



# Experience of CGM in pregnancy in women with Type 2 and gestational diabetes.

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# Disclosures and declarations

- Previous recipient of speaker fees from Dexcom
- I am passionate about preconception care

# Overview

- Diabetes and pregnancy; why is it important and challenging
- Evidence for using CGM for women with type 2 diabetes in pregnancy
- Current guidance
- Practice in Sheffield
- Digital inequality
- The importance of preconception care

# Why are we concerned about diabetes and pregnancy?

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## Risks to Mum



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## Risks to baby



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## Risks to Mum

- Worsening of pre-existing complications
- Pre-eclampsia
- Hypoglycaemia unawareness

## Risks to baby



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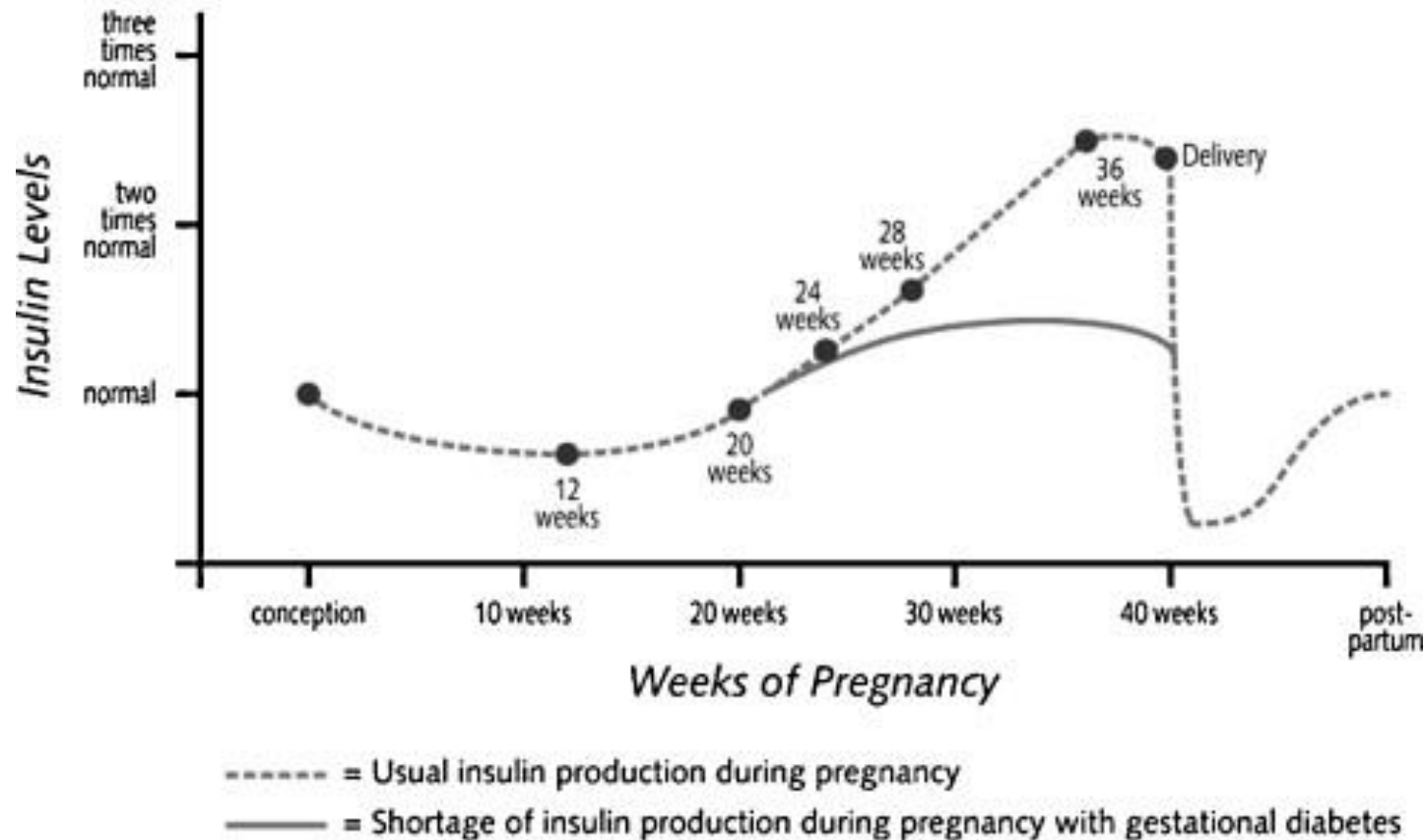
## Risks to baby

- Heart defects
- Spinal defects
- Miscarriage
- Stillbirth
- Macrosomia
  - Birth injury
- Hypoglycaemia
- Jaundice
- Obesity in later life



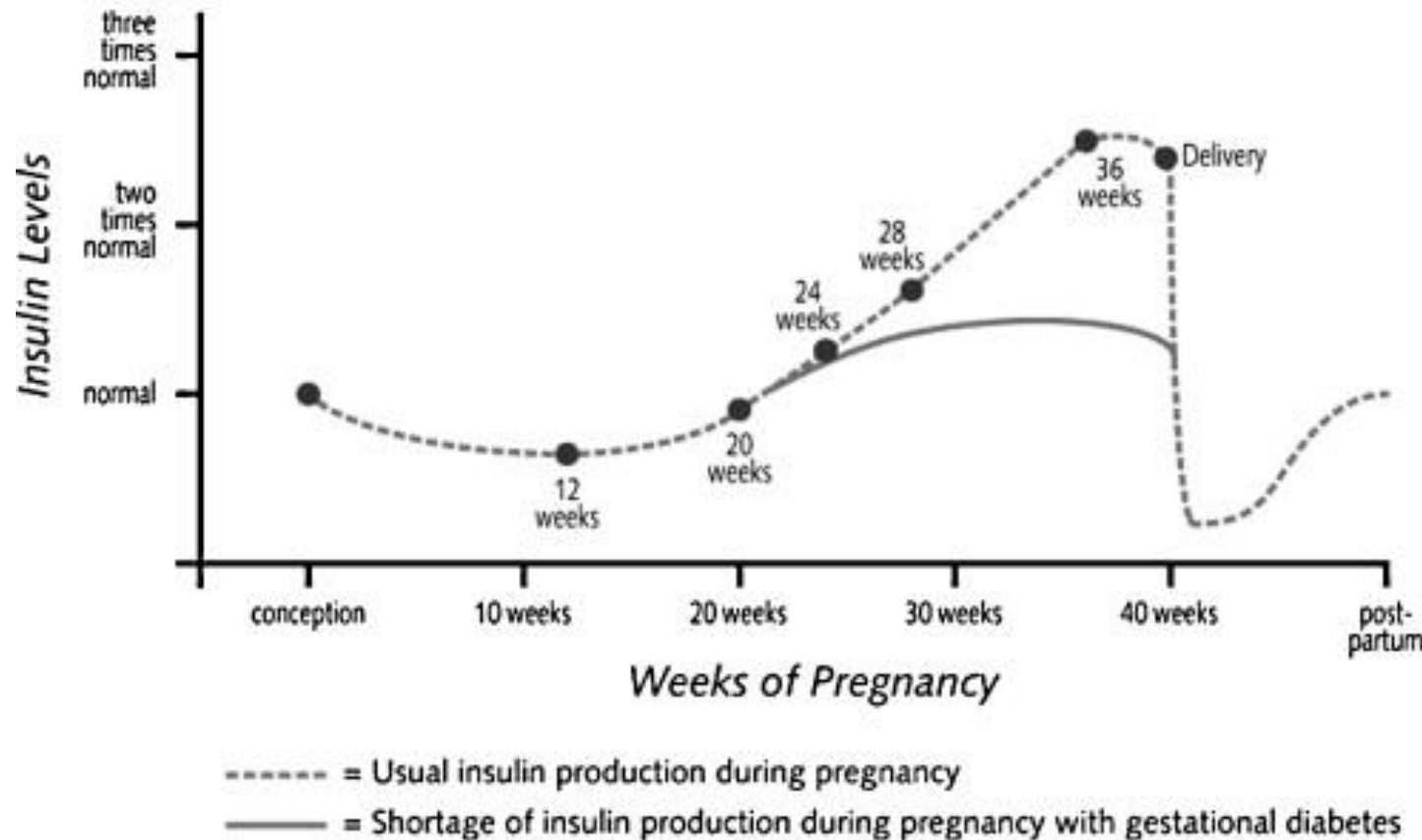
# Pregnancy – A state of insulin resistance

## Insulin Requirements during Pregnancy



# Pregnancy – A state of insulin resistance

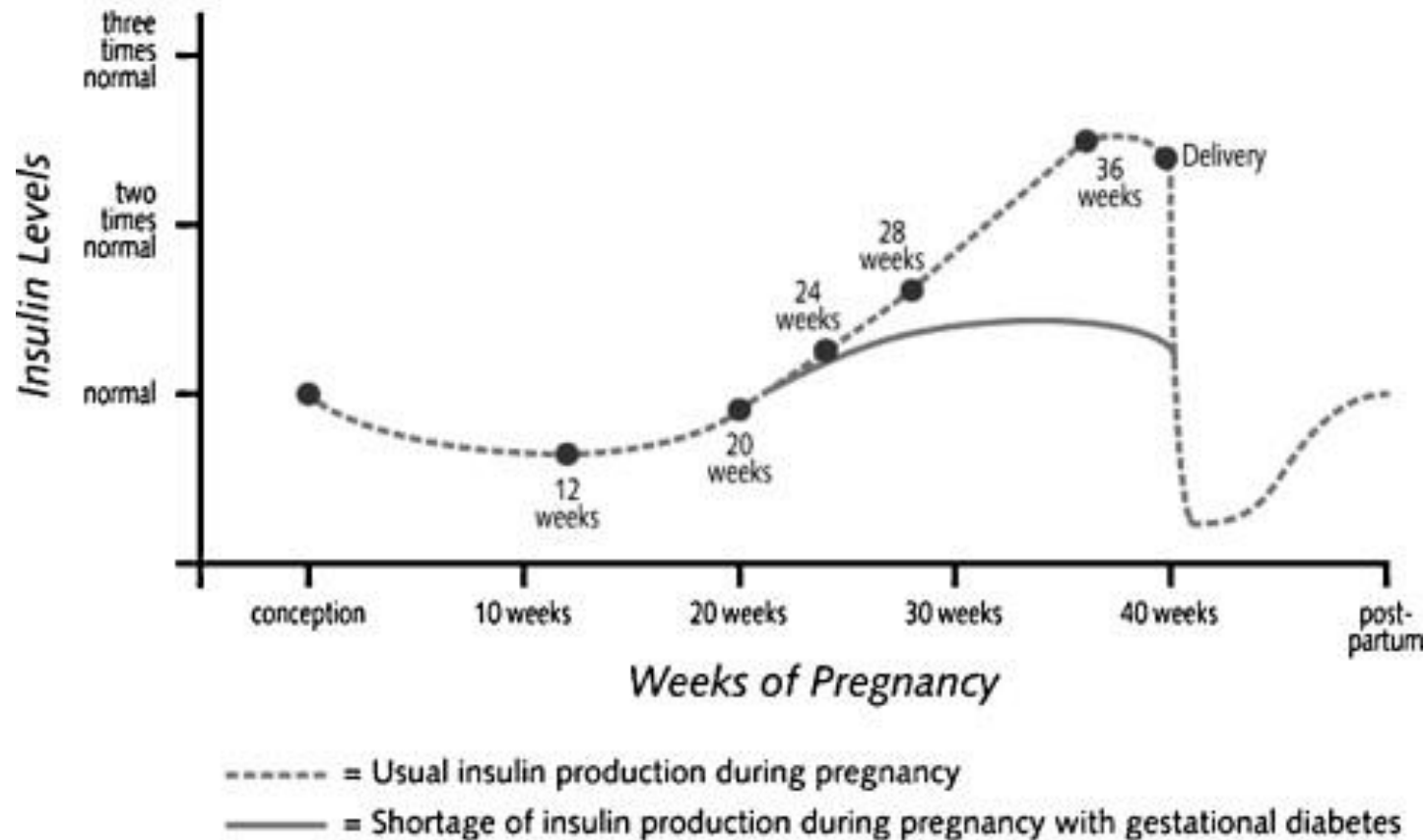
## Insulin Requirements during Pregnancy



- First trimester insulin sensitivity increases

# Pregnancy – A state of insulin resistance

## Insulin Requirements during Pregnancy



- First trimester insulin sensitivity increases
- Late second and third trimester insulin resistance increases

# National Pregnancy in Diabetes (NPID) Audit Report 2020



Digital

England and Wales  
14th October 2021



Information and technology  
for better health and care

## NPID audit results 2013 to 2020

**2013 – 128 organisations**

**2016 – 172 organisations**

**2020 – 172 organisations**

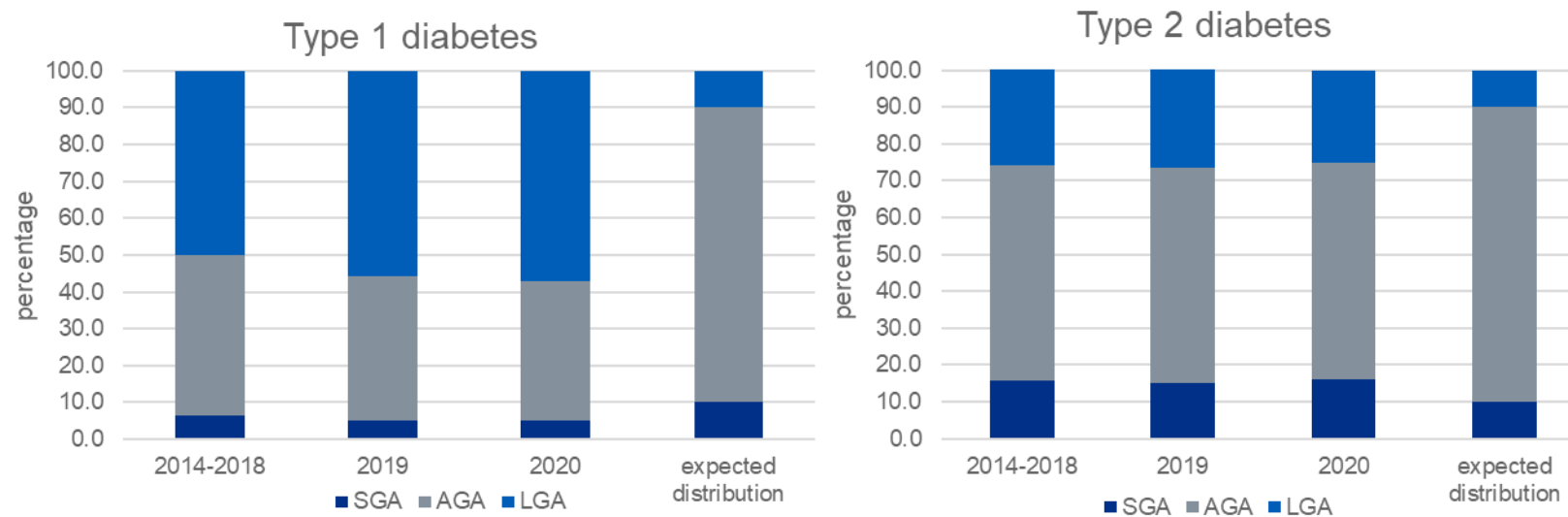
DiabetesType	Type 1	Type 2
2013	55%	45%
2016	51%	49%
2020	46%	54%

# Large and small for gestational age babies

- 57% of type 1 and 25% of type 2 babies were LGA (using Gestation Related Optimal Weight ([GROW](#)) centiles)
- LGA rates are high and increasing in type 1 diabetes
- SGA rates are higher in type 2 diabetes

GROW centiles adjust birthweight for maternal ethnicity, height, weight and gestational age at delivery.

**Figure 25: Large for Gestational Age (LGA), Appropriate for Gestational Age (AGA) and Small for Gestational Age (SGA) infants by diabetes Type, 2014-20**



# Stillbirth

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	Diabetes	England and Wales
2014	1.3%	0.5%
2016	1%	0.4%
2020	1.2%	0.4%

# CONCEPTT

## Continuous Glucose Monitoring in Women with Type 1 Diabetes in Pregnancy Trial

- ❖ International, multicentre, randomised controlled trial
- ❖ Women with type 1 diabetes in early pregnancy or planning pregnancy receiving intensive insulin therapy
- ❖ Compared CGM to capillary glucose monitoring
- ❖ Outcomes
  - HbA1c
  - Maternal and neonatal outcomes



Feig DS et al.; *Continuous glucose monitoring in pregnant women with type 1 diabetes (CONCEPTT): a multicentre international randomised controlled trial. Lancet 2017;390:2347–2359*



# CONCEPTT

## Continuous Glucose Monitoring in Women with Type 1 Diabetes in Pregnancy Trial

- ❖ 325 women (215 pregnant, 110 planning)
- ❖ CGM was associated with
  - Increased Time in Range (TIR) (68% vs 61%;  $p=0.0034$ )
  - Lower HbA1c (45.9 vs 47.9  $p=0.0207$ )
  - Lower incidence of large for gestational age babies (53% vs 69%  $p=0.021$ )
  - Fewer neonatal intensive care admissions lasting more than 24 hours (27% vs 43%  $p=0.016$ )
  - Fewer incidences of neonatal hypoglycaemia (15% vs 27%  $p=0.025$ )



Feig DS et al.; *Continuous glucose monitoring in pregnant women with type 1 diabetes (CONCEPTT): a multicentre international randomised controlled trial. Lancet 2017;390:2347–2359*

*\*A non-dexcom system was used for this study.*

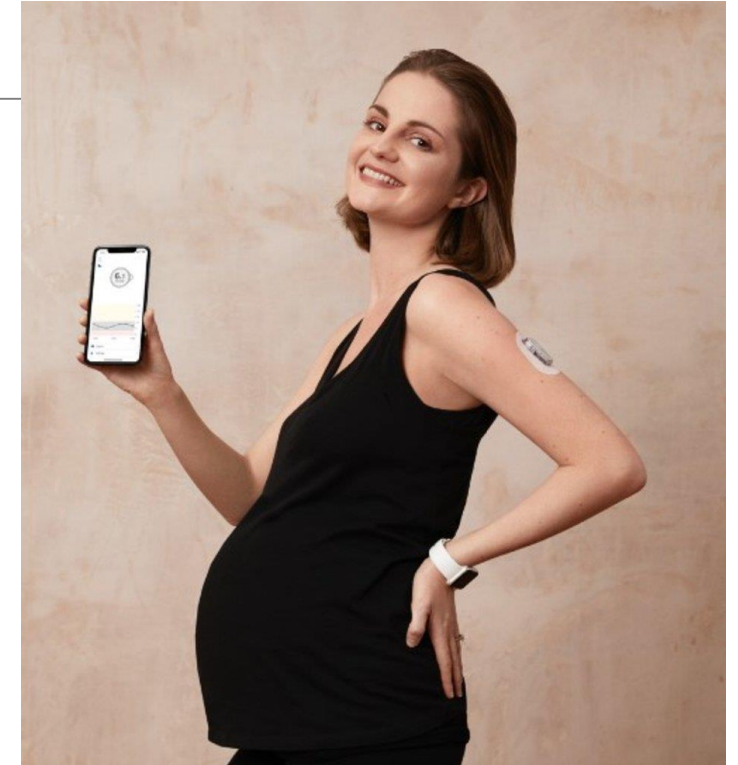
# CONCEPTT

## Continuous Glucose Monitoring in Women with Type 1 Diabetes in Pregnancy Trial

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### Number needed to treat (NNT) with CGM

- NNT= 6 to prevent one NICU admission
- NNT= 6 to prevent one large for gestational age baby
- NNT=8 to prevent one case of neonatal hypoglycaemia



Feig DS et al.; *Continuous glucose monitoring in pregnant women with type 1 diabetes (CONCEPTT): a multicentre international randomised controlled trial. Lancet 2017;390:2347–2359*

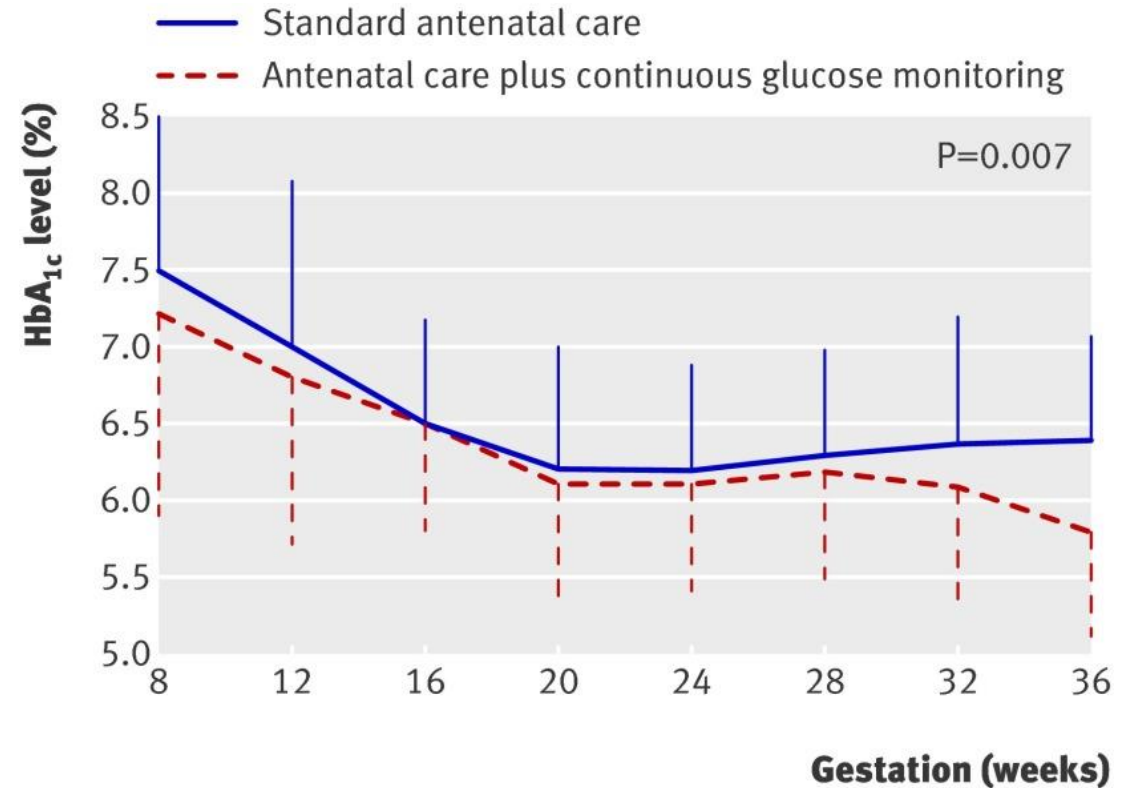
*\*A non-dexcom system was used for this study.*

# Effectiveness of continuous glucose monitoring in pregnant women with diabetes: randomised clinical trial

Murphy et al. BMJ 2008

- UK study
- 71 women
- Randomised to CGM and standard antenatal care vs standard antenatal care
- CGM arm showed lower HbA<sub>1c</sub> and a reduction in large for gestational age babies

- Ten women with T2
- CGM for seven days every 4-6 weeks
- Not real time
- White European women only



# The Effect of RT-CGM in pregnant women with diabetes.

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Secher et al. Diabetes Care, 2013.

- 123 women
- 31 with type 2 diabetes
- Real time CGM for 6-7 days at 8/12/21/27/35 weeks gestation
- Found no differences in average glucose, HbA1c or outcomes

# GlucO MOMS

Voormolen et al. Diabetes, Obesity and Metabolism 2018.

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- Continuous glucose monitoring during diabetic pregnancy;  
A multicentre randomised controlled trial.
- Netherlands
- Included women with diabetes and taking insulin before  
16 weeks
- 300 women in total which included 82 women with Type 2  
diabetes
- No difference in outcomes between the two groups

# Continuous glucose monitoring in T2DM in pregnancy and perinatal outcomes: a systematic review and meta – analysis.

Wilkie et al. American Journal of Obstetrics and Gynaecology, 2023.

- Three RCTs
- 56 women allocated CGM and 53 controls
- No difference in outcomes
  
- No evidence that CGM in Type 2 diabetes improves outcomes
- Review limited by small amount of data
- Recommend further research

# **NICE Guidelines NG3 Intermittently scanned CGM and continuous glucose monitoring. Update December 2020.**



Consider continuous glucose monitoring for pregnant women who are on insulin therapy but do not have type 1 diabetes,

- if: they have problematic severe hypoglycaemia (with or without impaired awareness of hypoglycaemia) or
- they have unstable blood glucose levels that are causing concern despite efforts to optimise glycaemic control. [2015, amended 2020]

NICE Guidance NG3. Type 1 diabetes in adults: diagnosis and management. 2015. Available from <https://www.nice.org.uk/guidance/ng18>

# Sheffield Teaching Hospitals NHS Foundation Trust

- Population 575000\*
- 6000 births a year
- 50 women with pre-existing diabetes a year
- 50.6% Type 2
- 600 women are diagnosed with gestational diabetes

\*[www.sheffield.gov.uk](http://www.sheffield.gov.uk)





## Sheffield Teaching Hospitals NHS Foundation Trust

- Offer all women with type 1 diabetes RT CGM in pregnancy
- Offer flash CGM to women with type 2 diabetes on MDI in pregnancy
  - Consider the use of CGM for women with either type 2 diabetes in pregnancy or gestational diabetes if concerns about blood glucose profile. Discussion required at MDT meeting
  - CGM stopped when the pregnancy ends
  - First sensor provided and then on prescription by GP





## Opportunity from CCG

- Pregnant women
- Type 2 diabetes or gestational diabetes
- On MDI before 20 weeks gestation
- Offer real time CGM
- Stopped after pregnancy ends

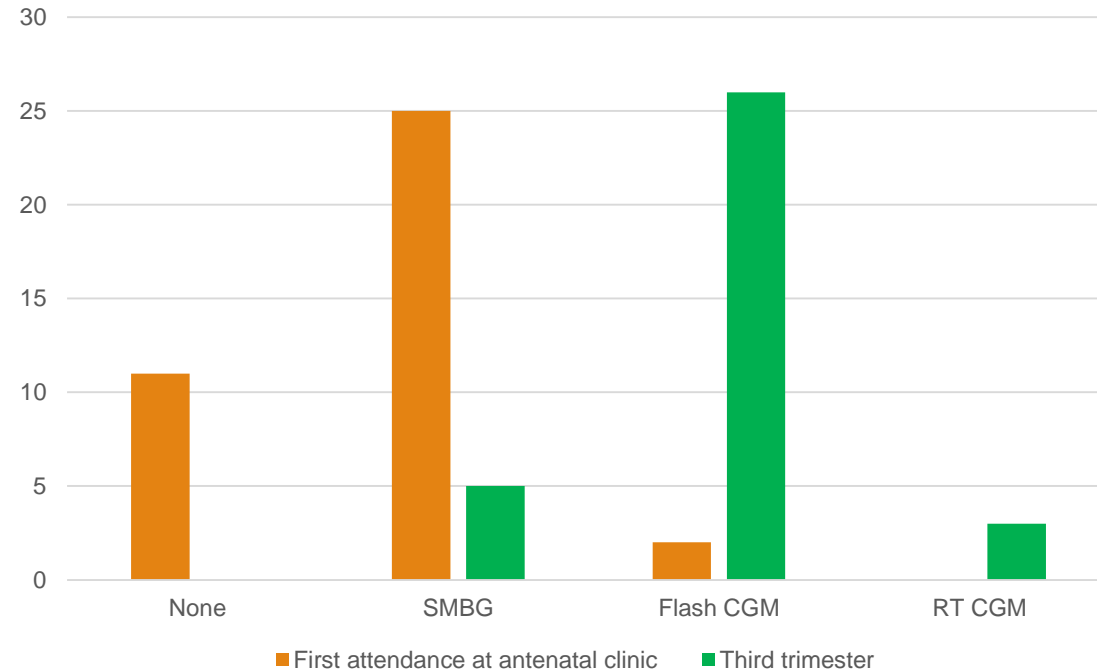
## Sheffield Teaching Hospitals NHS Foundation Trust 2022

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- 64 pregnancies
- 21 Type 1 diabetes
- 38 Type 2 diabetes
- 2CF, 2 MODY, 1 pancreatic



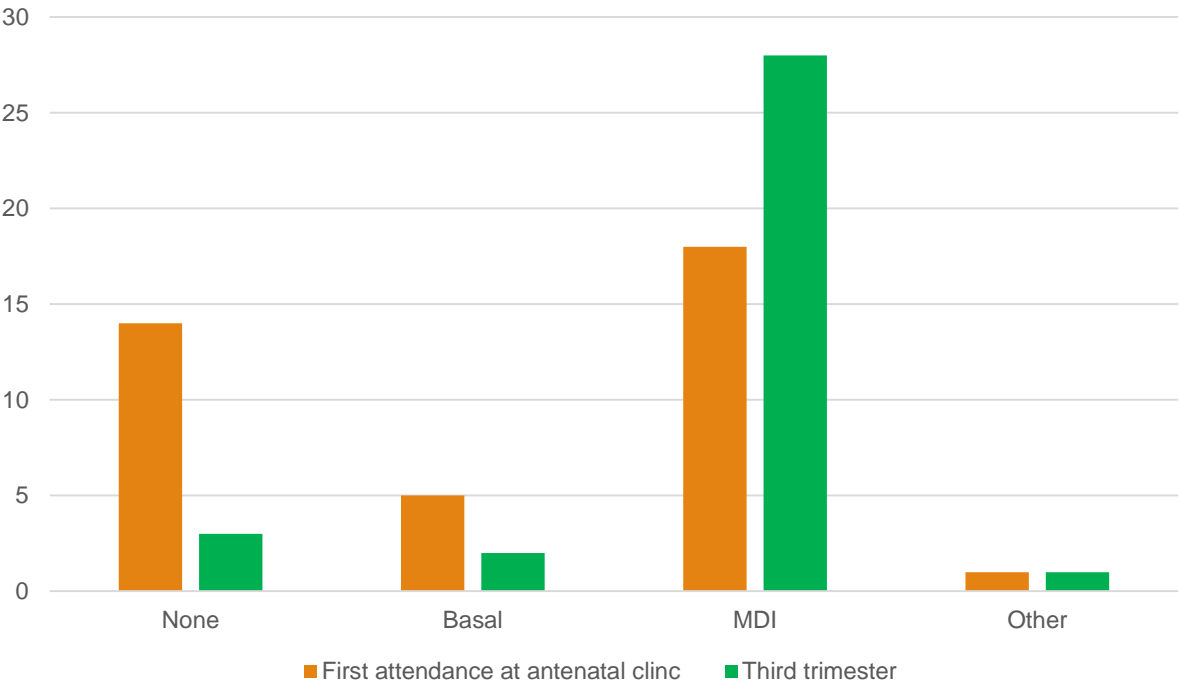
## Glucose monitoring



\* 25 year old with poor obstetric outcomes, out of area referral, BD mix, learning difficulties

\*\* 3 x Miscarriage, 1 x TOP

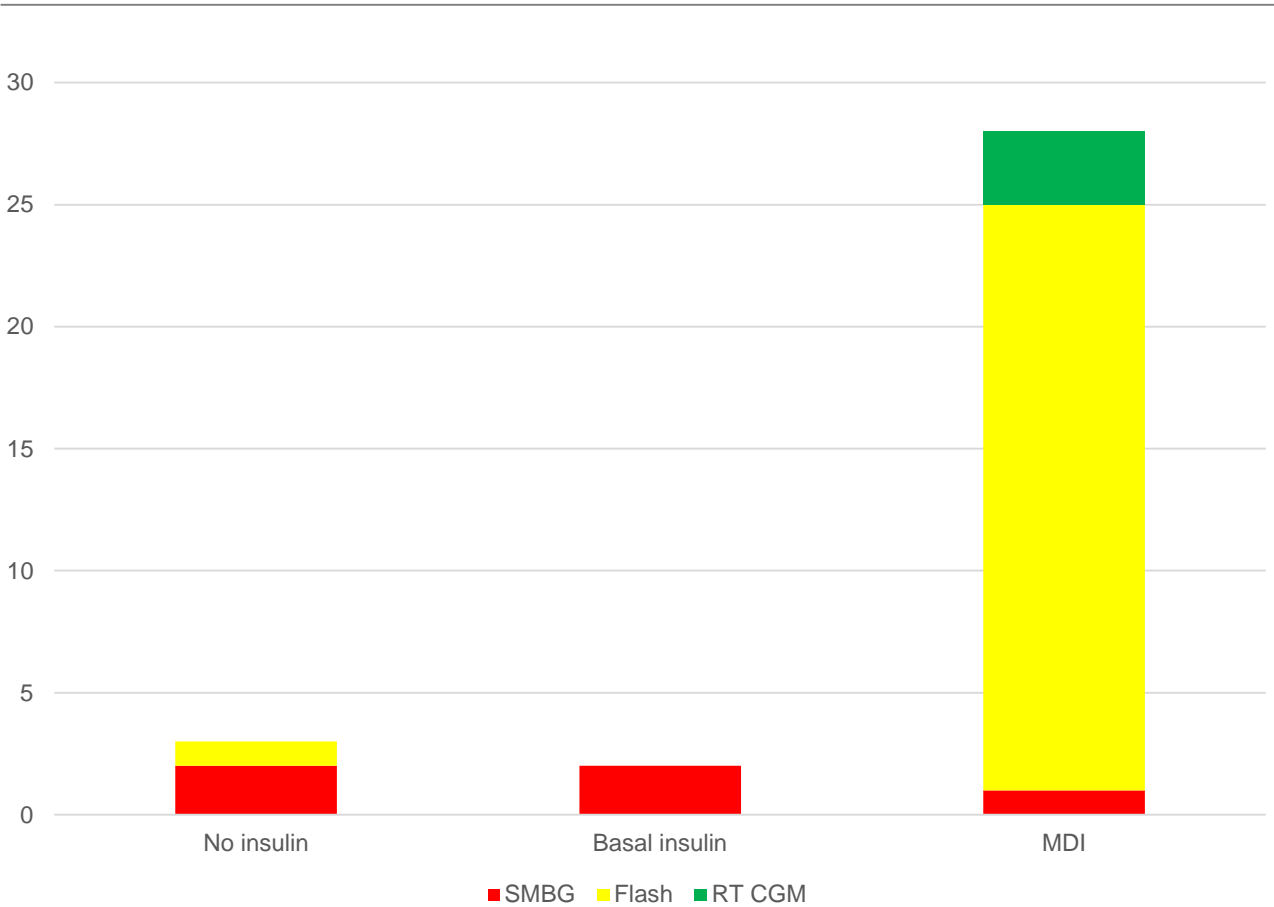
# Insulin therapy



\* QA insulin with meals

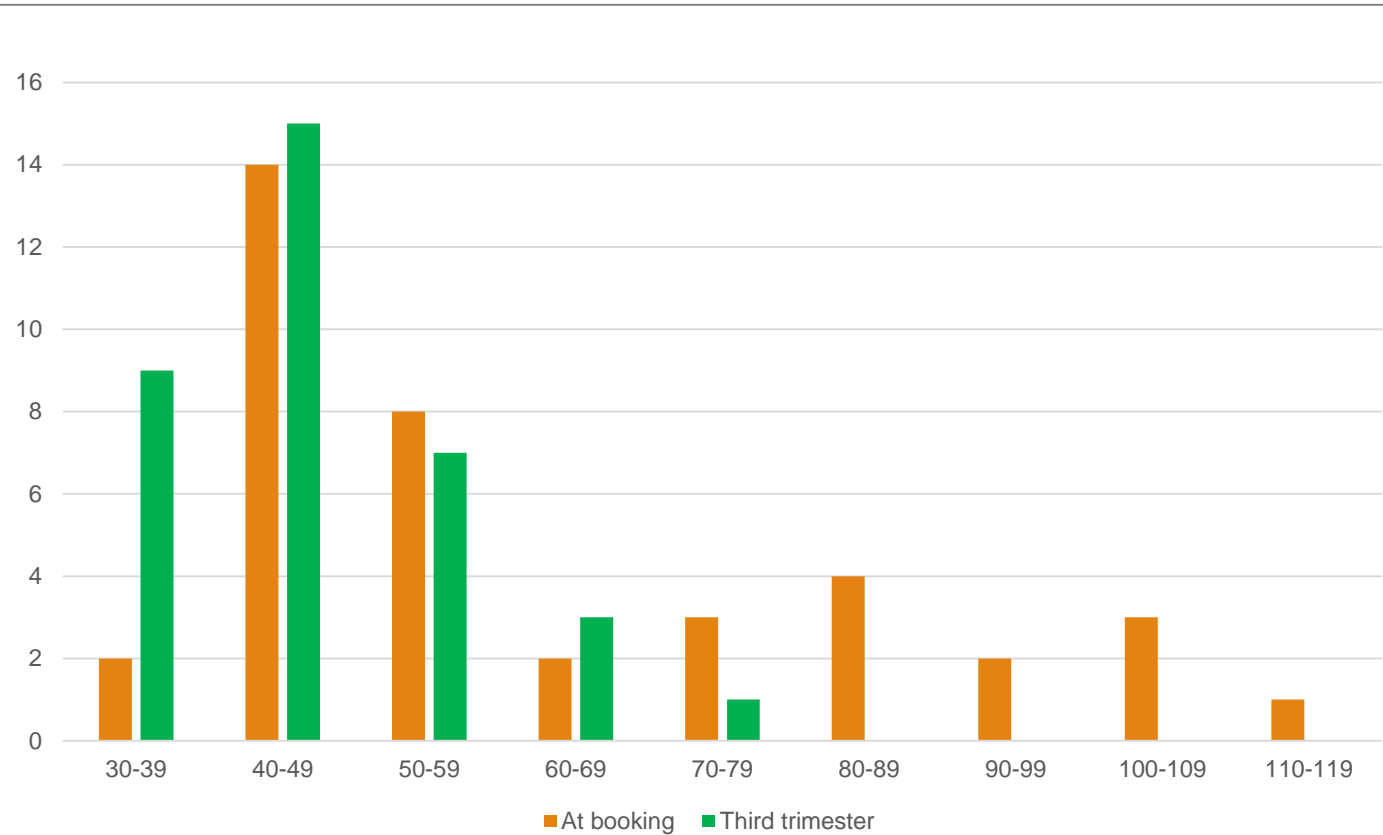
\*\* 3 x miscarriages, 1 x TOP

# Glucose monitoring and insulin therapy



\*QA insulin with meals

# HbA1c



## Outcomes

Glucose monitoring	HbA1c	IUFD	NICU	SCBU
SMBG	42	0	0	0
Flash	48	2*	5	3
RT CGM	39	0	0	0



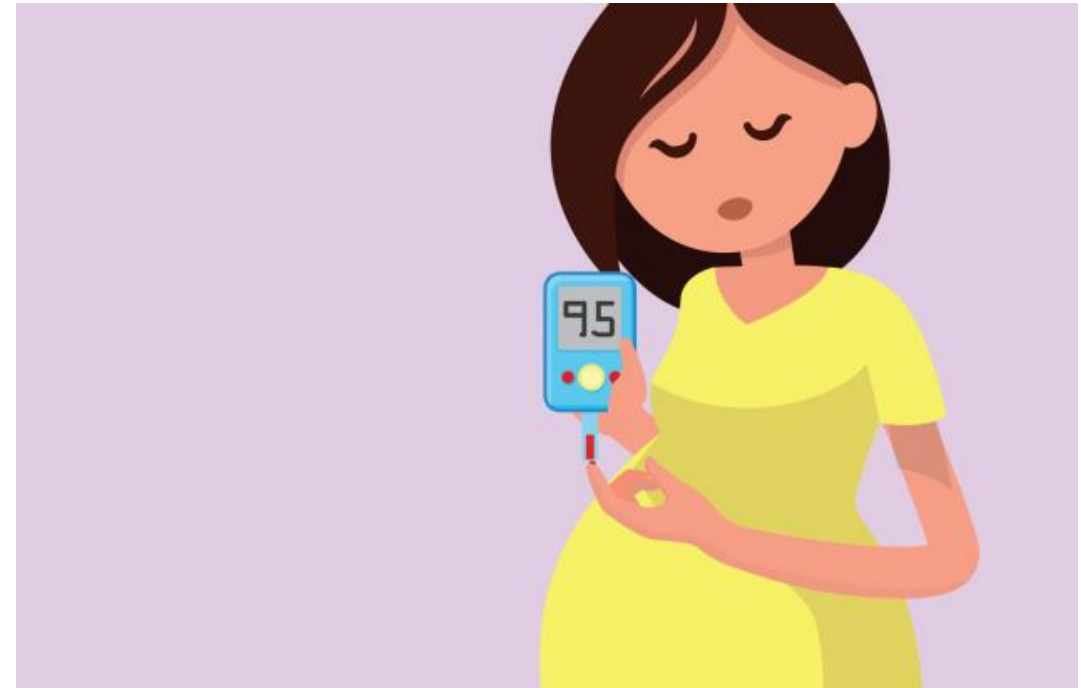
IUFD 24 weeks HbA1c 58 1<sup>st</sup> trimester and 40 in second trimester

IUFD 37 weeks HbA1c 58 1<sup>st</sup> trimester and 41 in third trimester



# What have we learnt?

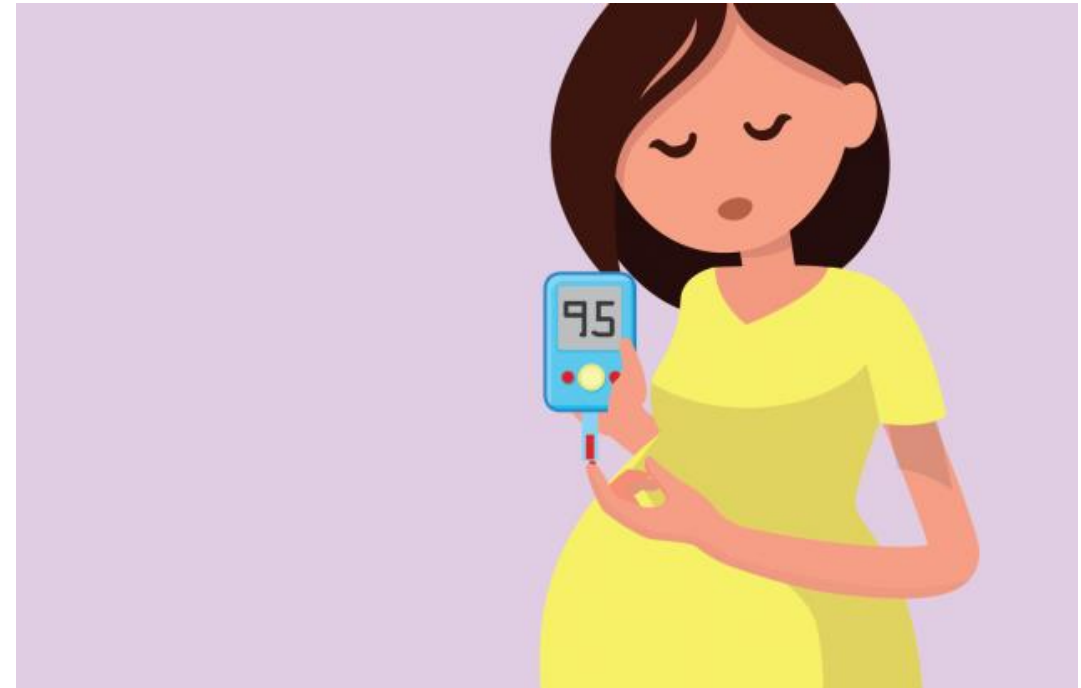
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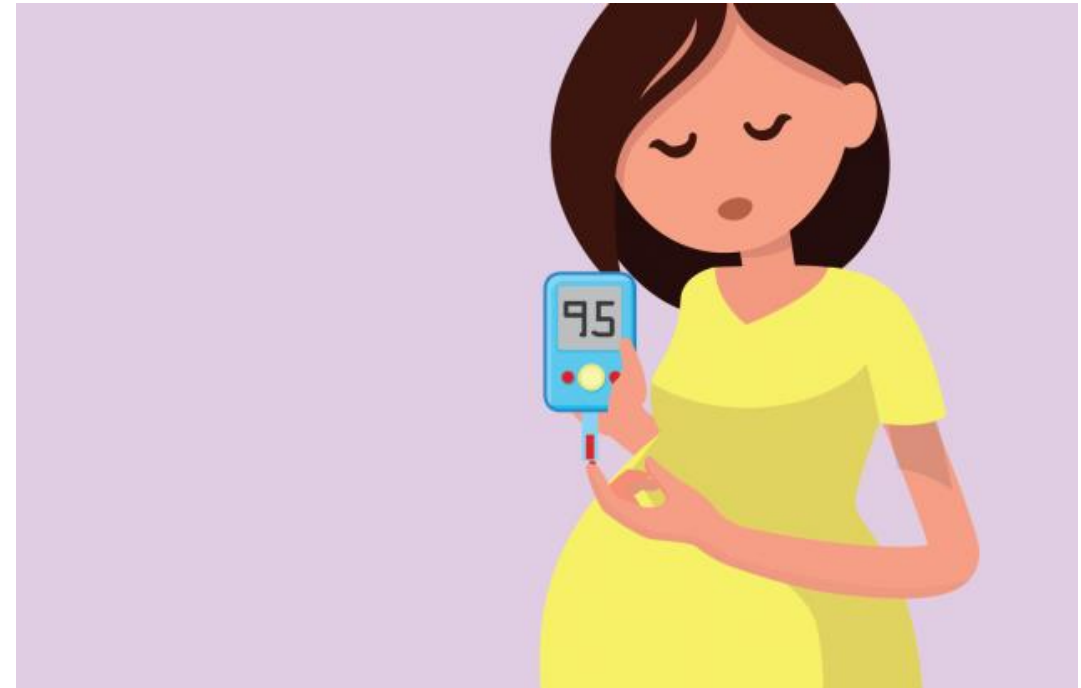
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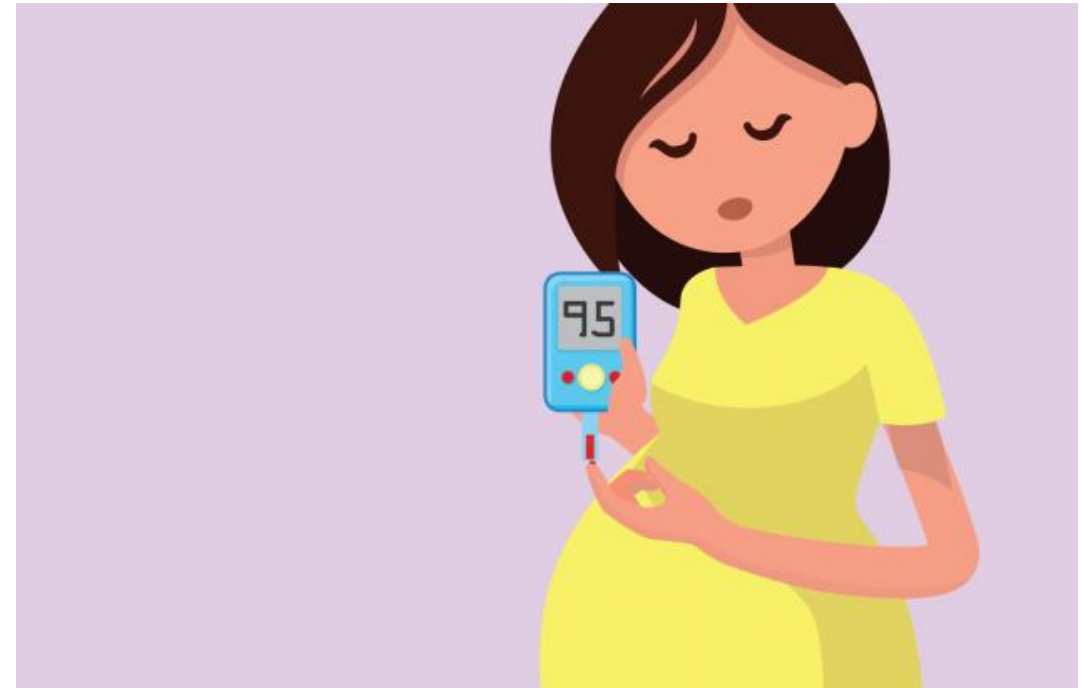
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- Appointments tend to be longer
- Appointments can be telephone if sharing data
- The 'time in range' can be misleading
- Access to a compatible smart phone is not always an option
- Being able to see the data is the most important aspect
- Some women have found dexcom more difficult to use than libre



# What have we learnt?

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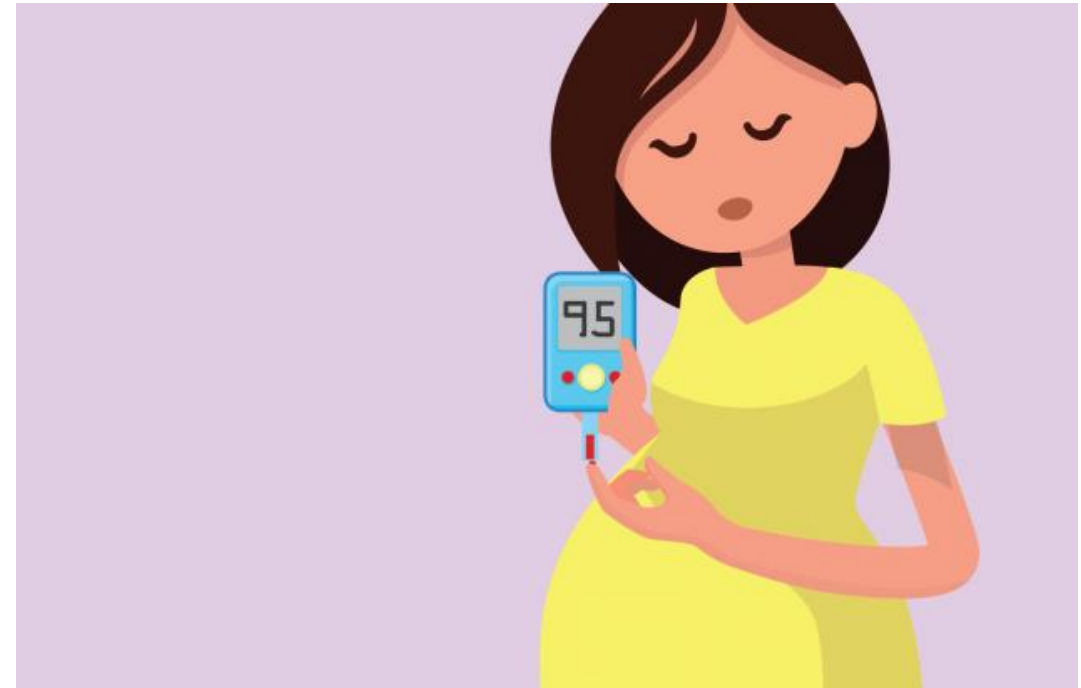




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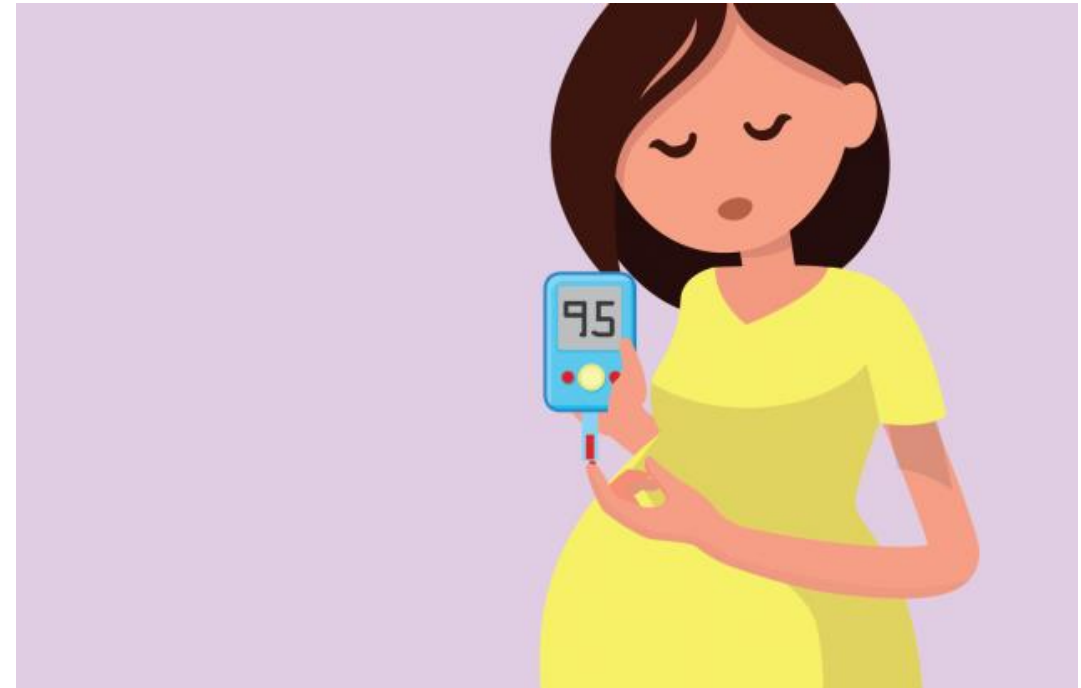
- Potentially disadvantaging women
  - Ethnic minorities
  - None English speaking
  - Lower social economical class
  - Less educated women



# What have we learnt?

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- Sometimes we find the unexpected (or the expected!)



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- Potentially disadvantaging women
  - Ethnic minorities
  - None English speaking
  - Lower social economical class
  - Less educated women
- Sometimes we find the unexpected (or the expected!)
- Individualised approach



# CGM and gestational diabetes

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- Do pregnant women with gestational diabetes need continuous glucose monitoring? Shen et al. Poster Abstract 2019.
  - Fasting glucose has a comparable effect on fetal growth to glucose metrics in CGM data
- A new continuous glucose monitor for the diagnosis of gestational diabetes: a pilot study. Filippo et al. BMC Pregnancy and Childbirth.
  - GCM was more acceptable



# CGM and gestational diabetes

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- Two women with GDM used RT CGM in 2022
- 31 years old, G2P1
  - Previous GDM
  - GTT Fasting 5.9/11.1
  - HbA1c 50
  - Left the UK – no contact, no testing, no treatment
  - IOL – live baby – 7lb
  - HbA1c post delivery 47
- 31 years old, G3P2
  - Previous GDM
  - HbA1c 49
  - HbA1c post delivery 45





- 229 women died during or up to six weeks after the end of pregnancy in 2018-20 10.9 women per 100,000 giving birth 24% higher than 2017-19
- More women from deprived areas are dying and this continues to increase
- Black women were 3.7x more likely to die than white women (34 women per 100,000 giving birth) Asian women were 1.8x more likely to die than white women (16 women per 100,000 giving birth)

# Digital technology and health inequalities: a scoping review

Matthew Honeyman, David Maguire, Harry Evans and Alisha Davies



Digital exclusion is a concept used to describe the situation where any benefits that might be available through using digital technologies are not available to the individual.

- different income groups or socioeconomic classes
- different ethnic and racial groups
- people living with disabilities
- homeless people

Understanding and addressing the factors contributing to lower levels of access, use and engagement is crucial to ensure that the application of digital technologies to support health does not inadvertently widen inequalities – with the introduction of a ‘digital inverse care law’



## National Pregnancy in Diabetes Audit, 2020

### Audit Question 1: Were women with diabetes adequately prepared for pregnancy?

*"It is deeply concerning that so few women are well prepared for pregnancy. A real step-change is needed here, with better systems and a coordinated effort both between primary and secondary health care providers and between diabetes and maternity teams. All women with diabetes between the ages of 15-50 years should be offered access to safe, effective contraception"*

NPID advisory group expert by experience perspective 1

- ❑ Overall seven out of eight women were not well prepared for pregnancy and this proportion has remained unchanged over the past seven years
- ❑ Current approaches to pregnancy preparation are not working for most women with diabetes, particularly Black women and women living in more deprived communities
- ❑ Women with type 2 diabetes face additional healthcare inequalities and are frequently not prepared for pregnancy.



## R Forde et al. Diabet Med. 2020 Jun.

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A qualitative study exploring the factors that influence the uptake of pre-pregnancy care among women with type 2 diabetes.

- Type 2 diabetes was perceived negatively by both the women and health care professionals
- Lack of awareness about the pre-pregnancy needs for this population
- Communication between health care professionals and women was unhelpful in eliciting the reproductive intentions of women
- **Lack of systemic processes to incorporate pre-pregnancy care into the care of women with type 2 diabetes**
- Health care professionals in primary care have limited capacity of provide support

If the current high levels of unprepared pregnancies in women with type 2 diabetes are to be reduced the reproductive healthcare needs of this group need to be **embedded into their mainstream diabetes management.**

# Preconception care

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## 1) Risks and the use of contraception



# Preconception care

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- 2) Target glucose and HbA1c



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- 1) Risks and the use of contraception
- 2) Target glucose and HbA1c
- 3) Medications, folic acid and vitamin D
- 4) Retinal and renal assessment
- 5) Dietary advice, weight and exercise



**THANK  
YOU!**

- Diabetes team at Sheffield Teaching Hospitals
- Joint diabetes antenatal team
  - Juli Waugh and Karen Towse
  - Carly Devin
  - Fatima Haq
  - Priya Madhuvrata, Hannah Yeeles, Gemma Govinden
  - Kim Clark, Joy Evans, Georgia Hewson, Clare Hennessey
- Inpatient team
  - Katy Thornton
- Young persons team
- Pump team