

National Pregnancy in Diabetes Audit Report, 2015

England, Wales and the Isle of Man

21 October 2016



Prepared in collaboration with:



The Healthcare Quality Improvement Partnership (HQIP). The National Pregnancy in Diabetes Audit is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit Programme (NCA). HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. Its aim is to promote quality improvement, and in particular to increase the impact that clinical audit has on healthcare quality in England and Wales. HQIP holds the contract to manage and develop the NCA Programme, comprising more than 30 clinical audits that cover care provided to people with a wide range of medical, surgical and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual audits, also funded by the Health Department of the Scottish Government, DHSSPS Northern Ireland and the Channel Islands.



NHS Digital is the new trading name for the Health and Social Care Information Centre (HSCIC). NHS Digital managed the publication of the 2015 annual report.



Diabetes UK is the largest organisation in the UK working for people with diabetes, funding research, campaigning and helping people live with the condition.

Supported by:



Public Health
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The national cardiovascular intelligence network (NCVIN) is a partnership of leading national cardiovascular organisations which analyses information and data and turns it into meaningful timely health intelligence for commissioners, policy makers, clinicians and health professionals to improve services and outcomes.

Introduction

- The National Pregnancy in Diabetes (NPID) audit measures the quality of care and outcomes for women with pre-gestational diabetes who are pregnant and aims to support quality improvement.
- Data is collected and submitted by antenatal diabetes services in England, Wales and the Isle of Man.
- Women consent for their data to be included in the audit.
- The NPID audit is part of the National Diabetes Audit (NDA) portfolio within the National Clinical (NCA) Audit programme, commissioned by the Healthcare Quality Improvement Partnership (HQIP).
- To reduce the burden of data collection for services, NHS Digital link this data to NDA and Hospital Episode Statistics (HES)/Patient Episode Database for Wales (PEDW) information.

Introduction

The audit seeks to answer three key questions:

- Were women with diabetes adequately prepared for pregnancy?
- Were appropriate steps taken during pregnancy to minimise adverse outcomes to the mother?
- Did any adverse outcomes occur?

The 2015 audit report:

- measures against updated NICE guideline NG3¹
- publishes service level data for the first time
(<http://digital.nhs.uk/pubs/npdaudit16>)
- does not compare audit data over time^a.

^a Any service improvements after first report in Oct 2014 will first be seen in the 2016 NPID data collection (to be published 2017).

¹See References section.

“The NPID audit is the clear benchmark for care and outcomes locally, regionally and nationally. It is a massive credit to all of the participating units, presents clearly the huge challenge ahead and provides a firm basis for changes.”

Nick Lewis-Barned, Clinical Lead

“Pregnancy can be stressful at the best of times; adding diabetes into the equation doesn't exactly make things any easier. Information collected by the NPID audit is being used to pinpoint what can be done to help women with diabetes before and throughout their pregnancies. The more data we have, the more happy and healthy pregnancies we can achieve.”

Melissa, Patient Representative, Advisory Group

“The NPID data enables us to evaluate our project statistically by undertaking historical comparison, and to identify local variations and action plan accordingly. Examples are late referral for specialist antenatal care, and low use of pre-conception folic acid by women with Type 2 diabetes.”

The Eastern Academic Health Science Network Pregnancy & Diabetes Project

Measuring against the NICE guideline

The NPID audit measures the quality of care using national standards set out in NICE guideline NG3¹, including:

Prior to pregnancy

- use of folic acid supplement prior to pregnancy
- keeping HbA_{1c} below 48 mmol/mol where achievable without causing problematic hypoglycaemia
- substitution of oral glucose-lowering medications apart from metformin
- suspension of statins and ACE inhibitors/ARBs

During pregnancy

- early first contact with joint diabetes and antenatal clinic
- monitoring HbA_{1c} to assess level of pregnancy risk
- retinal screening

Birth and neonatal care

- elective birth and timing of birth
- keeping babies with their mothers unless clinical need for intensive, high dependency or special care.

¹See References section.

Key findings

- In 2015, 3,044 pregnancies in 3,036 women with diabetes were recorded by 155 antenatal diabetes services.
- 46 per cent (1,386 women) had Type 2 diabetes (over 50 per cent in some regions, and over 70 per cent among some ethnic groups). Women with Type 2 diabetes tended to be older, and more likely to live in areas of social deprivation.
- There is large variation between services/localities in meeting the NICE guideline recommendations for
 - pregnancy preparation
 - first contact with the antenatal diabetes team
 - minimising admissions to a neonatal unit

Key findings

Few women were prepared for pregnancy in the ways recommended in the NICE guideline:

- Only 16 per cent of women with Type 1 diabetes and 38 per cent of women with Type 2 diabetes had first trimester HbA_{1c} <48 mmol/mol.
- 46 per cent of women with Type 1 diabetes and 23 per cent of women with Type 2 diabetes were taking 5mg folic acid prior to pregnancy.
- Women with Type 1 diabetes from deprived areas were much less likely to be taking 5mg folic acid or have first trimester HbA_{1c} < 48 mmol/mol.

Key findings

The majority of women did not have contact with the antenatal diabetes team before they were 8 weeks pregnant:

- Only 36 per cent of women with Type 2 diabetes and 55 per cent of women with Type 1 diabetes had contact in the first 8 weeks of pregnancy.

Hypoglycaemia during pregnancy:

- Almost 1 in 10 women with Type 1 diabetes had at least one admission to hospital with recorded hypoglycaemia during their pregnancy.

The majority of births were by caesarean section:

- 66 per cent of women with Type 1 diabetes and 56 per cent of women with Type 2 diabetes had a birth by caesarean section (elective or emergency).

Key findings

There was a modest reduction in adverse pregnancy outcomes:

- The stillbirth rate has reduced significantly since the 2002-03 CEMACH study² for women with Type 1 and Type 2 diabetes (10.7 and 10.5 per 1,000 respectively), although it is still higher than in the general population (4.7 per 1,000 live and stillbirths).

However, preterm delivery and large for gestational age babies were common and the admission rate to neonatal units was high:

- 40 per cent of singleton births to women with Type 1 diabetes and 22 per cent of births to women with Type 2 diabetes were preterm (before 37⁺⁰ weeks).
- Preterm delivery, babies large for gestational age and admission to a neonatal unit were more common for women who had HbA_{1c} at 24 weeks+ above 48 mmol/mol.

² See References section.

Recommendations

Diabetes and maternity services

A collaborative approach by diabetes and maternity services is needed to improve pregnancy outcomes in women with diabetes by:

- improving preparation for pregnancy:
 - promoting access to pregnancy preparation advice
 - tailoring approach to offer women the right information at the right time
 - informing women about the importance of, and options for, safe effective contraception
- improving early contact with specialist support:
 - creating clear pathways for rapid referral to specialist teams, and publicising these to primary care and family planning services
- improving achievement of safe glucose control in pregnancy:
 - focussing on proactive glucose management in pregnancy

Recommendations - Core diabetes care services

Primary care, family planning and community teams are recommended to:

- develop a clear plan for all women with diabetes to ensure awareness of the value of pregnancy preparation and the importance of safe effective contraception (including identification from primary care registers and discussion of pregnancy as a part of care planning/annual review)
- maintain a clear understanding of how to use referral pathways for specialist support

Specialist diabetes services are recommended to:

- routinely discuss pregnancy with all appropriate women
- access, where needed, new technologies to support glucose management
- lead or to identify leadership for quality improvement in antenatal diabetes care

Recommendations

Commissioners and Networks

	Recommendation
CCGs and LHBs	Monitor and improve local performance against NICE Quality Standard 109 Diabetes in pregnancy ³ .
Public Health Programmes	Work with networks and services to raise awareness and address inequalities, especially in Black and Asian populations and deprived areas.
Patient education programmes	Include learning about pregnancy explicitly in diabetes education sessions.
Diabetes and Maternity Networks	Develop explicit strategies for pregnancy in diabetes with CCGs, LHBs and Acute Trusts and coordinate across local health communities.
Diabetes support groups and charities	Raise awareness of the benefits of pregnancy preparation.

³ See references section.

Participation

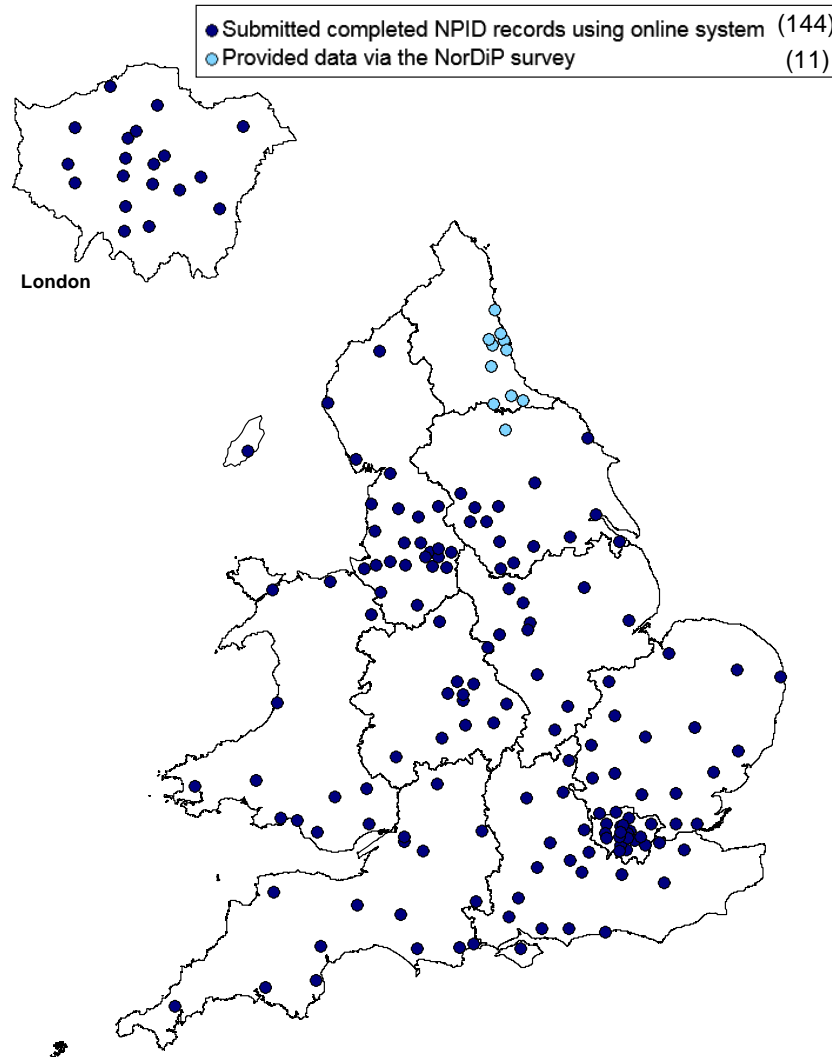
- 155 services submitted data on pregnancies ending in 2015.
- 10 units submitted data to the audit for the first time.
- 144^a of 167 consultant-led maternity units identified in the RCOG 2013 census⁴ took part in the audit (86 per cent).

^a Difference between 155 services submitting to NPID and 144 from RCOG census due to non-response to census, services in the NPID audit that provide antenatal care only and different trust/unit level groupings.

Of the 23 units in the RCOG census not participating in the NPID audit for 2015, 7 have reported they are collecting data in 2016 and 2 have confirmed they are not eligible for the NPID audit.

⁴ See References section

Figure 1: Map of services that participated in the audit, 2015



Records used in this report

Table 1: Numbers of women, pregnancies and babies, 2015

	All diabetes	Type 1 diabetes	Type 2 diabetes	Other
Women	3,036	1,563	1,386	87 ^a
Pregnancies ^b	3,044	1,566	1,391	87
Total pregnancy outcomes ^c	3,086	1,587	1,409	90
Pregnancies ongoing after 24 weeks	2,866	1,470	1,313	83
Live births after 24 weeks	2,868	1,474	1,313	81
Stillbirths	35	16	14	5
Total infants born after 24 weeks	2,903	1,490	1,327	86
Live births with gestation unknown	4	1	3	0
Live births before 24 weeks	1	1	0	0
Total registered births	2,908	1,492	1,330	86

^a Diabetes type not specified (39), maturity onset diabetes of the young (MODY) (30) or 'Other' diabetes type (18).

^b 8 women had two pregnancies recorded.

^c 42 twin pregnancies were recorded.

National Pregnancy in Diabetes Audit 2015

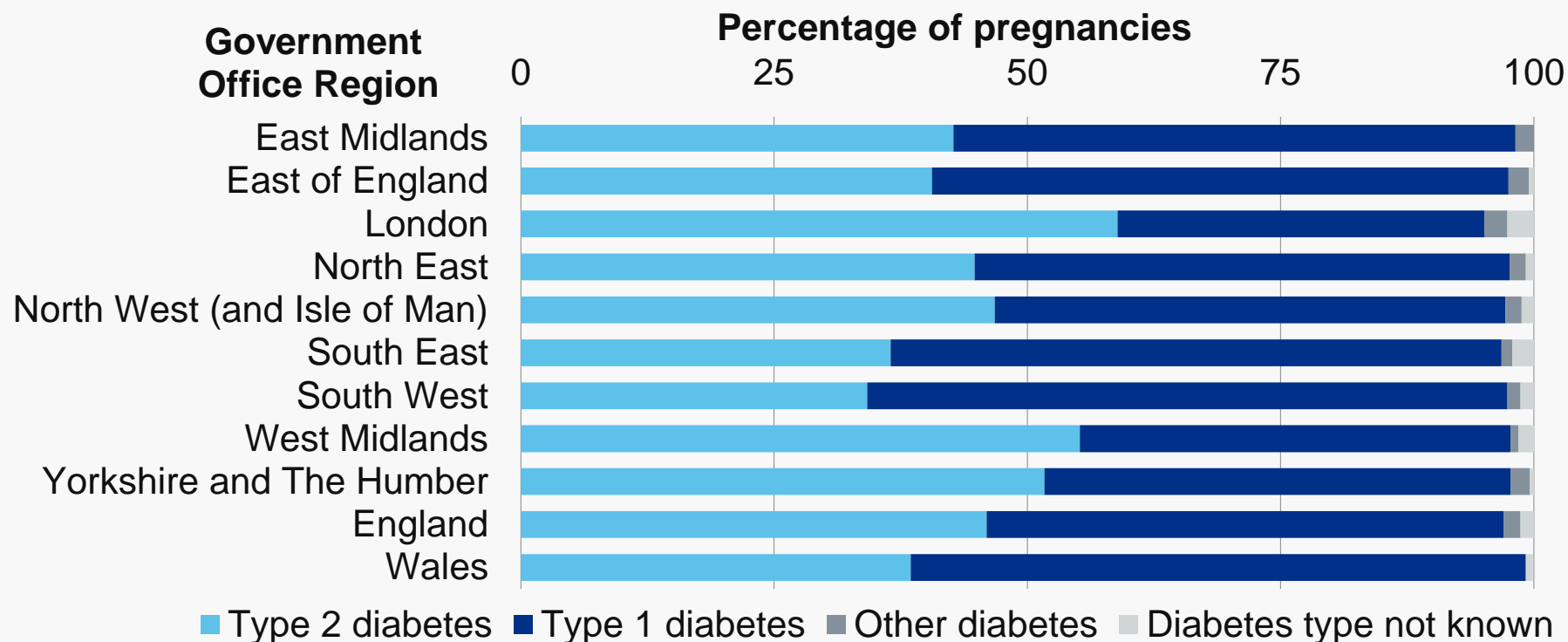
Characteristics of women

- Diabetes type
- Age
- Duration of diabetes
- BMI
- Ethnicity
- Deprivation

Diabetes type by region

- Overall 46 per cent of pregnancies were in women with Type 2 diabetes.
- Over 50 per cent of pregnancies in London, West Midlands, and Yorkshire and Humber were in women with Type 2 diabetes.

Figure 2: Mother's diabetes type for pregnancies by Government Office Region^a, 2015



^a Based on location of booking unit (may differ from delivery unit and woman's residence).

Characteristics

- Women with Type 2 diabetes were older and had higher Body Mass Index (BMI) than women with Type 1 diabetes.
- Almost 90 per cent of women of asian origin in the audit and just over 70 per cent of women of black origin in the audit had Type 2 diabetes, compared with about 30 per cent of women of white origin^a.

Table 2: Average maternal age, duration of diabetes and Body Mass Index for pregnancies, 2015

	Type 1 diabetes	Type 2 diabetes
Mean age ^b (years)	29.9	33.6
Mean duration ^c of diabetes (years)	14.9	4.8
Mean Body Mass Index (kg/m ²)	26.8	33.3

^a See supporting information for ethnicity data

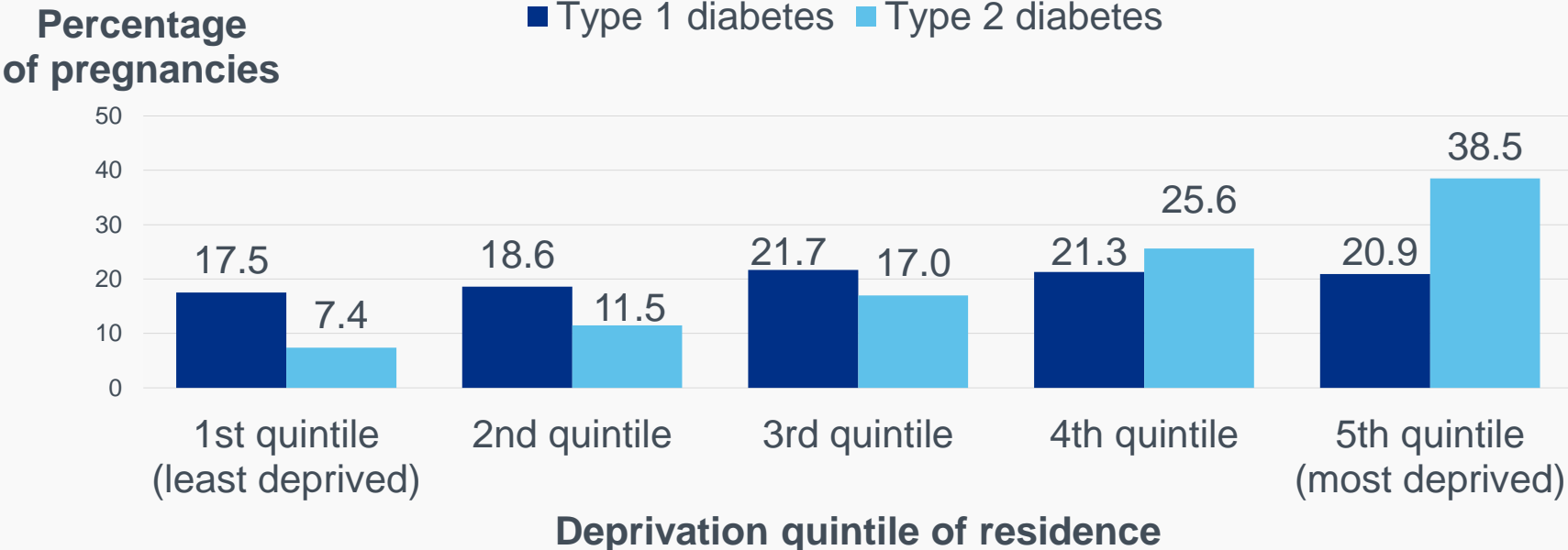
^b Age at completion of pregnancy.

^c Duration of diabetes at start of pregnancy.

Deprivation

- More women with Type 2 diabetes were resident in the most deprived areas.

Figure 3: Deprivation quintile^{a,b} of mother's area of residence, England and Wales, 2015



^a Deprivation quintile is only available where the woman's details were recorded in the NDA.

^b See the Methodology statement for details of index of multiple deprivation (IMD) method.

Characteristics of women - comment

- In some areas of England, over half of women in the audit had Type 2 diabetes.
- The proportion of women with Type 2 diabetes was extremely high among black and asian ethnic groups.
- Women with Type 2 diabetes were older, more overweight and more likely to live in deprived areas.
- Initiatives to increase engagement with women with diabetes prior to pregnancy and offer access to safe, effective contraception will need to take into account the different characteristics of women with Type 1 and Type 2 diabetes and how they access health services.

National Pregnancy in Diabetes Audit 2015

Were women adequately prepared for pregnancy?

- HbA_{1c} management
- Folic acid supplement
- Diabetes treatments
- Statins and ACE inhibitors

NICE guideline – HbA_{1c}

NICE recommendation (NG3¹): Explain to women with diabetes who are planning to become pregnant that establishing good glucose control before conception and continuing this throughout pregnancy will reduce the risk of miscarriage, congenital malformation, stillbirth and neonatal death.

The guideline recommends:

- advising women with diabetes who are planning to become pregnant to aim to keep their HbA_{1c} level below 48 mmol/mol if this is achievable without causing problematic hypoglycaemia
- strongly advising women with diabetes whose HbA_{1c} level is above 86 mmol/mol not to get pregnant because of the associated risks

The NPID audit records the first HbA_{1c} measurement in pregnancy and uses the readings that are in the first trimester as an indication of HbA_{1c} prior to pregnancy.

¹See References section.

First trimester HbA_{1c}

Women with Type 2 diabetes were much more likely than women with Type 1 diabetes to have first trimester HbA_{1c} below 48 mmol/mol.

Table 3: First trimester HbA_{1c} measurement, 2015

	Type 1 diabetes	Type 2 diabetes
Percentage with HbA _{1c} <48 mmol/mol	16.2	38.3
Percentage with HbA _{1c} ≥86 mmol/mol	9.6	7.9
Mean HbA _{1c} mmol/mol [standard deviation]	62.7 [16.7]	56.0 [17.4]

Which women had first trimester HbA_{1c} <48 mmol/mol?

- Women with Type 2 diabetes and first trimester HbA_{1c} <48 mmol/mol had lower BMI and shorter diabetes duration.
- Those with Type 1 diabetes and first trimester HbA_{1c} <48 mmol/mol had lower BMI and were older.

Table 4: Average maternal age, duration of diabetes and BMI for women with first trimester HbA_{1c} <48 mmol/mol or ≥48 mmol/mol, 2015

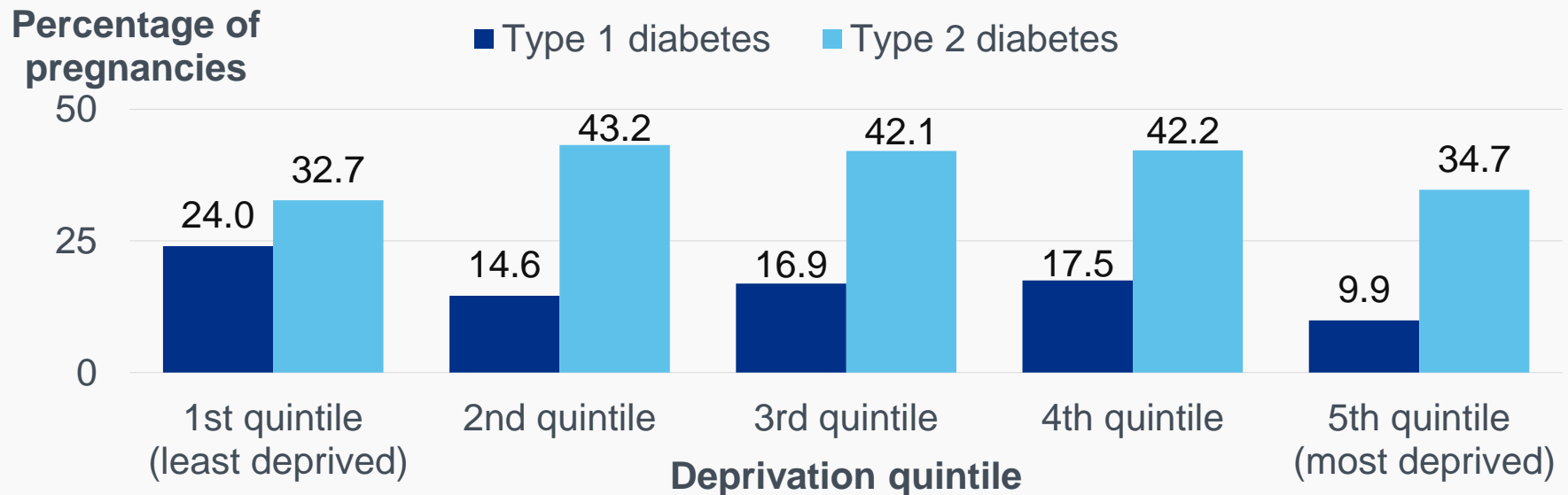
	Type 1 diabetes		Type 2 diabetes	
	HbA _{1c} <48	HbA _{1c} ≥48	HbA _{1c} <48	HbA _{1c} ≥48
Mean age ^a (years)	31.3	29.8	33.9	33.4
Mean duration ^b of diabetes (years)	14.6	15.3	4.2	5.4
Mean Body Mass Index (kg/m ²)	25.7	27.0	31.9	34.0

^a Age at completion of pregnancy. ^b Duration of diabetes at start of pregnancy.

Which women had first trimester HbA_{1c} <48 mmol/mol?

- More than twice as many women with Type 1 diabetes in the least deprived areas had HbA_{1c} < 48 mmol/mol as in the most deprived areas.

Figure 4: Percentage of pregnancies with first trimester HbA_{1c} < 48 mmol/mol by deprivation quintile^{a,b} of mother's residence, England and Wales, 2015



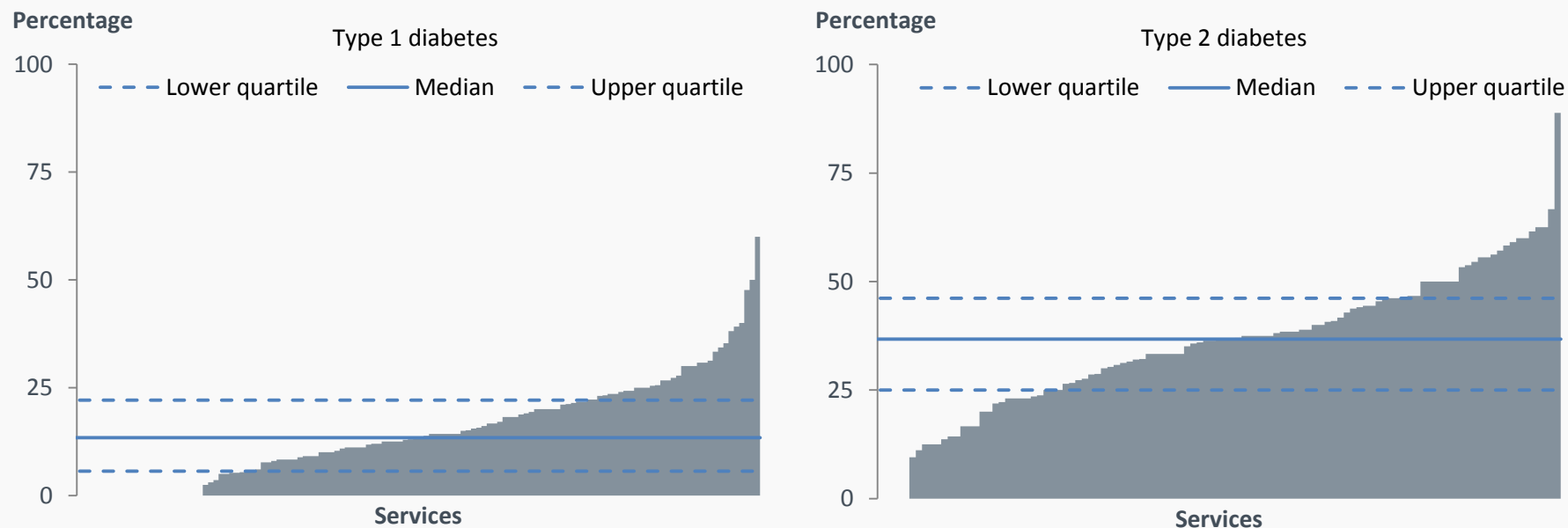
^a Deprivation quintile is only available where the woman's details were recorded in the NDA.

^b See the Methodology statement for details of index of multiple deprivation (IMD) method.

Local variation in first trimester HbA_{1c}

- The percentage of women achieving first trimester HbA_{1c} <48 mmol/mol varied greatly between services.

Figure 5: Percentage of pregnancies where mother had first trimester HbA_{1c} <48 mmol/mol, by service^a, 2013 - 2015



^a Includes services with at least 10 completed pregnancy records: Type 1 diabetes – 130 services, Type 2 diabetes – 107 services

NICE guideline – folic acid

- Women with diabetes have an increased risk of having a pregnancy affected by a neural tube defect.
- NICE recommendation (NG3¹): Advise women with diabetes who are planning to become pregnant to take 5mg/day folic acid up to 12 weeks gestation to reduce this risk.
- The 5mg dose is available on prescription.

¹See References section.

Use of folic acid supplement

- 46.1 per cent of women with Type 1 diabetes were taking the recommended 5mg dose of folic acid prior to pregnancy, compared with only 22.5 per cent of women with Type 2 diabetes.

Table 5: Use of folic acid supplement prior to pregnancy, 2015

	Type 1 diabetes (per cent)	Type 2 diabetes (per cent)
Dose 5mg	46.1	22.5
Dose 400mcg	5.6	11.2
All doses	51.7	33.7
Not taken	39.0	53.0
Not known ^a	9.3	13.2

^a 'Not known' includes women recorded as taking folic acid but with unknown dose.

Which women were taking 5mg folic acid?

- Women with Type 1 diabetes taking 5mg folic acid prior to pregnancy on average were older and had diabetes for longer than those not taking any folic acid.
- For women with Type 2 diabetes, there was no difference in average age or duration of diabetes between the two groups.

Table 6: Average maternal age and duration of diabetes for women taking 5mg folic acid/no folic acid prior to pregnancy, 2015

	Type 1 diabetes		Type 2 diabetes	
	5mg	None	5mg	None
Mean age ^a (years)	31.6	27.8	33.4	33.8
Mean duration ^b of diabetes (years)	16.4	13.4	5.1	4.6

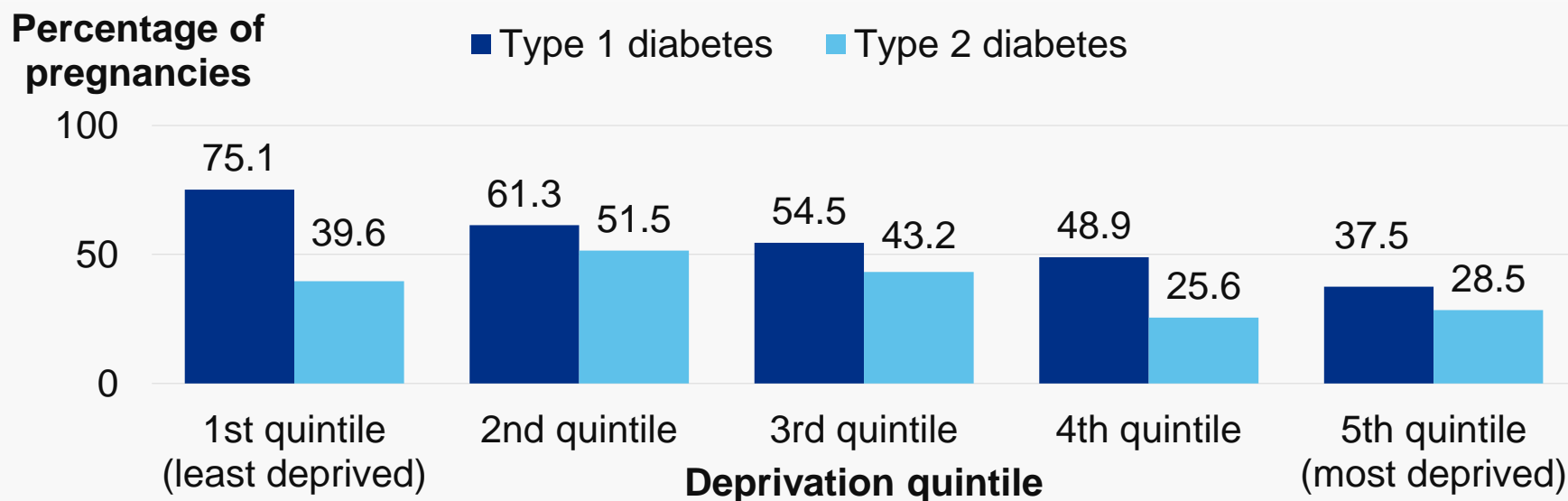
^a Age at completion of pregnancy.

^b Duration of diabetes at start of pregnancy.

Which women were taking 5mg folic acid?

- 75 per cent of women with Type 1 diabetes in the least deprived areas were taking 5mg folic acid, twice as many as in the most deprived areas.
- Women with Type 2 diabetes were least likely to be taking 5mg folic acid in the most deprived areas (4th and 5th quintiles).

Figure 6: Percentage taking 5mg folic acid supplement prior to pregnancy by deprivation quintile^{a,b} of mother's residence, England and Wales, 2015



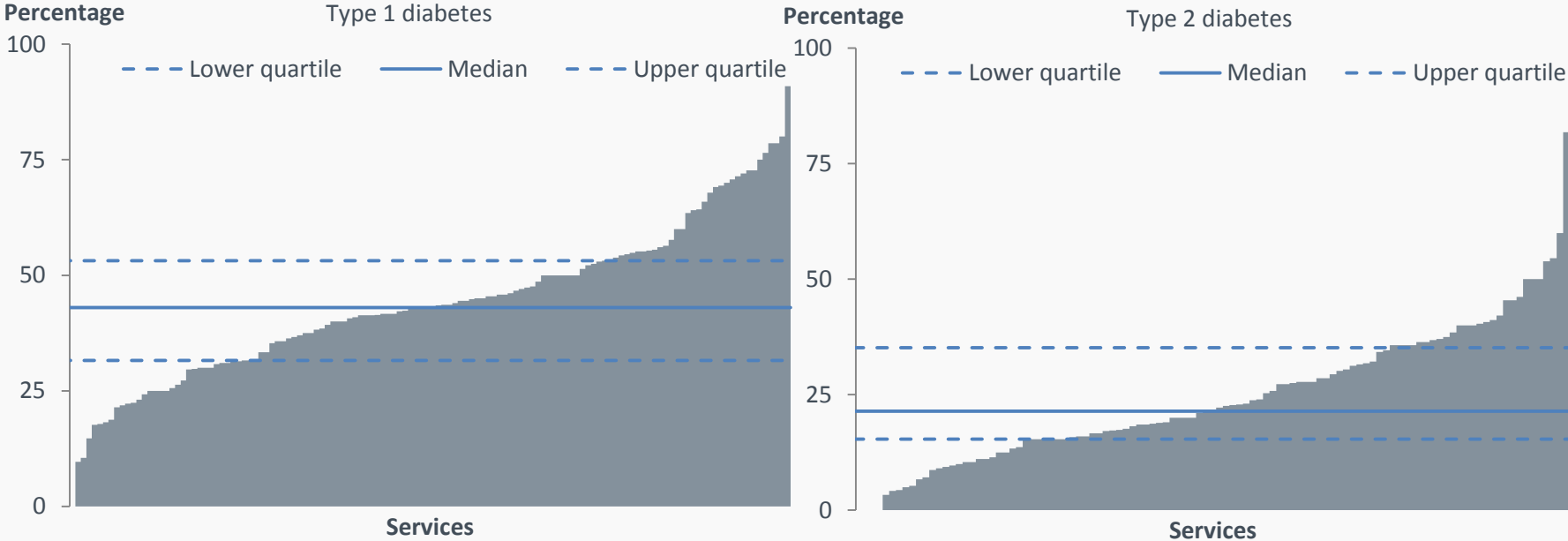
^a Deprivation quintile is only available where the woman's details were recorded in the NDA.

^b See the Methodology statement for details of index of multiple deprivation (IMD) method.

Local variation in use of 5mg folic acid

- The percentage of women taking 5mg folic acid varied greatly between services.

Figure 7: Percentage of pregnancies where mother was taking 5mg folic acid prior to pregnancy, by service^a, 2013 - 2015



^a Includes services with at least 10 completed pregnancy records: Type 1 diabetes – 130 services, Type 2 diabetes – 107 services

First trimester HbA_{1c} and folic acid

- Only 13 per cent of women had their first trimester measurement of HbA_{1c} <48 mmol/mol and were taking 5mg folic acid.
- The findings of the audit suggest that primary care initiatives are key to reaching women with Type 2 diabetes to support pregnancy preparation such as incorporation of pregnancy planning in group education programmes, consultation prompts in care and support planning, prompts for pregnancy information prescriptions embedded into GP IT systems, working with family planning services, and practice facilitation to support case finding. This will also help a significant proportion of women with Type 1 diabetes, although many will still need pregnancy education and support by specialist teams.

NICE guideline – medications

NICE recommendations (NG3¹):

- Women may be advised to use metformin as an adjunct or alternative to insulin before conception and during pregnancy, when the likely benefits from improved blood glucose control outweigh the potential for harm.
- all other oral blood glucose-lowering agents should be discontinued before pregnancy and insulin substituted.
- ACE inhibitors/ARBs and statins should be discontinued before pregnancy or as soon as pregnancy is confirmed.

¹See References section.

Diabetes treatment regimen prior to pregnancy

- 8 per cent of women with Type 2 diabetes became pregnant while taking potentially hazardous glucose lowering medications.

Table 7: Percentage of women^a on selected diabetes treatment regimens at last menstrual period, 2015

	Type 1 diabetes	Type 2 diabetes
On insulin ^b only	93.4	8.8
On insulin ^b and metformin only	4.5	10.2
On metformin only	0.9 ^d	52.7
On other diabetes medications ^c	0.2	8.0

^a This table excludes pregnancies recorded in the NorDIP survey due to the difference in response options for this question.

^b 'On insulin' includes basal bolus insulin regimen, mixed insulin or basal insulin only and insulin pump therapy.

^c 'Other diabetes medications' are sulphonylurea or glitinide, gliptin, GLP-1 analogue and pioglitazone, irrespective of whether the woman was also taking metformin and/or insulin.

^d Data quality warning – women with Type 1 diabetes would not be on metformin only.

Statins and ACE inhibitors/ARBs

- 8.6 per cent of women with Type 2 diabetes were taking either statins or an ACE inhibitor/ARB or both medications when they became pregnant.

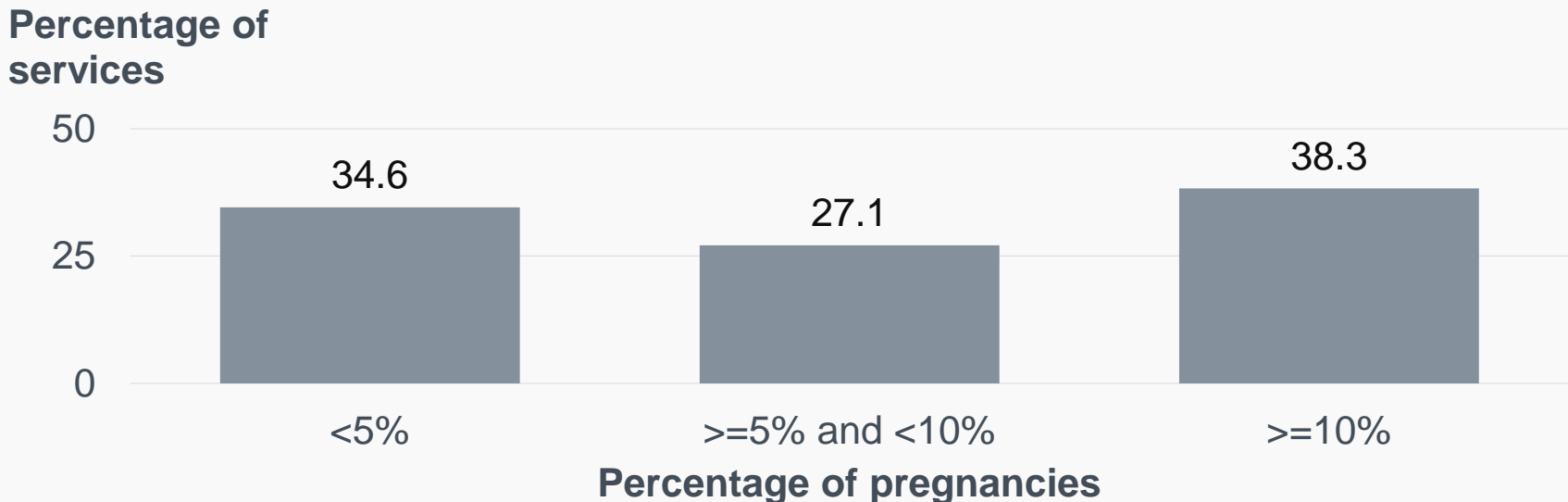
Table 8: Percentage of pregnancies where mother taking statins or ACE inhibitors/ARBs at last menstrual period, 2015

	Type 1 diabetes	Type 2 diabetes
On statins	1.5	5.9
On ACE inhibitor/ARB	1.7	4.5
On at least one of statins/ACE inhibitor/ARB	2.9	8.6

Local variation in use of statins/ACE inhibitors for mothers with Type 2 diabetes

41 services (38 per cent) found at the time of booking 10 per cent or more of women with Type 2 diabetes were taking statins and/or an ACE inhibitor at their last menstrual period.

Figure 8: Percentage of services^a reporting <5%, 5-10% or >=10% of women with Type 2 diabetes on statins and/or ACE inhibitor/ARB at last menstrual period, 2015



^aIncludes 107 services with at least 10 completed pregnancy records for women with Type 2 diabetes.

Preparation for pregnancy - comment

- Few women with diabetes were well prepared for pregnancy.
- Women with Type 2 diabetes were more likely to have HbA_{1c} <48 mmol/mol than women with Type 1 diabetes (especially those with shorter diabetes duration). However they had a low pre-pregnancy use of 5mg folic acid, and appreciable use of statins and ACE inhibitors/ARB. This suggests that they were poorly informed/supported in preparation for pregnancy.
- Among women with Type 1 diabetes, women were more likely to have HbA_{1c} <48 mmol/mol or be taking 5mg folic acid if they were older, and much less likely to be prepared in either of these ways if they lived in a deprived area.

Preparation for pregnancy - comment

- Improving pregnancy preparation will require collaboration between all sectors of care and women with diabetes.
- For women with Type 2 diabetes, from black and asian communities, and from areas of social deprivation raising awareness and pre-pregnancy treatment review should be priorities.
- For women with Type 1 diabetes pre-pregnancy glucose control and folic acid use are the priorities.
- The significant variations between services in 5mg folic acid use, achievement of safer HbA_{1c} levels and medications used prior to pregnancy suggests a widespread urgent need to improve practice.

National Pregnancy in Diabetes Audit 2015

Care in pregnancy and HbA_{1c} values

- Timing of first contact with antenatal diabetes team
- HbA_{1c} values in pregnancy

NICE guideline

Antenatal care and monitoring HbA_{1c}

NICE recommendations (NG3¹):

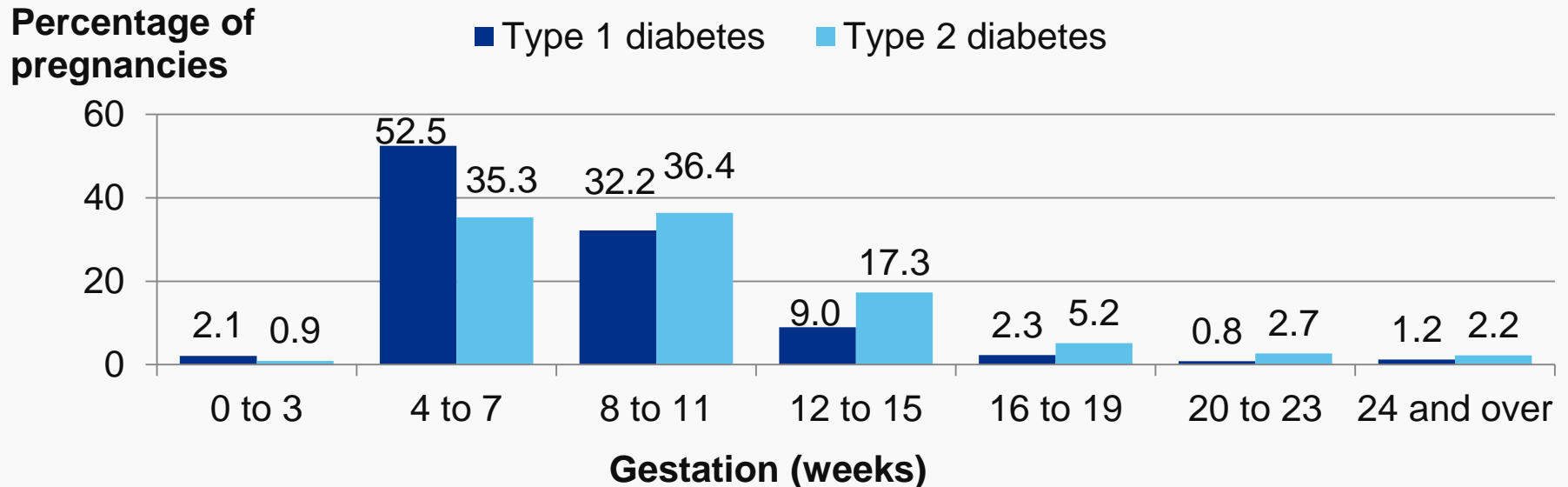
- Offer immediate contact with a joint diabetes and antenatal clinic to women with diabetes who are pregnant
- Measure HbA_{1c} levels at the booking appointment to determine the level of risk for the pregnancy
- Consider measuring HbA_{1c} levels in the second and third trimesters of pregnancy to assess the level of risk for the pregnancy
- Be aware that level of risk for the pregnancy increases with an HbA_{1c} level above 48mmol/mol.

¹See References section.

First contact with antenatal diabetes team

Only 54.6 per cent of women with Type 1 diabetes and 36.2 per cent of women with Type 2 diabetes had their first antenatal diabetes team contact prior to 8 weeks gestation.

Figure 9: Gestation (weeks) at first contact^{a,b} with specialist antenatal diabetes team, 2015



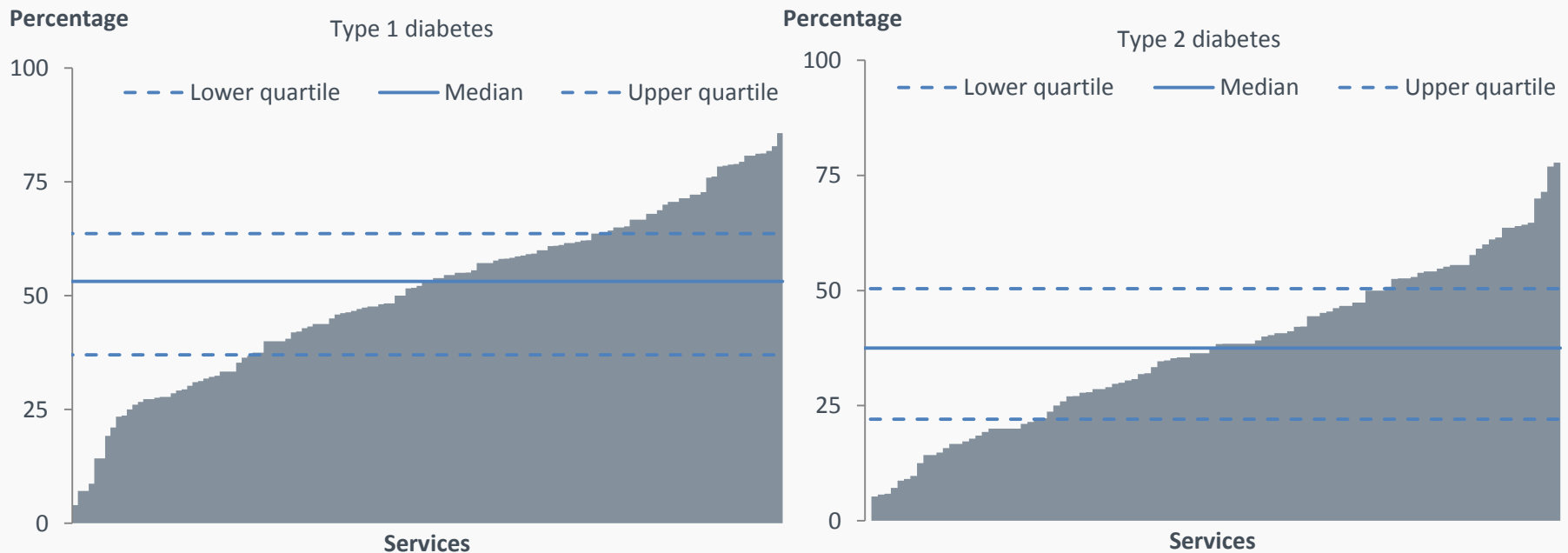
^a NICE recommends to offer immediate contact with the antenatal diabetes team – the NPID audit records the date of first contact with the team during pregnancy.

^b Very early appointments are likely to be preconception care appointments already in place.

Local variation in timing of first contact with antenatal diabetes team

The percentage of women having contact in the first 8 weeks of pregnancy varied greatly between services.

Figure 10: Percentage of pregnancies where first contact with antenatal diabetes team at < 8 weeks gestation by service^a, 2013 - 2015



^a Includes services with at least 10 completed pregnancy records:
Type 1 diabetes – 130 services, Type 2 diabetes – 107 services

HbA_{1c} values in pregnancy^a

Over 75 per cent of women with Type 2 diabetes, but only 40 per cent of women with Type 1 diabetes had HbA_{1c} below 48 mmol/mol in late pregnancy^b.

Table 9: HbA_{1c} measurements in first trimester and at 24 weeks+, 2015

	Type 1 diabetes		Type 2 diabetes	
	<13 weeks	24 weeks+	<13 weeks	24 weeks+
Percentage with HbA _{1c} <48 mmol/mol	16.2	40.0	38.3	76.0
Mean HbA _{1c} (mmol/mol)	62.7	51.2	56.0	43.2
Standard deviation (mmol/mol)	16.7	11.6	17.4	9.7

^a NICE recommends measuring HbA_{1c} at booking, and consider measuring in the second and third trimesters - the NPID audit records the first and last measurements in pregnancy.

^b HbA_{1c} falls physiologically in pregnancy because of changes in iron transport and red cell turnover⁵.

⁵ See References section.

Care in pregnancy and HbA_{1c} values - comment

- Just under half of women with Type 1 diabetes and almost two thirds with Type 2 diabetes saw the antenatal diabetes team for the first time when they were 8 weeks pregnant or more.
- Knowing to urgently contact the antenatal diabetes team as soon as a positive pregnancy test is found should be part of pregnancy preparation. These figures again suggest poorer levels of preparation among women with Type 2 diabetes.
- HbA_{1c} levels in later pregnancy remained above 48 mmol/mol for more than half of women with Type 1 diabetes, and almost a quarter of women with Type 2 diabetes. Women should receive more effective support to manage their blood glucose to target throughout pregnancy to reduce the risks of preterm delivery, large for gestational age babies and neonatal care unit admissions.⁴⁵

National Pregnancy in Diabetes Audit 2015

Were adverse maternal outcomes minimised during pregnancy?

- Hospital admissions with hypoglycaemia
- Hospital admissions with DKA (diabetic ketoacidosis)

Hypoglycaemia and DKA

Table 10: Hospital episodes with diagnosed hypoglycaemia^a during pregnancy, England and Wales, 2014

	Type 1 diabetes		Type 2 diabetes	
	Number	Percentage	Number	Percentage
At least one admission	124	9.6	25	2.1
No admissions recorded	1,172	90.4	1,144	97.9

Table 11: Hospital episodes with diagnosed DKA^a during pregnancy, England and Wales, 2014

	Type 1 diabetes		Type 2 diabetes	
	Number	Percentage	Number	Percentage
At least one admission	32	2.5	2	0.2
No admissions recorded	1,264	97.5	1,167	99.8

^aSee Data Quality statement.

Maternal outcomes during pregnancy - comment

- Hypoglycaemia carries significant risks for pregnant women, and pregnancies complicated by diabetic ketoacidosis are associated with increased rates of perinatal morbidity and mortality⁶.
- Among women with Type 1 diabetes:
 - Almost one in ten had at least one admission to hospital with hypoglycaemia
 - One in 40 had an admission to hospital with DKA
- It should be possible to reduce the risk of these serious complications that can affect both the mother and their baby.

⁶ See References section.

National Pregnancy in Diabetes Audit 2015

Timing and mode of birth

- Gestation length
- Onset of labour
- Mode of delivery

NICE guideline – timing and mode of birth

NICE recommendations (NG3¹):

- advise women with no other complications to have an elective birth by induction of labour, or elective caesarean section if indicated, between 37⁺⁰ and 38⁺⁶ weeks of pregnancy^a
- consider elective birth before 37⁺⁰ weeks if there are metabolic or any other maternal or fetal complications.

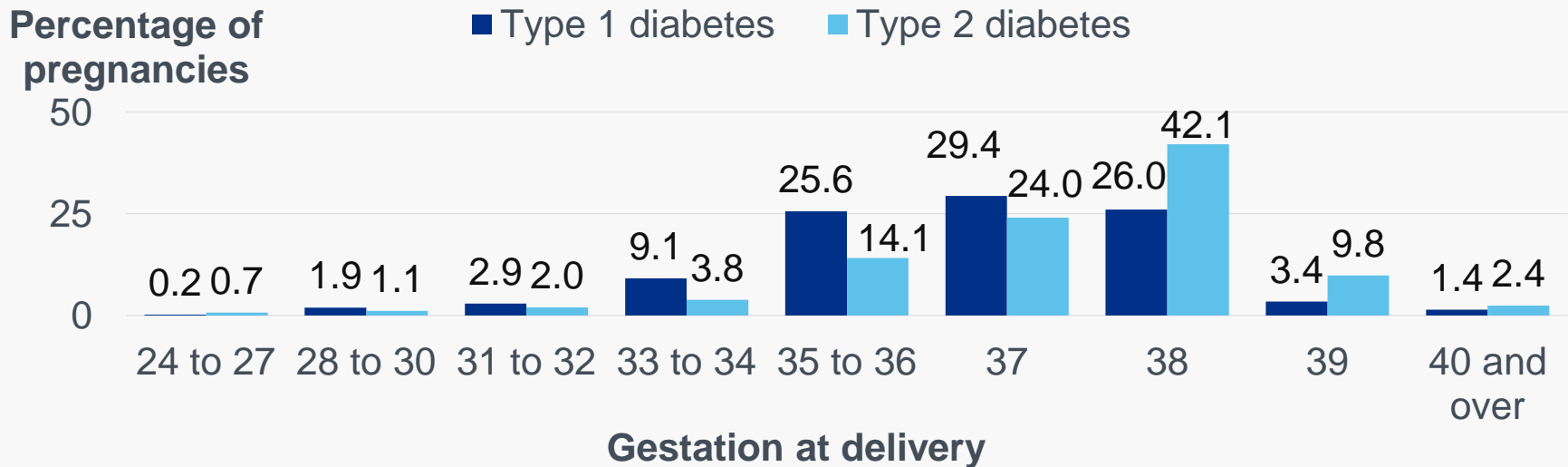
^a37⁺⁰ = 37 weeks and 0 days, 38⁺⁶ = 38 weeks and 6 days

¹ See References section.

Gestation length for singleton births

- The majority of births were between 37⁺⁰ and 38⁺⁶ weeks.
- 40 per cent of births to women with Type 1 diabetes and 22 per cent of births to women with Type 2 diabetes were before 37⁺⁰ weeks.

Figure 11: Gestation at delivery for singleton live births, 2015



Onset of labour

- Only a small proportion of women had a spontaneous labour. This may be due to NICE guidance which recommends advising women to have an elective birth between 37⁺⁰ and 38⁺⁶ weeks of pregnancy.
- Women with Type 1 diabetes were more likely to have a caesarean before labour (45 per cent) than women with Type 2 diabetes (37 per cent).

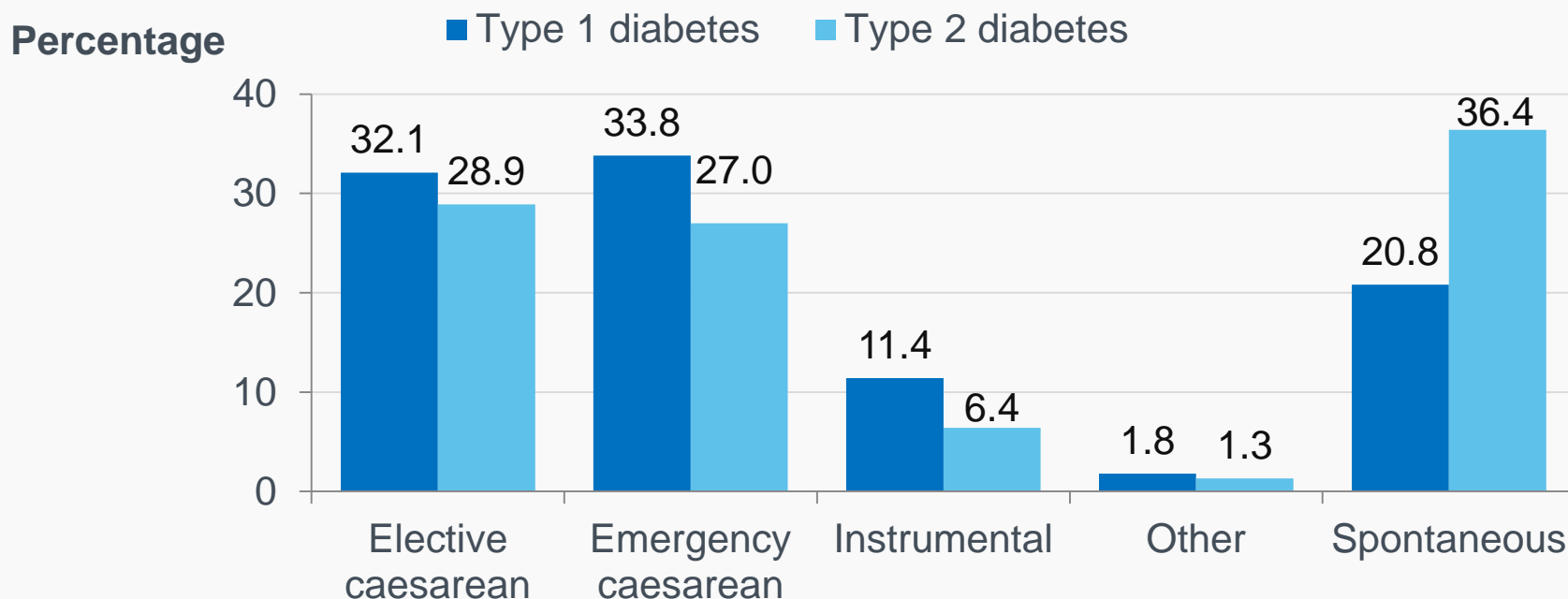
Table 12: Onset of labour for pregnancies continuing at 24 weeks gestation, 2014

	Type 1 diabetes		Type 2 diabetes	
	Number	Percentage	Number	Percentage
Spontaneous	123	13.2	122	14.6
Induced	384	41.3	404	48.4
Caesarean	423	45.5	308	36.9

Method of delivery

Caesarean (either emergency or elective) was the most common mode of delivery (66 per cent of women with Type 1 diabetes and 56 per cent of women with Type 2 diabetes).

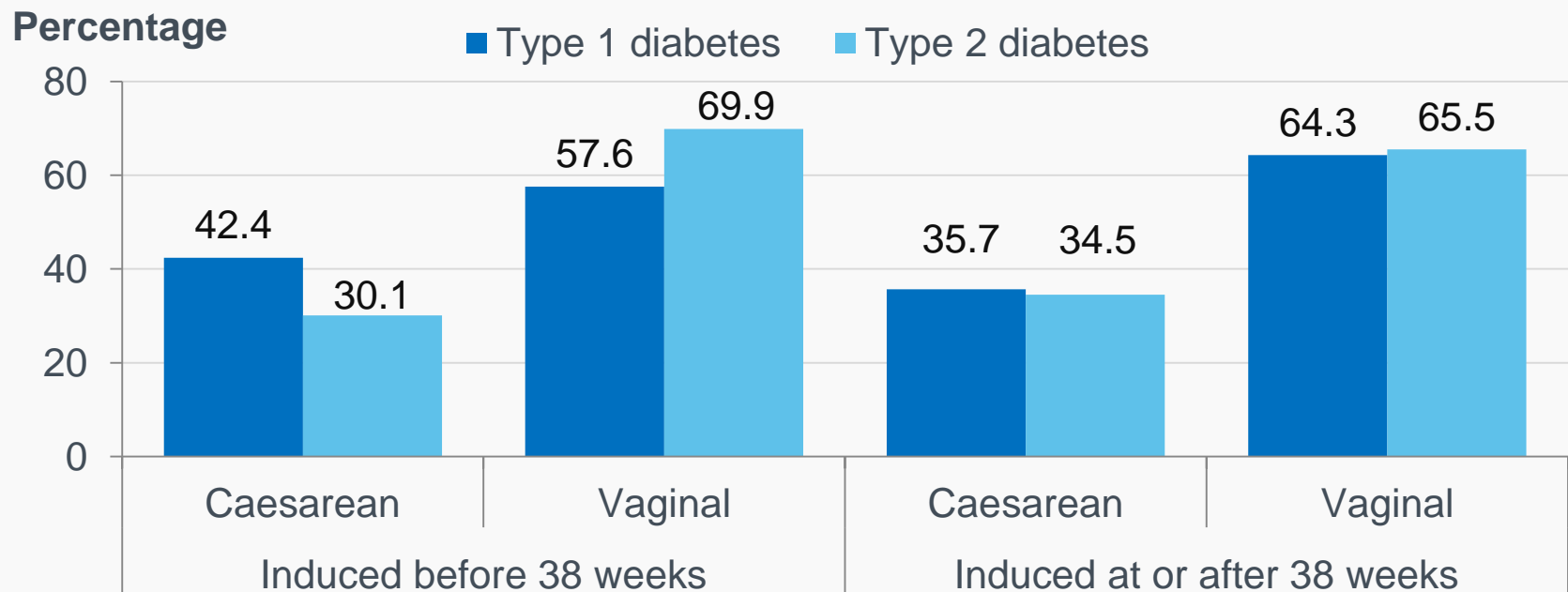
Figure 12: Mode of delivery for births at or after 24 weeks gestation, England and Wales, 2014



Method of delivery where labour induced

42 per cent of women with Type 1 diabetes who had labour induced before 38⁺⁰ weeks^a had a caesarean section compared with only 30 per cent of women with Type 2 diabetes.

Figure 13: Mode of delivery for singleton births where labour induced, England and Wales, 2014



^aThe NICE guideline in place during 2014 recommended elective birth after “38 completed weeks”. 54

Timing and mode of birth - comment

- Most births were between 37⁺⁰ and 38⁺⁶ weeks.
- A substantial minority of births were preterm; 40 per cent of births to women with Type 1 diabetes were before 37⁺⁰ weeks, compared with 22 per cent of births to women with Type 2 diabetes.
- Almost two thirds of women with Type 1 diabetes and over half of women with Type 2 diabetes had a caesarean section (elective or emergency).
- Over 40 per cent of women with Type 1 diabetes who had labour induced before 38⁺⁰ weeks went on to have a caesarean section, compared with 30 per cent of women with Type 2 diabetes.

National Pregnancy in Diabetes Audit 2015

Were adverse fetal/infant outcomes minimised?

- Pregnancy outcomes
- Stillbirths and neonatal deaths
- Congenital anomalies
- Preterm births
- Birthweights and large for gestational age
- Neonatal unit admissions

Pregnancy outcomes

- 98.8 per cent of registered births (live and stillbirths) were live births.
- In the general England and Wales maternity population, 99.6 per cent of all registered births in 2015 were live births⁷.

Table 13: Pregnancy outcomes, 2015

	Live birth	Stillbirth	Termination of pregnancy	Miscarriage ^b
Type 1 diabetes	1,476	16	15	80
Type 2 diabetes	1,316	14	14	65
Other ^a	81	5	1	3

^a Diabetes type not specified, maturity onset diabetes of the young (MODY) or 'Other' diabetes type. Although the stillbirth rate in this group appears high this should be interpreted with great caution, as 'Diabetes type not specified' may include women with Type 1 or Type 2 diabetes, and the small numbers mean there is a large margin of uncertainty in any estimated rate.

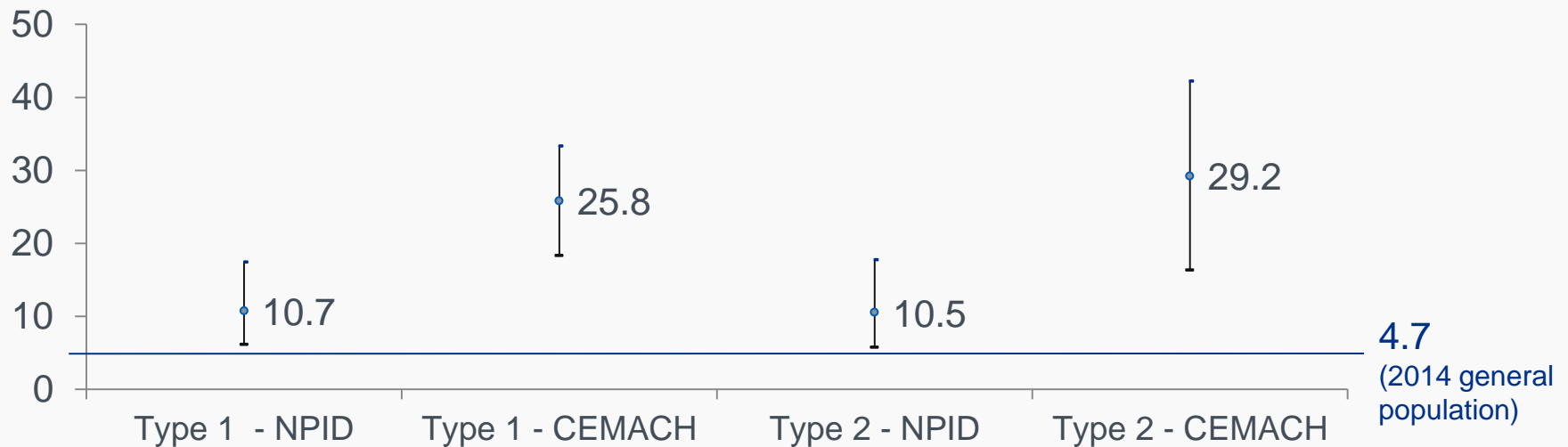
^b Early miscarriages (prior to booking) are likely to be under-reported.

⁷ See References section.

Adverse outcomes – stillbirth

- Stillbirth rates for both Type 1 and Type 2 diabetes were significantly lower than in the 2002-03 CEMACH survey².
- However they remain higher than the rate of 4.7 per 1,000 in the 2014 general maternity population⁷. (The proportion of older women in the NPID audit may be a contributing factor.)

Figure 14: Stillbirth rate (per 1,000 live and stillbirths) with 95 per cent confidence interval, 2015 compared to CEMACH, 2002- 2003

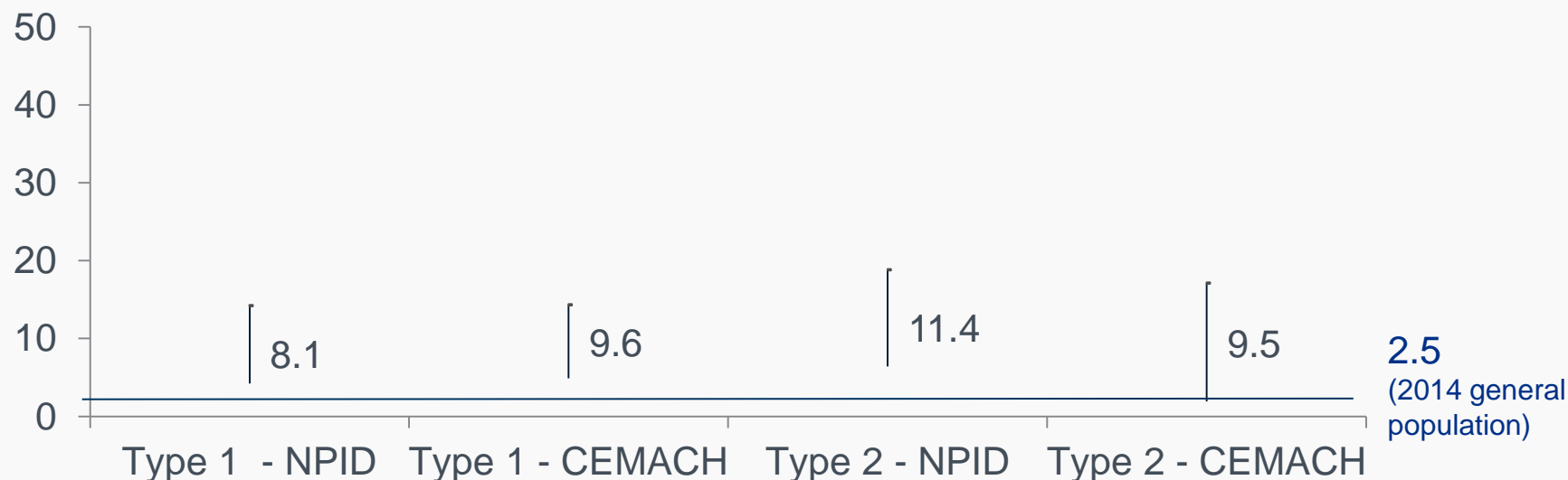


^{2,7} See References section.

Adverse outcomes – neonatal death

- There was no change in the neonatal death rate compared with the CEMACH survey in 2002-03².
- The rate remained higher than in the general population (2.5 neonatal deaths per 1,000 live births in 2014).

Figure 15: Neonatal death rate (per 1,000 live births) with 95 per cent confidence interval, 2015, compared to CEMACH, 2002- 03



² See References section.

Adverse outcomes – congenital anomalies

Table 14: Congenital anomaly rate per 1,000 live and stillbirths, 2015

	Type 1 diabetes	Type 2 diabetes
Rate per 1,000 ^a	46.2	34.6
95 per cent confidence interval	(36.0, 58.5)	(25.3, 46.1)

^a Includes live births and terminations at any gestation, stillbirths and miscarriages after 20 weeks.

Comparisons with other published rates should be made cautiously because:

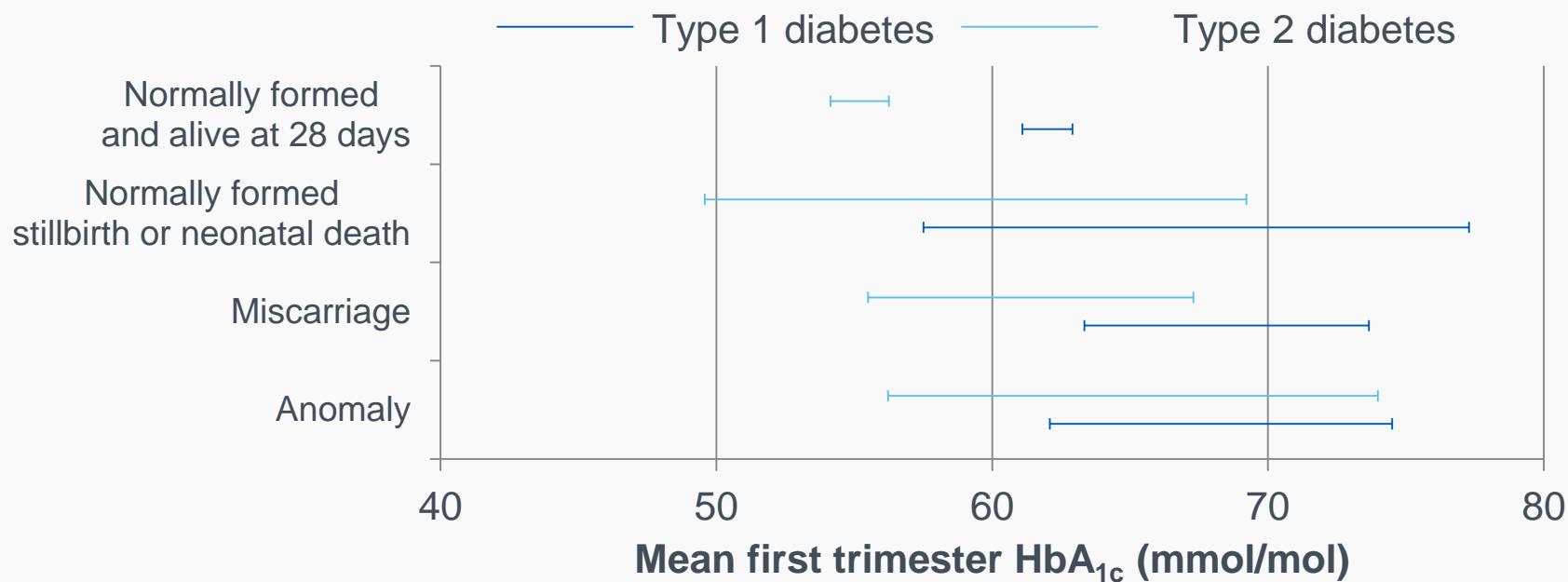
- some anomaly rates exclude certain ‘minor’ anomalies, while the NPID rate includes any reported anomaly
- NPID data are likely to only include anomalies identified prior to discharge from hospital, while other sources may include anomaly notifications some time after birth

First trimester HbA_{1c} and outcomes

First trimester HbA_{1c} was significantly higher where:

- the pregnancy ended in a miscarriage or
- there was a congenital anomaly.

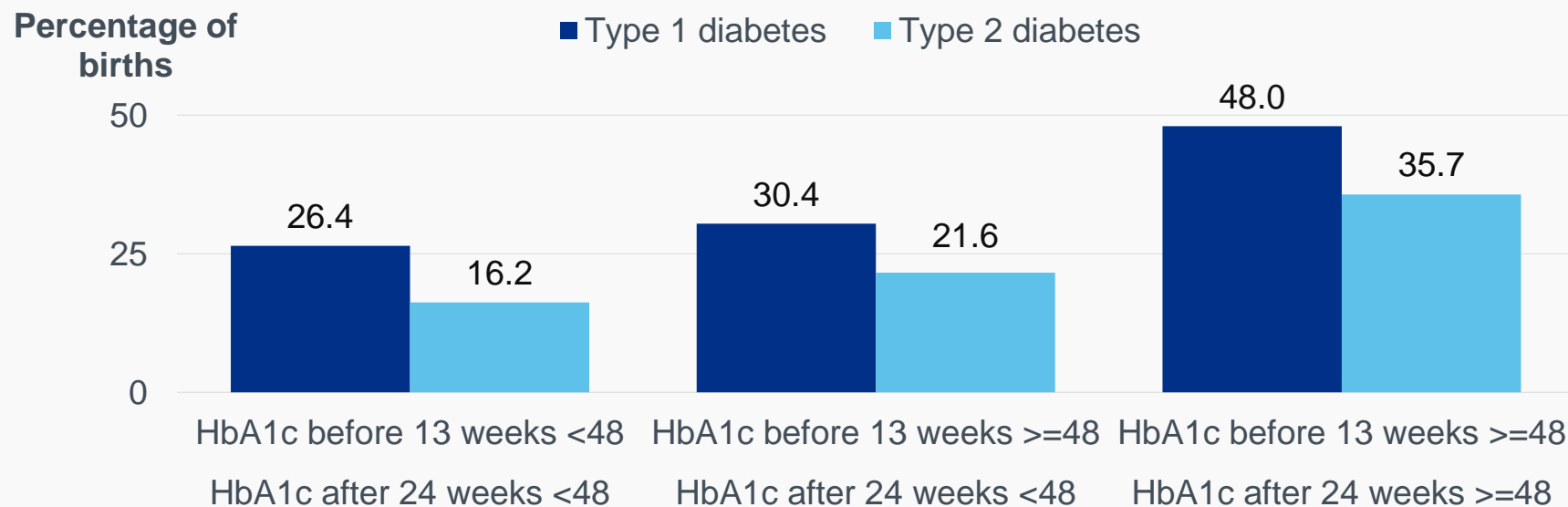
Figure 16: 95 per cent confidence intervals for mean first trimester HbA_{1c} for selected pregnancy outcomes, 2015



Preterm births and HbA_{1c}

Among women who had first trimester HbA_{1c} ≥ 48 mmol/mol, the preterm birth rate was significantly lower where HbA_{1c} reduced to < 48 mmol/mol by 24 weeks+.

Figure 17: Preterm births and HbA_{1c} measurements during pregnancy^{a,b}, 2015



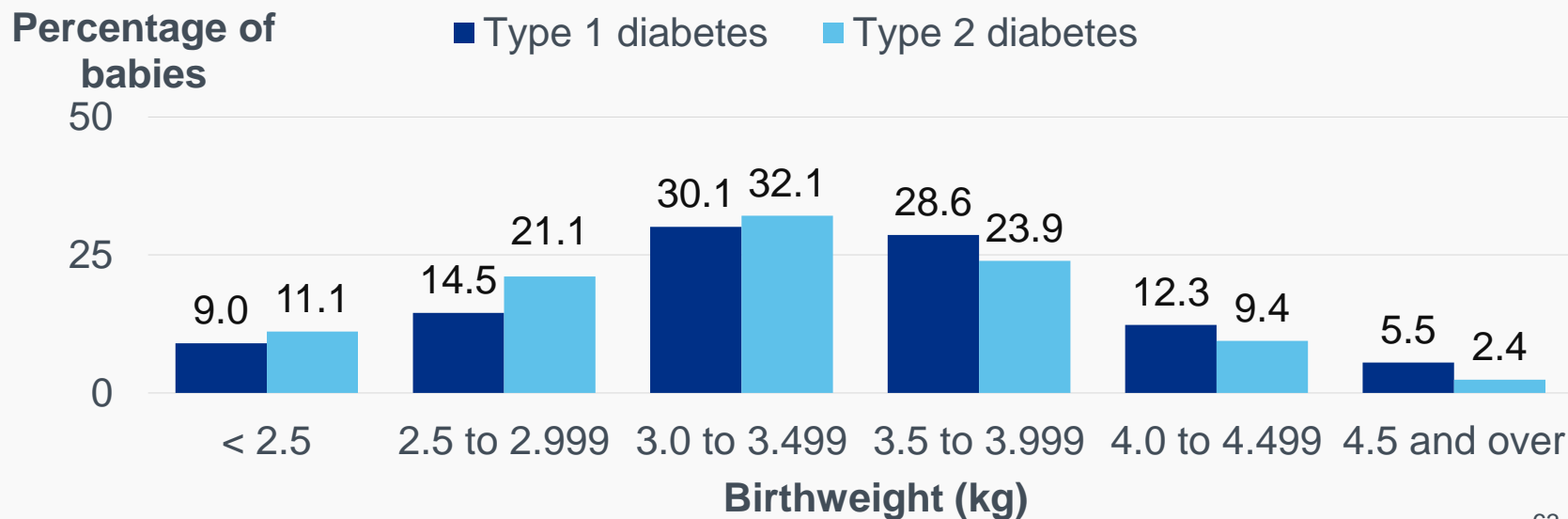
^a HbA_{1c} measurements in mmol/mol.

^b A small number of women not shown on this chart had first trimester HbA_{1c} < 48 and HbA_{1c} at 24 weeks+ ≥ 48 .

Birthweights

- Macrosomia (birthweight 4 kg or more) is a recognised complication for babies of women with diabetes.
- 18 per cent of babies of women with Type 1 diabetes and 12 per cent of babies of women with Type 2 diabetes had a birthweight of 4 kg or more.

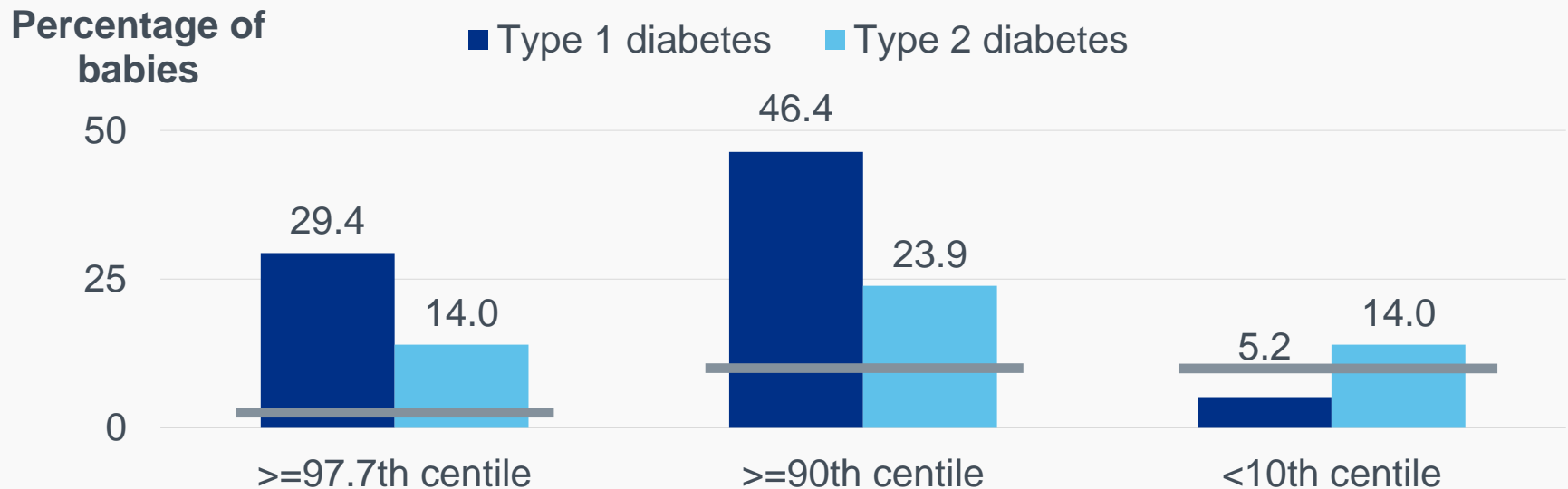
Figure 18: Birthweight distribution for singleton babies, 2015



Birthweight centiles

The number of babies above the 97.7th and 90th birthweight centiles was much higher than expected for both diabetes types, based on the range of general population baby weights.

Figure 19: Birthweight centiles^a for singleton babies, 2015



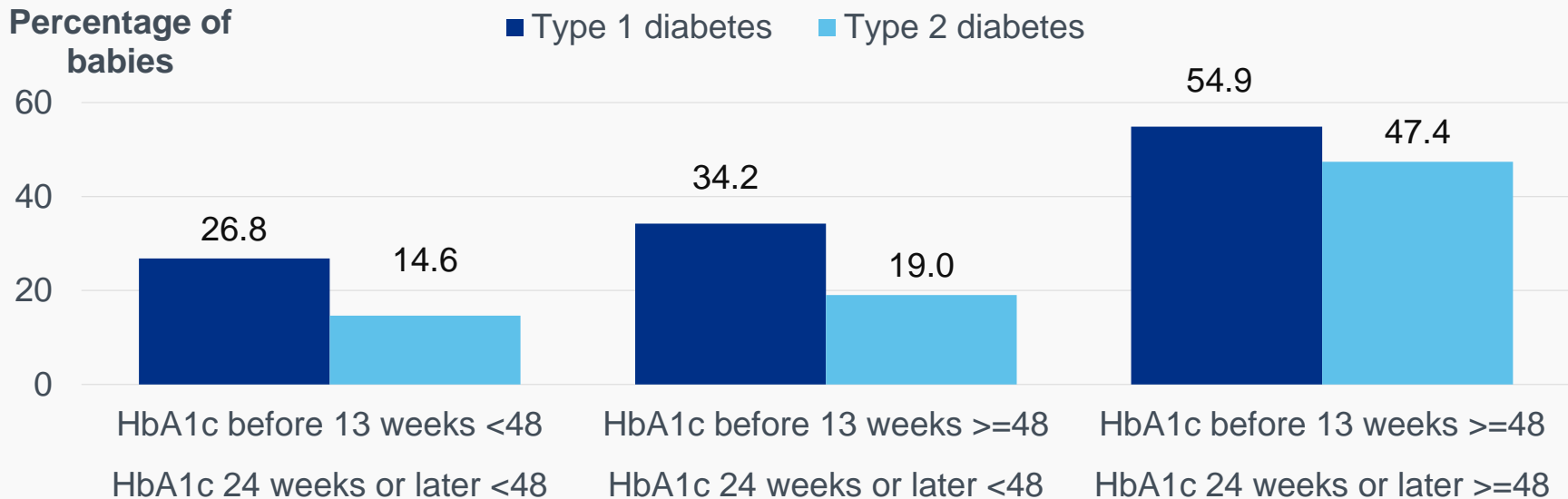
^a Centiles adjust the actual birthweight for maternal ethnicity, height, weight and gestational age at delivery⁸.

⁸ See References section.

Large for gestational age (LGA) and HbA_{1c}

Women who had first trimester HbA_{1c} ≥ 48 mmol/mol were less likely to have LGA babies ($\geq 90^{\text{th}}$ birthweight centile) where their HbA_{1c} at 24 weeks+ was below 48 mmol/mol.

Figure 20: Babies large for gestational age and HbA_{1c} during pregnancy^{a,b}, 2015



^a HbA_{1c} measurements in mmol/mol.

^b A small number of women not shown on this chart had first trimester HbA_{1c} <48 and HbA_{1c} at 24 weeks+ ≥ 48 .

Fetal/infant outcomes - comment

- There was a significant reduction in the stillbirth rate for both diabetes types from the CEMACH survey in 2002-03.
- However, the rates of all serious adverse outcomes (stillbirth, neonatal death and congenital anomaly) remained high compared with the background population.
- Women who had a miscarriage or a baby with a congenital anomaly had higher HbA_{1c} in early pregnancy.
- Large for gestational age (LGA) babies were much more common than in the general population.
- Women with HbA_{1c} above 48 mmol/mol in early pregnancy that managed to reduce HbA_{1c} below 48 mmol/mol by 24 weeks were less likely to have a preterm delivery or LGA baby.

NICE guideline – neonatal care

NICE recommendation (NG3¹): Babies of women with diabetes should stay with their mothers unless there is a clinical complication or there are abnormal clinical signs that warrant admission for intensive or special care.

The guideline lists specific criteria for admission to the neonatal unit, including if babies have been born:

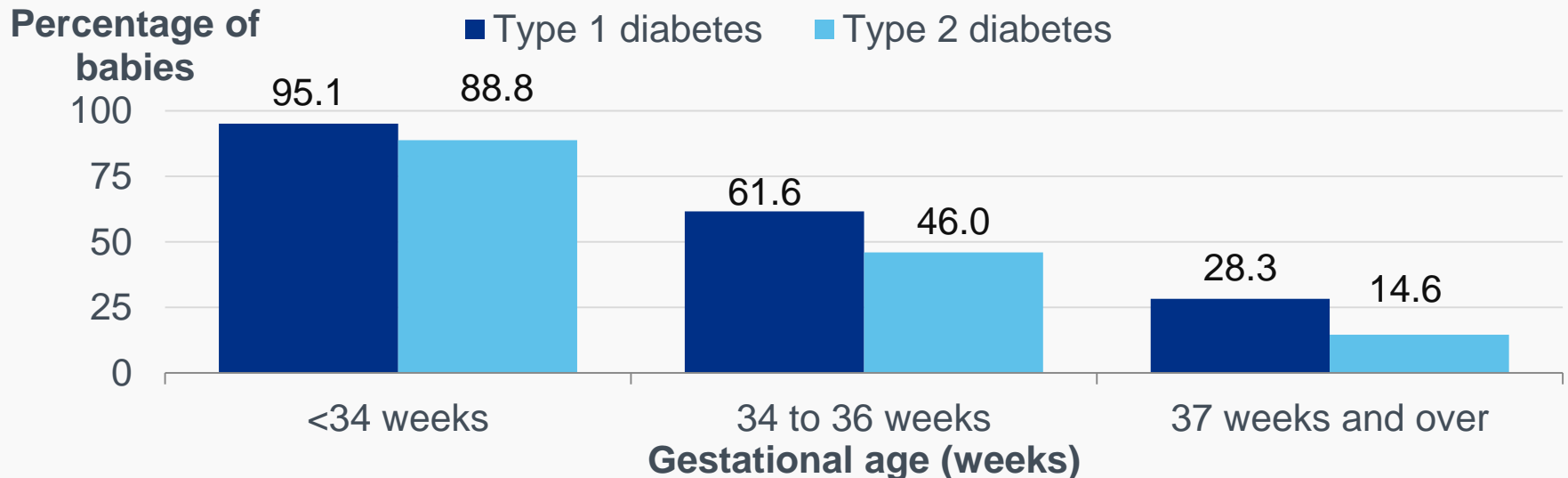
- before 34 weeks
- between 34 and 36 weeks if dictated clinically

¹ See References section.

Neonatal unit admissions

- The rate of admissions to a neonatal unit^a was higher among babies of mothers with Type 1 diabetes.
- For babies born at ≥ 37 weeks, the admission rate was higher than for full term babies in the general population (6.1 per cent in 2012 data⁹).

Figure 21: The Percentage of babies admitted to a neonatal unit^a, 2015



^a Neonatal unit includes special care and intensive care.

⁹ See References section. (General population data not available for preterm births.)

Neonatal unit admissions – mother and baby characteristics

Babies born at or after 37 weeks were more likely to be admitted to a neonatal unit^a if:

- their mother had HbA_{1c} ≥ 48 mmol/mol at 24 weeks+ gestation or
- they were LGA ($\geq 90^{\text{th}}$ birthweight centile).

Figure 22: Percentage of babies born at 37 weeks+ admitted to a neonatal unit^a by maternal HbA_{1c} at 24 weeks+, 2015

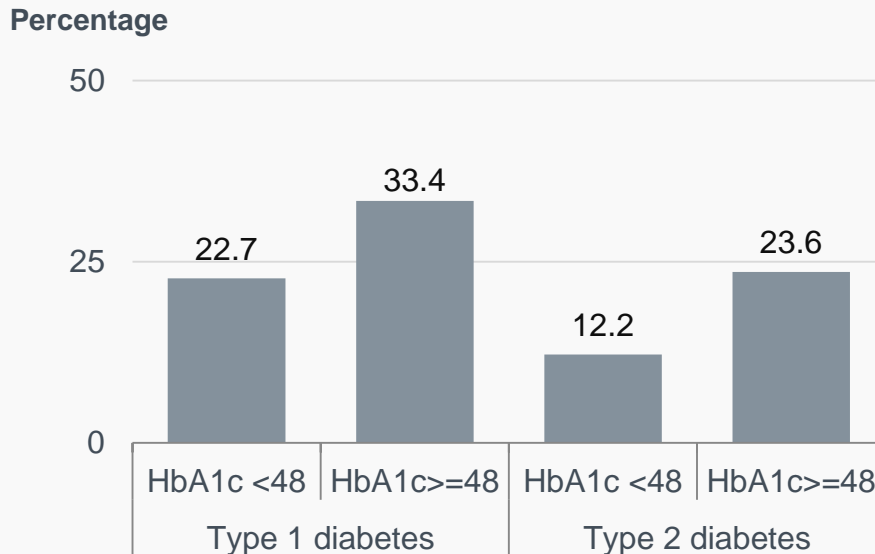
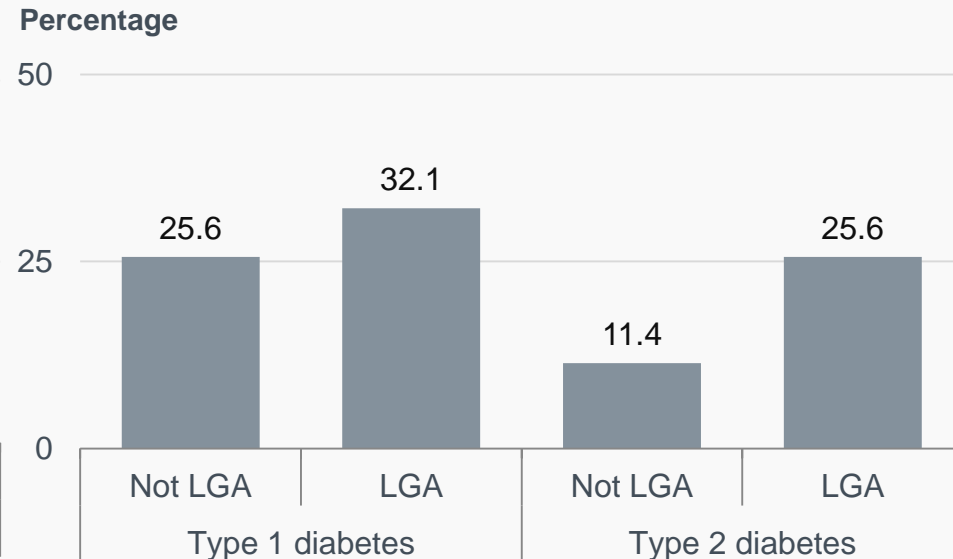


Figure 23: Percentage of babies born at 37 weeks+ admitted to a neonatal unit^a that were large for gestational age (LGA), 2015

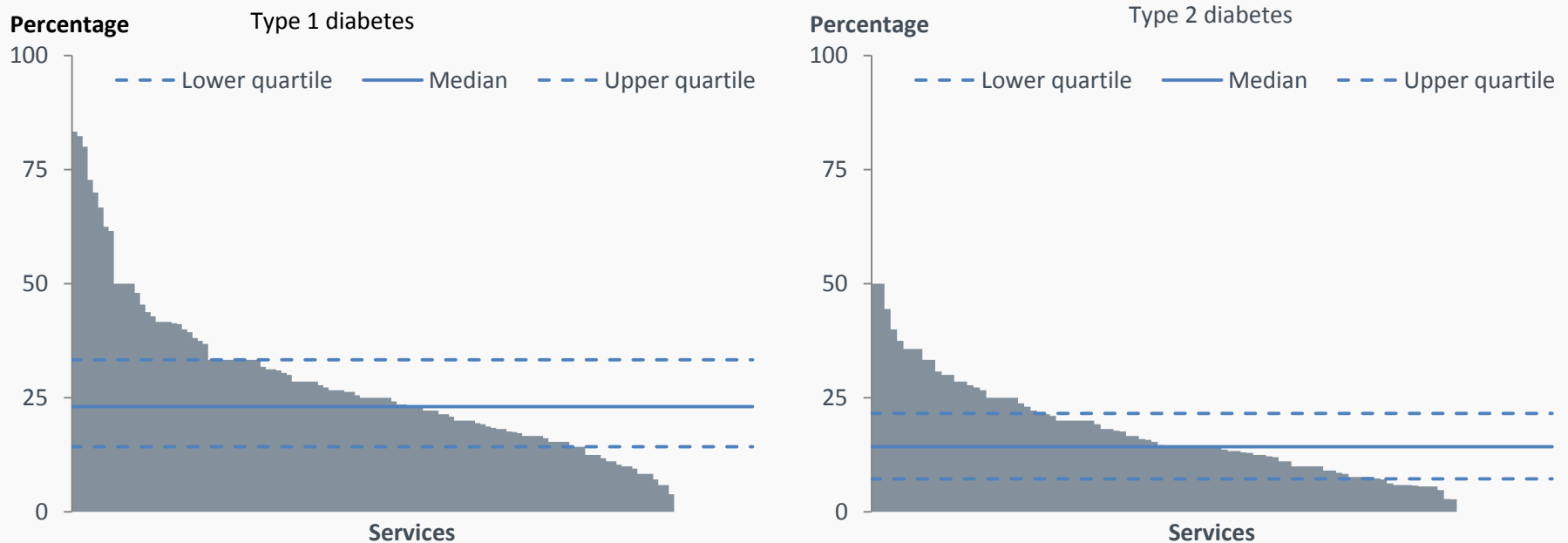


^a Neonatal unit includes special care and intensive care.

Local variation in babies born at/after 37 weeks admitted to neonatal unit

The percentage of full term babies admitted to a neonatal unit varied greatly between services.

Figure 24: The percentage of babies born at/after 37 weeks admitted to a neonatal unit by service^a, 2013 - 2015



^a Includes services with at least 10 completed pregnancy records: Type 1 diabetes – 130 services, Type 2 diabetes – 107 services.

Fetal/infant outcomes - comment

- Rates of admission to a neonatal unit remained high.
- Admission to the neonatal unit was more likely where maternal HbA_{1c} was high (≥ 48 mmol/mol) in late pregnancy, and/or where the baby was LGA.
- Although some specialist units looking after the highest risk pregnancies are likely to have a higher rate of admissions to a neonatal unit, the spread of the data may reflect local variation in admission policies between similar units.
- Admission to a neonatal unit carries risk as well as reducing early skin to skin contact and breastfeeding opportunities and should largely be avoidable.

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**Additional information and
references**

Additional information

The following documents are available from <http://digital.nhs.uk/pubs/npdaudit16>

- Supporting data in Excel
- Powerpoint version of this report
- Summary of Key Findings and Recommendations
- Service level 2013-2015 data
- Data Quality Statement
- Methodology
- Glossary

References

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9. NHS Digital: NHS Outcomes Framework Indicator 5.5 Admission of full-term babies to neonatal care
<http://content.digital.nhs.uk/nhsf>

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