

# Pre- and early pregnancy diet is associated with fertility and health in pregnancy

Professor Claire Roberts

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**Flinders University  
(BA 1985)**



**University of  
Adelaide (BSc  
1988, BSc Hons  
1990, PhD 1995).**



**Deputy Director of  
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**President,  
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**Placental biologist  
and pregnancy  
researcher:**



**Clinical and  
lifestyle factors  
such as maternal  
BMI, socio-  
economic and  
micronutrient  
status that  
together interact  
with genetic  
factors to  
influence health in  
pregnancy and  
beyond.**

bench to bedside approach  
in vitro and animal models  
human pregnancy cohort and  
placental research




## Adjuvant Treatment in IVF NEWSCLIPS

- 'Snake oil': the popular IVF therapy that has just been proven useless
- ESHRE adds its name to HFEA statement on add-ons
- **IVF** regulator is cracking down on “add-on” **treatments** offered by clinics
- All too often couples requiring IVF treatment are taken for a ride when it comes to a bewildering array of unproven tests and adjuvant treatment

# Healthy mother Healthy Baby

- Health in pregnancy of mother matters for the baby
  - Before pregnancy
  - During pregnancy
  - Chronic disease
    - Mother
    - Baby
    - 3<sup>rd</sup> generation

# The SCOPE Cohort


- SCreening fOr PRegnancy Endpoints
  - N=5628 nulliparous women from SCOPE cohort recruited in Adelaide, Auckland, Cork, Manchester, London and Leeds from 2004-2011.
  - N=5598 complete dietary data and no male factor infertility
  - Healthy women only
- 

**Pre-pregnancy  
fast food and  
fruit intake is  
associated with  
time to  
pregnancy**

Jessica A Grieger, Luke E Grzeskowiak, Tina Bianco-Miotto, Tanja Jankovic-Karasoulos, Lisa J Moran, Rebecca L Wilson, Shalem Y Leemaqz, Lucilla Poston, Lesley McCowan, Louise C Kenny, Jenny Myers, James J Walker, Robert J Norman, Gus A Dekker, Claire T Roberts

Human Reproduction, Volume 33, Issue 6, June 2018, Pages 1063–1070,

# Fertility in the Cohort

- 468 (8%) couples were classified as infertile (> 1 year to conceive)
  - 2205 (39%) conceived within one month
  - Women with the lowest intake of fruit (1-3serves/month)” the risk of infertility increase from 8 to 12%.
  - Women who ate fast food  $\geq 4$  serves/week, the risk of infertility increased from 8 to 16%
- 

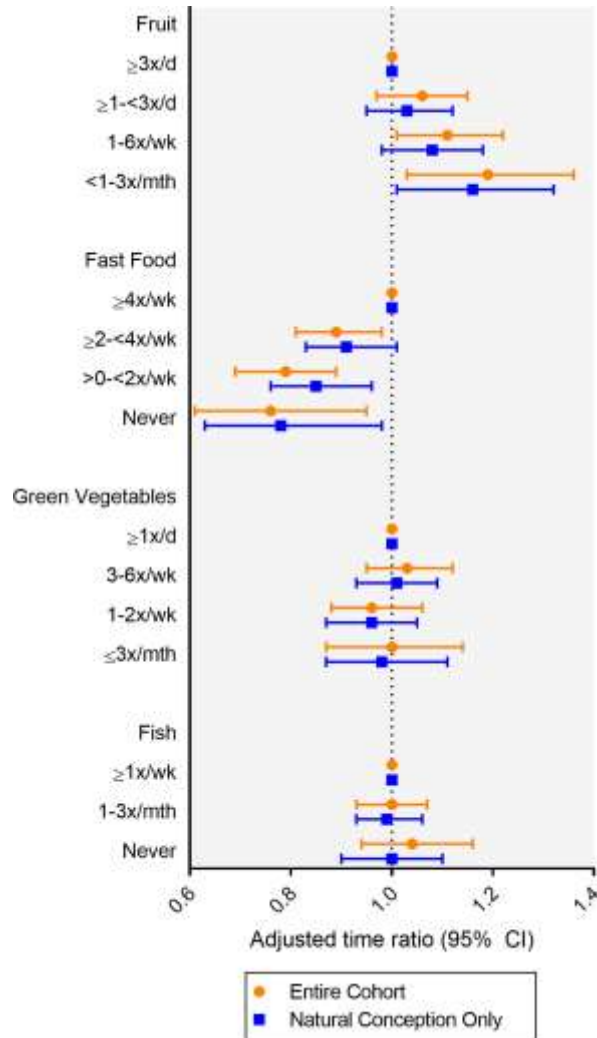
<b>Maternal characteristics (<i>n</i> = 5598)</b>	<b>Natural conception (<i>n</i> = 5258)</b>	<b>Assisted conception (<i>n</i> = 340)</b>
Age (years) <sup>a</sup>	28.4 (5.4)	33.1 (4.5)
BMI (kg/m <sup>2</sup> ) <sup>a</sup>	25.3 (4.9)	25.8 (5.4)
Socioeconomic index	41.4 (16.5)	47.7 (16.4)
Polycystic ovary syndrome <i>n</i> (%)	259 (4.9)	93 (27.4)
Previous miscarriage <i>n</i> (%)		
Yes	704 (13.4)	65 (19.1)
Smoking status <i>n</i> (%)		
Non-smoker	3819 (72.6)	313 (92.1)
Alcohol intake <i>n</i> (%)		
None	1169 (22.2)	122 (35.9)
Frequency of sexual intercourse per month <sup>a</sup>	12.8 (11.3)	9.1 (5.6)



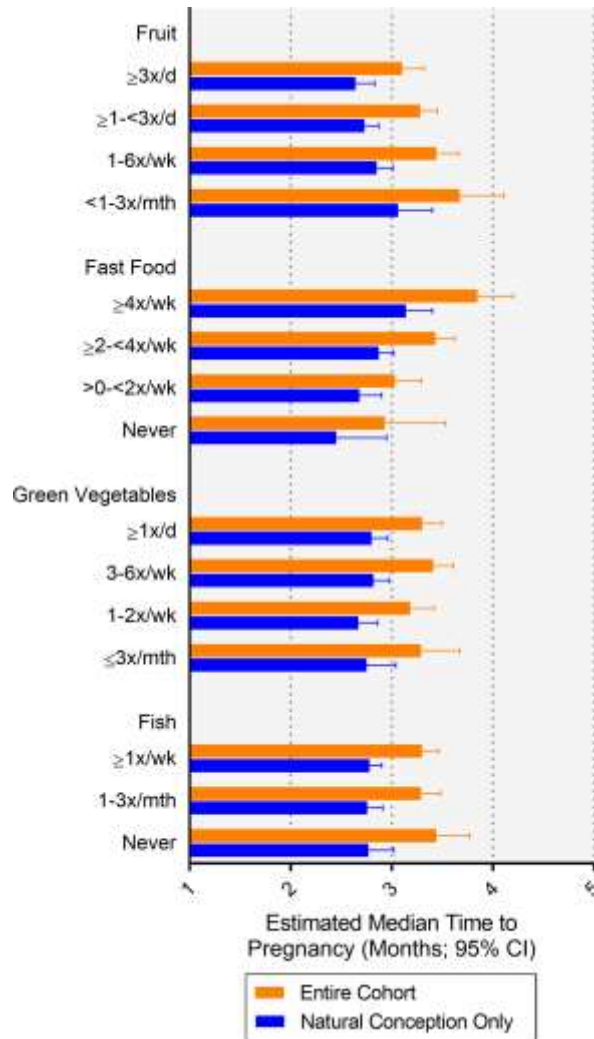
# Diet

<b>Fruit intake <i>n</i> (%)</b>	<b>Natural Conception (n=5258)</b>	<b>Assisted Conception (n=340)</b>
≥3x/day	1165 (22.2)	87 (25.6)
≥1–<3x/day	2002 (38.1)	147 (43.2)
1–6x/week	1609 (30.6)	92 (27.1)
<1–3x/month	482 (9.2)	14 (4.1)
<b>Green leafy vegetable intake <i>n</i> (%)</b>		
≥1x/day	1895 (36.0)	147 (43.2)
3–6x/week	1739 (33.1)	118 (34.7)
1–2x/week	1117 (21.2)	56 (16.5)
<1–3x/month	507 (9.6)	19 (5.6)
<b>Fish intake <i>n</i> (%)</b>		
≥1x/week	2775 (52.8)	194 (57.1)
1–3x/month	1806 (34.4)	105 (30.9)
Never	677 (12.9)	41 (12.1)
<b>Fast food intake <i>n</i> (%)</b>		
Never	146 (3.5)	16 (6.2)
>0–<2x/week	917 (22.2)	63 (24.3)
≥2–<4x/week	2067 (50.0)	147 (56.8)
≥4x/week	1008 (24.4)	33 (12.7)

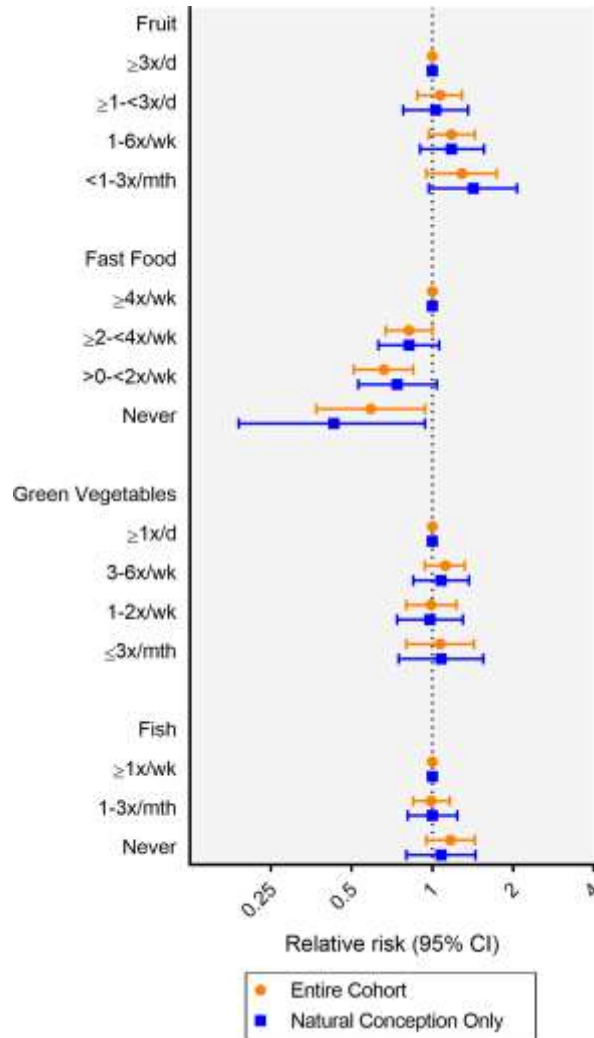
# Association between pre-pregnancy dietary intake and time to pregnancy.



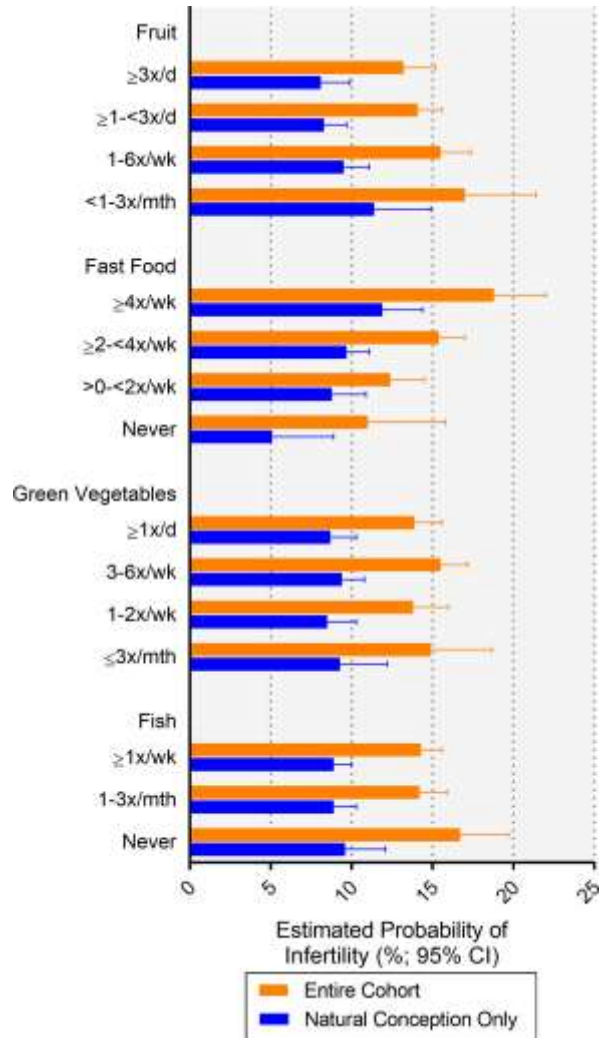
Estimated median time to pregnancy according to pre-pregnancy dietary intake.



# Association between pre-pregnancy dietary intake and **infertility** (TTP >12 months).



# Estimated probabilities of prolonged time to pregnancy (>12 months to conceive)



**Metabolic  
syndrome in  
pregnancy and risk  
for adverse  
pregnancy  
outcomes: A  
prospective cohort  
of nulliparous  
women**

- Grieger JA, Bianco-Miotto T, Grzeskowiak LE, Leemaqz SY, Poston L, McCowan LM, Kenny LC, Myers JE, Walker JJ, Dekker GA, Roberts CT.

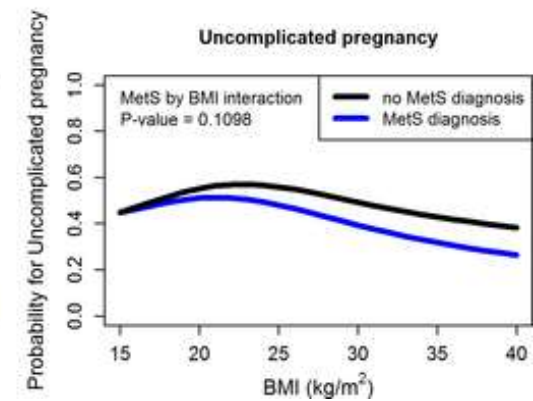
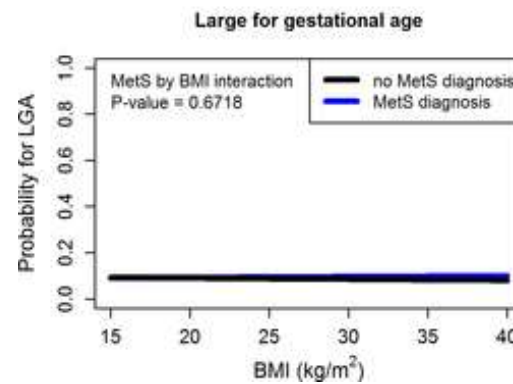
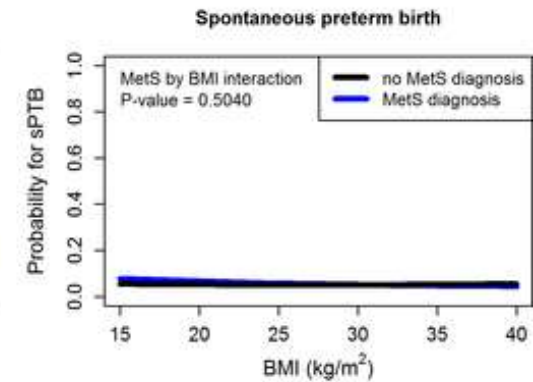
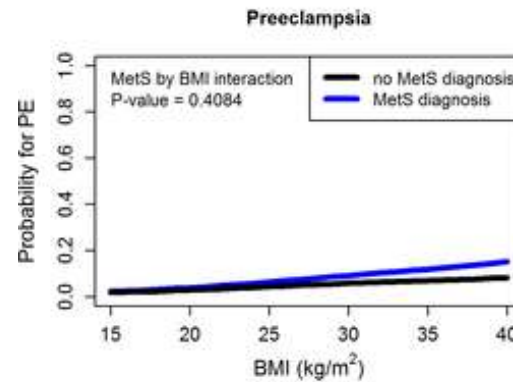
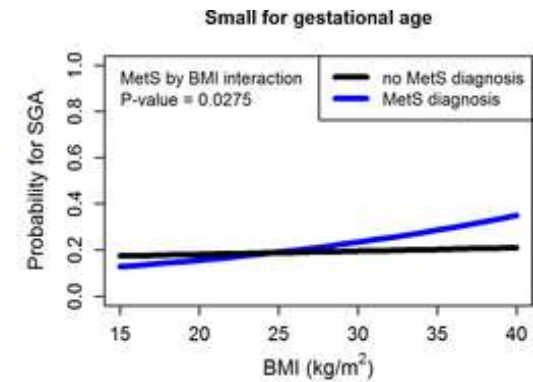
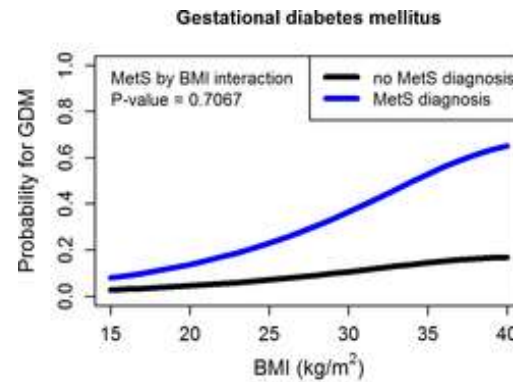
PLOS Medicine 15(12): e1002710.

# Metabolic Syndrome: IDF criteria

- Waist circumference > 80 cm **along** with any 2 of the following:
  - Raised TG
  - Reduced HDL-C
  - Raised blood pressure
  - Raised plasma glucose
- 
- Total N=5530
  - N-684 had Metabolic Syndrome (12% of “healthy” women)

# Pregnancy Outcome Metabolic Syndrome/BMI

- GDM
- SGA
- Preeclampsia
- Uncomplicated Pregnancy






**Metabolic  
syndrome and  
time to  
pregnancy: a  
retrospective  
study of  
nulliparous  
women**

- JA Grieger, LE Grzeskowiak, LG Smithers, T Bianco-Miotto, SY Leemaqz, P Andraweera, L Poston, LM McCowan, LC Kenny, J Myers, JJ Walker, RJ Norman, GA Dekker and CT Robert

BJOG. 2019 Jun;126(7):852-862

# Women with Metabolic Syndrome

- Took 1 month longer to conceive
  - 62% more likely to be infertile
  - Reduced HDL-C & raised TG appear to be the major drivers of delayed conception
- 

# Summary of Dietary data N= 3196

## • Pre-conception

- $\geq 3$  serves Fast Food/week  $\uparrow$  risk 2.45 fold for GDM
- $\geq 1$  serve Green Veg/day  $\downarrow$  risk for SGA by 27% & for GDM by 37%
- $\geq 1$  serve Fruit/day  $\downarrow$  risk for SGA by 28% & for sPTB by 34%



## • 15 weeks' gestation

- $\geq$  serve Green Veg/day  $\downarrow$  risk for SGA by 23%
- $\geq$  serve Fruit/day  $\downarrow$  risk for sPTB by 34%



**Asthma  
treatment  
impacts time to  
pregnancy:  
evidence from  
the international  
SCOPE study**

- Luke E. Grzeskowiak, Lisa G. Smithers, Jessica A. Grieger, Tina Bianco-Miotto, Shalem Y. Leemaqz, Vicki L. Clifton, Lucilla Poston, Lesley M. McCowan, Louise C. Kenny, Jenny Myers, James J. Walker, Robert J Norman, Gus A. Dekker and Claire T. Roberts

European Respiratory Journal 2018 51: 1702035

## Use of short-acting relievers but not long-term preventers is associated with reduced fertility in asthmatic women

- 8–13% of pregnancies
- significant perinatal morbidities and mortality
- **SABAs** was associated with reduced fertility
- ICS with or without LABAs was not associated with reduced fertility
- Women with asthma planning a pregnancy should be encouraged to continue taking their preventer medications.

**Early pregnancy  
maternal trace  
mineral status and  
the association  
with adverse  
pregnancy  
outcome in a  
cohort of  
Australian women**

- Rebecca L.Wilson, TinaBianco-Miotto, Shalem Y.Leemaqz, Luke E.Grzeskowiak, Gustaaf A.Dekker and Claire T.Roberts

Journal of Trace Elements in Medicine and Biology, Volume 46,  
March 2018, Pages 103-109

**Maternal  
Selenium,  
Copper and Zinc  
Concentrations  
in Early  
Pregnancy, and  
the Association  
with Fertility**


Jessica A. Grieger, Luke E. Grzeskowiak, Rebecca L. Wilson, Tina Bianco-Miotto, Shalem Y. Leemaqz, Tanja Jankovic-Karasoulos , Anthony V. Perkin, Robert J. Norman, Gus A. Dekker and Claire T. Roberts.

Nutrients 2019, 11(7), 1609

## **Fertility** is influenced by maternal trace element concentrations

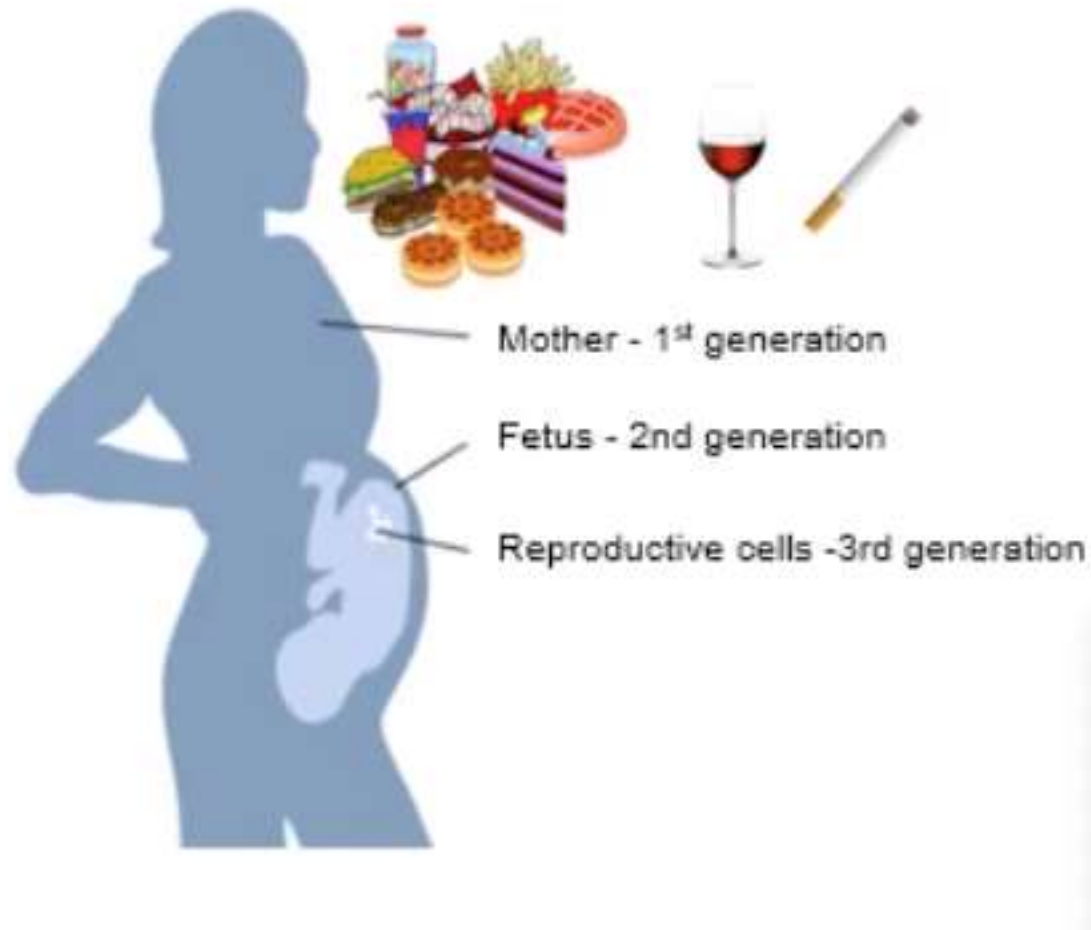
- Low plasma Zinc and low selenium increase Time To Pregnancy
- Low selenium is associated with sub-fertility (>12 moths to conception)

## Early pregnancy maternal trace mineral status and the association with **adverse pregnancy outcome**

- High Copper increase in Pregnancy Complications
  - Low Zinc + low Copper reduce Pregnancy Complications.
- 



# Transgenerational effects through Pregnancy



# Take home message

- Pre- and early pregnancy diet is associated with fertility and health in pregnancy
  - Reproductive events shape life long health and chronic disease
  - influenced by maternal diet
  - Advice that we give to our patients is of utmost importance
  - Advice must be evidence based and not commercially driven
  - Fertility, conception, pregnancy and long-term health are a continuum.
- 