and/or health behaviours including paternal body composition ($n = 25$), alcohol intake ($n = 6$), cannabis use ($n = 5$), physical activity ($n = 2$), smoking ($n = 20$), stress ($n = 3$) and nutrition ($n = 13$). Outcomes included fecundability, IVF/ISCI live birth, offspring weight, body composition/BMI, asthma, lung function, leukemia, preterm birth, and behavioural issues. Despite the limited number of studies and substantial heterogeneity in reporting, results of studies assessed as good quality showed that paternal smoking may increase the risk of birth defects and higher paternal BMI was associated with higher offspring birthweight.

Conclusion The current evidence demonstrates a role of paternal preconception health in influencing outcomes related to pregnancy success and offspring health. The evidence is however limited and heterogenous, and further

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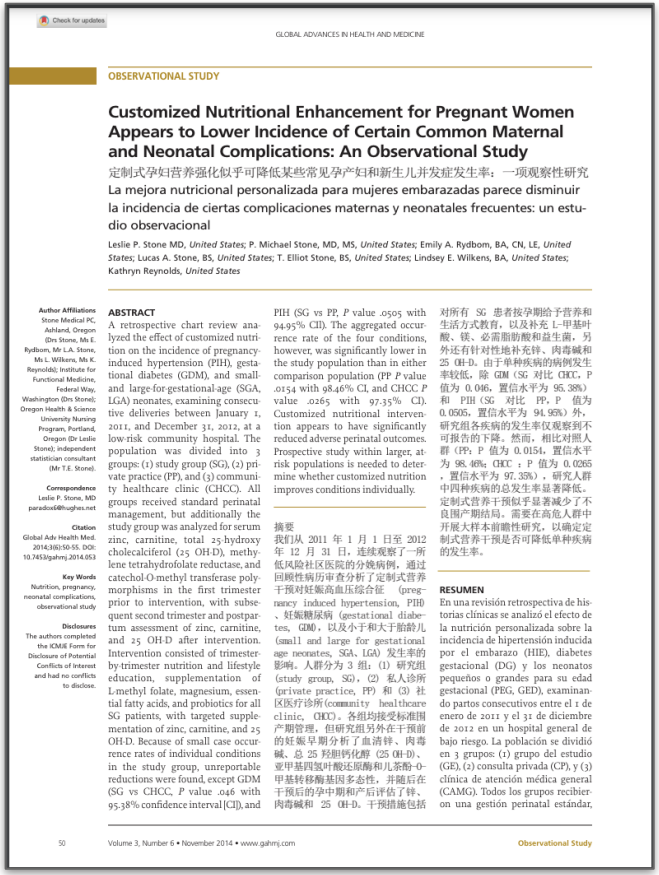
Using genetics as the foundation for personalised nutrition optimises effectiveness

A customised nutrition plan, using specific genomic markers was shown to reduce common maternal and neonatal complications (Stone et al., 2014).



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OBSERVATIONAL STUDY

Customized Nutritional Enhancement for Pregnant Women Appears to Lower Incidence of Certain Common Maternal and Neonatal Complications: An Observational Study

定制式孕妇营养强化似乎可降低某些常见孕产妇和新生儿并发症发生率：一项观察性研究

La mejora nutricional personalizada para mujeres embarazadas parece disminuir la incidencia de ciertas complicaciones maternas y neonatales frecuentes: un estudio observacional

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Citation
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Key Words
Nutrition, pregnancy, neonatal complications, observational study

Disclosures
The authors completed the ICMJE Form for Disclosure of Potential Conflicts of Interest and had no conflicts to disclose.

ABSTRACT

A retrospective chart review analyzed the effect of customized nutrition on the incidence of pregnancy-induced hypertension (PIH), gestational diabetes (GDM), and small- and large-for-gestational-age (SGA, LGA) neonates, examining consecutive deliveries between January 1, 2011, and December 31, 2012, at a low-risk community hospital. The population was divided into 3 groups: (1) study group (SG), (2) private practice (PP), and (3) community healthcare clinic (CHCC). All groups received standard perinatal management, but additionally the study group was analyzed for serum zinc, carnitine, total 25-hydroxy cholecalciferol (25 OH-D), methylene tetrahydrofolate reductase, and catechol-O-methyl transferase polymorphisms in the first trimester prior to intervention, with subsequent second trimester and postpartum assessment of zinc, carnitine, and 25 OH-D after intervention. Intervention consisted of trimester-by-trimester nutrition and lifestyle education, supplementation of L-methyl folate, magnesium, essential fatty acids, and probiotics for all SG patients, with targeted supplementation of zinc, carnitine, and 25 OH-D. Because of small case occurrence rates of individual conditions in the study group, unreportable reductions were found, except GDM (SG vs CHCC, *P* value .046 with 95.38% confidence interval [CI]), and PIH (SG vs PP, *P* value .0505 with 94.95% CII). The aggregated occurrence rate of the four conditions, however, was significantly lower in the study population than in either comparison population (PP *P* value .0154 with 98.46% CI, and CHCC *P* value .0265 with 97.35% CI). Customized nutritional intervention appears to have significantly reduced adverse perinatal outcomes. Prospective study within larger, at-risk populations is needed to determine whether customized nutrition improves conditions individually.

摘要

我们从 2011 年 1 月 1 日至 2012 年 12 月 31 日，连续观察了一所低风险社区医院的分娩病例，通过回顾性病历审查分析了定制式营养干预对妊娠高血压综合征 (pregnancy induced hypertension, PIH)、妊娠糖尿病 (gestational diabetes, GDM)，以及小于和大于胎龄儿 (small and large for gestational age neonates, SGA、LGA) 发生率的影响。人群分为 3 组：(1) 研究组 (study group, SG)，(2) 私人诊所 (private practice, PP) 和 (3) 社区医疗诊所 (community healthcare clinic, CHCC)。各组均接受标准围产期管理，但研究组另外在干预前的妊娠早期分析了血清锌、肉毒碱、总 25 羟胆钙化醇 (25 OH-D)、亚甲基四氢叶酸还原酶和儿茶酚-O-甲基转移酶基因多态性，并随后在干预后的孕中期和产后评估了锌、肉毒碱和 25 OH-D。干预措施包括对所有 SG 患者按孕期给予营养和生活方式教育，以及补充 L-甲基叶酸、镁、必需脂肪酸和益生菌，另外还有针对性地补充锌、肉毒碱和 25 OH-D。由于单种疾病的病例发生率较低，除 GDM (SG 对比 CHCC，P 值为 0.046，置信水平为 95.38%) 和 PIH (SG 对比 PP，P 值为 0.0505，置信水平为 94.95%) 外，研究组各疾病的发生率仅观察到不可报告的下降。然而，相比对照人群 (PP，P 值为 0.0154，置信水平为 98.46%；CHCC：P 值为 0.0265，置信水平为 97.35%)，研究人群中四种疾病的总发生率显著降低。定制式营养干预似乎显著减少了不良围产期结局。需要在高危人群中开展大样本前瞻性研究，以确定定制式营养干预是否可降低单种疾病的发生率。

RESUMEN

En una revisión retrospectiva de historias clínicas se analizó el efecto de la nutrición personalizada sobre la incidencia de hipertensión inducida por el embarazo (HIE), diabetes gestacional (DG) y los neonatos pequeños o grandes para su edad gestacional (PEG, GED), examinando partos consecutivos entre el 1 de enero de 2011 y el 31 de diciembre de 2012 en un hospital general de bajo riesgo. La población se dividió en 3 grupos: (1) grupo del estudio (GE), (2) consulta privada (CP), y (3) clínica de atención médica general (CAMG). Todos los grupos recibieron una gestión perinatal estándar,

https://doi.org/10.7453/GAHMJ.2014.053

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GrowBaby is a test and protocol designed and tested to improve intergenerational health

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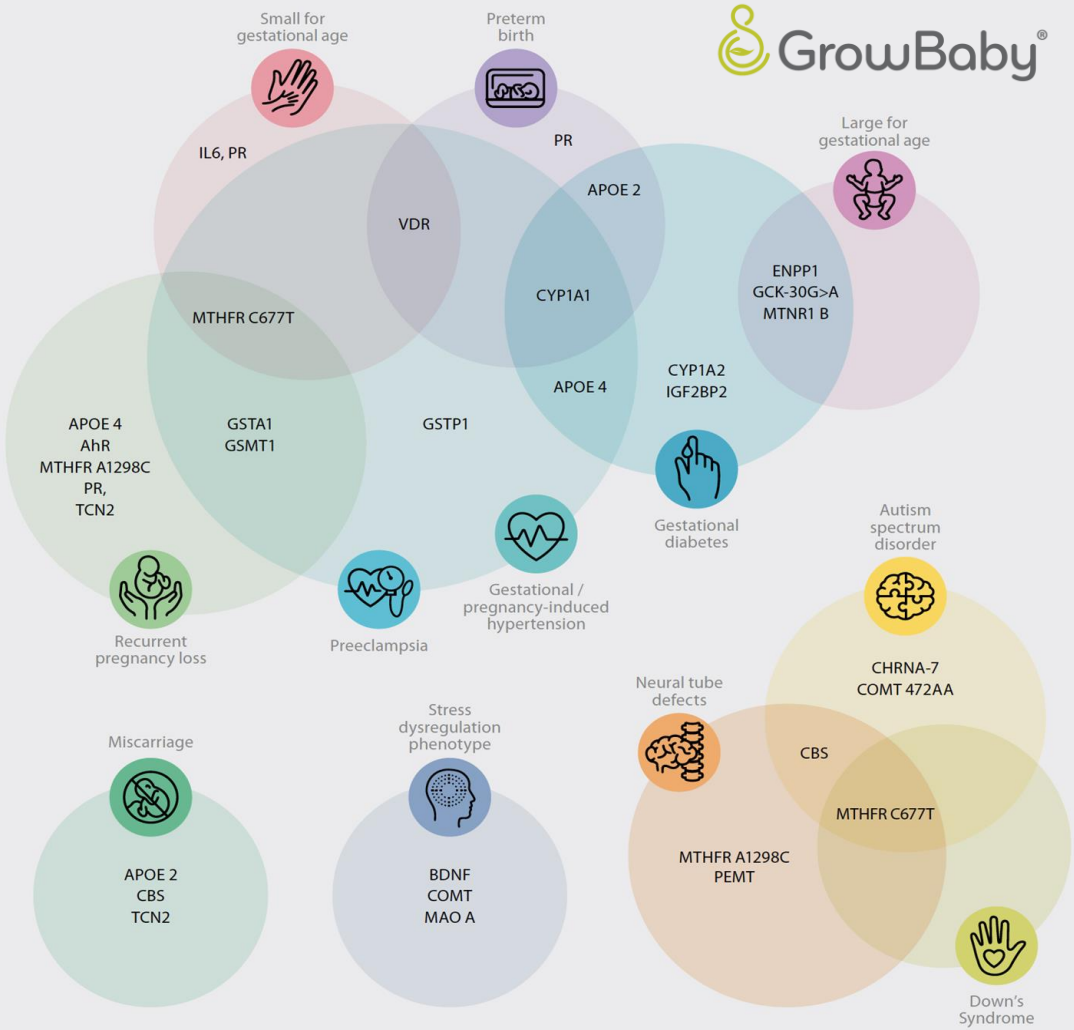
PHENOTYPE
CONDITION
OUTCOME

✓ Overlap
✓ Interplay
✓ Opportunity

42 SNPs in 27 genes involved in 11 key biological processes associated with preconception outcomes, as well as maternal and fetal health outcomes.



Genetic ecosystem across the lifespan:

Mother

Baby

MTHFR C677T	MTHFR A1298C	TCN2	VDR	MTNRIB	APOE2
Mother					
· RPL · Preeclampsia · Small for gestational age	· RPL · NTD	· RPL · Miscarriage	· Preterm birth · Small for gestational age · HTN	· GDM	· Miscarriage · Preterm birth · GDM
Baby					
· NTD · ASD · Down's syndrome · Vascular dementia · Stroke · Some CA · Schizophrenia* · T2DM · Male infertility	· Male infertility · Some CA · Protective for hypothyroid	· Failure to thrive · Substance misuse · B12 cellular delivery · Infertility · Recurrent implantation failure · Crohn's disease · Hyper-homocystinemia**	· Asthma · HTN · >BFP · OA · Osteoporosis · Vitamin D deficiency · Squamous/basal cell cancer · Melanoma	· T2DM · Childhood obesity risk · Adulthood obesity traits · Chronotype-breast CA · Colorectal CA	· Protective for Alzheimer's · Hypertriglyceridemia risk

* African, Asian, Caucasian ** European descent

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PMID: 31826236 / PMID: 34020621 / PMID: 35467761 / PMID: 34629798 / PMID: 27025471 / PMID: 25449138 / PMID: 31663297 / PMID: 34960114

I have 2 requests to end with...

GrowBaby®

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The first is to researchers...

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GrowBaby has the potential to drive a significant shift in short and long term health outcomes

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At Nordic Group we are working on multiple projects demonstrating the impact of longitudinal health tracking on lifetime health outcomes

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Understanding who we are so we can optimise our nutrition, lifestyle and behaviours around the reality of our personal genetics and biochemistry should start at birth.

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Correction: It should start BEFORE birth.

This research is the beginning...

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We need UK and European partners for further studies

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The second is to Politicians...

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The Government's own target (with cross party consensus) is to reduce the preterm birth rate to 6%.
It is currently at 7.9%. And moving in the opposite direction.

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In the US we reduced the rate to 1%

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The potential isn't just to reduce spending...

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Behind every statistic is a real life human story.
Behind every statistic is a stressed, worried, traumatised family. And a baby that has not had the best start in life.
This can change.
This should change.

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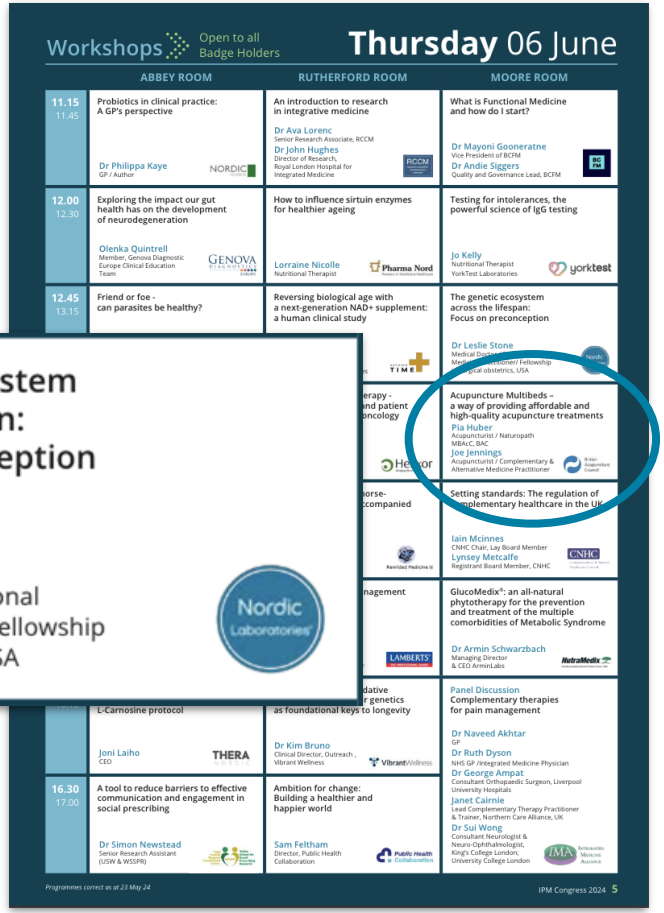
This is just an introduction

Please come and join our workshop session to take a deeper dive into GrowBaby and the role of genetics in supporting healthy mums and babies.

1245 - 1315
Moore Room



The genetic ecosystem across the lifespan: Focus on preconception

Dr Leslie Stone
Medical Doctor / Functional Medicine Practitioner/ Fellowship in surgical obstetrics, USA

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Thanks for listening

Chris Moore
CEO, Nordic Group

Dr Leslie Stone
Founder, GrowBaby Health

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Longitudinal Outcomes

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