# GESTATIONAL DIABETES

## A STATE OF INSULIN RESISTANCE

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# GESTATIONAL DIABETES

## PREDICTION & PREVENTION

# HBA1C

| Optimising Sensitivity* | | | | |
|---|---|---|---|---|
| | Women with risk factors | Women without risk factors | All women | |
| | Trimester 1 and 2/3 | | Trimester 1 | Trimester 2/3 |
| Sensitivity (95% CI) | 0.88 (0.75-0.94) | 0.86 (0.47-0.98) | 0.93 (0.66-0.99) | 0.82 (0.70-0.89) |
| Specificity(95% CI) | 0.26 (0.15-0.41) | 0.32 (0.06-0.77) | 0.22 (0.05-0.62) | 0.40 (0.29-0.54) |
| LR+ (95% CI) | 1.18 (0.93-1.42) | 1.28 (0.40-2.15) | 1.18 (0.71-1.66) | 1.37 (1.04-1.71) |
| LR- (95% CI) | 0.49 (0.05-0.92 | 0.43 (0.00-1.34) | 0.34 (0.00-1.08) | 0.45 (0.18-0.73) |
| Optimal Cut-off (%) | 5.0 | 5.2 | 5.2 | 5.1 |
| **HbA1c value (mmol/mol)** | **31** | **33** | **33** | **32** |
| AUC | 0.67 | 0.69 | 0.63 | 0.71 |
| Number of studies | 17 | 6 | 6 | 17 |

| Optimising Specificity | | |
|---|---|---|
| | Population = with or without risk factors<br>Trimester = 2nd/3rd | Population = with risk factors<br>Trimester = 2nd/3rd |
| Sensitivity (95% CI) | 0.36 (0.23-0.52) | 0.35 (0.20-0.53) |
| Specificity (95% CI) | **0.90 (0.79-0.95)** | **0.91 (0.78-0.97)** |
| LR+ (95% CI) | 3.55 (0.51-6.58) | 3.77 (0.00-7.75) |
| LR- (95% CI) | 0.71 (0.53-0.89) | 0.72 (0.52-0.92) |
| Optimal cut-off (%) | 5.7 | 5.9 |
| **HbA1c value (mmol/mol)** | 39 | 41 |
| AUC | 0.71 | 0.70 |
| Number of studies | 17 | 13 |

Meta-Analysis > Curr Opin Obstet Gynecol. 2020 Oct;32(5):322-334.
doi: 10.1097/GCO.0000000000000648.

**The accuracy of haemoglobin A1c as a screening and diagnostic test for gestational diabetes: a systematic review and meta-analysis of test accuracy studies**

Chiamaka Esther Amaefule [1], Archana Sasitharan [1], Princee Kalra [1], Stamatina Iliodromoti [1], Mohammed S B Huda [2], Ewelina Rogozinska [1], Javier Zamora [1 3], Shakila Thangaratinam [4]

# Predictors of GDM

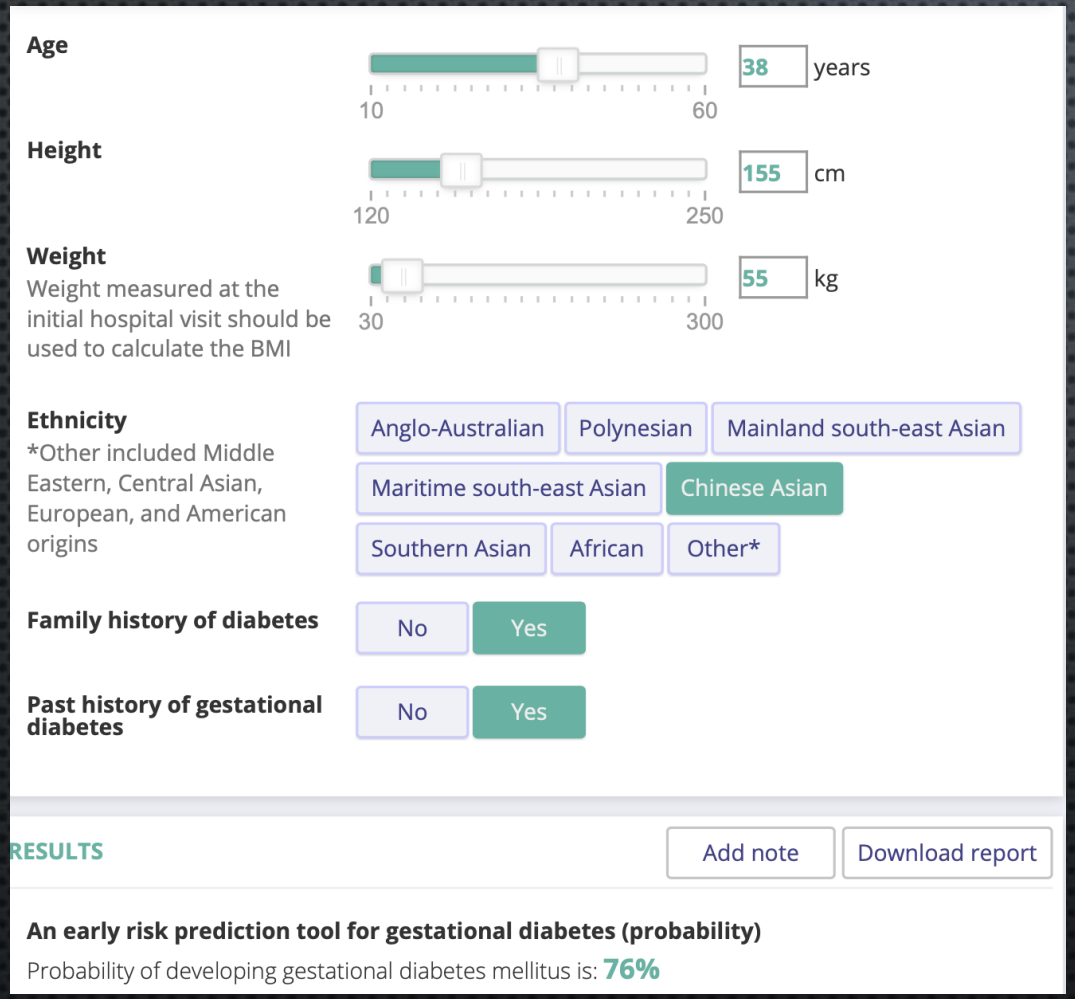
| Predictors |
| --- |
| Maternal age |
| Weight |
| Body mass index, before pregnancy |
| Body mass index |
| Blood pressure |
| History of gestational diabetes mellitus |
| Family history of diabetes mellitus (first or second degree) |
| History of chronic hypertension |
| Ethnicity |
| Parity |
| Poor obstetric outcome |
| History of macrosomia |
| Method of conception |
| Smoking |
| Glucose |

External validation of prognostic models to predict risk of gestational diabetes mellitus in one Dutch cohort: prospective multicentre cohort study

Marije Lamain-de Ruiter,[1] Anneke Kwee,[1] Christiana A Naaktgeboren,[2] Inge de Groot,[3] Inge M Evers,[4] Floris Groenendaal,[5] Yolanda R Hering,[6] Anjoke J M Huisjes,[7] Cornel Kirpestein,[8] Wilma M Monincx,[9] Jacqueline E Siljee,[10] Annewil Van 't Zelfde,[11] Charlotte M van Oirschot,[12] Simone A Vankan-Buitelaar,[13] Mariska A A W Vonk,[14] Therese A Wiegers,[15] Joost J Zwart,[16] Arie Franx,[1] Karel G M Moons,[2] Maria P H Koster[1,17]

BMJ 2016

# IMPLEMENTATION: Prediction model for GDM




**AN EARLY RISK PREDICTION TOOL FOR GESTATIONAL DIABETES**

The current model is intended to be used at the first-trimester of the pregnancy. This risk prediction tool identifies women at high risk of Gestational Diabetes Mellitus (GDM).

Research authors: Helena J. Teede, Cheryce L. Harrison, Wan T. Teh, Eldho Paul, Carolyn A. Allan

Result interpretation

Temporal external validation of the model resulted in a c index of 0.703. Indicating a 70.3% probability that a randomly selected patient with GDM will receive a higher risk score than a randomly selected patient without GDM.

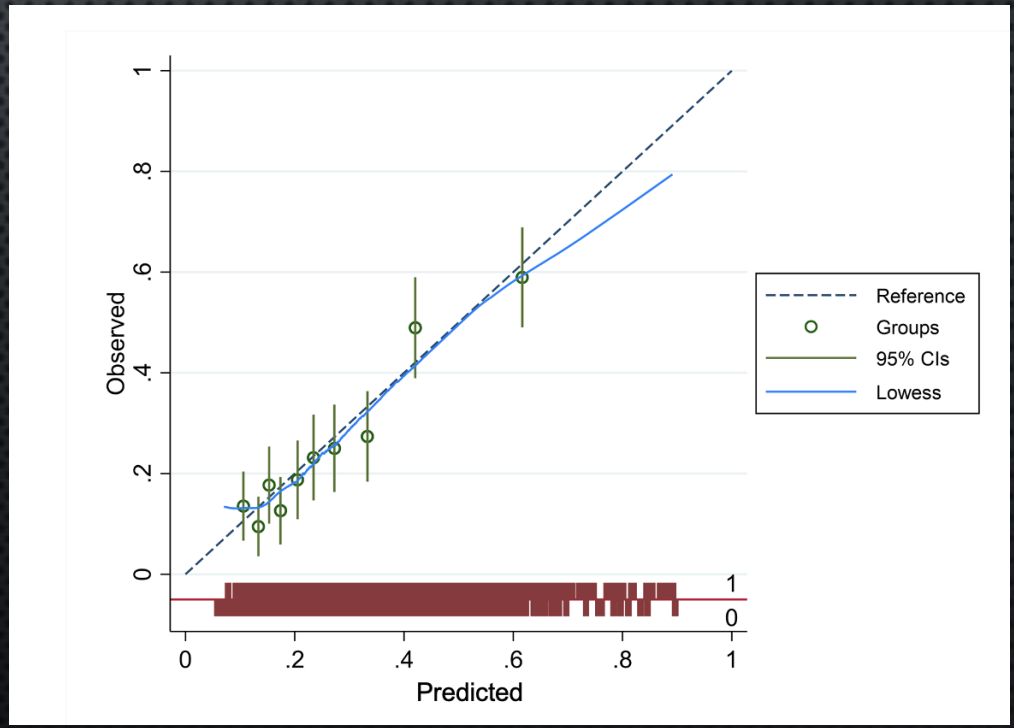
https://www.evidencio.com/models/show/2106

# Prediction of GDM complications

PerSONAL GDM model

composite outcome: hypertensive disorder of pregnancy, large-for-gestational age neonate, neonatal hypoglycaemia requiring intravenous therapy, shoulder dystocia, perinatal death, neonatal bone fracture and nerve palsy

fasting and 1 hour post load glucose from the diagnostic OGTT
gestational age of GDM diagnosis
previous macrosomia or LGA
previous pre-eclampsia
Ethnicity
weight at GDM diagnosis
parity



# GESTATIONAL DIABETES

PREDICTION

**PREVENTION**

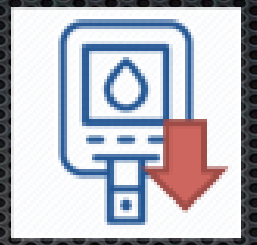
**36 teams**
**17 countries**
**12,526 women**

i-WIP International Weight Management in Pregnancy IPD network

Queen Mary University of London
King's College London
Robinson Research Institute
Monash University
KHLim
University of Antwerp
UZ Leuven
Sports Lifestyle Health
Herlev Hospital
University of Copenhagen
University of Tampere
NTNU – Trondheim Norwegian University of Science and Technology
UKK Institute
Oslo University Hospital
St. Olavs Hospital
Norwegian School of Sport Sciences
Sørlandet Sykehus
The University of Western Australia
Cal Poly
UNICAMP
UFCSPA
The University of Melbourne
The University of North Carolina at Chapel Hill
University of Manitoba

BMJ 2017;358:j3119

IPD+non-IPD



Gestational diabetes

| Outcomes | No of studies (No of women) | | Intervention: event/No event | | Control: event/No event | | Odds ratio (95% CI) | | $I^2$ (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | IPD | IPD and non-IPD | IPD | IPD and non-IPD | IPD | IPD and non-IPD | IPD | IPD and non-IPD | IPD | IPD and non-IPD |
| Gestational diabetes: | | | | | | | | | | |
| Overall | 27 (9427) | 59 (16 885) | 584/4333 | 974/7764 | 571/3939 | 1046/7101 | 0.89 (0.72 to 1.10) | 0.76 (0.65 to 0.89) | 23.8 | 36.8 |

LARGE & PRECISE

# Prevention of GDM

## ESTEEM: Mediterranean diet in pregnancy

**Effect of simple, targeted diet in pregnant women with metabolic risk factors on pregnancy outcomes: A randomised trial**

| ESTEEM | St Carlos |
|---|---|
| 2014-2015 | 2015 |
| UK | Spain |
| 1138 women | 874 women |
| GDM | GDM |

PLOS ONE

RESEARCH ARTICLE

A Mediterranean diet with additional extra virgin olive oil and pistachios reduces the incidence of gestational diabetes mellitus (GDM): A randomized controlled trial: The St. Carlos GDM prevention study

| Outcome | Study or Subgroup | Experimental Events | Total | Control Events | Total | Weight | Odds Ratio M-H, Random, 95% CI | Odds Ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|---|---|
| Gestational diabetes | ESTEEM | 84 | 553 | 124 | 585 | 54.4% | 0.67 [0.49, 0.90] | |
| | St Carlo | 74 | 434 | 103 | 440 | 45.6% | 0.67 [0.48, 0.94] | |
| | **Total (95% CI)** | | **987** | | **1025** | **100.0%** | **0.67 [0.53, 0.84]** | |
| | Total events | 158 | | 227 | | | | |

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 0.00$, $df = 1$ ($P = 0.97$); $I^2 = 0\%$

Test for overall effect: $Z = 3.50$ ($P = 0.0005$)

## ESTEEM St Carlos

| 2014-2015 | 2015 |
|---|---|
| UK | Spain |
| 1138 women | 874 women |
| GDM | GDM |

PLOS ONE

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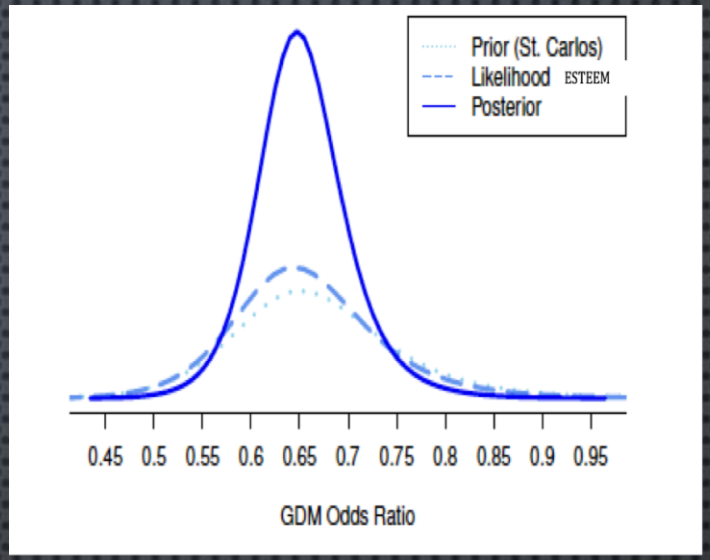


average risk reduction of 35%

95% probability that the true risk reduction lies between 19% and 48%.

| Outcome | Study or Subgroup | Experimental Events | Total | Control Events | Total | Weight | Odds Ratio M-H, Random, 95% CI | Odds Ratio M-H, Random, 95% CI |
|---|---|---|---|---|---|---|---|---|
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Heterogeneity: Tau² = 0.00; Chi² = 0.00, df = 1 (P = 0.97); I² = 0%

Test for overall effect: Z = 3.50 (P = 0.0005)

LARGE & PRECISE

# IMPACT

Department of Health | An Roinn Sláinte | Männystrie O Poustie

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## Physical activity advice for expectant mothers – Chief Medical Officer

Date published: 29 June 2017

Topics: Professional medical and environmental health advice , Midwifery

Chief Medical Officer, Dr Michael McBride, along with his counterparts in England, Scotland and Wales, have jointly released new advice on physical activity for expectant mothers – believed to be the first of its kind in the world.

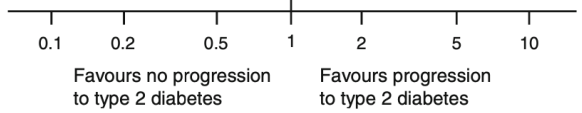
This new advice is being issued in the form of an infographic, aimed at providing midwives, nurses, GPs, obstetricians, gynaecologists, as well as the leisure sector, with the latest evidence on physical activity during pregnancy.

### Latest news

- Reappointment of four non–executive members of the Health and Social Care Regulation and Quality Improvement Authority (RQIA)
  18 April 2018
- Message from DoH Director of Communications David Gordon
  12 April 2018
- The Department of Health seeks to amend the Fire and Rescue Services (Northern Ireland) Order 2006

# Prediction of Type 2 diabetes after GDM

| Risk factor | No. of studies | No. of women with GDM | RR | $I^2$ | *p* value |
|---|---|---|---|---|---|
| Body mass index (kg/m²) | | | | | |
| >25 | 5 | 4,795 | 3.18 (1.96, 5.16) | 77% | <0.001 |
| >27 | 4 | 1,251 | 2.52 (1.69, 3.74) | 23% | <0.001 |
| >30 | 5 | 4,255 | 2.85 (2.21, 3.69) | 45% | <0.001 |
| Mean | 14 | 5,350 | 1.95 (1.60, 2.31) | 65% | <0.001 |
| Family history | 22 | 6,895 | 1.70 (1.47, 1.97) | 13% | <0.001 |
| Ethnicity | | | | | |
| Non-white vs white | 10 | 48,508 | 1.49 (1.14, 1.94) | 88% | 0.003 |
| Age (years) | | | | | |
| >30 | 3 | 2,539 | 1.36 (0.69, 2.67) | 90% | 0.370 |
| >35 | 5 | 2,011 | 1.21 (0.58, 2.52) | 74% | 0.620 |
| Mean | 17 | 6,549 | 1.20 (1.09, 1.34) | 0% | <0.001 |
| Early GA at GDM diagnosis | 8 | 4,026 | 2.13 (1.52, 3.56) | 64% | <0.001 |
| Mean blood glucose (mmol/l) | | | | | |
| Fasting glucose | 14 | 6,043 | 3.57 (2.98, 4.04) | 90% | <0.001 |
| 1 h glucose (100 g OGTT) | 5 | 1,923 | 3.05 (2.40, 3.63) | 64% | <0.001 |
| 2 h glucose (100 g OGTT) | 5 | 1,923 | 3.46 (2.60, 4.10) | 80% | <0.001 |
| 3 h glucose (100 g OGTT) | 5 | 1,923 | 3.20 (2.54, 3.75) | 65% | <0.001 |
| 2 h glucose (75 g OGTT) | 5 | 1,947 | 3.22 (2.65, 3.71) | 57% | <0.001 |
| Mean $HbA_{1c}$ | 6 | 1,545 | 2.56 (2.00, 3.17) | 54% | <0.001 |
| Insulin use in pregnancy | 24 | 7,723 | 3.66 (2.78, 4.82) | 71% | <0.001 |
| Hypertension in pregnancy | 3 | 35,826 | 1.38 (1.32, 1.45) | 0% | <0.001 |
| Preterm delivery (<37 weeks) | 3 | 1,599 | 1.81 (1.35, 2.43) | 0% | <0.001 |
| Mean gestational weight gain | 6 | 1,578 | 0.74 (0.44, 1.19) | 69% | 0.220 |
| Parity | | | | | |
| Multiparous vs nulliparous | 6 | 2,039 | 1.23 (1.01, 1.50) | 0% | 0.040 |
| Mean | 6 | 3,558 | 1.10 (0.88, 1.37) | 39% | 0.390 |
| No breast feeding | 4 | 1,448 | 0.77 (0.48, 1.22) | 9% | 0.260 |
| Birthweight | | | | | |
| Macrosomia (birthweight >4 Kg) | 3 | 1,021 | 0.91 (0.44, 1.86) | 0% | 0.790 |
| Mean | 7 | 2,719 | 1.19 (0.86, 1.58) | 60% | 0.270 |




BMI
Ethnicity
Glycaemia
Early diagnosis of GDM

Diabetologia (2016) 59:1403–1411
DOI 10.1007/s00125-016-3927-2

Meta-Analysis

**Quantification of the type 2 diabetes risk in women with gestational diabetes: a systematic review and meta-analysis of 95,750 women**

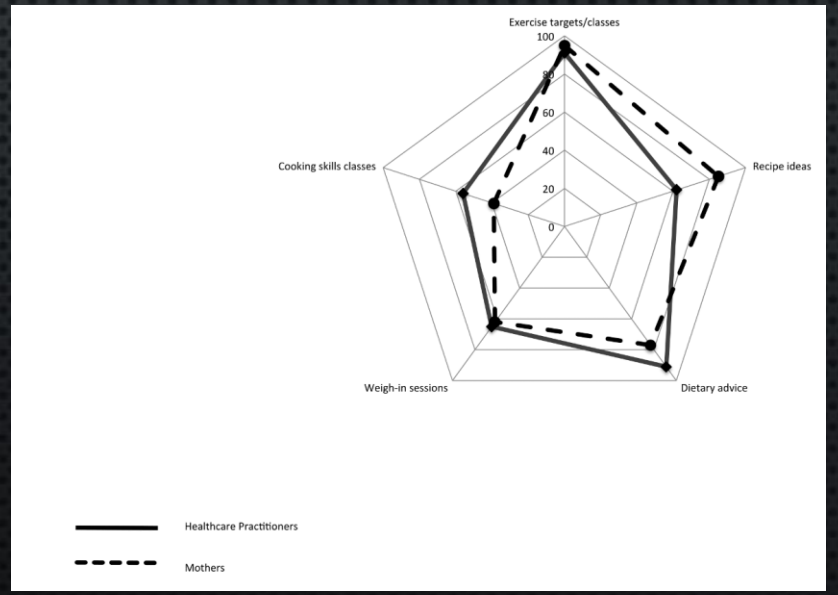
Girish Rayanagoudar[1] · Amal A. Hashi[1] · Javier Zamora[1,2,3] · Khalid S. Khan[1,4] · Graham A. Hitman[1] · Shakila Thangaratinam[1,4]

# Prevention of Type 2 diabetes after GDM

# Prevention of Type 2 diabetes after GDM

## Views of women and healthcare professionals

- 80% of women in this survey were not ready to engage in a postpartum lifestyle intervention within the first 6 months of giving birth
- 52% of health professionals recommended they should be engaged in the first six weeks
- A community setting was preferred to a medical one
- Mothers wanted recipe ideas (95%) in preference to general dietary advice (76%) or cooking skills courses (39%)
- Walking was the main form of exercise for 79% of mothers



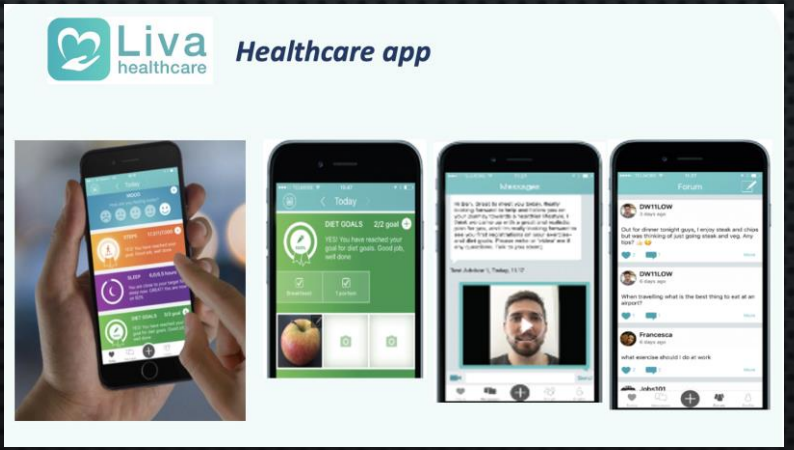

**Women highlighted difficulty in focusing on their own health goals because of competing demands of looking after a baby**

# Prevention of Type 2 diabetes after GDM

## Views of women and healthcare professionals

- OMAHA pilot - continuing metformin after delivery in postnatal period to prevent GDM

- MERIT – Mediterranean diet in postnatal period to prevent GDM



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