

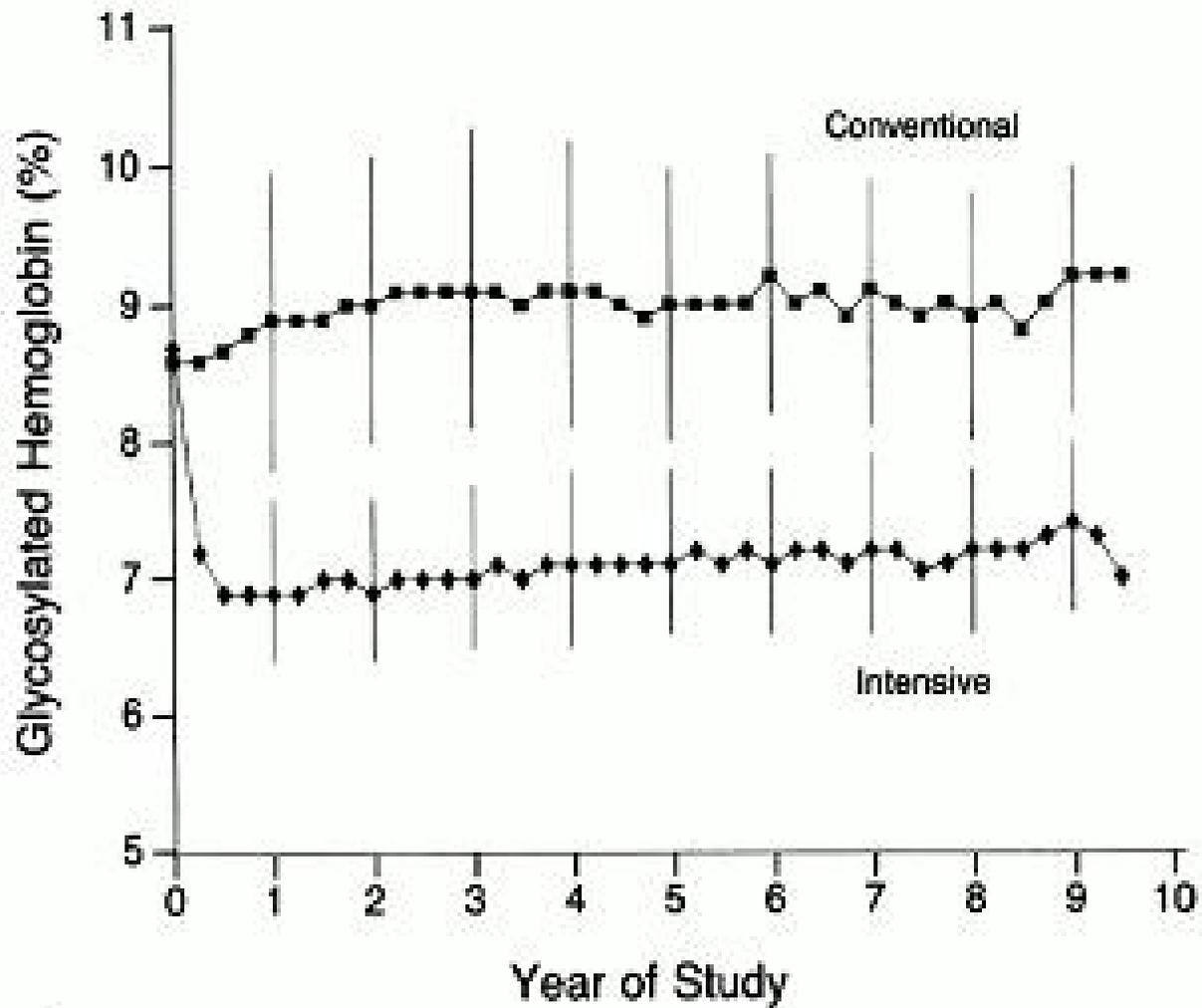
FAT BOY SLIM

I'M  
#1  
SO WHY  
TRY HARDER

YOU'VE COME A LONG WAY, BABY

**WARNING:**  
This recording  
contains explicit  
language

## Measurements of Glycosylated Hemoglobin and Blood Glucose in Patients with IDDM Receiving Intensive or Conventional Therapy

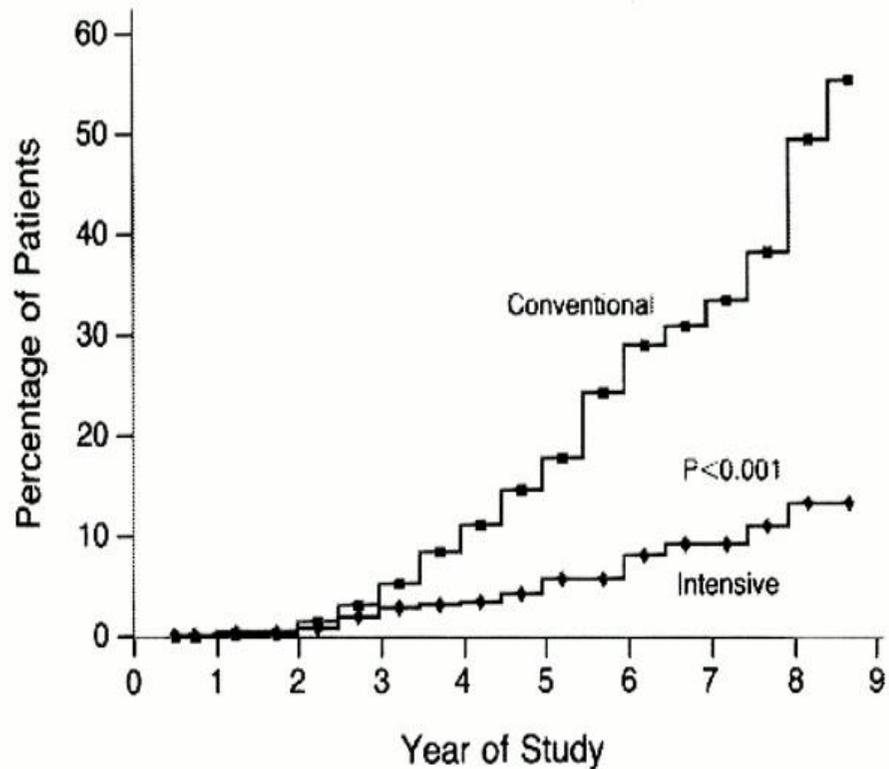


The Diabetes Control and Complications Trial Research Group, N Engl J Med 1993;329:977-986



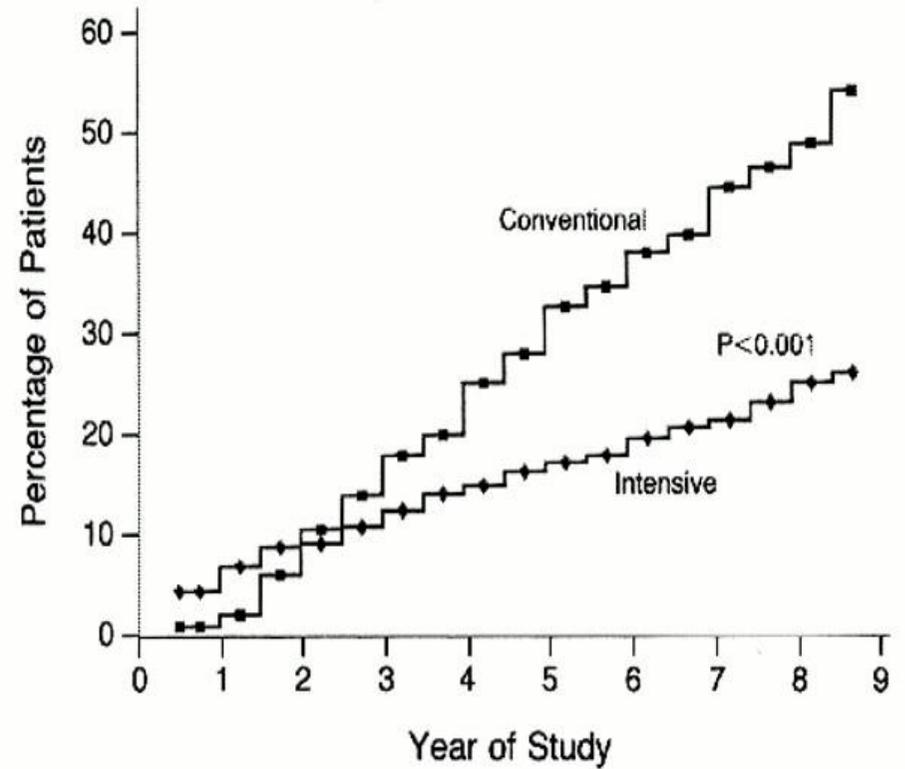
The NEW ENGLAND  
JOURNAL of MEDICINE

## Cumulative Incidence of a Sustained Change in Retinopathy in Patients with IDDM Receiving Intensive or Conventional Therapy



Conventional	375	220	79	52
Intensive	342	202	78	49

A



Conventional	348	324	128	79
Intensive	354	335	136	93

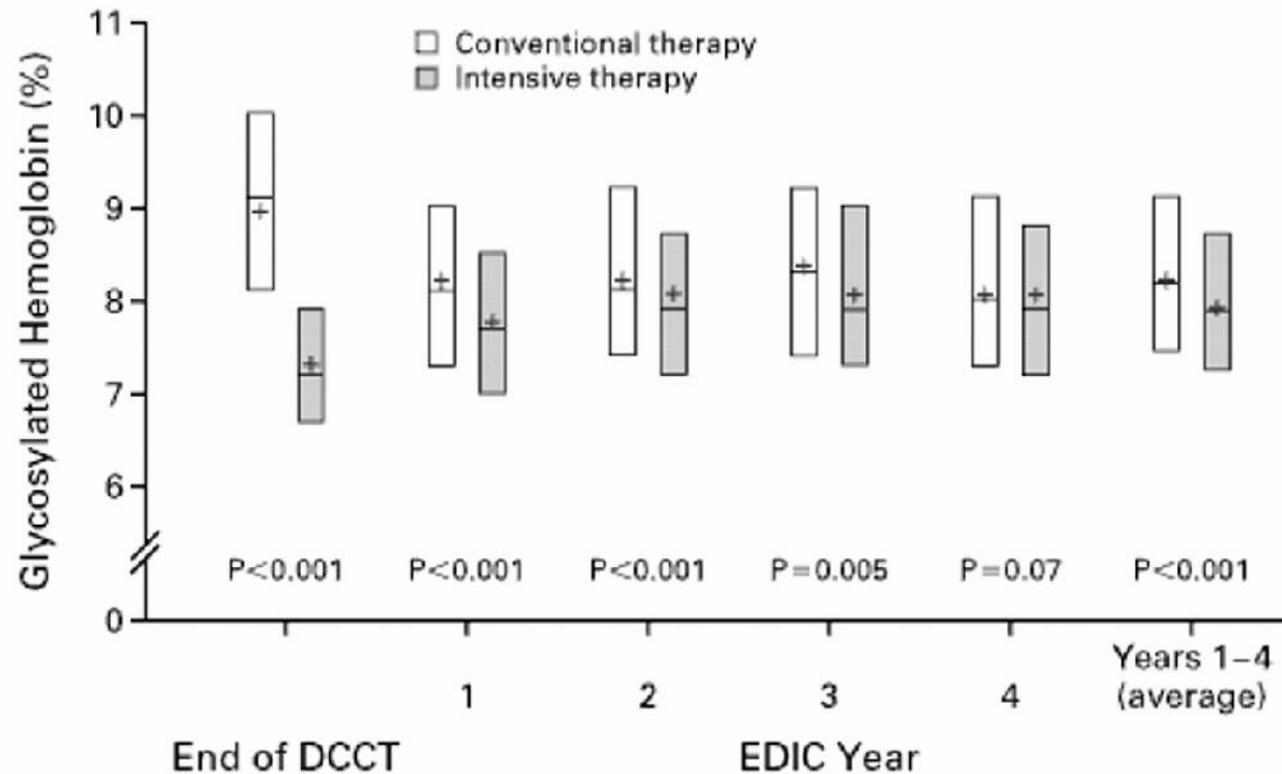
B

# A 1 % reduction in HbA1c

- For ten years
  - NNT to prevent three step change in retinopathy = 5.6
  - NNT to prevent microalbuminuria = 16.8
  - NNT to prevent clinical neuropathy = 16.8

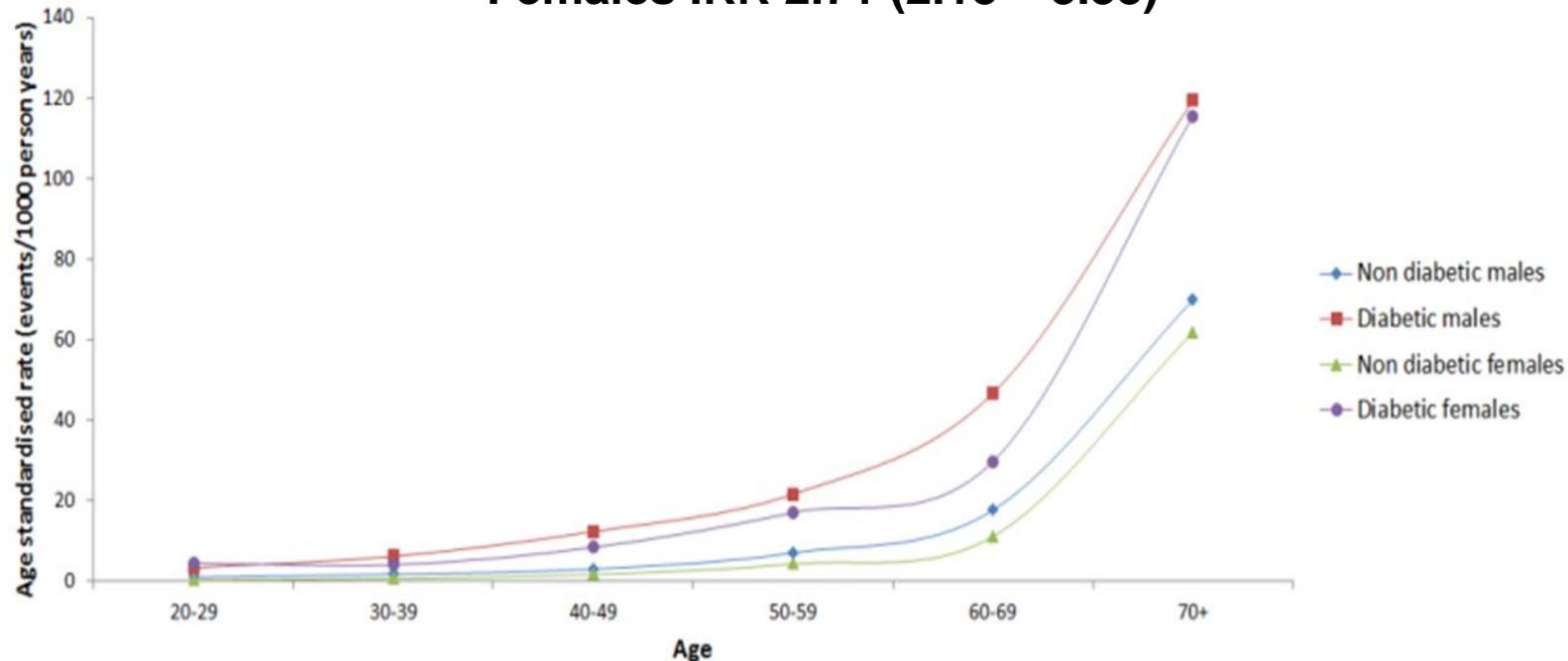
James Walker

**Distribution of Glycosylated Hemoglobin (Hemoglobin A1c) Values in the Conventional-Therapy and Intensive-Therapy Groups at the End of the Diabetes Control and Complications Trial (DCCT), in Each of the Four Years of the Epidemiology of Diabetes Interventions and Complications (EDIC) Study, and Averaged over the Four Years of the EDIC Study**



# Death Rates by Age : 21789 T1DM compared with 3.6 million Non DM

**Total mortality**  
**Males IRR 2.58 (2.23-2.98)**  
**Females IRR 2.71 (2.18 – 3.38)**

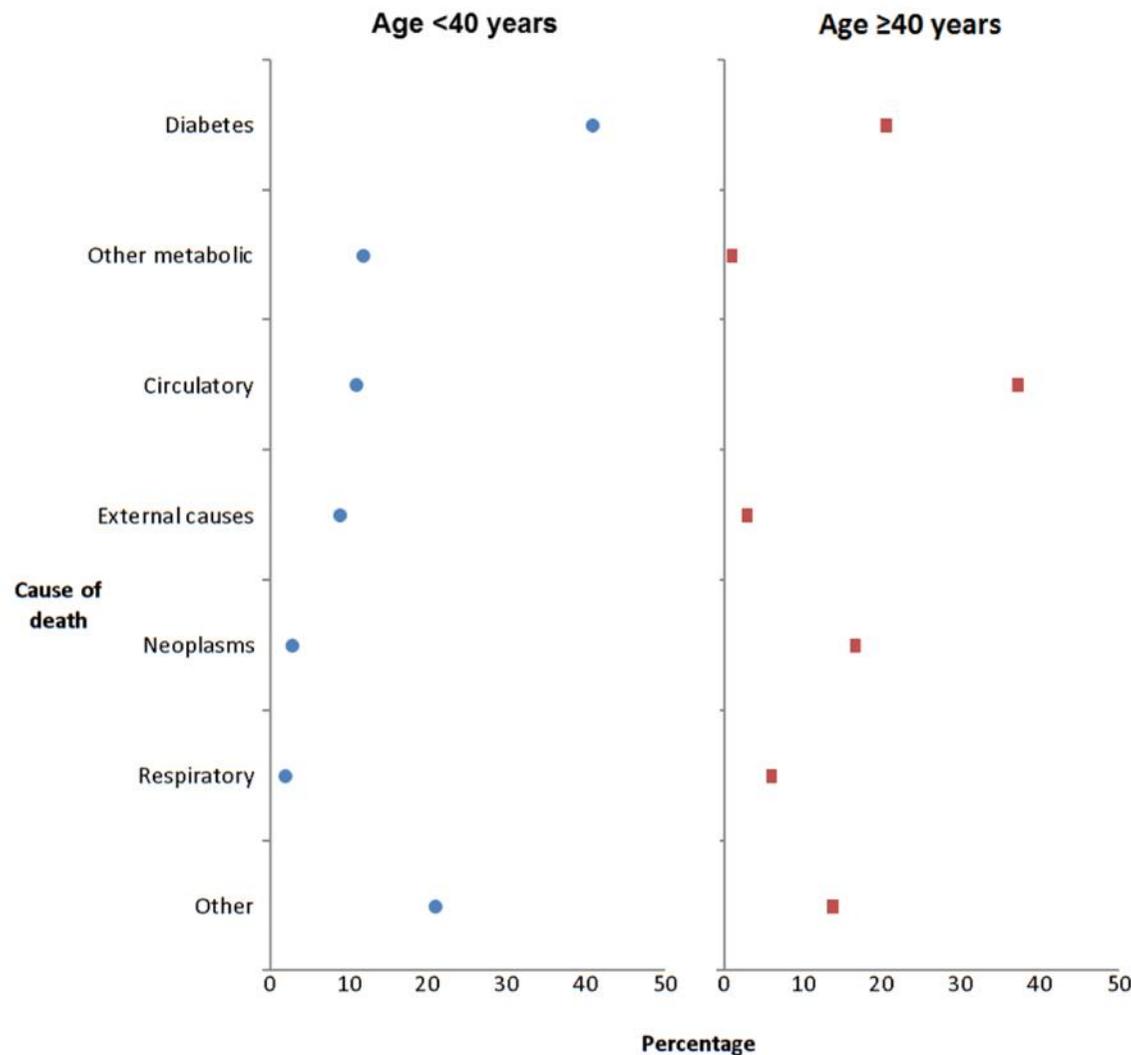


**Much lower mortality relative risks than in earlier studies**

*Livingstone...Colhoun for SDRN Epi Group*

*PloS Med 2012*

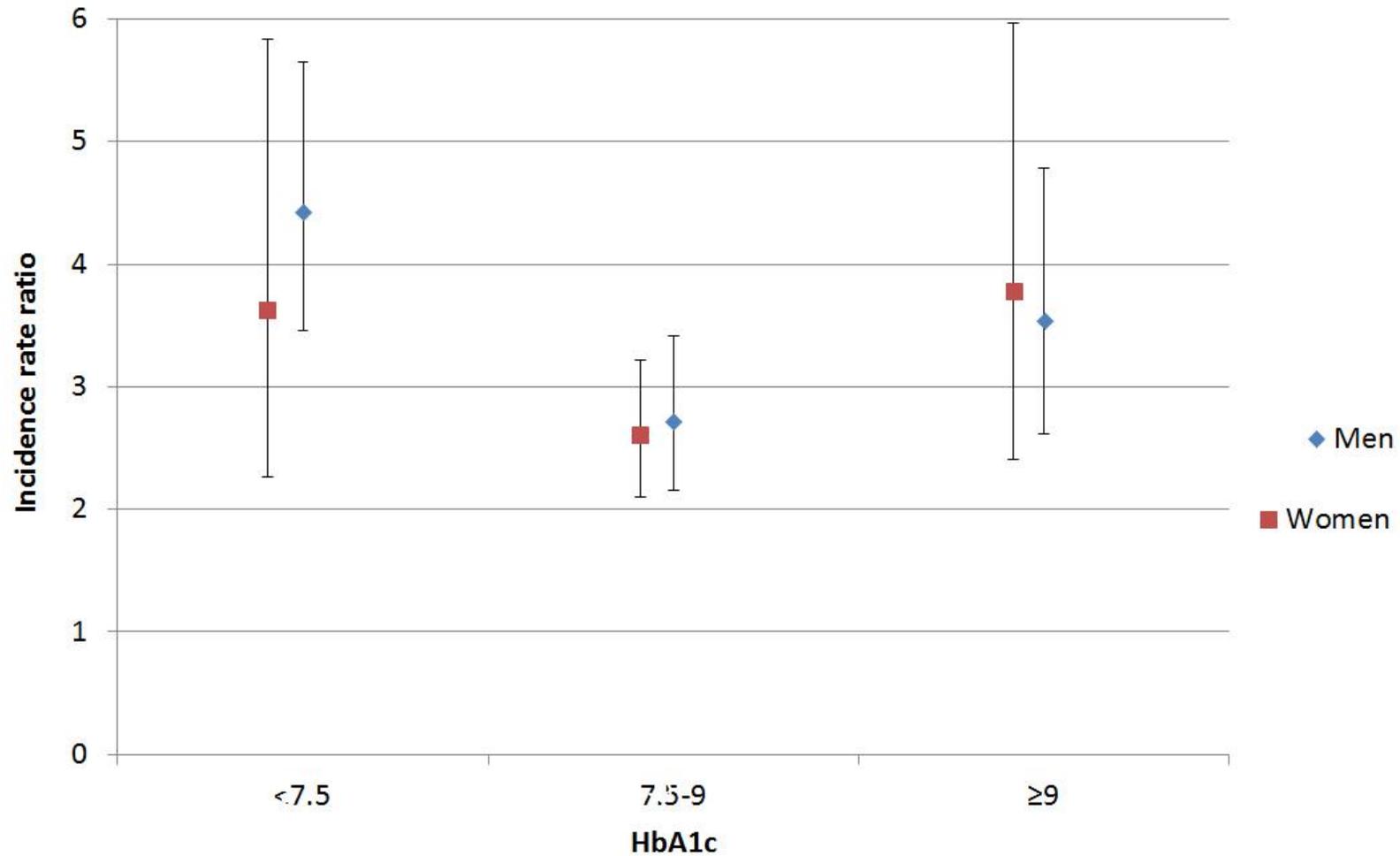
# % of Deaths due to various Causes Causes by Age Among Those with Type 1 DM



**Still high levels of early deaths directly from diabetes: about 12 deaths per year among those 10173 patients aged 20-40 yrs with underlying cause of death of hypo or hyperglycaemic crises:**

**Among those dying with coma over the three years the median preceding HbA1c was 8.65 (7.75 -10.65) and many had not had HbA1c for a few years**

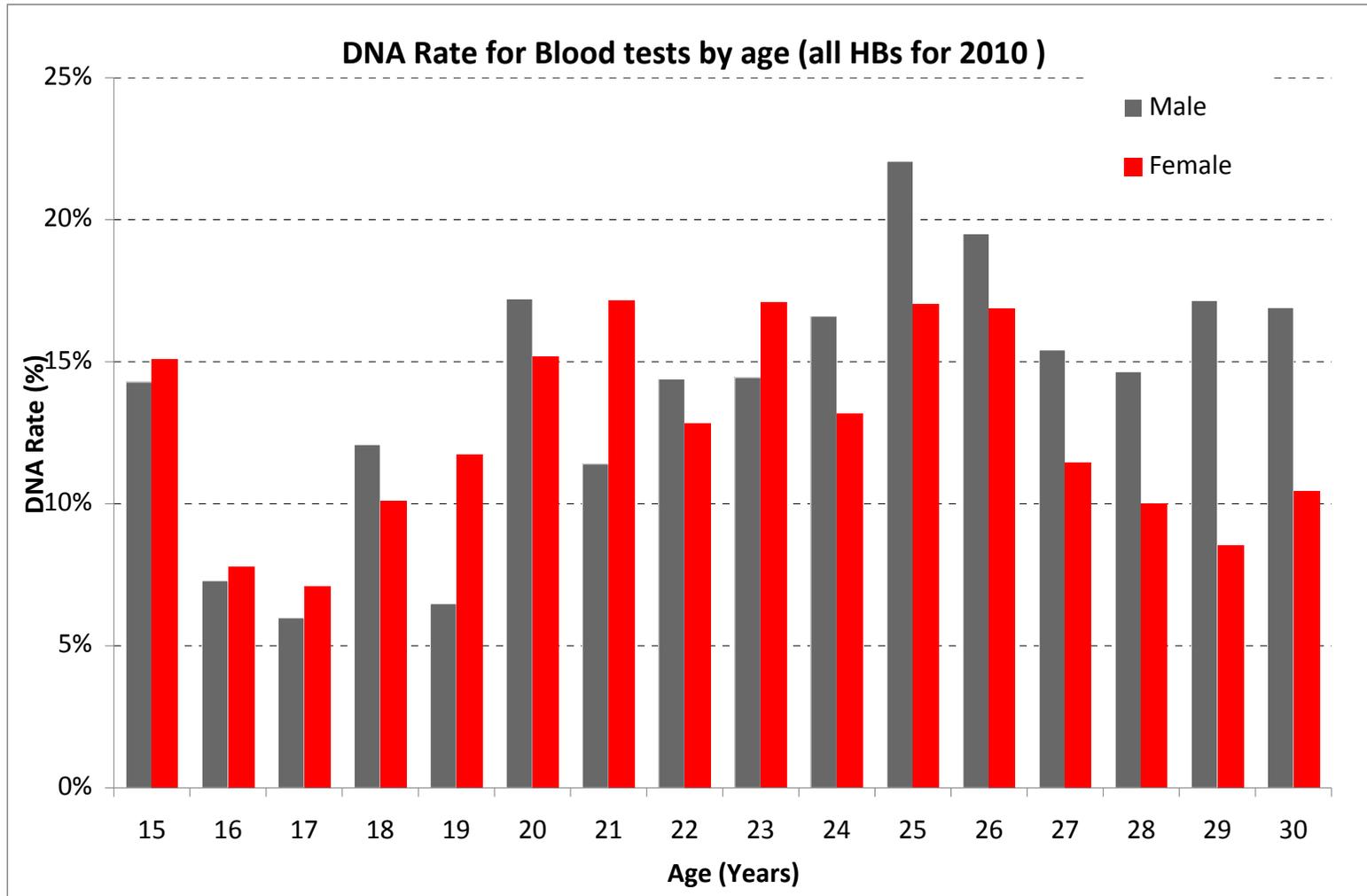
# Mortality IRR associated with T1DM by HbA<sub>1c</sub> and sex

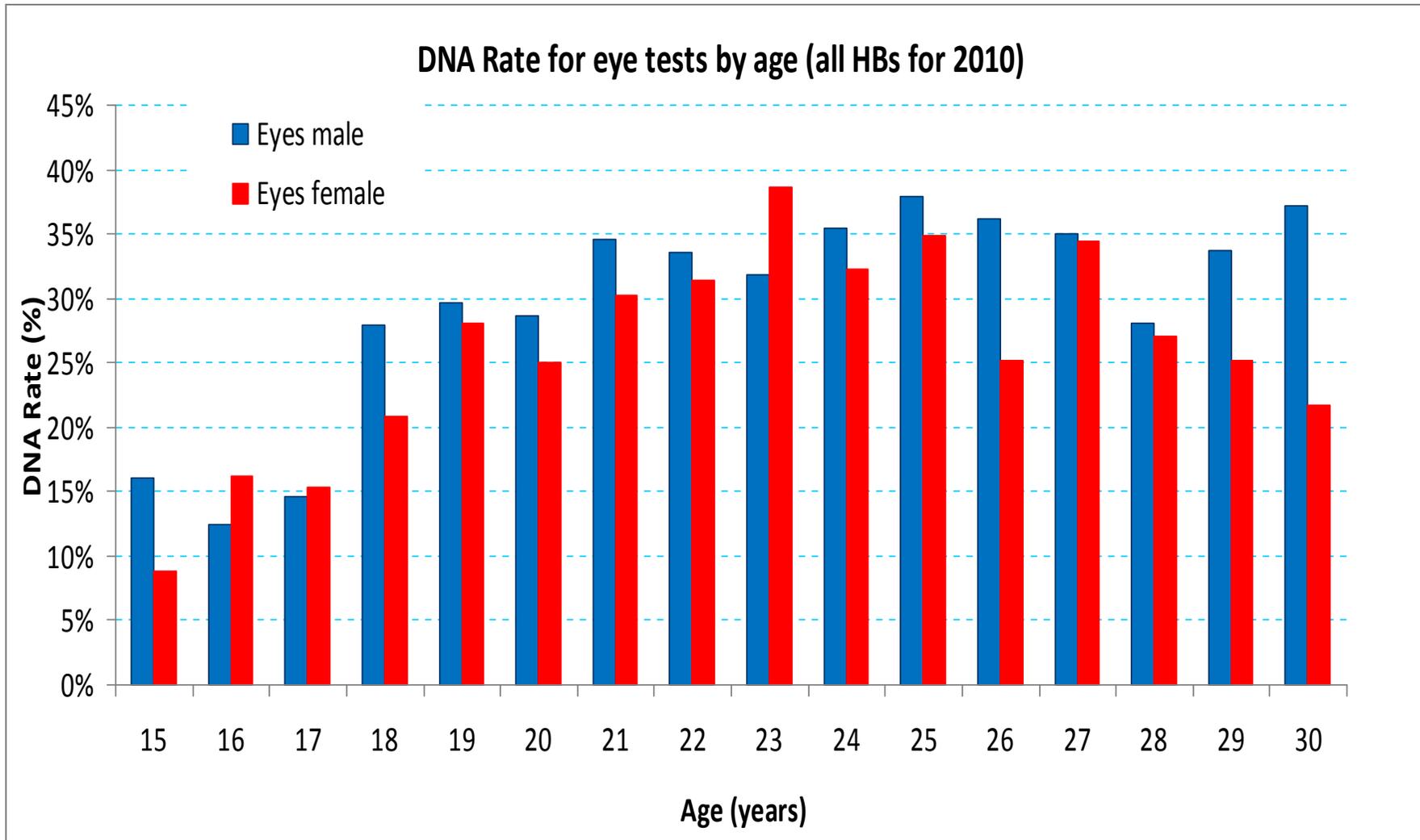


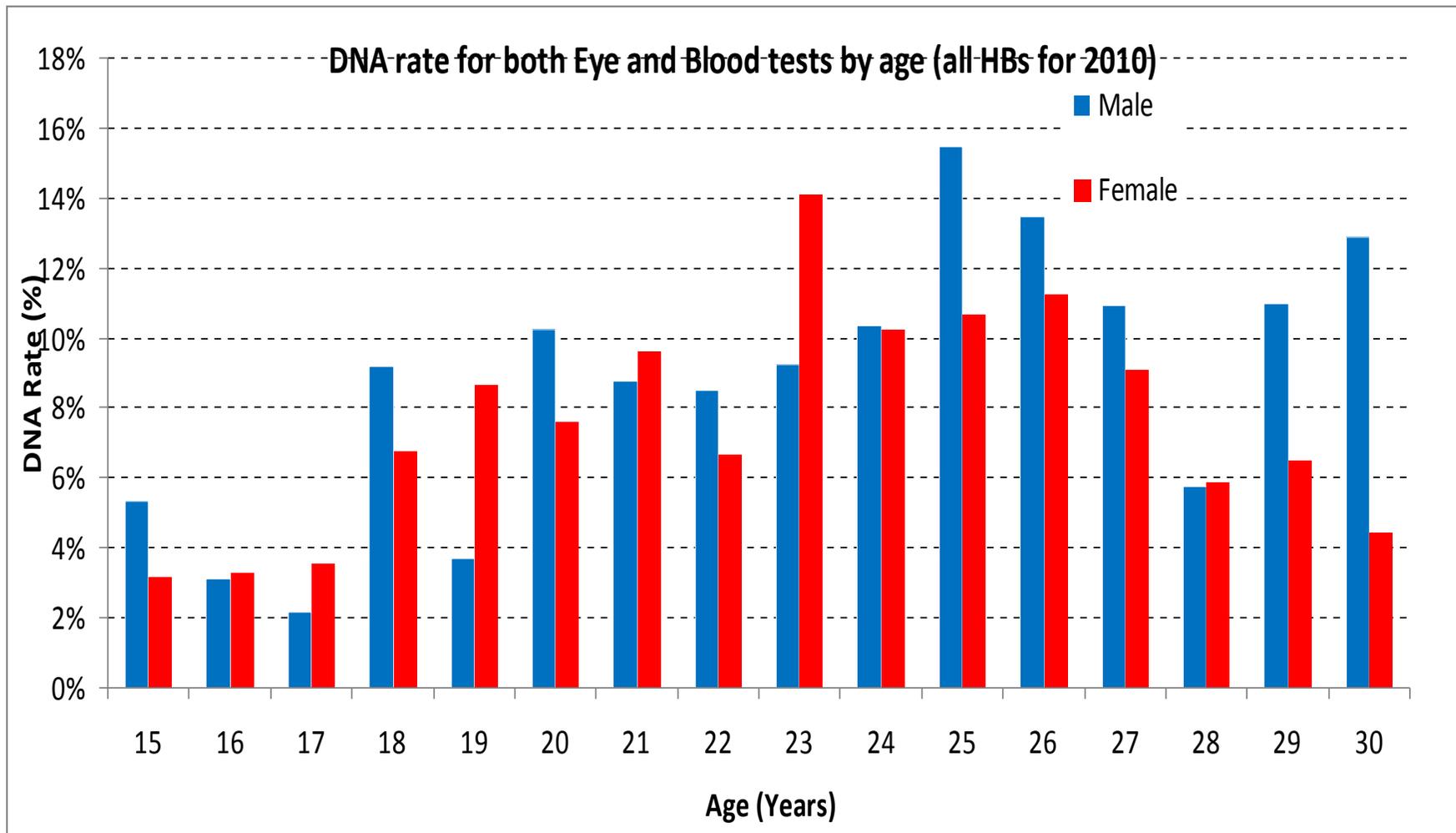
# Disengagement



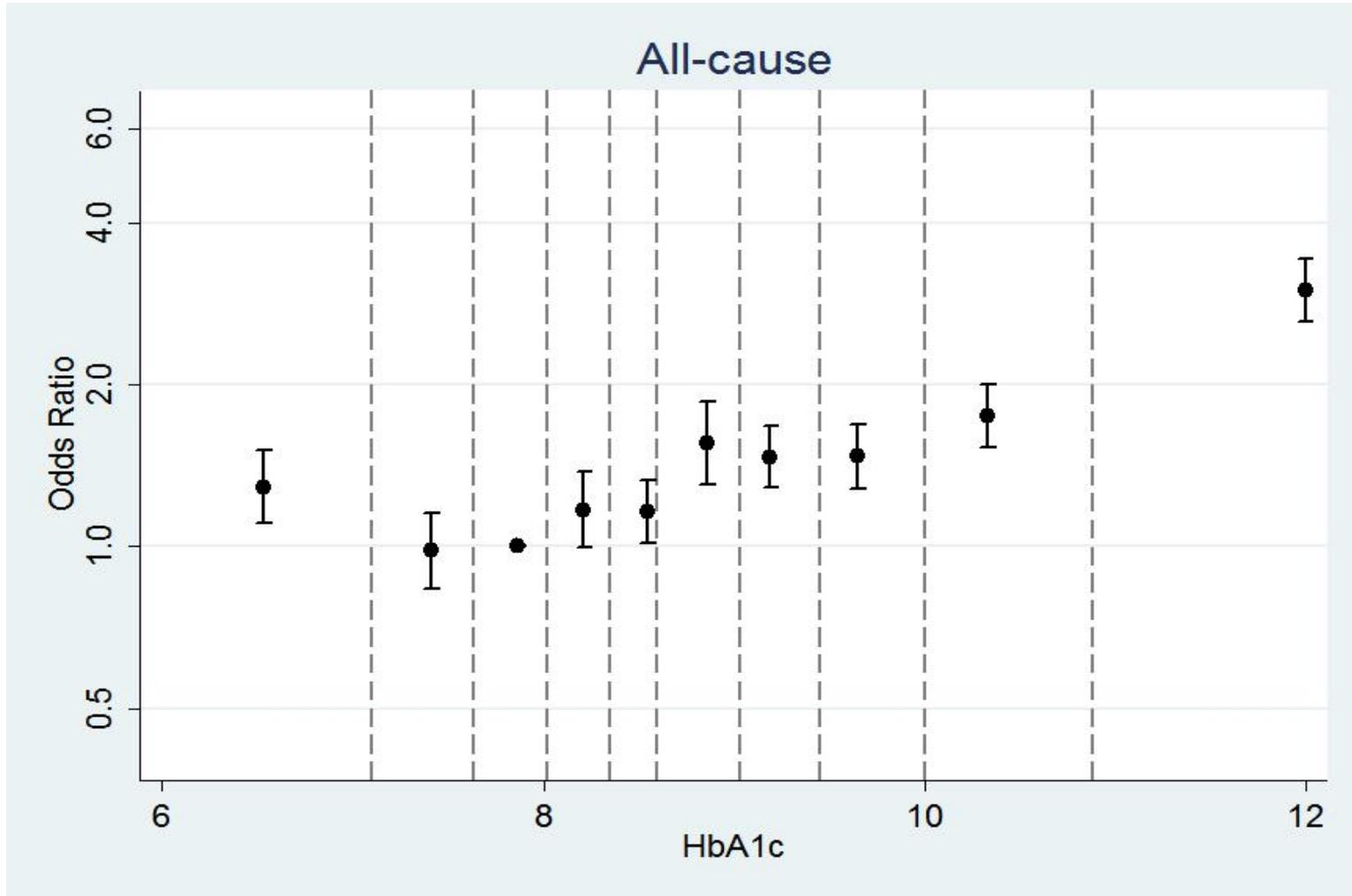
- Type 1 screening 'performance' is not as good as Type 2
- Investigation
  - All persons with diabetes aged 15-30
- SCI-DC data for 2010 (taken from 15<sup>th</sup> Nov 2009 to 15<sup>th</sup> Feb 2011)
- Disengagement from services
  - No record of HbA1c measurement
  - Failure to have retinal screening performed







# Odds ratios of admission by HbA<sub>1c</sub> decile (All cause)



Lindsay Govan; *Diabetes Care* 2011;34(9):1992-7

# Cost of extra admissions

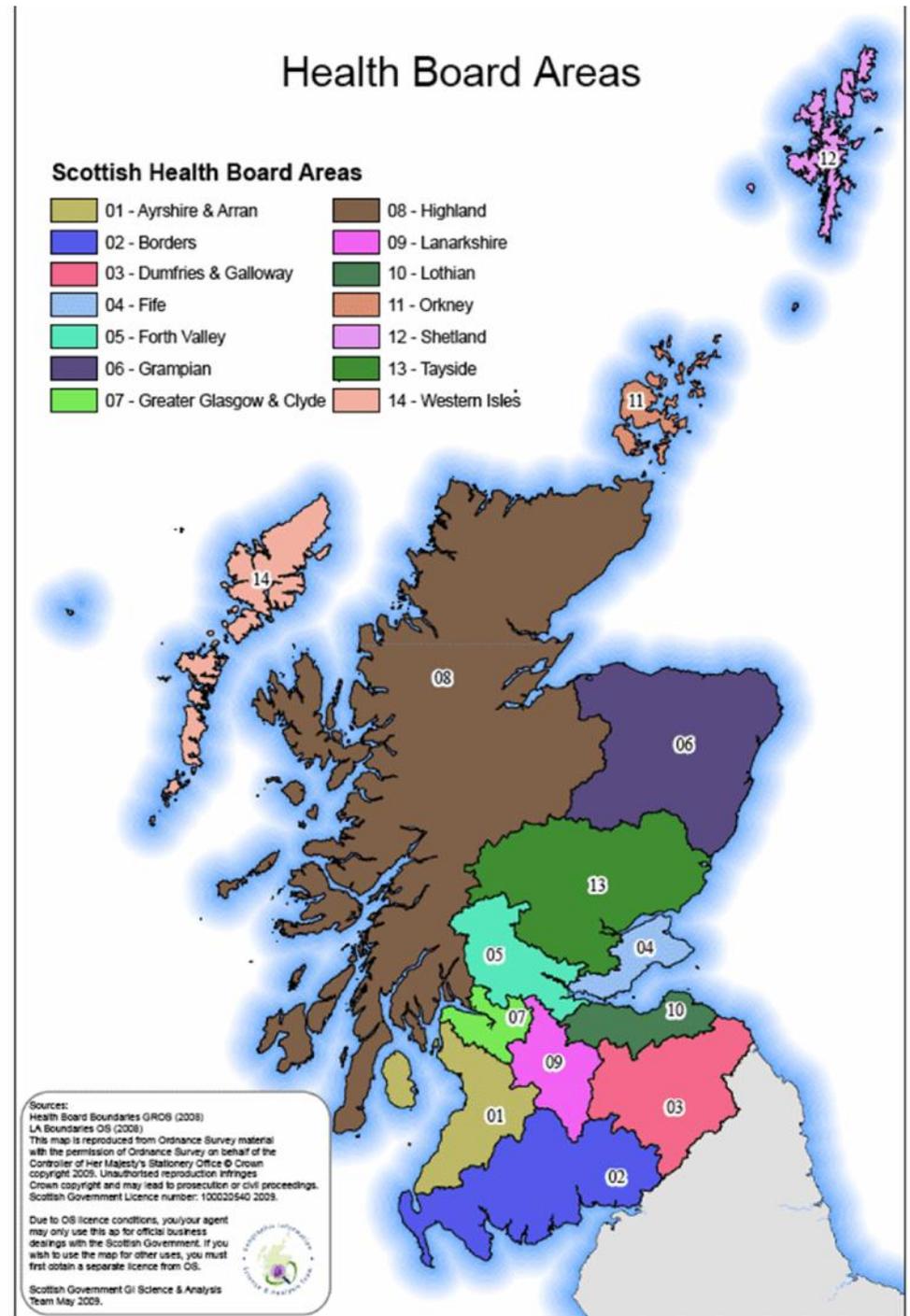
- **Decile 10 vs decile 3**
  - Extra 2915 hospital admissions over 3 years
  - 2759 “diabetes related” group
  - 1616 “diabetic ketoacidosis”
- **“extra” cost for those with HbA1c >10.8%**
  - £2.4m per annum for all admissions
  - £1.3m per annum for “extra” ketoacidosis admissions in decile 10

# Scotland

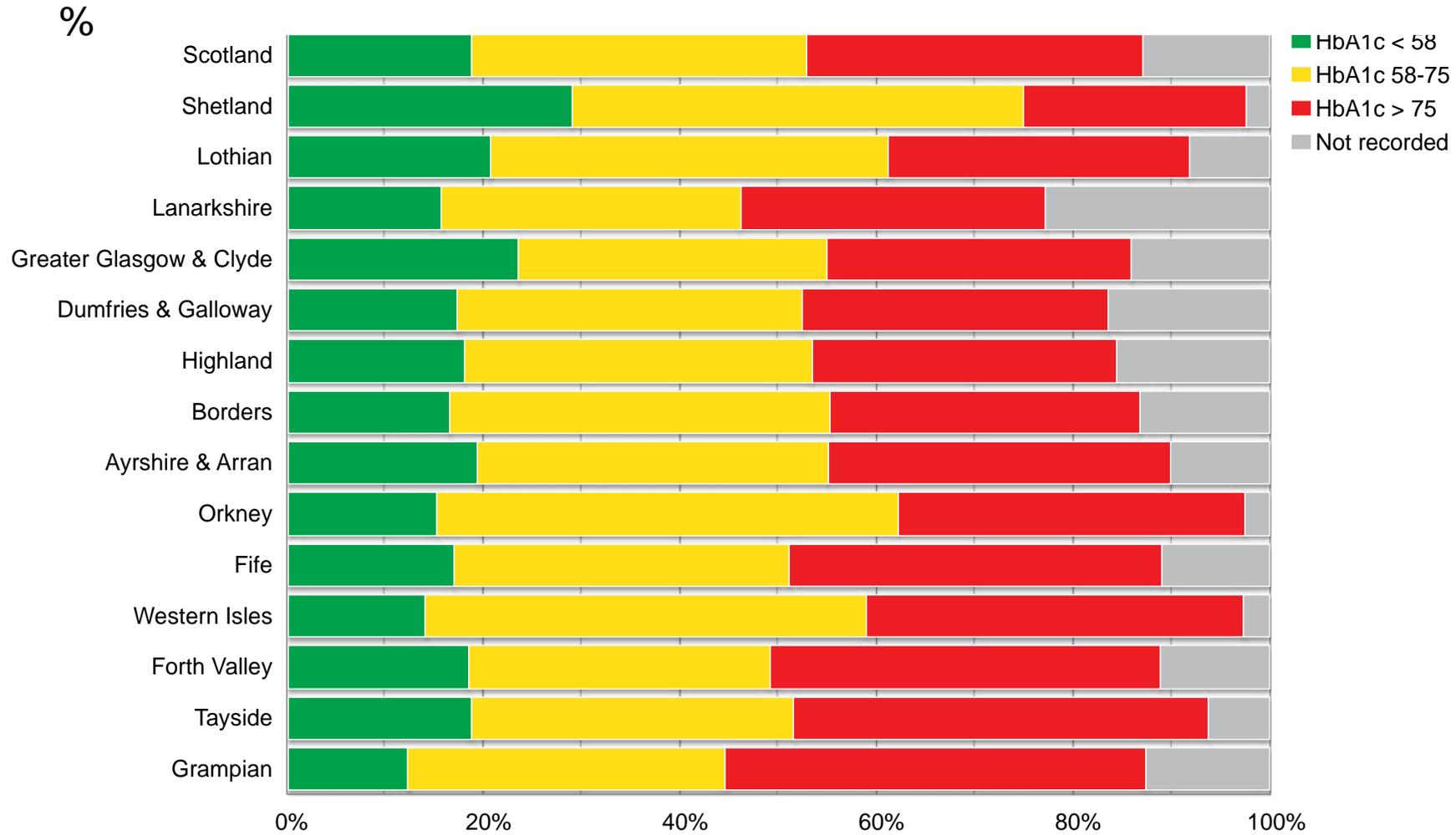
- 5.3 million people
- 276,430 have diabetes
- 26,294 had Type 1 in 2006
- 29,802 registered with Type 1 diabetes in Dec 2014

## 14 NHS Boards

- 21,750 to 1.1 million people in an NHS Board
- 28 adult diabetes centres



# Type 1 Glycaemic control in Scotland



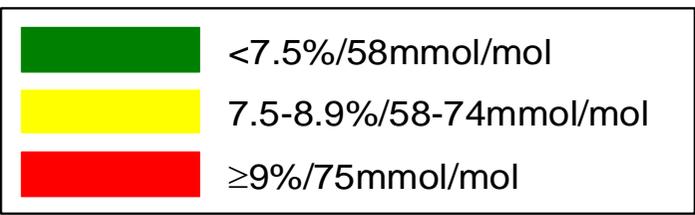
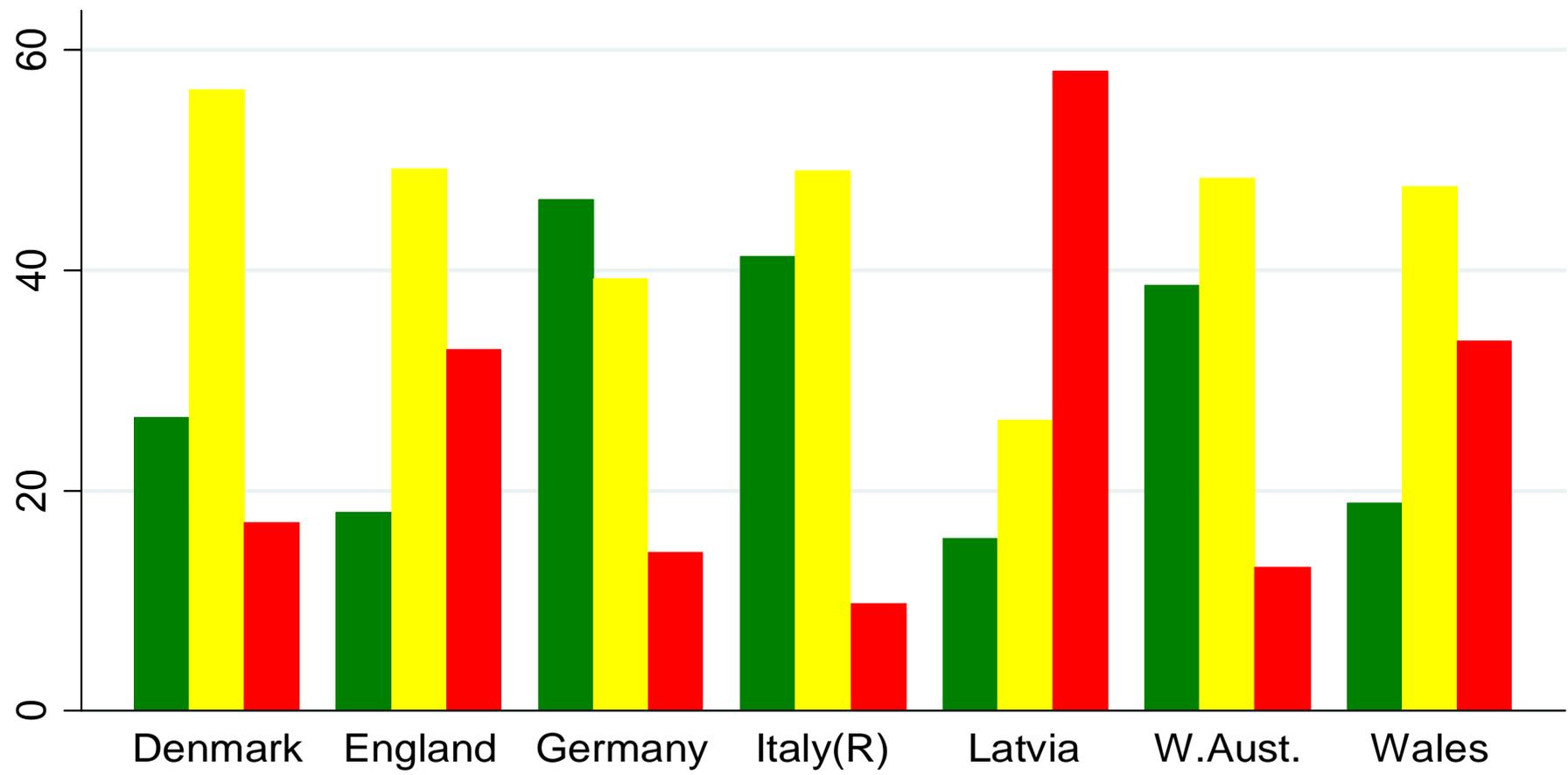
# Type 1 diabetes care

- Question1
  - Are we similar to most other countries?

# **Glycaemic control of type 1 diabetes in clinical practice early in the 21<sup>st</sup> century: an international comparison**

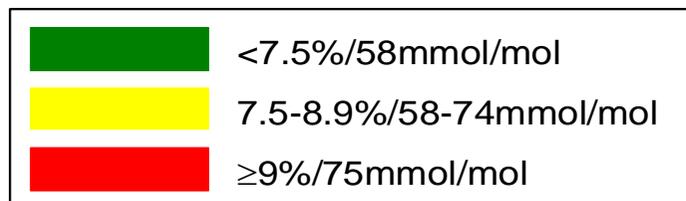
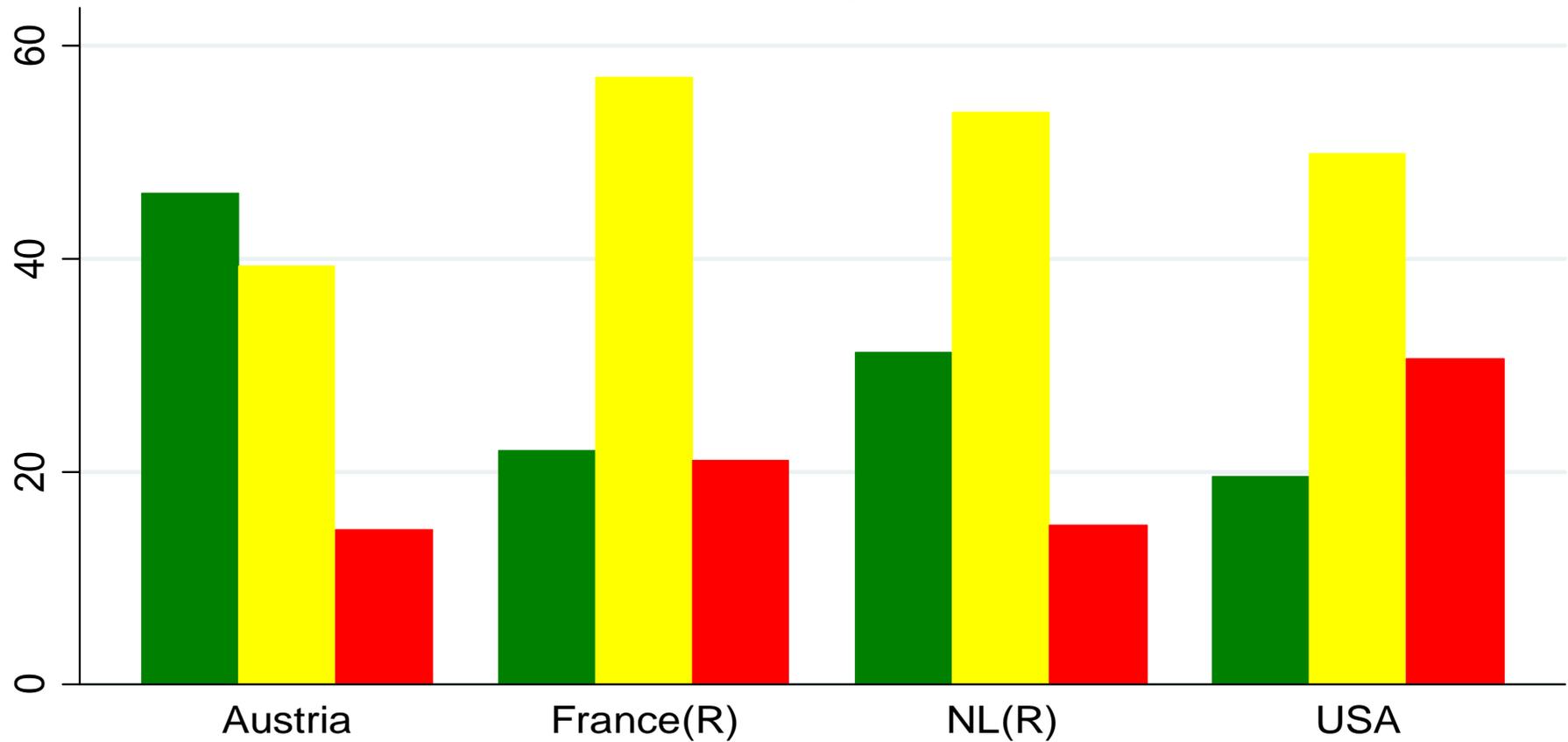
- 19 countries
- 324,501 people
- Sample size varied from 355 to 173,880
- Population or clinic based registers

# Populations under 15 years of age

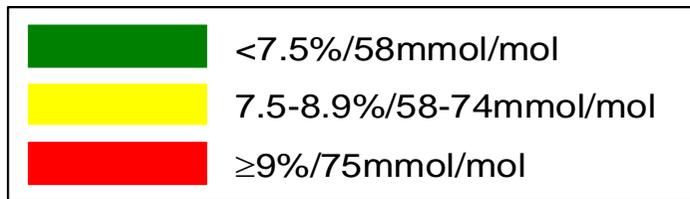
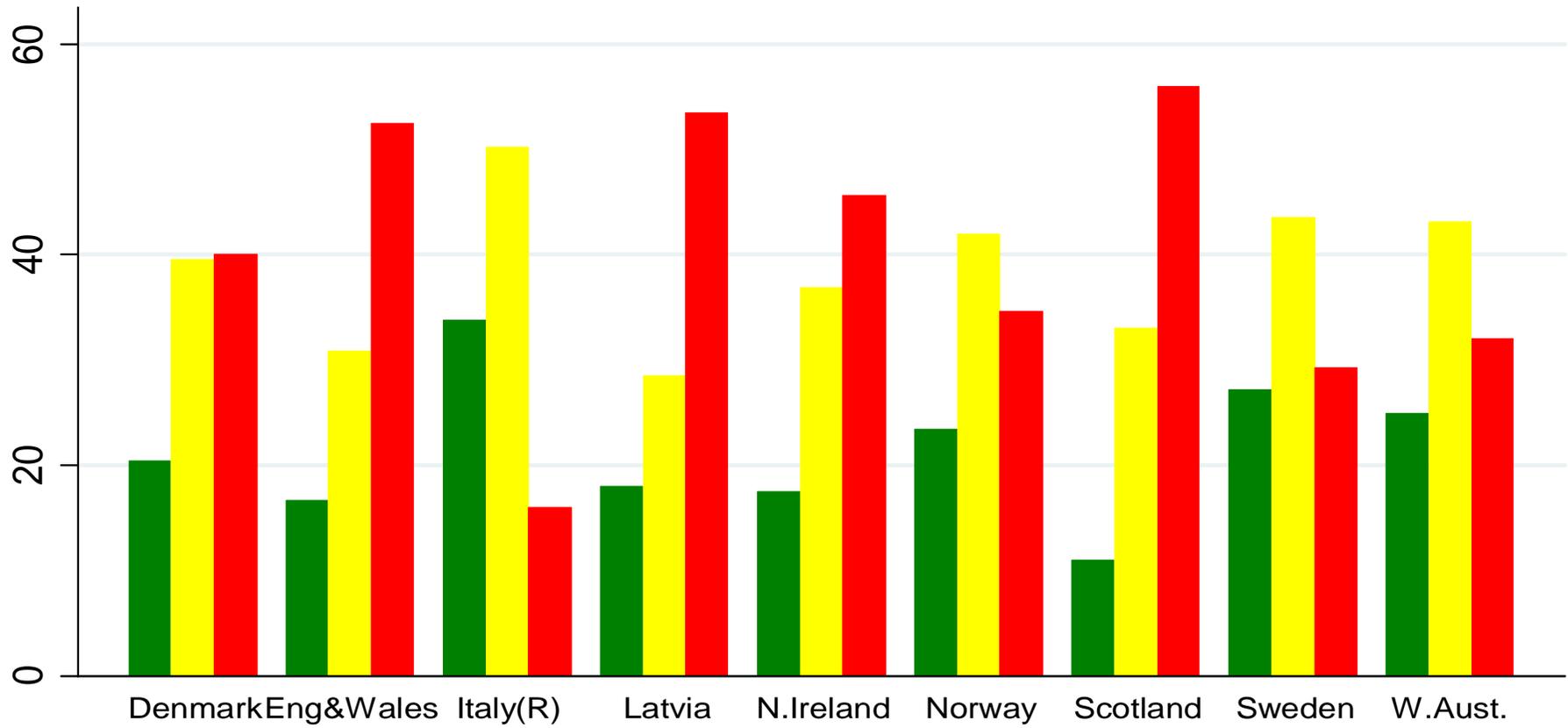


# Clinic based register

b. <15 years

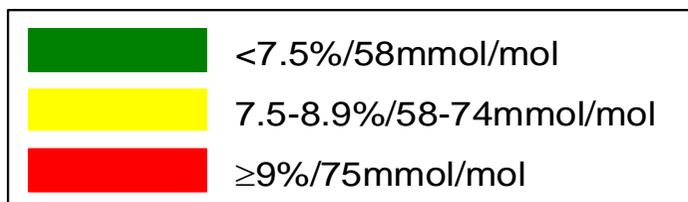
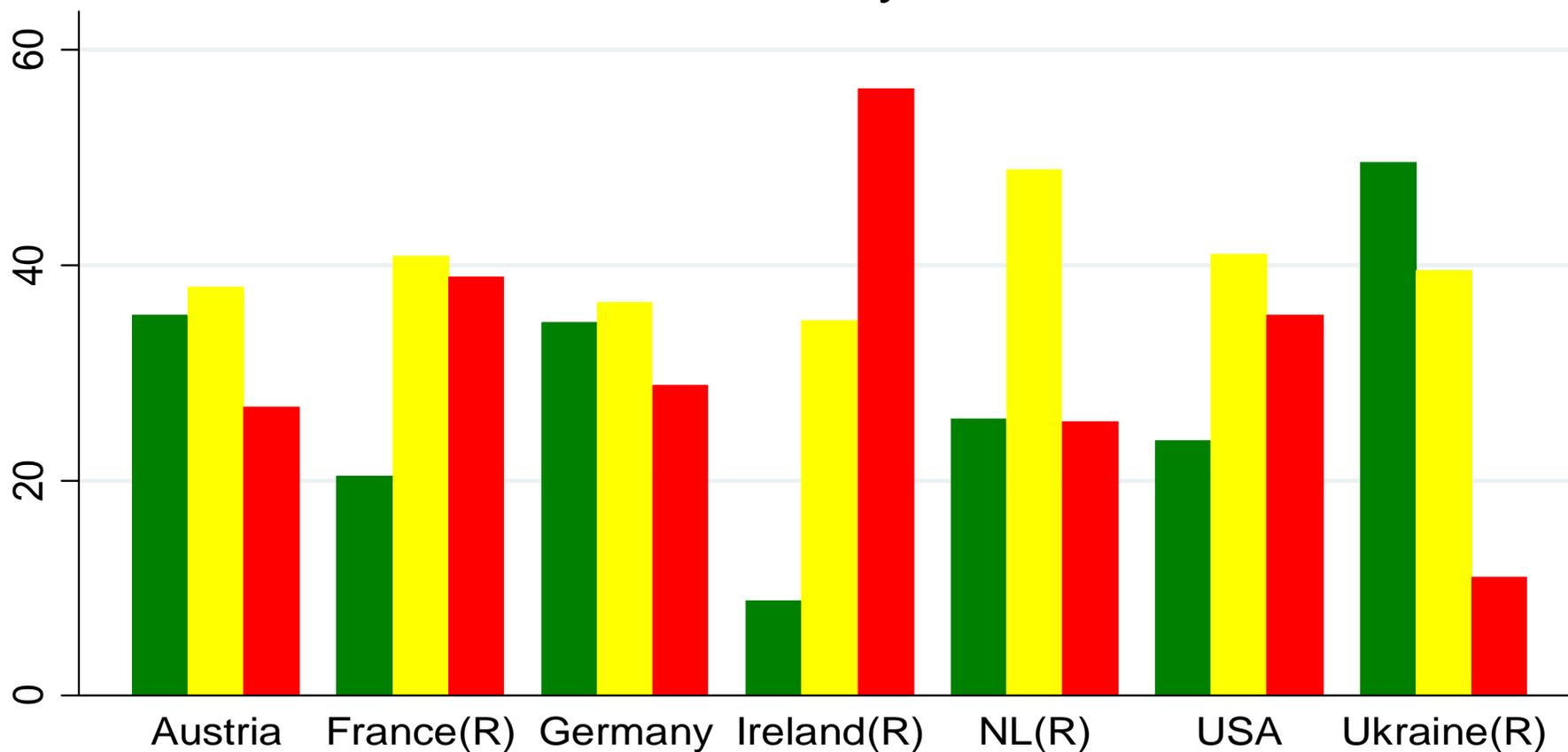


# Populations 15 to 24 years of age

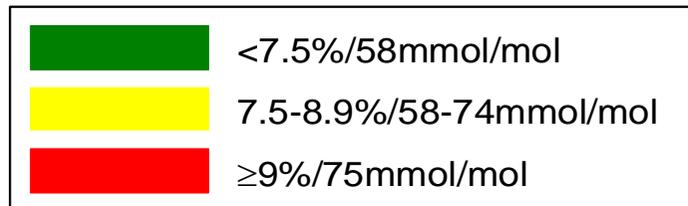
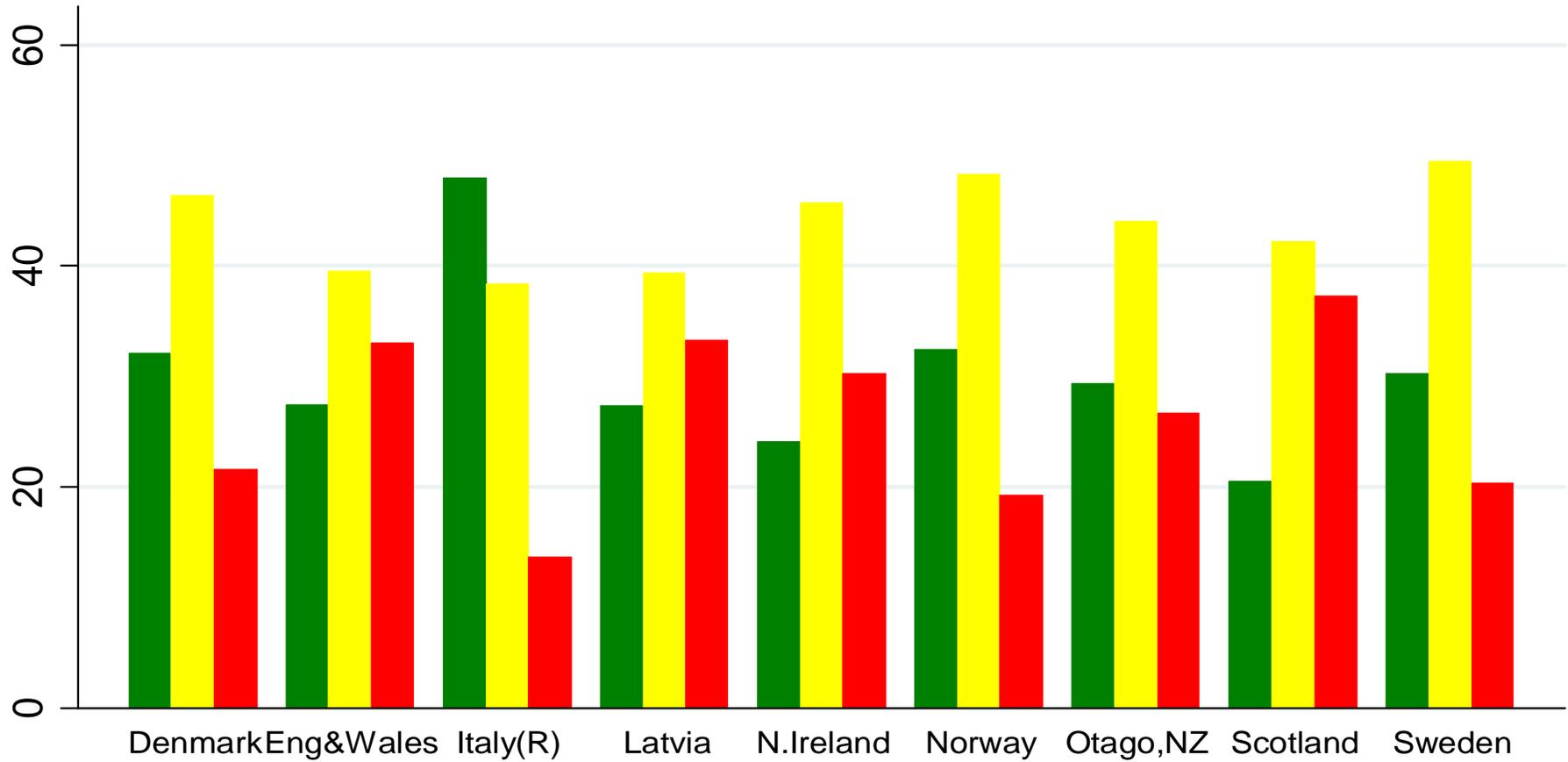


# Clinic based register

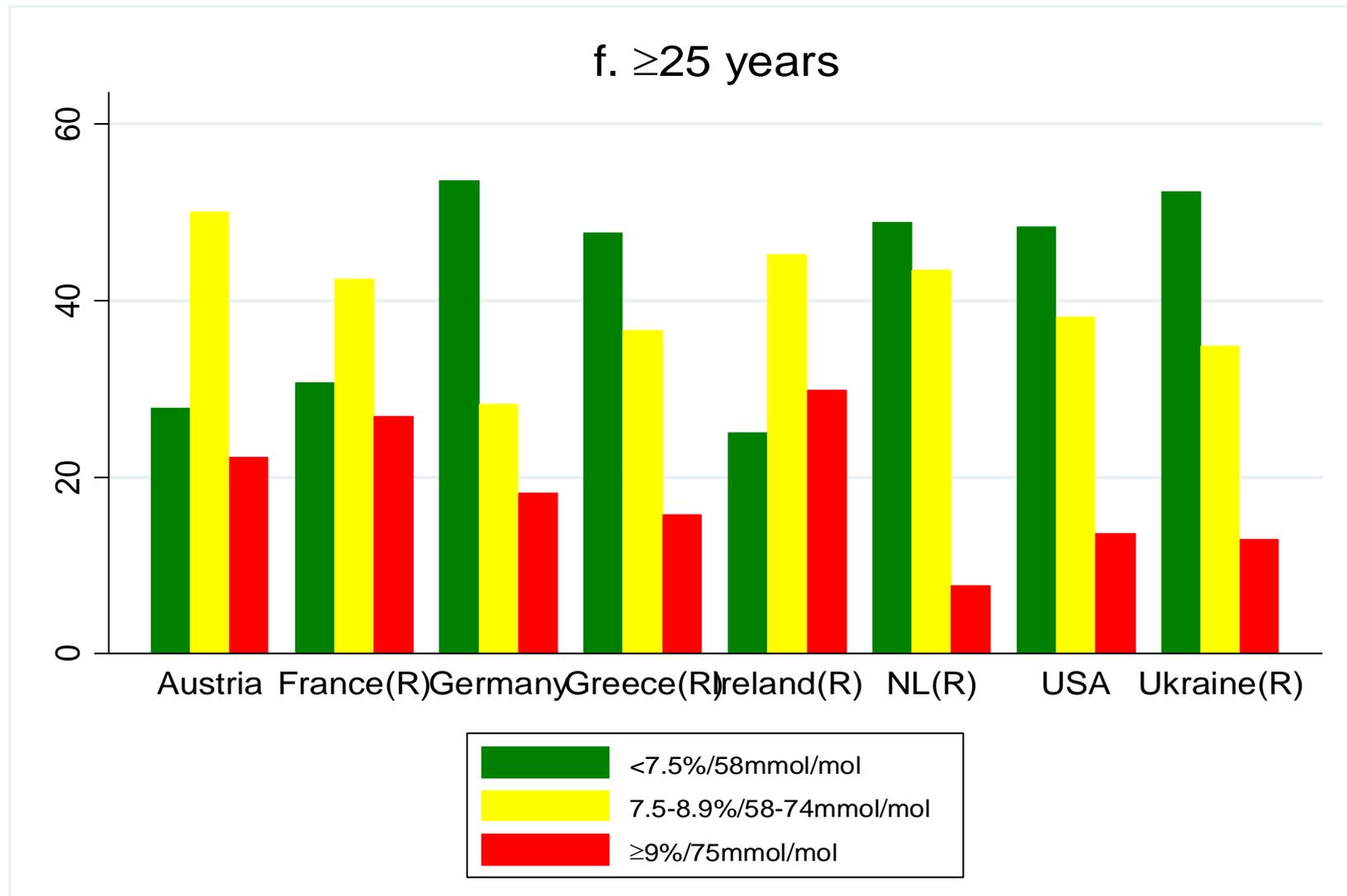
d. 15-24 years



# Populations 25 + years of age



# Clinic based register



# Type 1 diabetes care

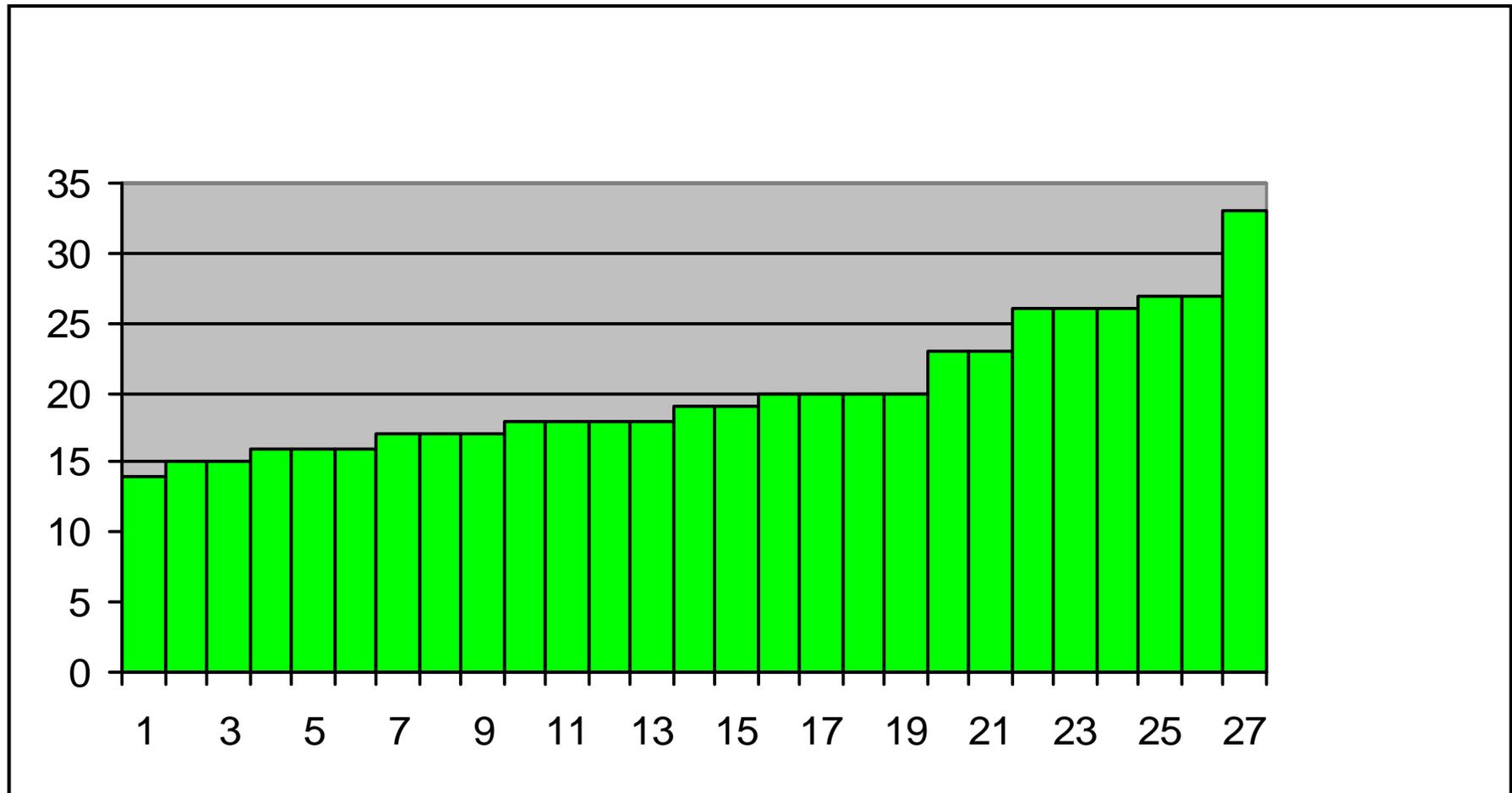
- Question1
  - Are we similar to most other countries?
- Answer
  - It looks as though we are not doing this as well as most other developed countries.
- Comment
  - “yeah but we are all equally poor”

# Type 1 diabetes care

- Question2
  - Are we all doing equally badly?

# Percentage in each clinic with HbA1c <7.5 %

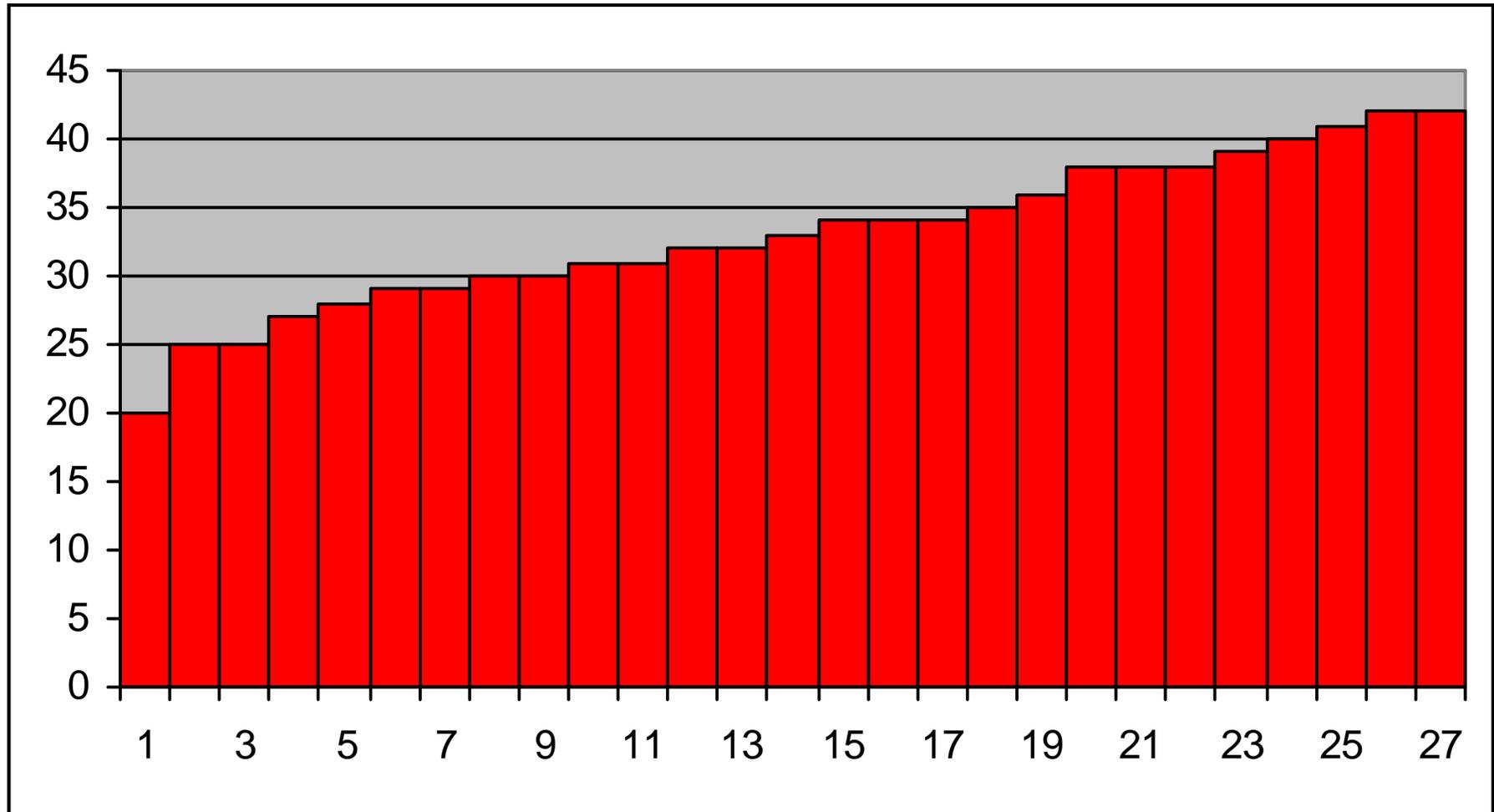
n = 17,253 (range 27 centres n = 164 to 1,555)



Range 14 to 33 %

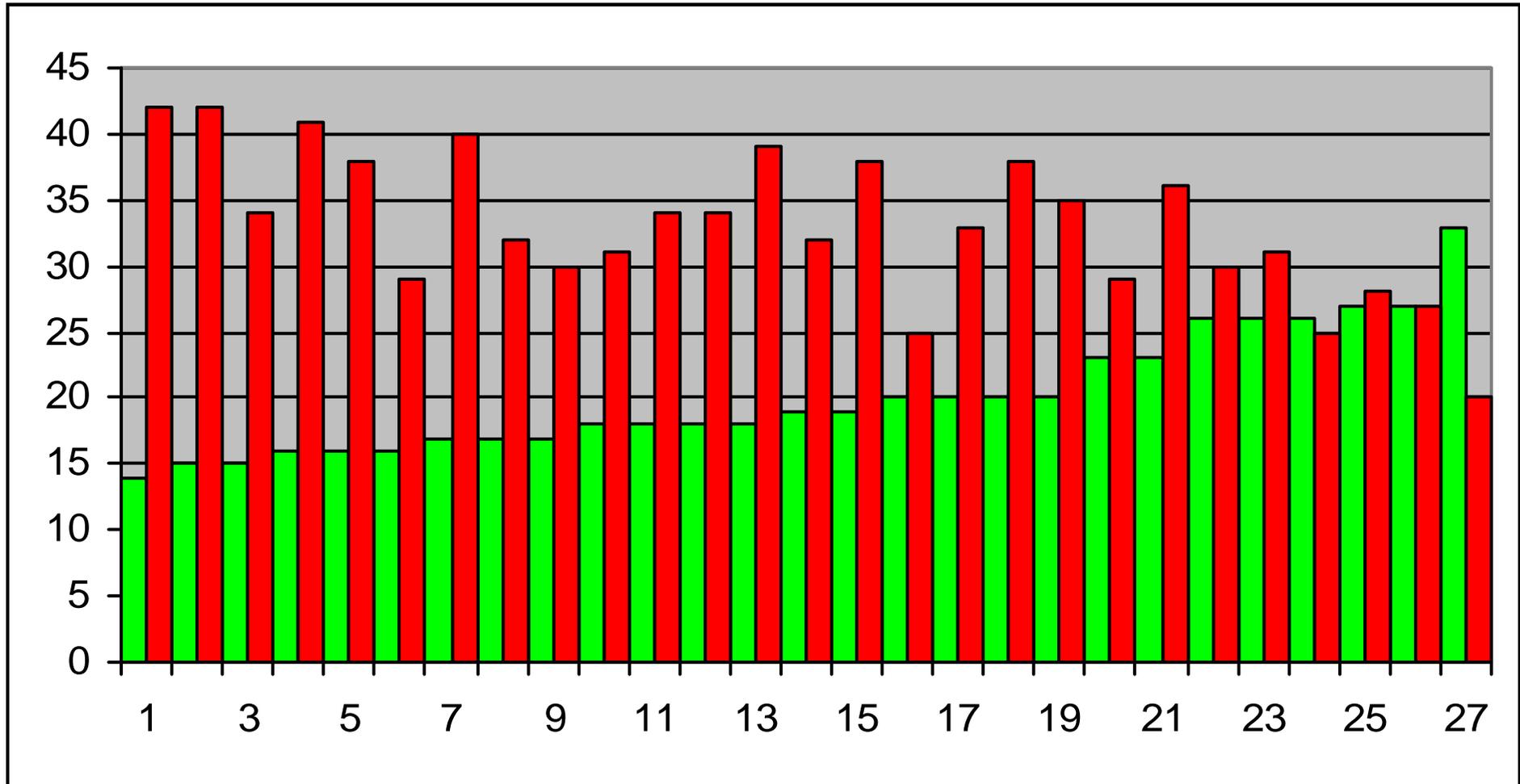
# Percentage in each clinic with HbA1c >9.0 %

n = 17,253 (range 164 to 1555)

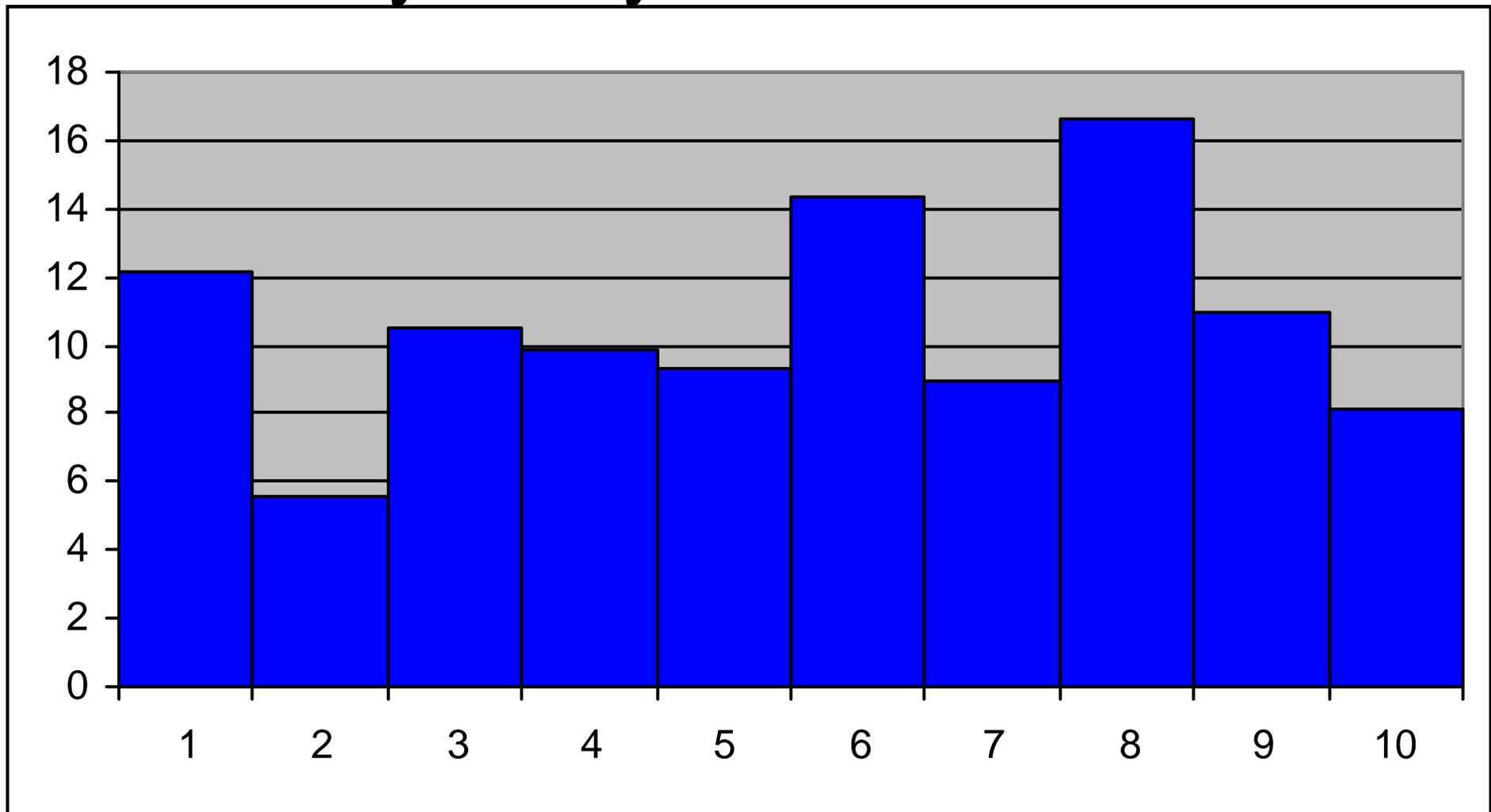


Range 20 to 42 %

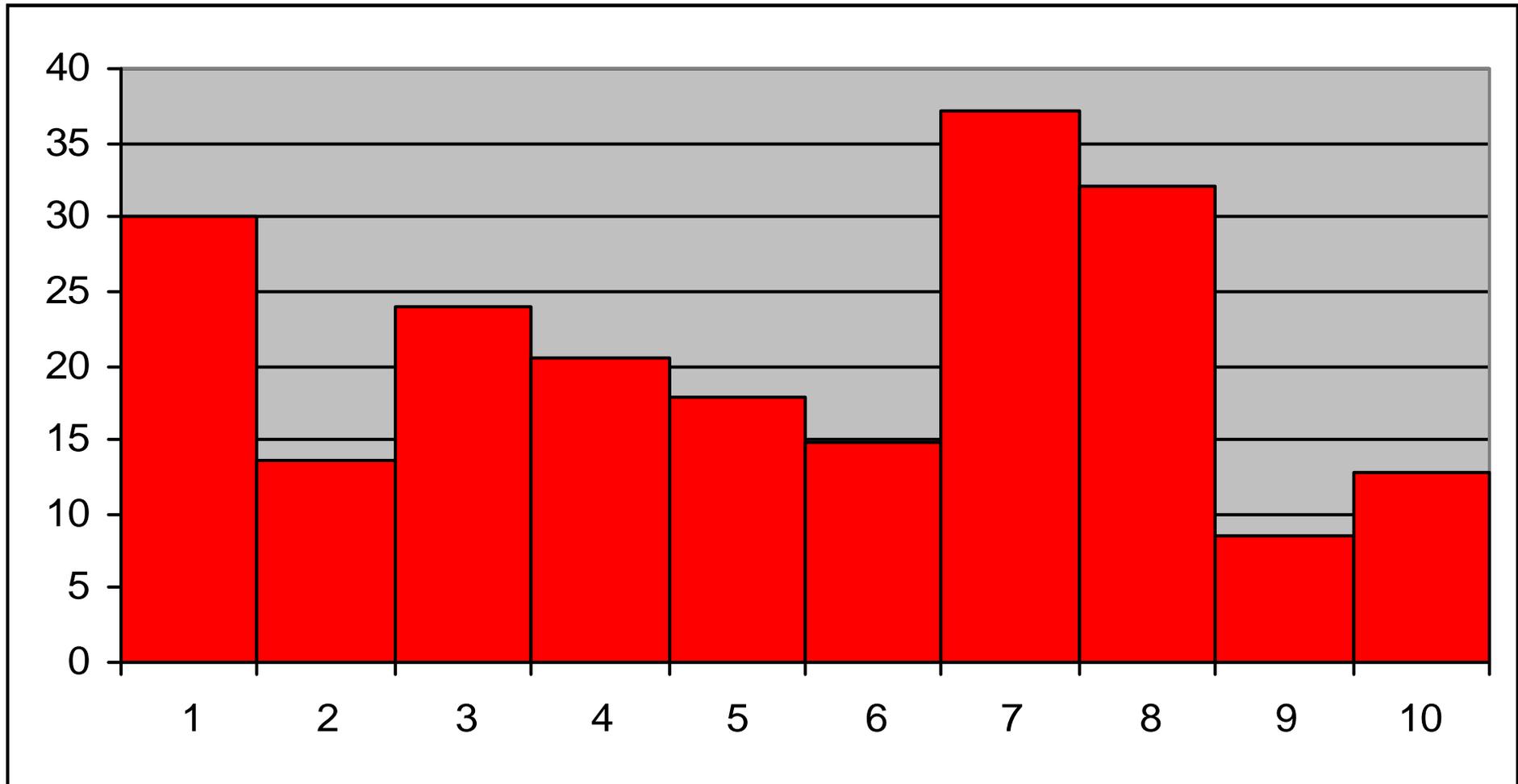
# Percentage in each clinic with HbA1c <7.5 % and >9.0 (ranked by <7.5 %)



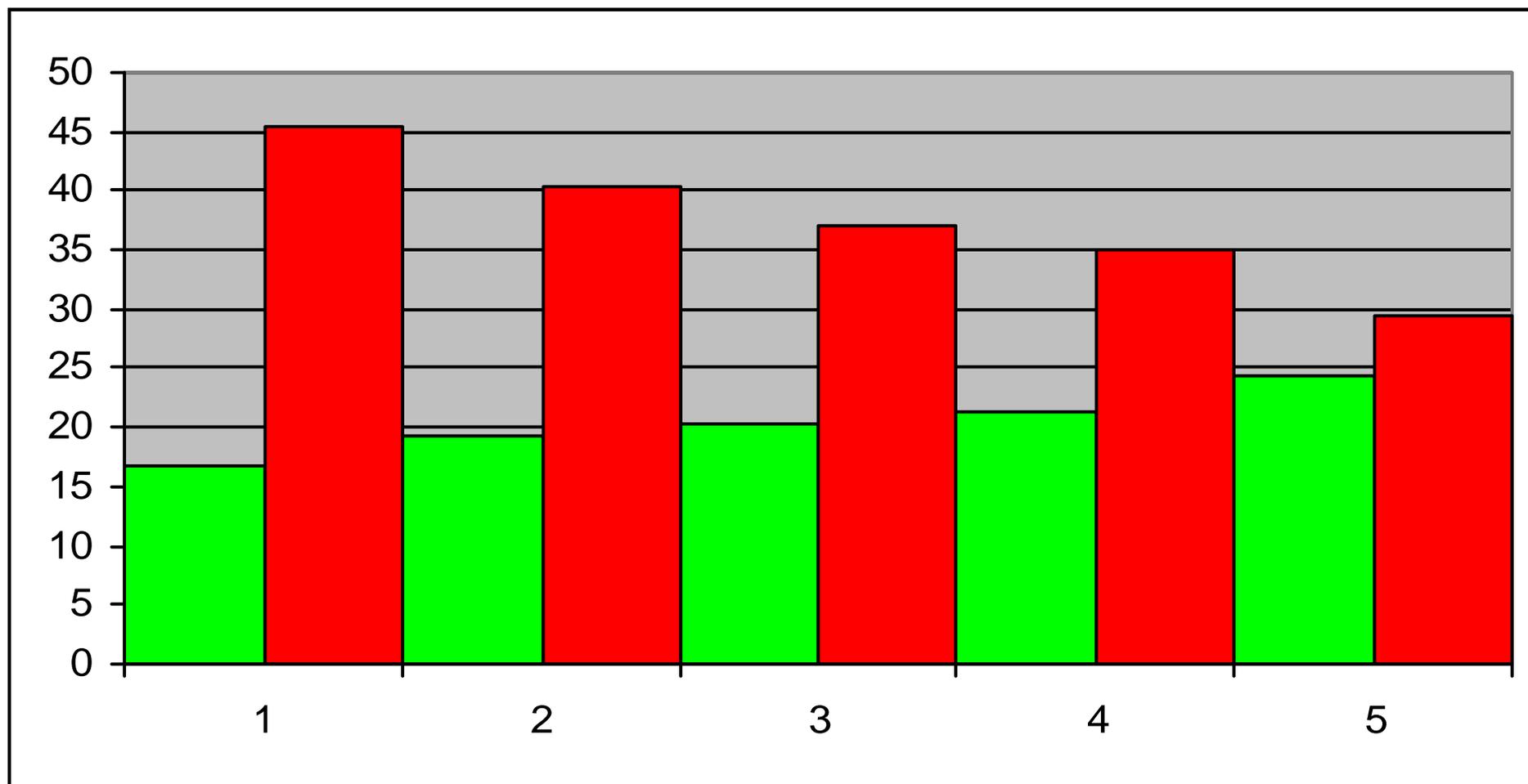
# Percentage with no result in last year by NHS Board



# % with no clinic visit but an HbA1c in last year



# Percentage HbA1c <7.5 or >9.0 by deprivation category



Most deprived (17 and 45%)

Least deprived (24 and 29 %)

# Comments

- ‘You are using the wrong values as the limits are too low.’
- Surprised, amazed and impressed if your results are within these ranges
- Issues with standardisation of HbA1c
- Some problems with linking data to specific clinics

# Type 1 diabetes

- Tools to improve
  - Structured education
  - Psychological interventions
  - CSII
  - Redesign?
- Paediatric and adolescent group

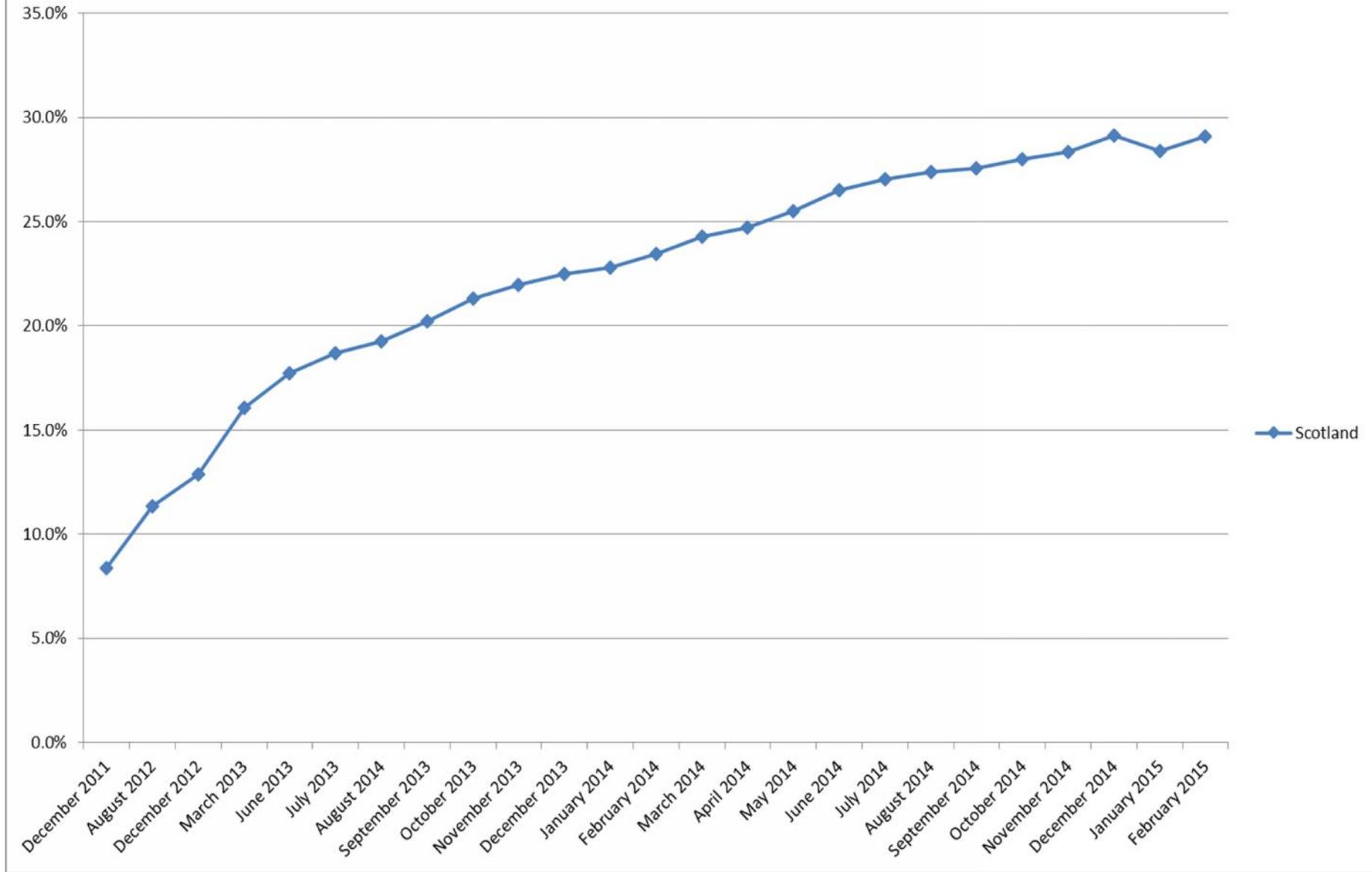
Health Board	N	DAFNE Delivered in	DAFNE Courses	DAFNE Graduates
Ayresshire & Arran	2,221	NA	0	0
Borders	614	NA	0	0
Dumfries and Galloway	893	Dumfries and Galloway Royal Infirmary	46	308
		Crichton Royal Hospital		
		Gtaehouse of Fleet Surgery		
		Galloway Hospital		
Fife	1,969	NA	0	0
Forth Valley	1,606	NA	0	0
Grampian (Aberdeen)	3,053	Aberdeen Royal Infirmary	66	478
		Aberdeen & Dr Gray's Hospital, Elgin		
Greater Glasgow and Clyde	6,180	New Victoria Infirmary	50	389
		Southern General Hospital		
		Stobhill Hospital		
Highland	1,758	NA	0	0
Lanarkshire (Monklands)	3,513	Monklands Hospital	65	500
		Hairmyers Hospital		
		Wishaw General Hospital		
Lothian (Edinburgh)	4,175	St John's Hospital at Howden, Livingstone	63	450
		Royal Infirmary of Edinburgh		
		Western General Hospital		
Orkney	120	NA	0	0
Shetland	124	NA	0	0
Tayside	1,864	NA	0	0
Western Isles	182	NA	0	0

**Total** 28272

**290**

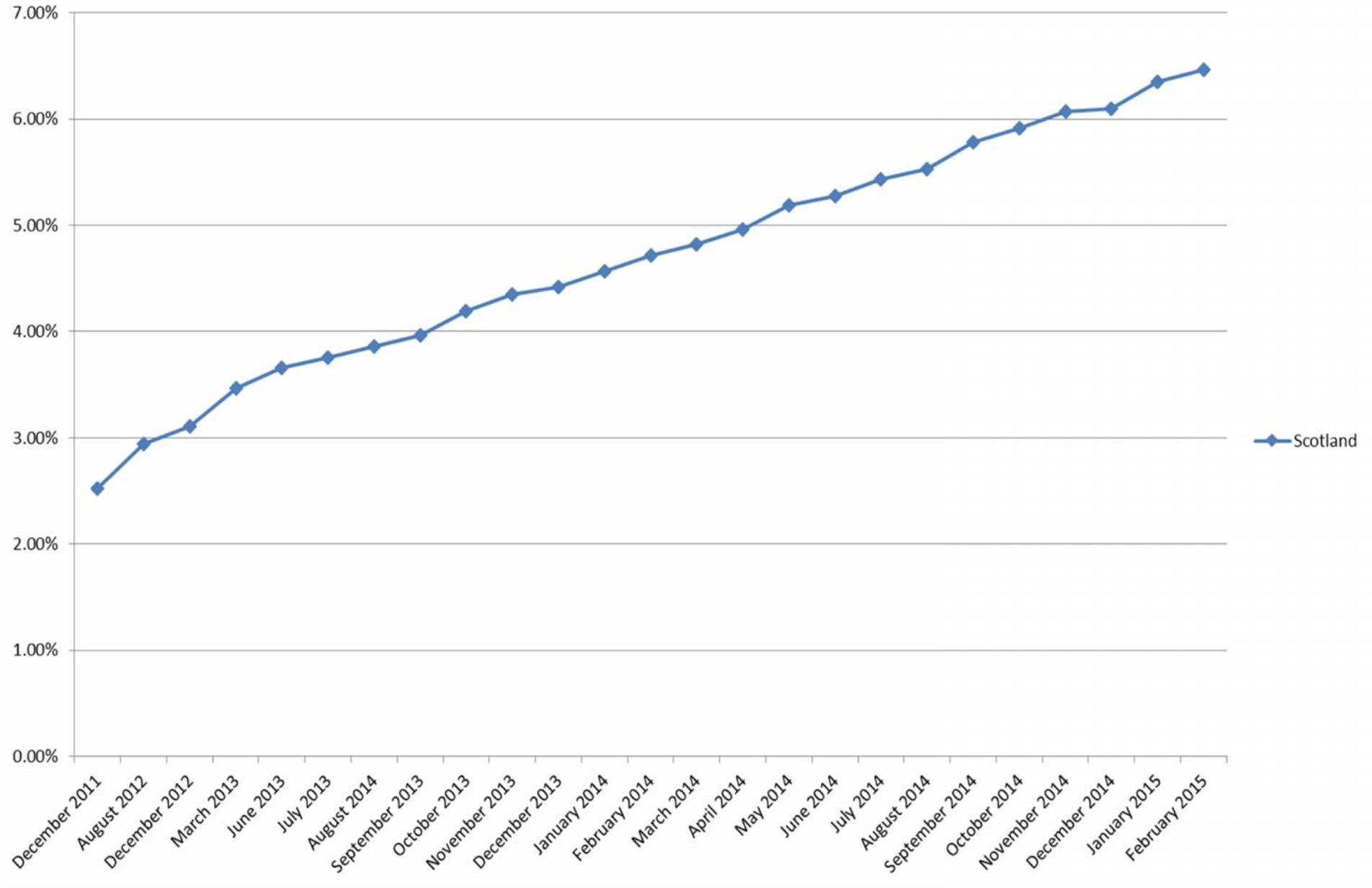
**2125**

### Scotland insulin pump provision - Percentage of under 18's



CEL Feb 2012

## Scotland insulin pump provision - Percentage of over 18's



# CSII in under 18s in Scotland

February 2015

NHS Board	number of people <18 with T1DM	25% target	Number and percentage of people <18 on an insulin pump	
NHS Ayrshire and Arran	276	69	82	29.7%
NHS Borders	69	17	28	40.6%
NHS Dumfries and Galloway	77	19	38	49.4%
NHS Fife	230	58	55	23.9%
NHS Forth Valley	198	50	46	23.2%
NHS Grampian	329	82	77	23.4%
NHS Greater Glasgow & Clyde	555	139	182	32.8%
NHS Highland	224	56	50	22.3%
NHS Lanarkshire	400	100	101	25.3%
NHS Lothian	367	92	115	31.3%
NHS Orkney	11	3	6	54.5%
NHS Shetland	13	3	4	30.8%
NHS Tayside	186	47	69	37.1%
NHS Western Isles	16	4	5	31.3%
<b>Scotland</b>	<b>2951</b>	<b>738</b>	<b>858</b>	<b>29.1%</b>

# CSII in over 18s in Scotland

February 2015

NHS Board	number of people >18 with T1DM	Total number needed to meet commitment	Number and percentage of people >18 on an insulin pump	
NHS Ayrshire and Arran	1961	121	103	5.25%
NHS Borders	591	34	58	9.81%
NHS Dumfries and Galloway	923	50	98	10.62%
NHS Fife	1818	113	163	8.97%
NHS Forth Valley	1547	88	97	6.27%
NHS Grampian	2926	166	154	5.26%
NHS Greater Glasgow & Clyde	5719	340	264	4.62%
NHS Highland	1688	95	101	5.98%
NHS Lanarkshire	3198	190	168	5.25%
NHS Lothian	4144	232	373	9.00%
NHS Orkney	103	6	5	4.85%
NHS Shetland	110	6	4	3.64%
NHS Tayside	1810	101	132	7.29%
NHS Western Isles	172	10	6	3.49%
<b>Scotland</b>	<b>26710</b>	<b>1552</b>	<b>1726</b>	<b>6.46%</b>

- For us it has been an awareness of the issue, seeing pts more often, plus our nurses have targeted the pts with higher A1c' s

# HbA1c: Know the score!

## ‘THINGS YOU SHOULD KNOW’

Your HbA1c provides a measure of your blood sugar over the last 6-8 weeks

The target HbA1c for most people with diabetes is between 48-58mmol/mol

Reducing your HbA1c by 10mmol/mol reduces your risk of microvascular (eye, kidneys and feet) complications by 20%

### LABORATORY TEST

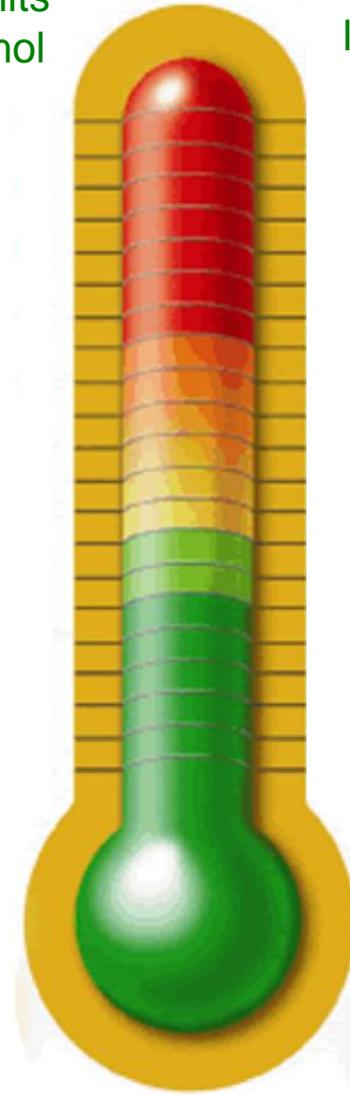
Old Units %      New Units mmol/mol

13.0%	119
12.0%	108
11.0%	97
10.0%	86
9.5%	80
9.0%	75
8.5%	69
8.0%	64
7.5%	58
7.0%	53
6.5%	48
6.0%	42

### FINGERPRICK TEST

Average blood glucose level mmol/l

18.1
16.5
14.9
13.3
12.6
11.8
11.0
10.2
9.4
8.6
7.8
7.0



eeced

Edinburgh Centre for  
Endocrinology & Diabetes



# T1DM: Royal Infirmary of Edinburgh

September 2014

Dr Fraser Gibb

# Clinic questionnaires

## Insulin-treated patients

- Frees up consultation time previously used to collect routine data
- Collected during wait between HbA1c and consultation
- Prevents important issues being overlooked
- Better quality data on hypoglycaemia being collected (audited)
- Generally positive feedback from clinicians

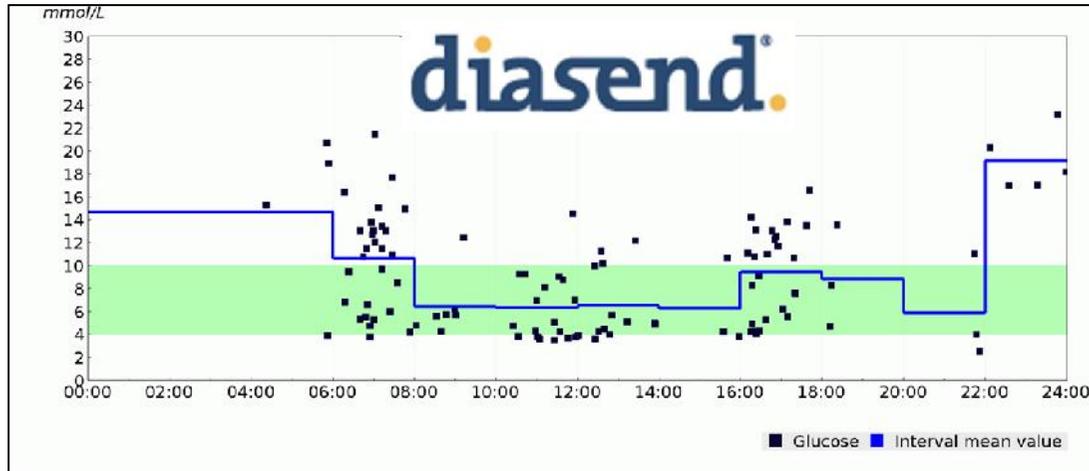
# Intensive T1DM clinic

## CSII and MDI patients

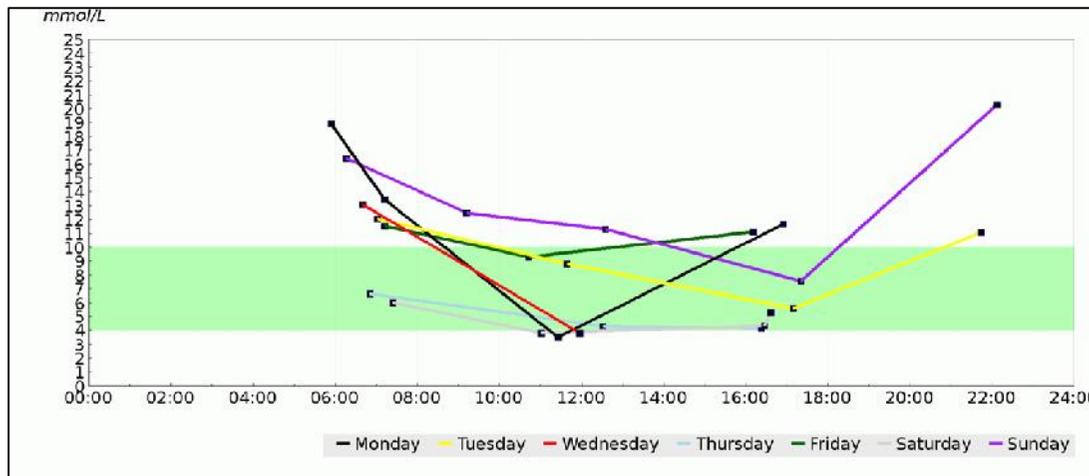
- Started in March 2014
- Intended for patients who regularly monitor blood glucose
  - Including CSII, MDI and DAFNE patients
- Consultants / trainees / DSN / Dietitian
- Longer consultations
- Aiming to utilise all available technologies
- Aspiration is that patients will submit information in advance of appointments for pre-clinic discussion – allocation of appointments (DSN / dietitian / doctor *etc.*)
- Post-clinic discussion – review of Diasend / data collection

# Diasend

Now routinely used in all clinics



- Positive response from most patients
- Much more effective in picking out trends and patterns
- Identifies hitherto unrecognised problems



- HbA1c often conceals a litany of issues

# Intensive T1DM clinic

## Initial feedback

- Early anecdotal patient feedback has been very positive:

“Best clinic appointment I’ve had”

“No one’s ever explained things as clearly before”

Over time, raise patients’ expectations about what can be achieved.

Plan to audit HbA1c and hypoglycaemia outcomes over the next few years, as the clinic model is refined.

# Challenges

## Improving T1DM care

- Information deficits
  - If we want to offer advice on improving control, we need access to contextualised blood glucose data
- Education deficits
  - Patients must have access to the best quality T1DM education programmes (RIE uses DAFNE)
  - This education must be consolidated
  - Clinic doctors should be delivering broadly consistent messages (all trainee consultations are discussed after clinic)

# Challenges

## Improving T1DM care

- Despite expansion in consultant numbers, there is no time in job plans beyond clinic time and associated admin
- It is difficult to know how to improve a service when we don't have time to assess what we're currently doing
- We don't know what works well and what doesn't
- Improving attendance / identifying people who don't attend our clinics
- In another HB the issue is losing the diabetes centre in a New hospital build and major loss of diabetes consultant time due to pressure in Acute Medicine

# Childhood & Adolescent Diabetes Update

Childhood & Adolescent Diabetes  
Scotland – An SDG Sub-Group

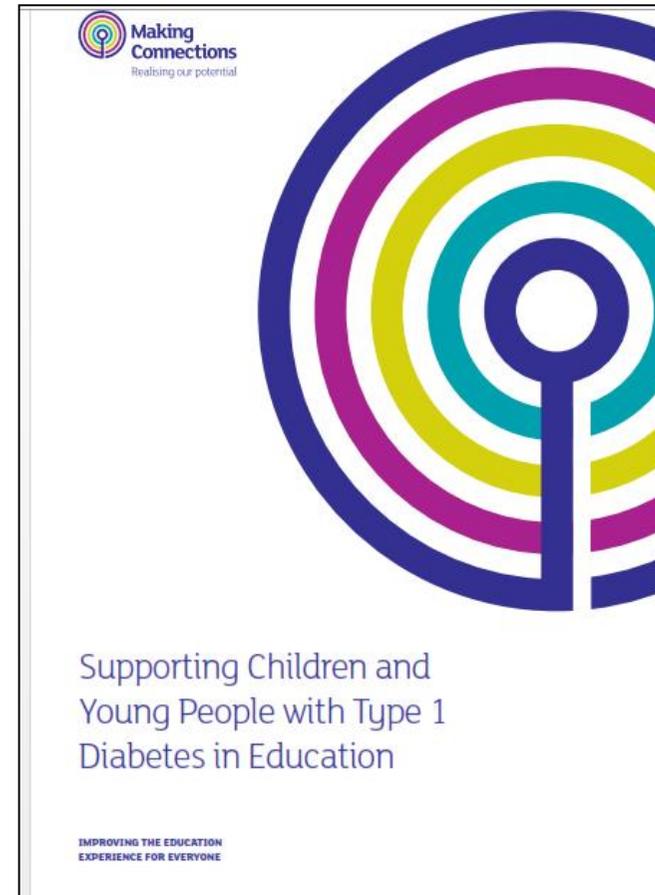
# Paediatric Data

- HbA1c Improvement meetings
- National comparative data discussed openly twice year
- Units present actions, results and challenges
- Data collected quarterly, sorted, graphed & circulated to every team
- Working on simple run charts & audit functionality

# Diabetes in Education Booklet

- Sent to every head teacher
- Sent to every director for Ed
- Supplies to every paed unit
- Supplies to DUK
- Great feedback from teachers, HCP's & parents
- Reprint of 3000 for education conference
- Linked to DUK's "Making the Grade" campaign

Childhood & Adolescent Diabetes  
Scotland – An SDG Sub-Group



# DKA Prevention Campaign Materials

- Pack of materials delivered to every surgery
- 2 Posters
- 8 page educational booklet
- Local Alerts / Referral pathways (local DKA data)
- Mousemat, Stylus/Pen, Sticky notes, Fridge magnets
- PowerPoint presentation
- Letter from CMO to every GP
- NHS24 to highlight in training / internal news

# Posters

**DIABETES SCOTLAND**  
CARE. CORRECT. GAINING.

**NHS**  
SCOTLAND

**healthier scotland**  
SCOTLAND'S GOVERNMENT

**UNDIAGNOSED  
TYPE 1 DIABETES  
IN CHILDREN IS A  
MEDICAL EMERGENCY.**

1 IN EVERY 4 CHILDREN WITH TYPE 1 DIABETES IS DIAGNOSED IN DIABETIC KETOACIDOSIS (DKA). DELAYING THE DIAGNOSIS OF TYPE 1 DIABETES CAN BE FATAL.

**THINK. TEST. TELEPHONE. NOW.**

**THINK** about their symptoms...  
Thirsty? Tired? Thinner? Using the Toilet more?

**TEST** their capillary blood glucose now.

**TELEPHONE** the Diabetes Team immediately.



**UNDIAGNOSED  
TYPE 1 DIABETES  
THINK. TEST.  
TELEPHONE.**

Developed by  
Childhood & Adolescent  
Diabetes Scotland

**DIABETES SCOTLAND**  
CARE. CORRECT. GAINING.

**NHS**  
SCOTLAND

**healthier scotland**  
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**UNDIAGNOSED  
TYPE 1 DIABETES  
THINK. TEST.  
TELEPHONE.**

Developed by  
Childhood & Adolescent  
Diabetes Scotland

# Booklet

## IMPROVING EARLY DIAGNOSIS OF DIABETES IN THE YOUNG

Nearly all young people with diabetes have **Type 1 diabetes**. Scotland has the **fifth highest incidence** of Type 1 diabetes in the world. Caused by autoimmune destruction of pancreatic beta cells, Type 1 diabetes results in **total insulin deficiency** and **life-threatening ketoacidosis** if diagnosis and treatment are delayed.

Each year in the UK **more than 10 children die** from ketoacidosis and a similar number suffer permanent **neurological disability** after developing cerebral oedema. Type 1 diabetes may occur at any age and in Scotland approximately **300 new cases under the age of 15 years are diagnosed annually**. More than **one in every four** of these children present in ketoacidosis, and this increases to **one in three** for those under 5 years of age.

Diabetic **ketoacidosis is preventable** if diabetes is diagnosed and treated sufficiently early, unfortunately this is often not the case, and **one third** of children with new-onset diabetes have had **at least one medical-related visit prior to diagnosis**. This represents a 'missed opportunity' for early recognition, testing, diagnosis and treatment.

## IS DELAYED DIAGNOSIS OF DIABETES IN CHILDREN REALLY A PROBLEM?

Every Health Board in Scotland has young people present critically unwell with new onset diabetes and tragically several deaths have occurred in recent years. The diagnosis has often not been contemplated or, even if diabetes is considered, inappropriate testing is performed or referral has been delayed.

## HOW CAN WE DIAGNOSE TYPE 1 DIABETES IN THE YOUNG EARLIER?

### THINK. TEST. TELEPHONE.

#### THINK DIABETES

The early symptoms of diabetes in a child, adolescent or young adult can be recognised by Diabetes Scotland's **'4 T's'** campaign in a matter of seconds:

#### Thirsty?

- increased, excessive thirst
- drinking more frequently (including overnight)

#### Tired?

- increased tiredness
- increased lethargy

#### Thinner?

- losing or not gaining weight
- looking thinner than usual

#### Using the toilet more?

- increased urinary frequency (polyuria, nocturia)
- bed wetting in a previously dry child - diabetes must be excluded
- heavier nappies in babies

### Young Children and Unusual Presentations

In the Under 5's, classic symptoms are not always obvious, but any of the following clinical features might suggest a possible diagnosis of diabetes:

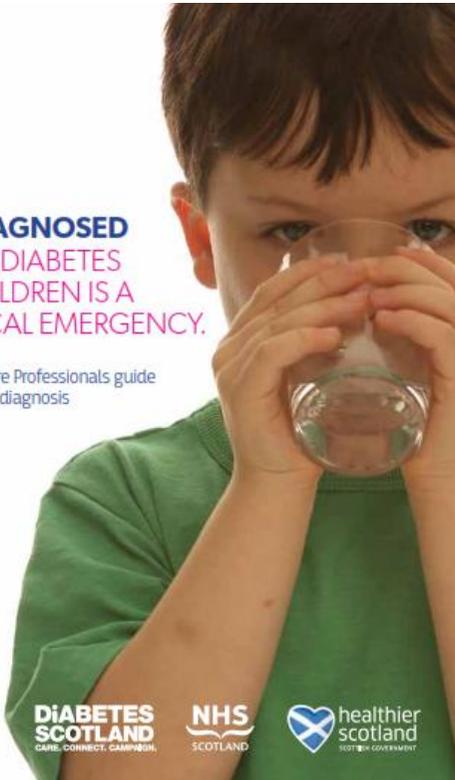
- nappies heavier than usual
- blurred vision
- candidiasis (oral, vulval)
- constipation
- recurring skin infections
- irritability, behaviour change

Type 1 diabetes may occur at any age.



## UNDIAGNOSED TYPE 1 DIABETES IN CHILDREN IS A MEDICAL EMERGENCY.

A Healthcare Professionals guide to an early diagnosis



**DIABETES SCOTLAND**  
CARE. CONNECT. CAMPAIGN.

**NHS**  
SCOTLAND

**healthier scotland**  
SCOTISH GOVERNMENT

### WHY GETTING IT RIGHT MAKES A DIFFERENCE...

#### A Mum's perspective

"When my son Tom was diagnosed, he was in a coma, had a bad smell and was close to death. He'd been ill for several weeks, but I didn't know the symptoms were enough to insist his doctors test for Type 1 diabetes. Five years later I spotted the early symptoms of Type 1 in his older brother, Jess. I took him straight to hospital and he was diagnosed very early, before ketoacidosis had set in. When Tom was diagnosed he was in a coma, when he was diagnosed he was well enough to go camping."

### PRACTICE POINTS TO REMEMBER

**OVER 300 CHILDREN UNDER 15 YEARS ARE DIAGNOSED IN SCOTLAND ANNUALLY.**

**TYPE 1 DIABETES OCCURS AT ANY AGE.**

**CHILDREN UNDER 5 YEARS OF AGE ARE AT GREATER RISK OF KETOACIDOSIS.**

**UNDIAGNOSED AND UNTREATED TYPE 1 DIABETES RESULTS IN KETOACIDOSIS AND DEATH.**

### Aims of national Diabetes Awareness & Ketoacidosis Prevention Campaign:

- Reduce number of children dying or becoming disabled due to a 'missed' diagnosis
- Reduce number of new cases of type 1 diabetes presenting in ketoacidosis
- Reduce length of time from presentation to diagnosis
- Reduce hospital admissions and length of stay

**UNDIAGNOSED TYPE 1 DIABETES THINK. TEST. TELEPHONE.**

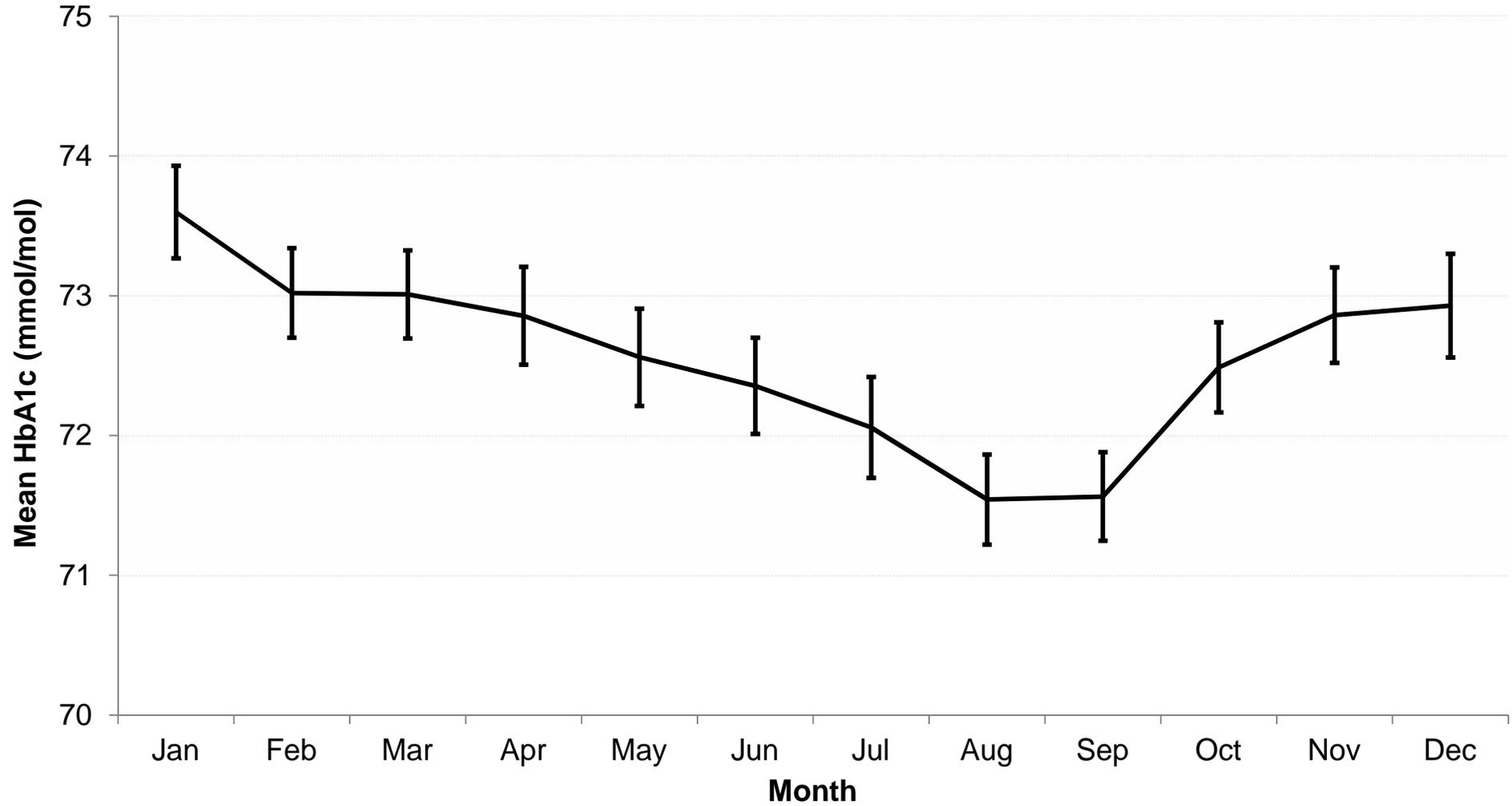


Developed by:  
**Childhood & Adolescent Diabetes Scotland**

# Has there been any effect of this work?

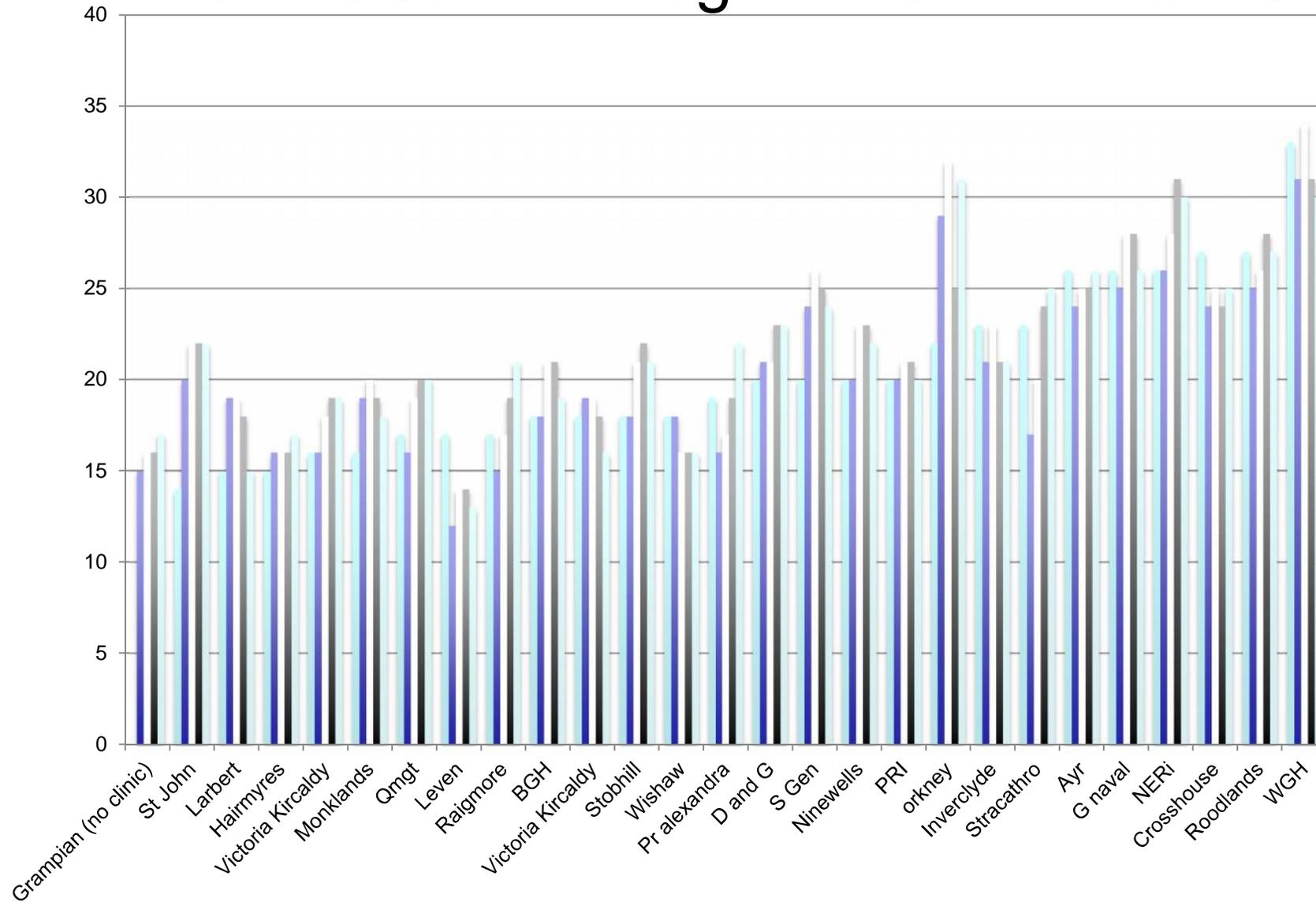
- Clinics
- NHS Boards
- Scotland

**Mean HbA1c by month for Type 1 patients (with 95% confidence intervals)**

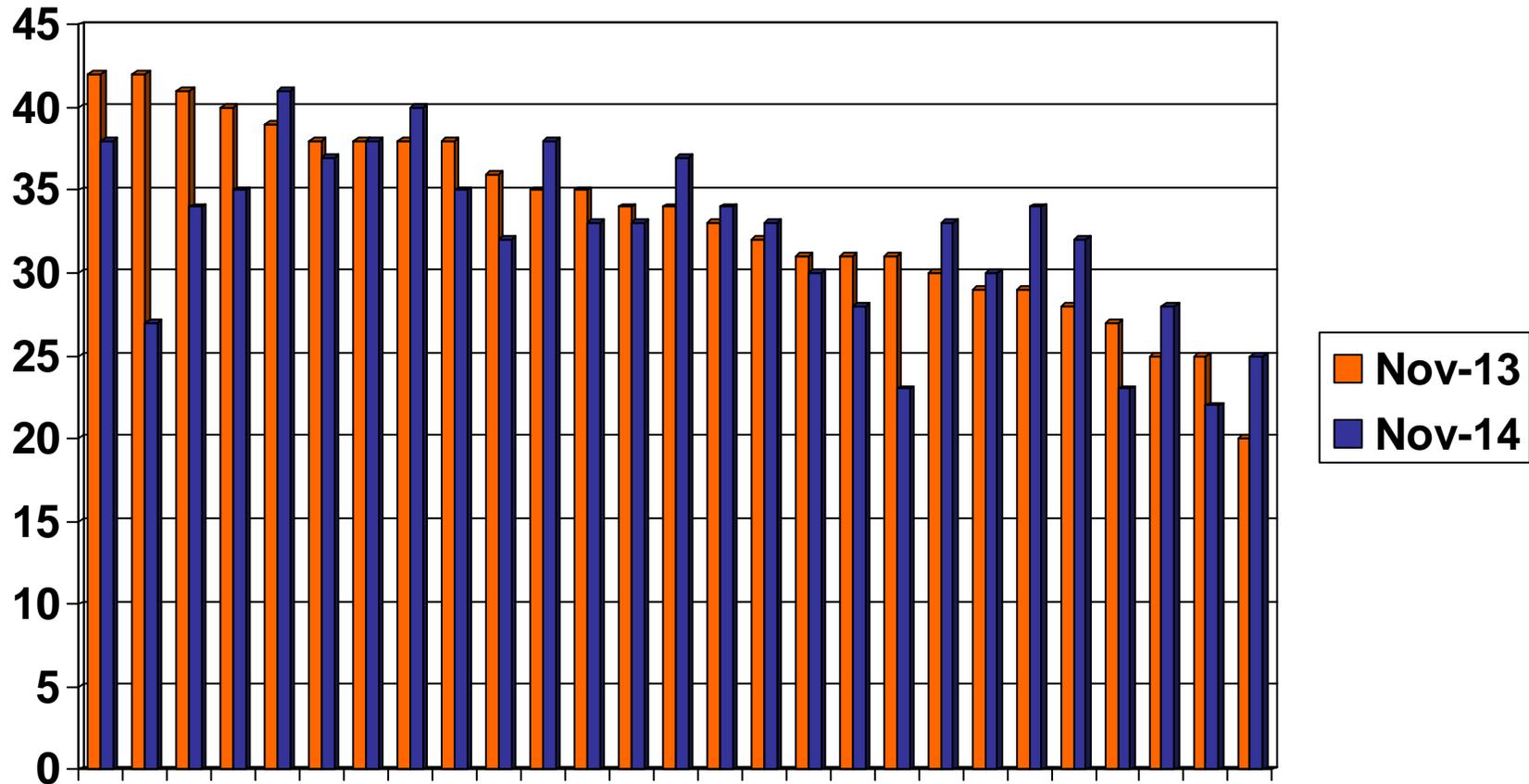


# Clinic % HbA1c under 58 mmol/mol

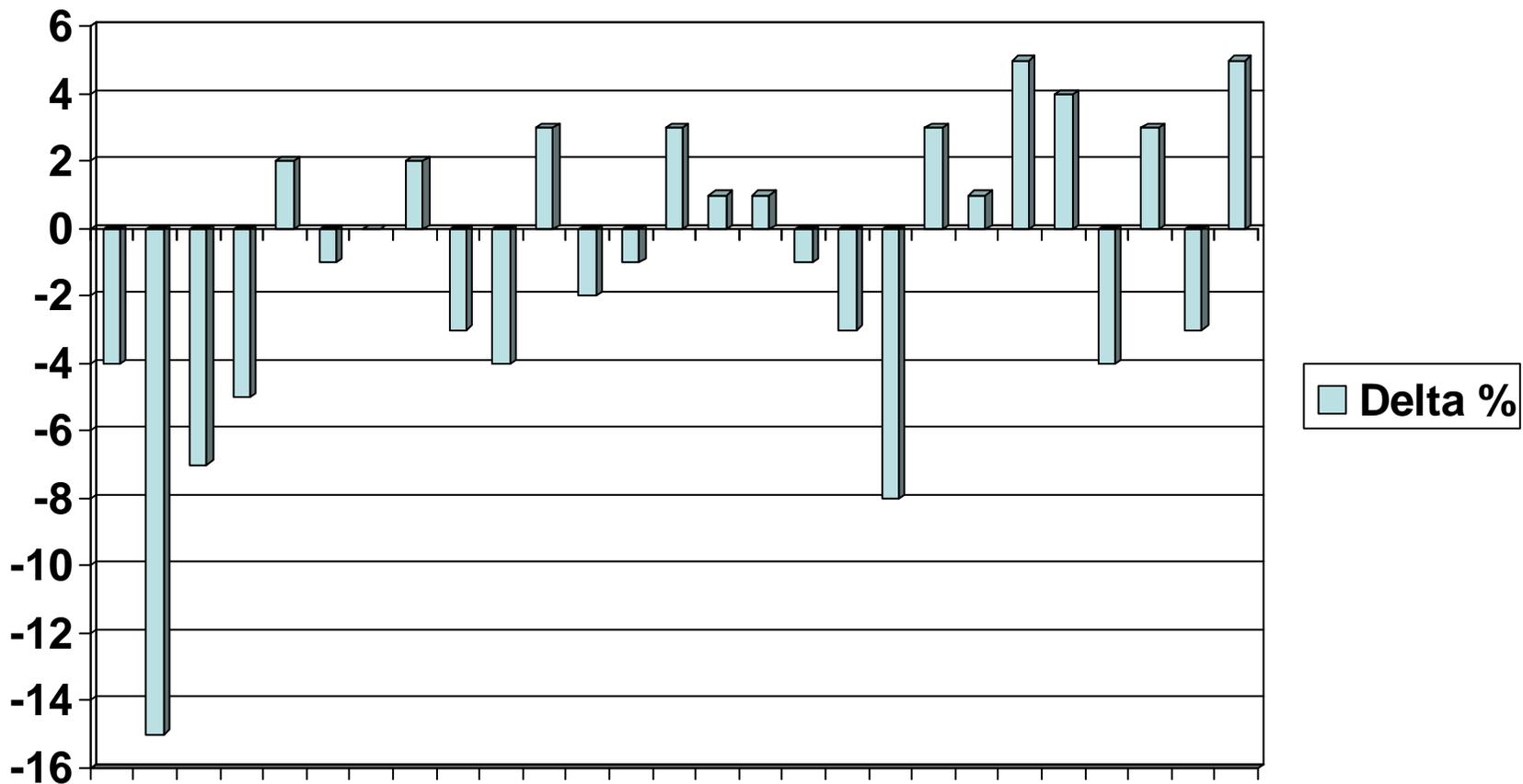
Nov-13 Jun-14 Aug-14 Nov-14 Mar-15



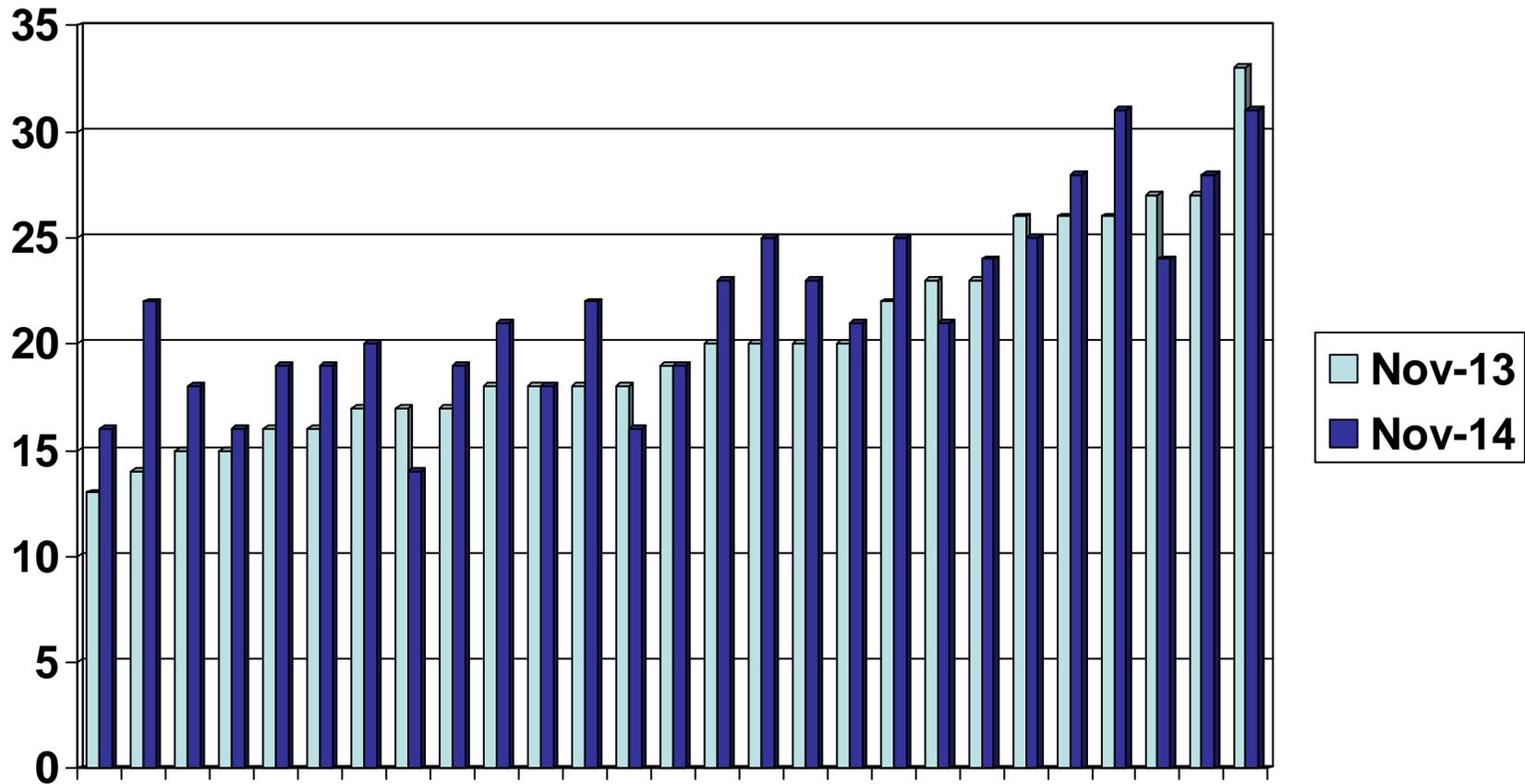
# Type 1 HbA1c > 75 mmol/mol In 27 diabetes centres



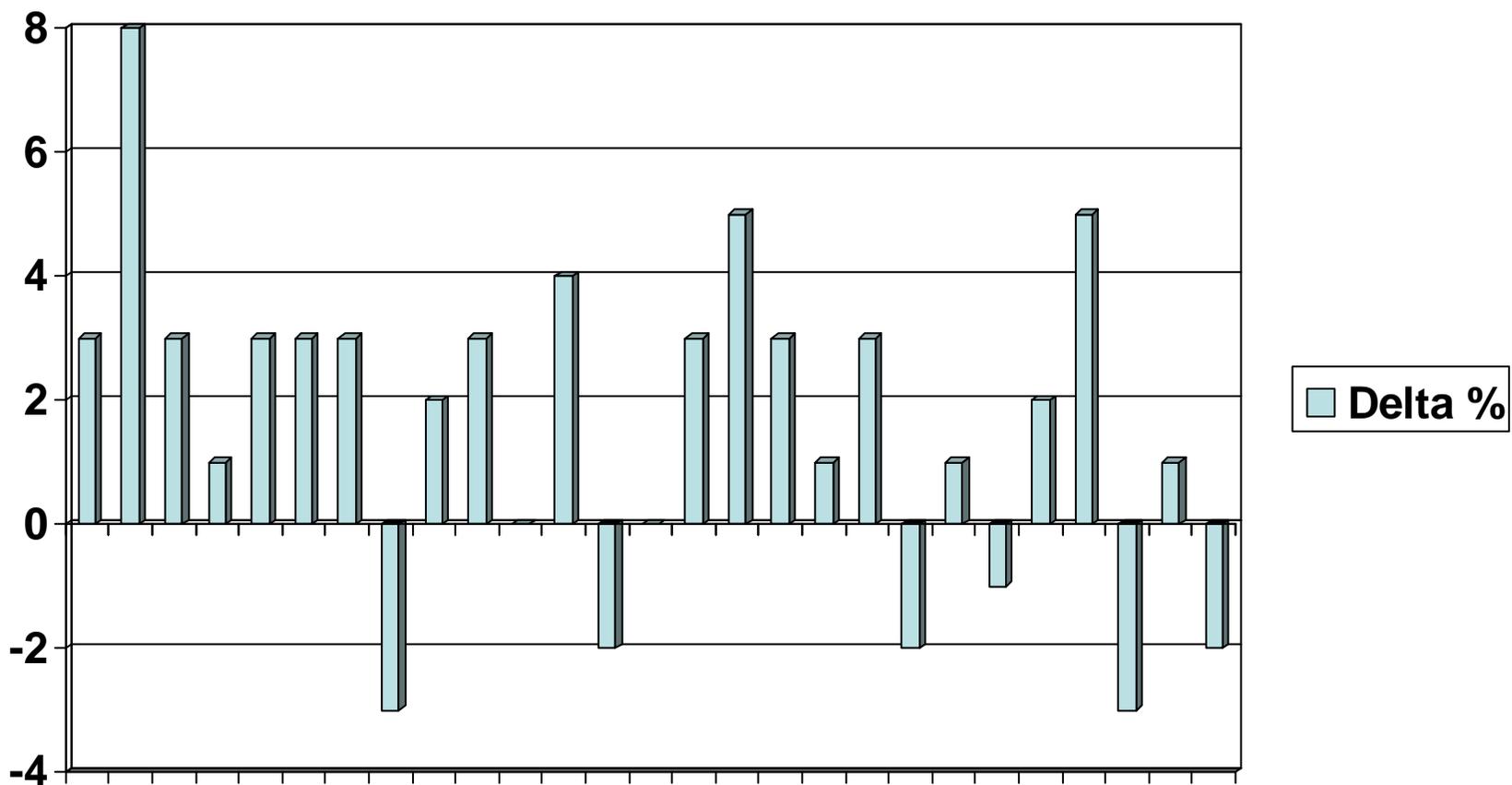
27 Diabetes Centres  
Change of % > 75 mmol/mol  
Ranked high to low by original percentage



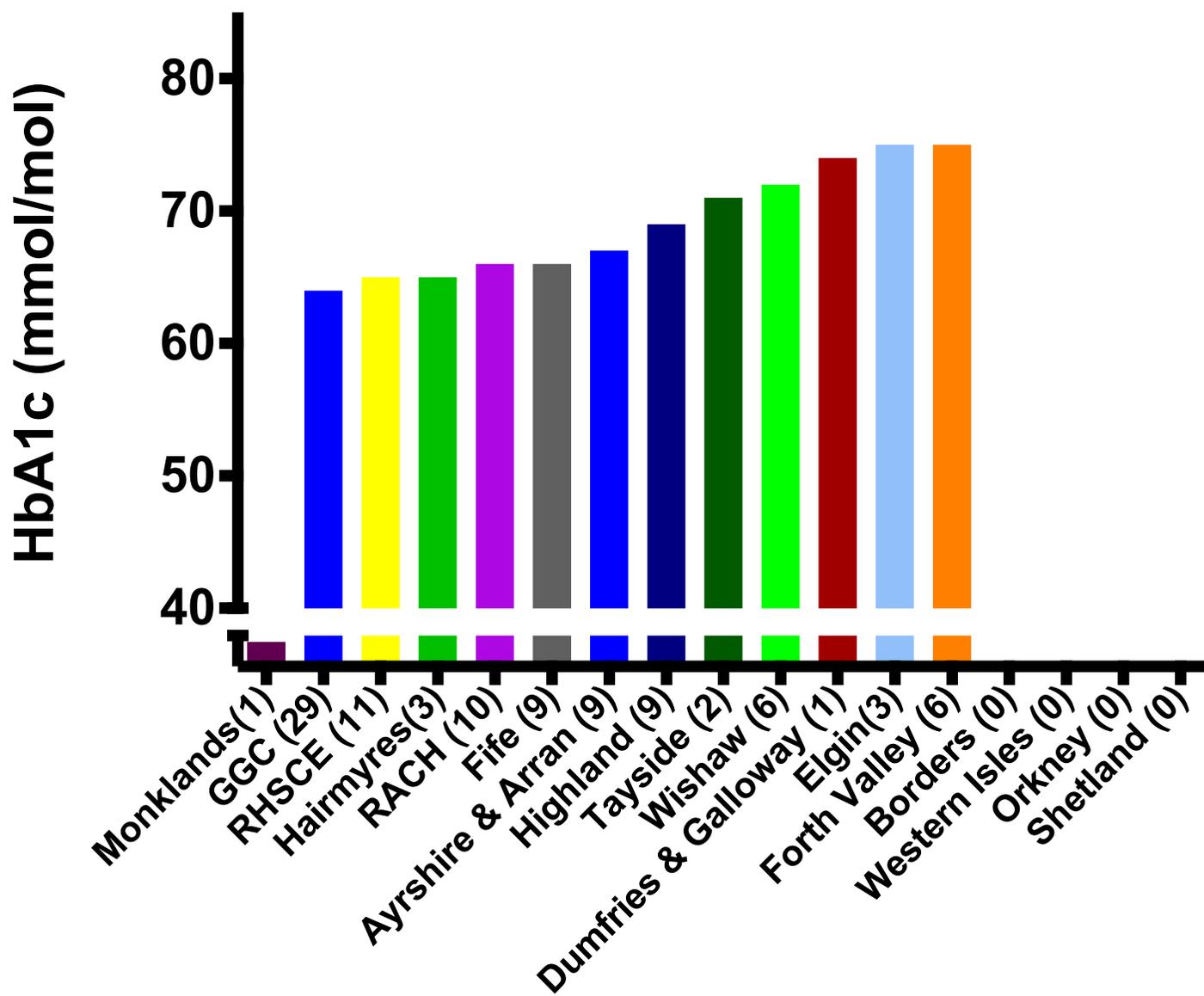
# Type 1 HbA1c <58 mmol/mol In 27 diabetes centres



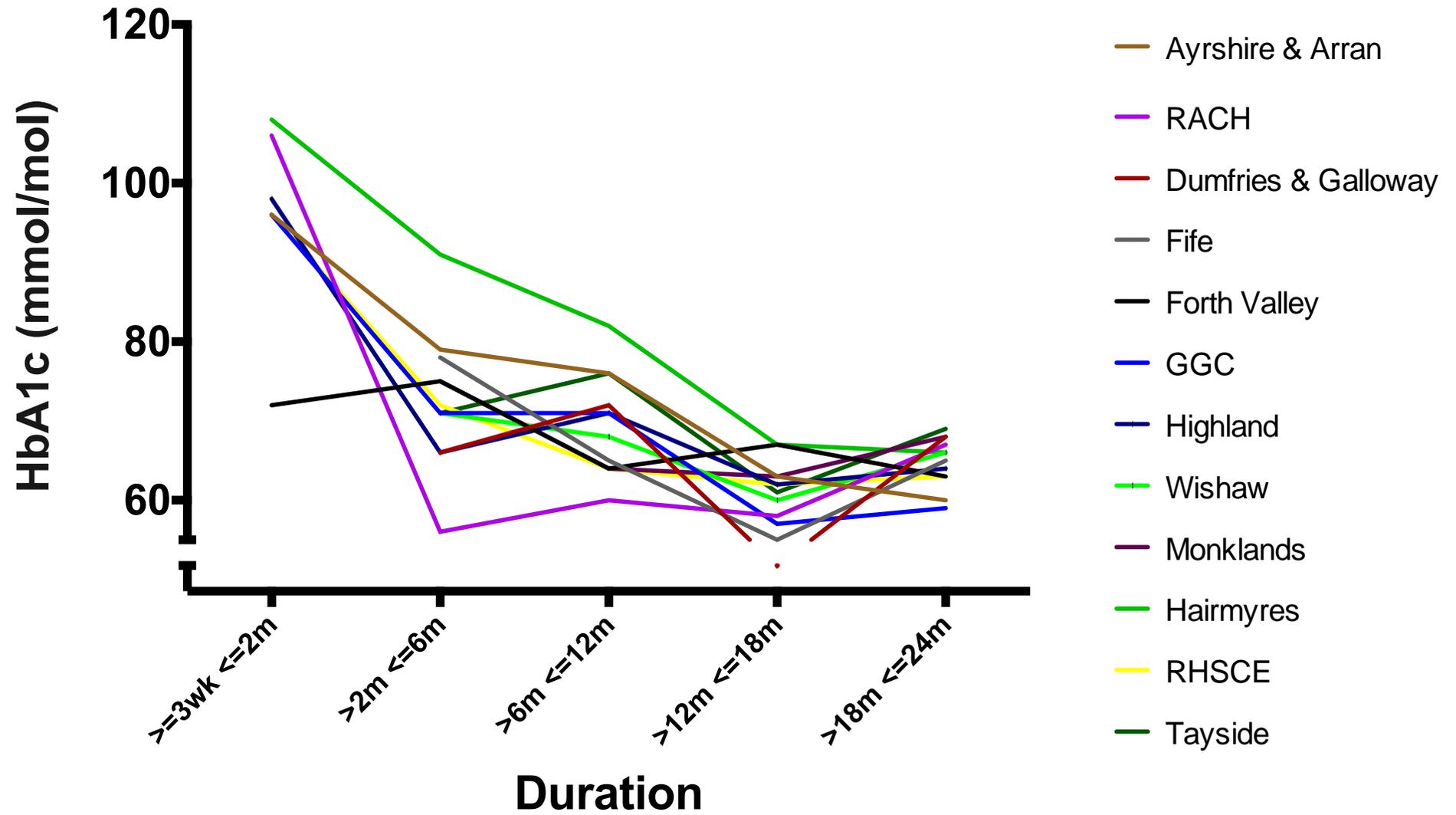
27 Diabetes Centres  
Change of % < 58 mmol/mol  
Ranked low to high by original percentage



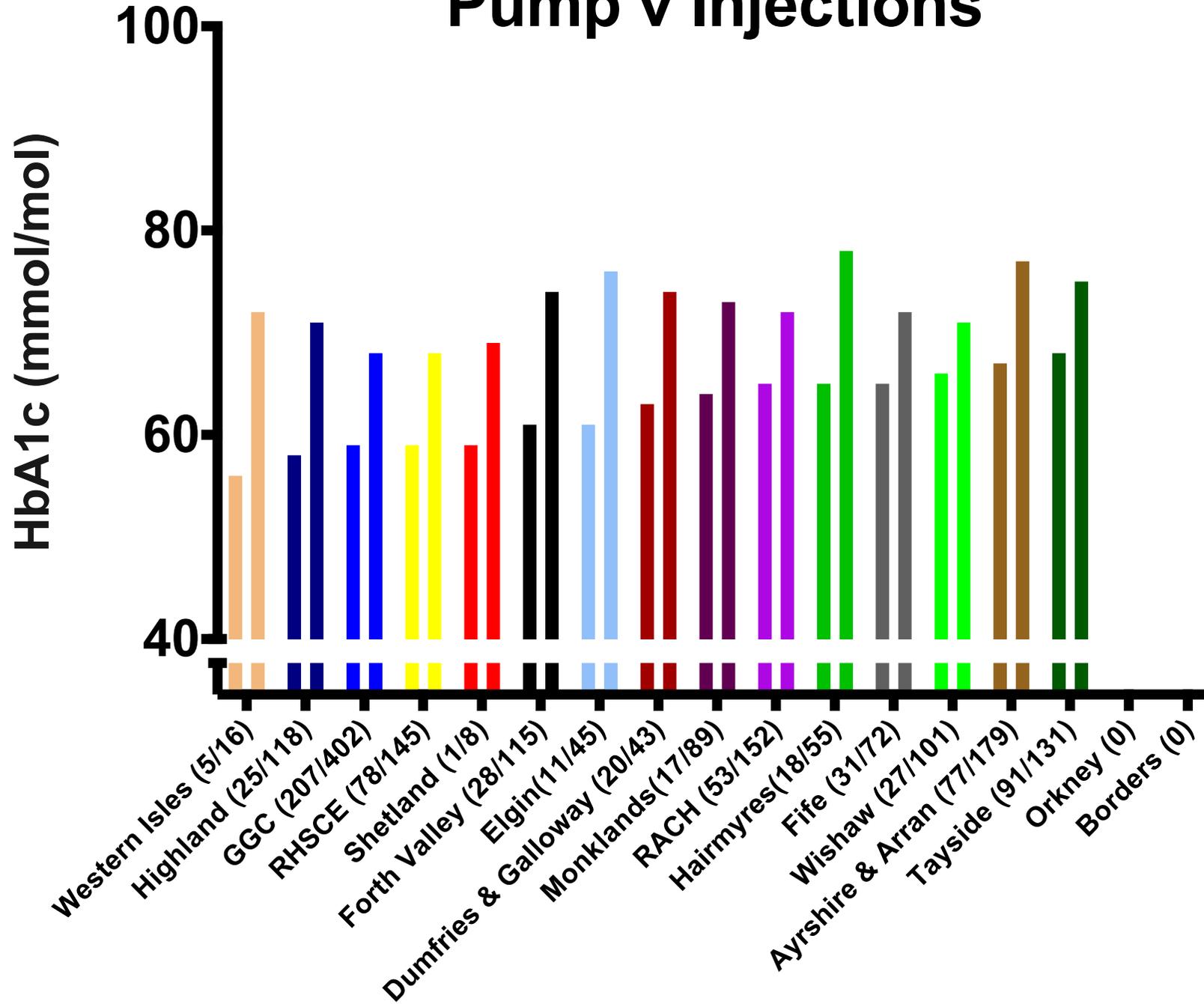
<5 yrs



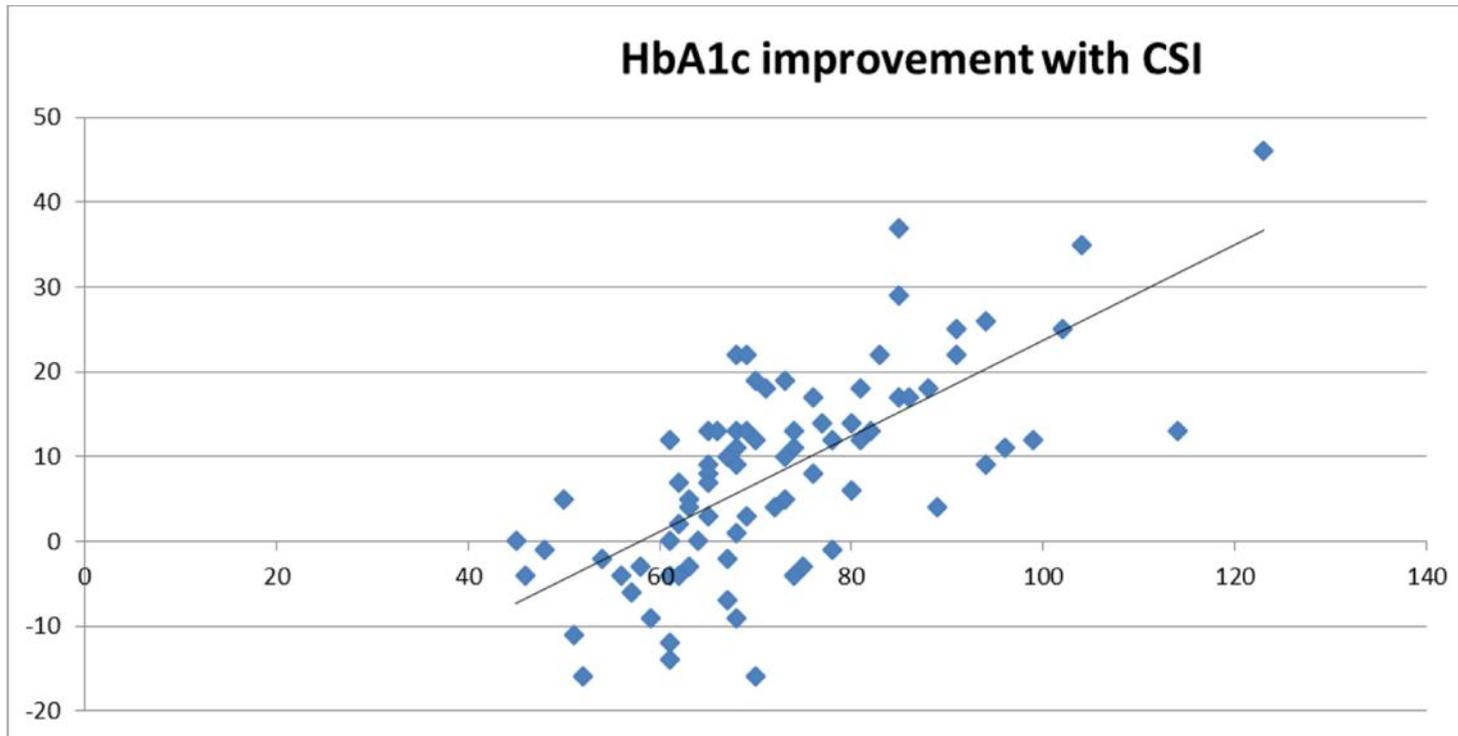
# Honeymoon



# Pump v Injections

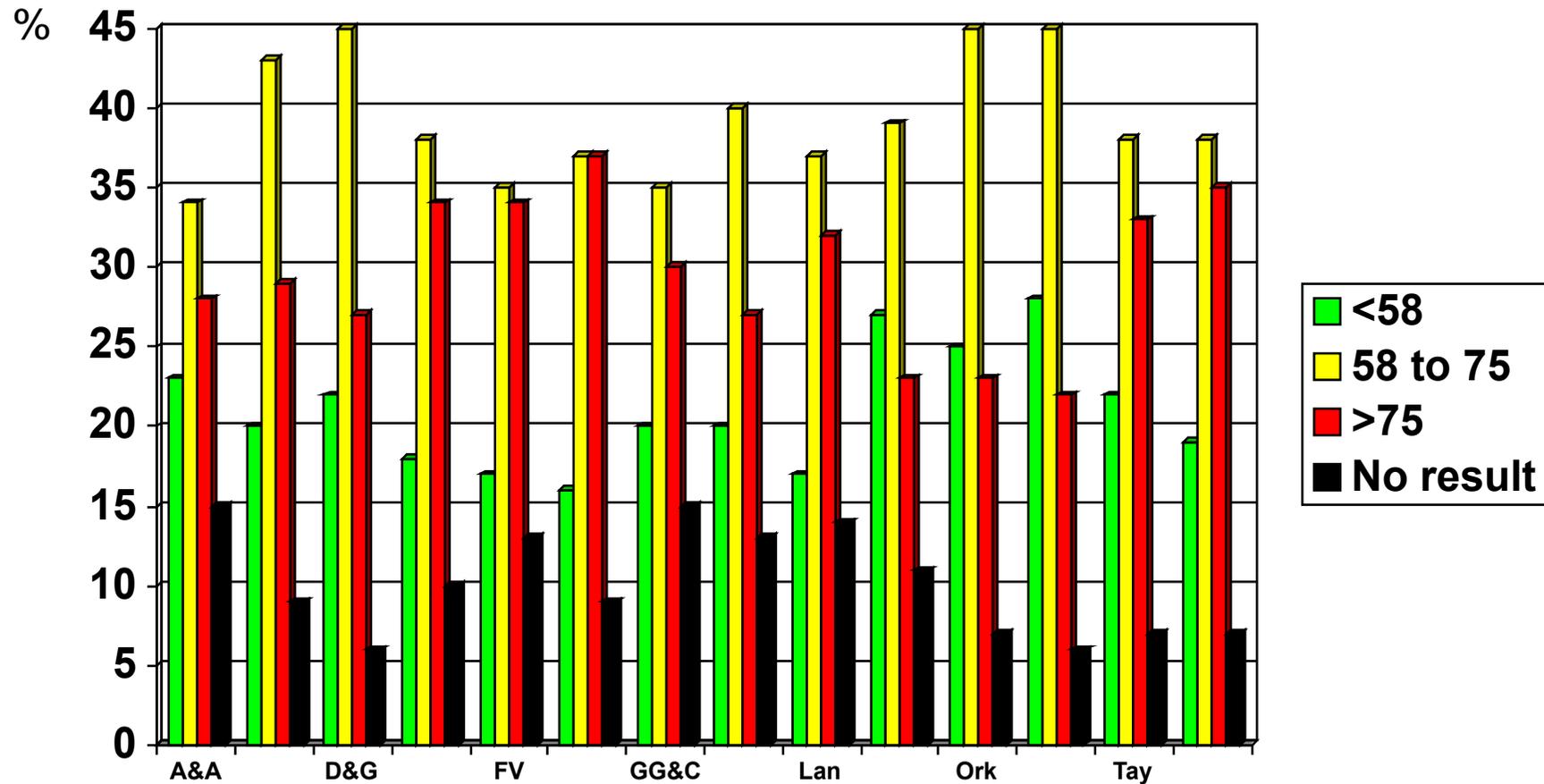


Change of HbA1c in those starting CSII in Forth Valley correlated with starting HbA1c  
Positive is a decrease!  
N = 80



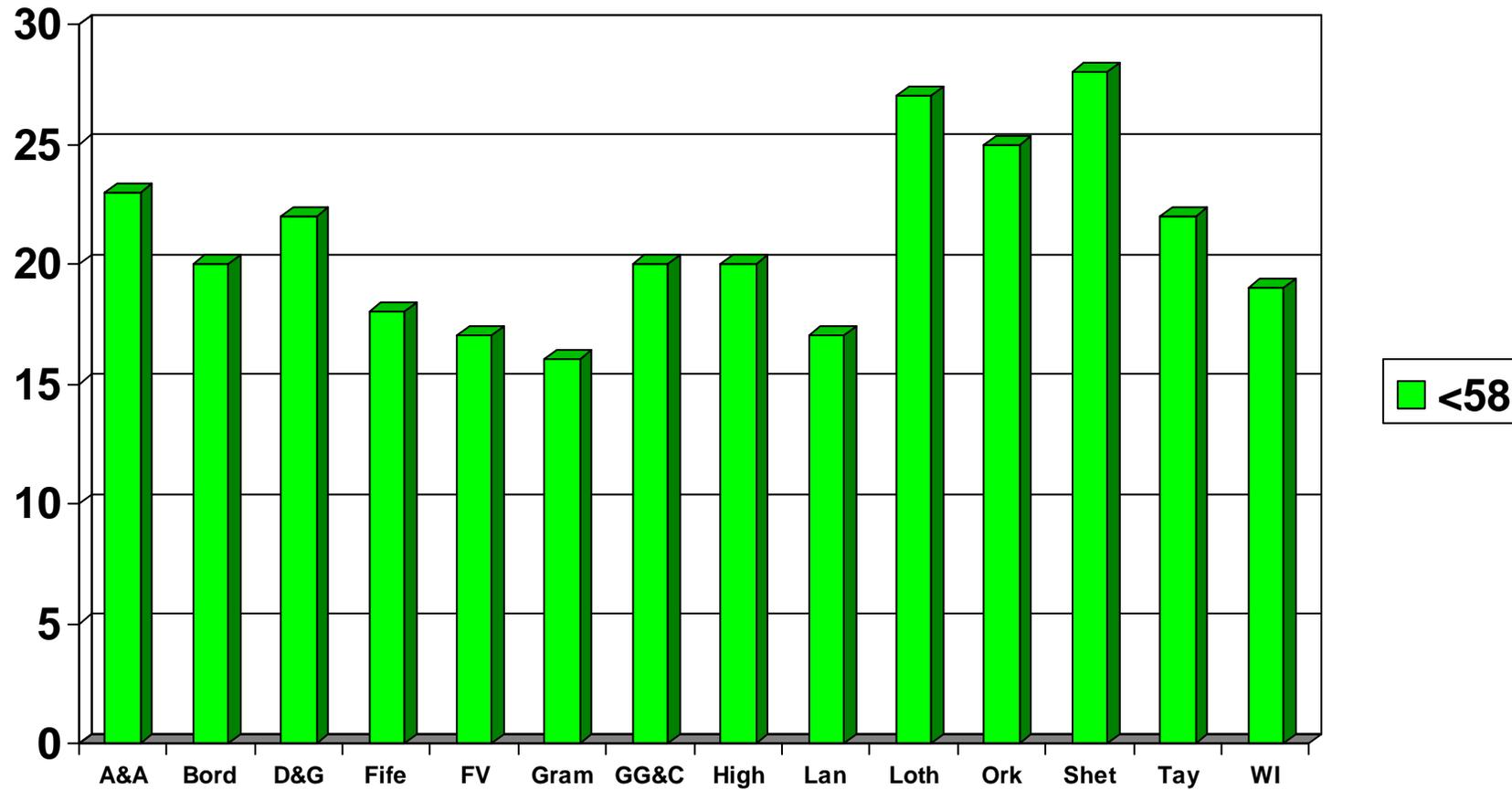
Mean pre 72 mmol/mol  
post 64 mmol/mol

# HbA1c (type 1) in each NHS Board



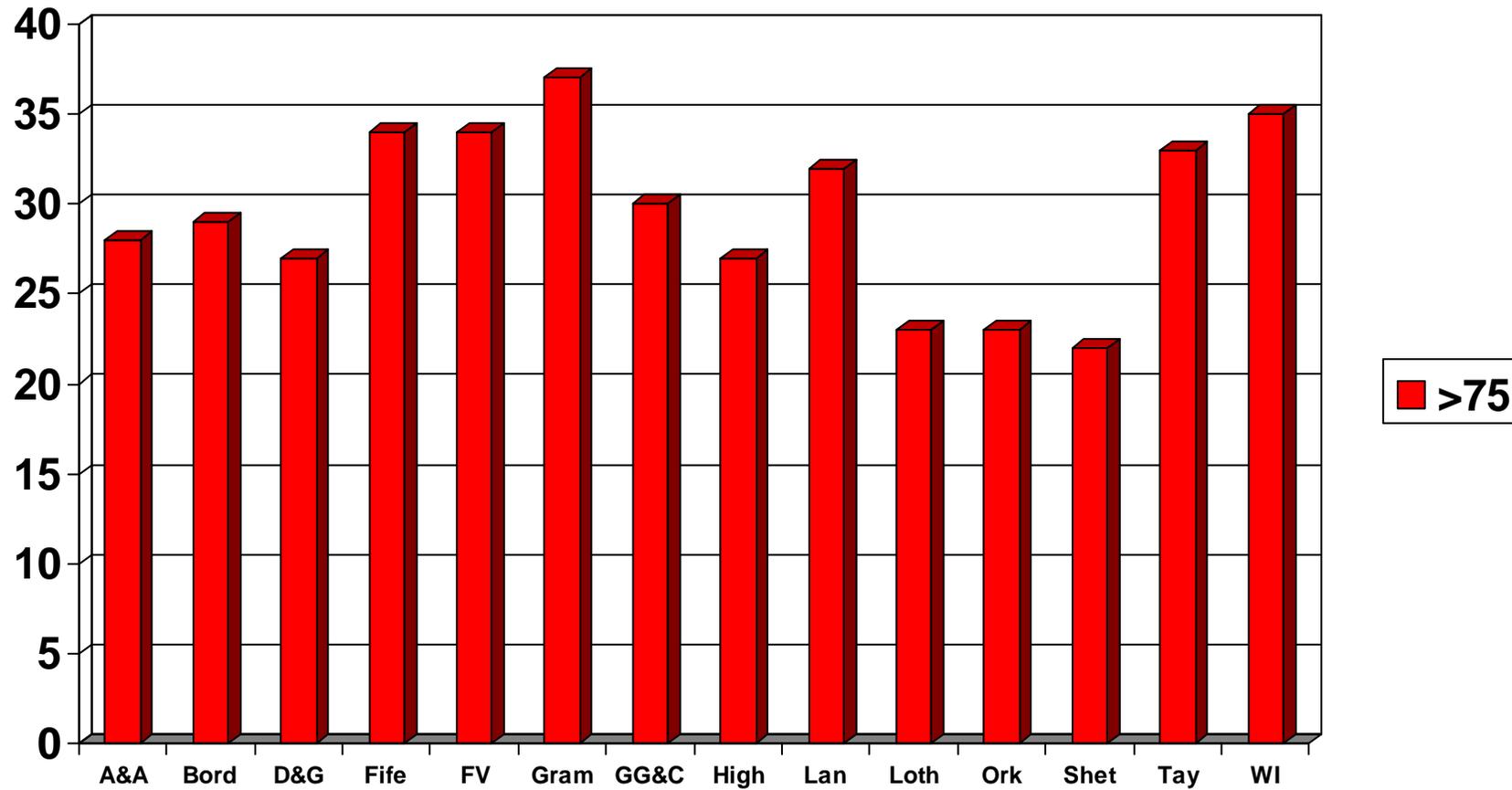
2014 Survey

# HbA1c < 58 mmol/mol NHS Board



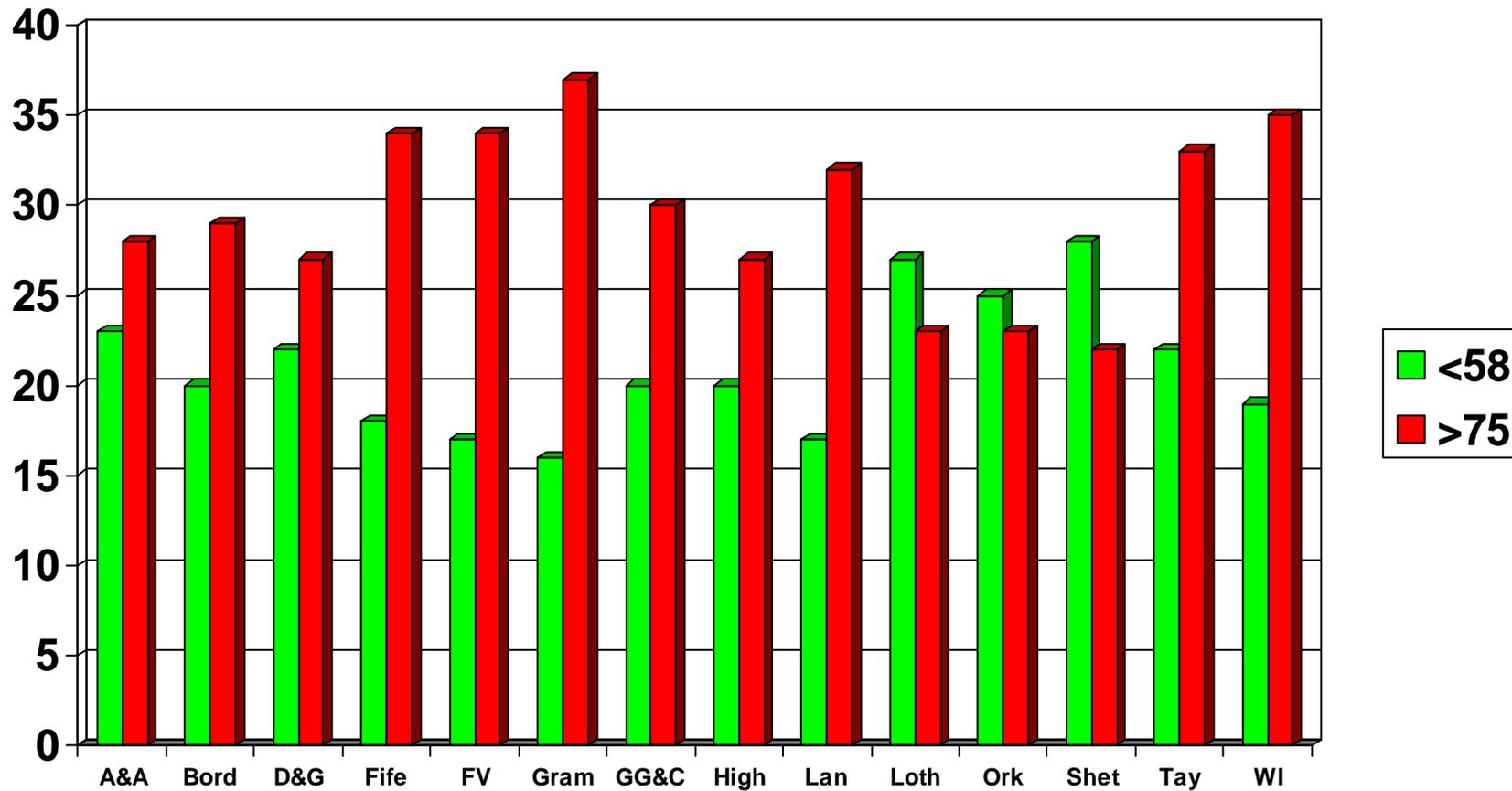
2014 Survey

# HbA1c >75 mmol/mol NHS Board



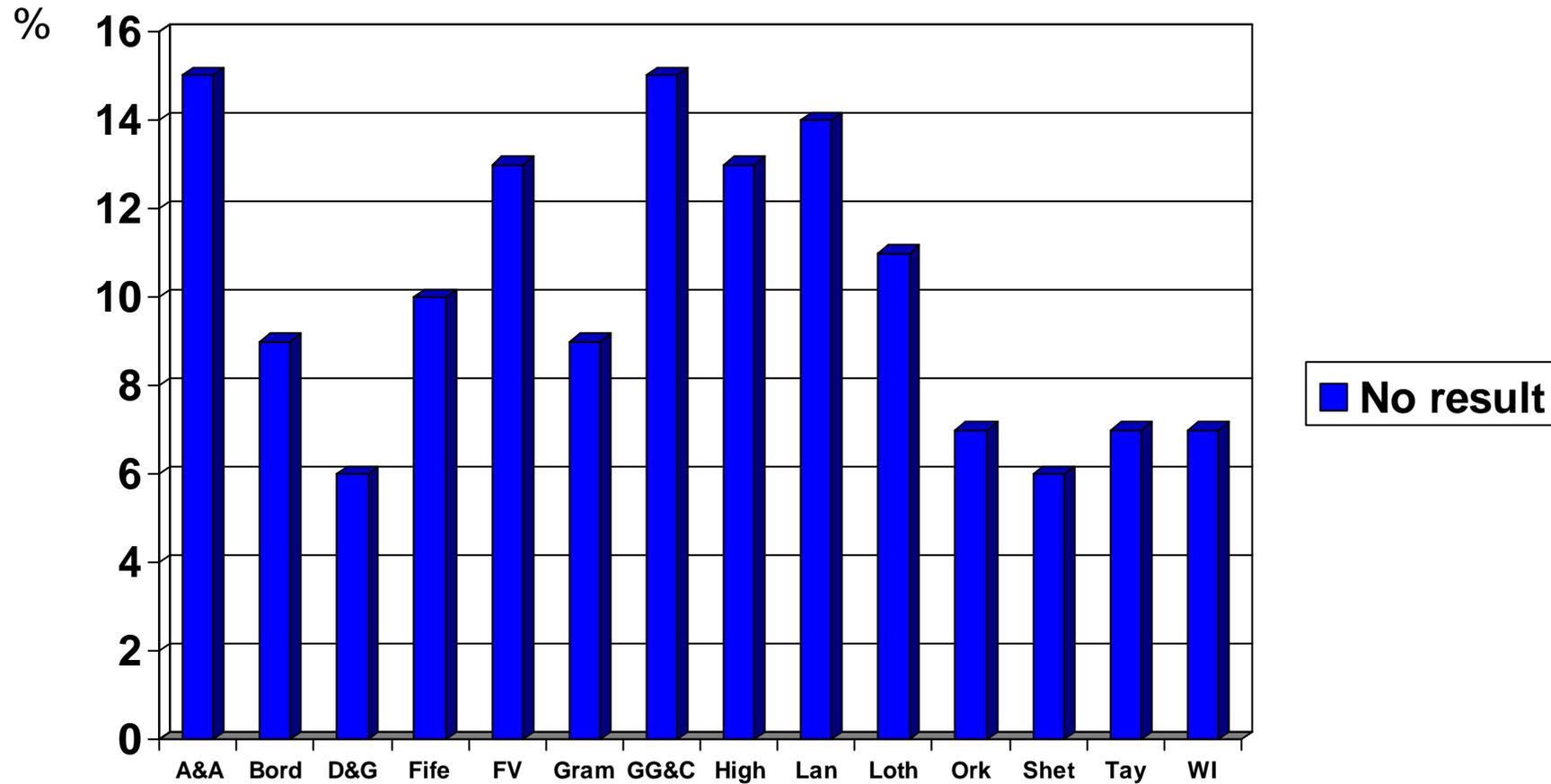
2014 Survey

# HbA1c < 58 or > 75 mmol/mol NHS Board



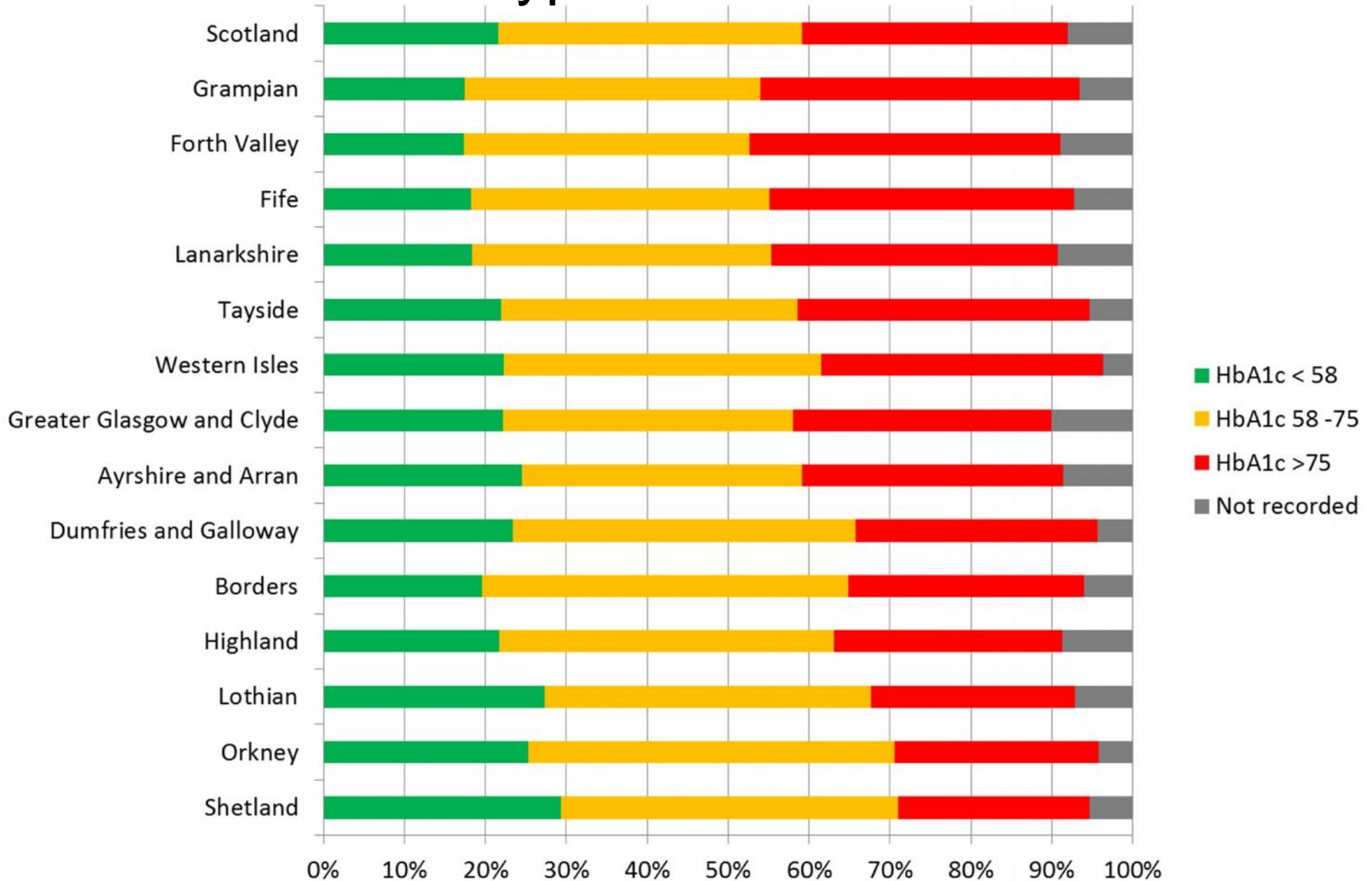
2014 Survey

# HbA1c not measured NHS Board

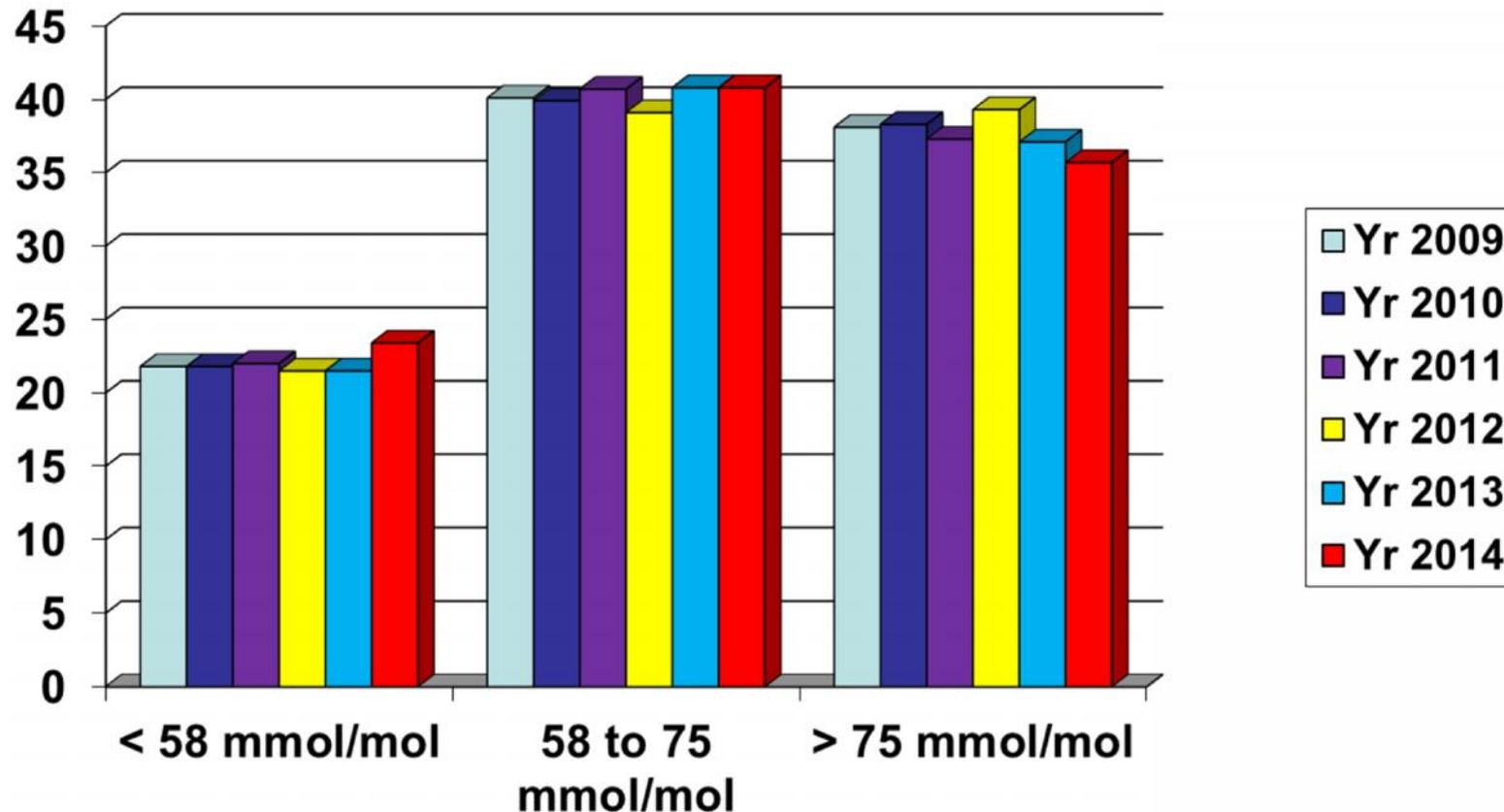


2014 Survey

# 2014 Survey Type 1 diabetes



# Scotland type 1 HbA1c by category 2009 and 2014



Year	HbA1c < 58 mmol/mol (7.5%)		HbA1c 58 -75 mmol/mol (7.5 - 9.0%)		HbA1c >75 mmol/mol (9%)		Total recorded	Not recorded
	Number	Percentage	Number	Percentage	Number	Percentage		
2014	6,375	23.4%	11,107	40.8%	9,714	35.7%	27,196	2,606
2013	5,578	21.5%	10,595	40.8%	9,788	37.1%	25,961	3,300
2012	5,407	21.5%	9,830	39.1%	9,881	39.3%	25,118	3,731
2011	5,345	22.0%	9,893	40.7%	9,071	37.3%	24,309	3,963
2010	5,337	21.8%	9,754	39.9%	9,375	38.3%	24,466	3,444
2009	5,194	21.8%	9,556	40.1%	9,096	38.1%	23,846	3,521

# Type 1 diabetes in Scotland

- Some progress in the right direction
- A long way to go yet

