National Diabetes Audit, 2015-16
Report 2a: Complications and Mortality
(complications of diabetes)

England and Wales

13 July 2017

Prepared in collaboration with:

The Healthcare Quality Improvement Partnership (HQIP). The National 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 name for the Health and Social Care Information Centre. NHS Digital managed the publication of the 2015-2016 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:

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

- This report from the National Diabetes Audit (NDA) covers complications of diabetes. It does not include diabetic eye disease or hypoglycaemia because presently there are no reliable records of these that the NDA can access. Most other cardiovascular and diabetes specific complications are included.

- An accompanying Report 2b: Complications and Mortality starts to investigate the associations between disease outcomes and preceding care.

Aims and Objectives

- To monitor progress towards reducing the prevalence of long term diabetes diabetic complications and additional mortality.
- To highlight variation in outcomes between health economies and stimulate service improvements.
- The report has been divided into 3 main sections :
  1. Cardiovascular Complications;
     - Angina,
     - Myocardial Infarction,
     - Heart Failure,
     - Stroke
  2. Diabetes Specific Complications;
     - End Stage Kidney Disease (Renal Replacement Therapy, RRT);
     - Amputations;
     - Diabetic Ketoacidosis (DKA);
  3. Mortality;
     - Causes of Death compared to general population
     - Rates of death related to age and type of diabetes
- Each section aims to address
  - Overall rates
  - Time trends
  - Geographical variation
  - Hospital utilisation.

Key Findings

- Diabetes remains responsible for a large number of additional deaths, with the greatest relative risk in younger people.
- Deaths in people with diabetes under the age of 80 years are more often due to cardiovascular disease than in the general population.
- The relative risk of cardiovascular disease in people with diabetes as compared to people without diabetes is increasing.
- About one in twenty people have diabetes, yet people with diabetes account for one quarter to one third of hospital admissions for cardiovascular disease.

Recommendations

- Providers of diabetes care should:
  - recognise the high cardiovascular risks of all types of diabetes
  - include assessment of cardiovascular risk and its preventive care within every annual care planning review e.g.
    - Primary prevention with diet, exercise, weight management, early sustained glucose control, target blood pressure, effective statins
    - Secondary prevention with all of the above plus low-dose aspirin.

- Providers of diabetes care should ensure that cardiovascular risk reduction especially includes people of working age and younger (about 1 in 3 people with diabetes) - they have the greatest relative risks including premature death.

1. Cardiovascular Complications

Cardiovascular Prevalence

From the NDA 2014-15[a], a total of 171,678 people with Type 1 diabetes, and 1,863,871 people with Type 2 and other diabetes, were alive on 31st March 2015 and were included in the analysis of diabetic complications.

Table 1 shows the prevalence of cardiovascular complications recorded between 1st April 2015 and 31st March 2016 in Hospital Episode statistics (HES) or Patient Episode Database for Wales (PEDW).

Table 1: One year prevalence of cardiovascular complications of diabetes, 2014-2015 audit

England and Wales

Complication[b]	Type 1		Type 2 and Other	
	Number of people experiencing the complication	Prevalence percentage (not adjusted for the age and sex structure of the population)	Number of people experiencing the complication	Prevalence percentage (not adjusted for the age and sex structure of the population)
Angina	2,168	1.3	56,046	3.1
Myocardial Infarction	886	0.5	14,762	0.8
Heart Failure	2,127	1.3	56,817	3.2
Stroke	844	0.5	19,350	1.1

[a] A supplementary cohort of people with diabetes was included in the 2013-14 and 2014-15 audit periods for analyses throughout this report. Please see the supporting NDA methodology document for further details.

[b] Complications in the financial year following the audit period.

Complication Ratios – Methodology Change

- The methodology for calculating complication ratios in this report has been amended from that used in NDA Report 2 January 2015: Complications and Mortality for the 2012-13 audit period.

- When calculating complication ratios in people with diabetes, rates of conditions such as MI or Stroke are compared with rates of the same conditions in people without diabetes, the non-diabetic population. This non-diabetic population had previously been defined by excluding from HES and PEDW data, people with diabetes included in the specific audit period being reported. However, because NDA ascertainment is always less than 100%, and in 2013-14 and 2014-15 was particularly low, this approach means that some people in the 'non-diabetic population' will actually have diabetes. Each year participation by practices and specialist services is slightly different so, in order to reduce this misclassification, the non-diabetic population in this report has been identified by excluding from HES and PEDW data, people with diabetes reported in any NDA period.

- We believe that this provides a more accurate picture of relative complication risk in people with diabetes because those who do not appear in the audit period being reported but did appear in a previous audit are correctly identified as having diabetes and not placed in the non-diabetic population. <u>This change in methodology means that complication ratios and additional risk figures in this report are not comparable to those reported in previously published NDA Report 2 reports.</u>

Cardiovascular Complication Ratios

These complication ratios compare the prevalence of complications during a one-year follow-up period for people in the 2014-15 NDA with the prevalence for people who have never appeared in the NDA.

The risk of cardiovascular complication is 3.5-4.5 times greater for people with Type 1 diabetes and 2-2.5 times greater for people with Type 2 diabetes.

Table 2: Standardised ratios for cardiovascular complications of diabetes, 2014-2015 audit

England and Wales

Complication[a]	Type 1			Type 2 and Other		
	Total expected[b]	Observed	Standardised ratio[b]	Total expected[b]	Observed	Standardised ratio[b]
Angina	563	2,165	384	20,687	56,043	271
Myocardial Infarction	205	885	431	6,286	14,755	235
Heart Failure	456	2,124	466	20,704	56,775	274
Stroke	244	841	345	9,672	19,343	200

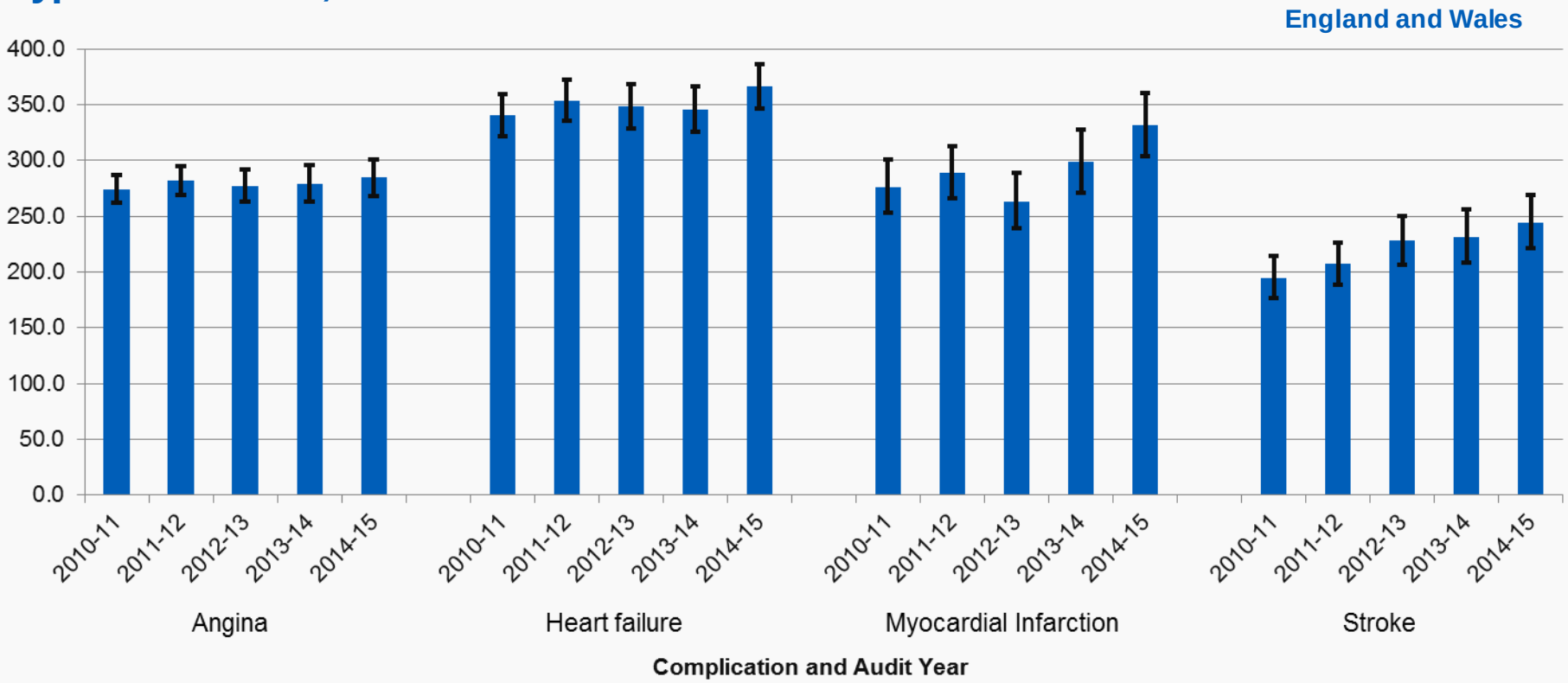
[a] Complications in the financial year following the audit period.

[b] Based on the prevalence in the population who have never appeared in the NDA. This may include people with diabetes who have never appeared in the NDA. Standardised by age, sex and locality.

Cardiovascular Complication Ratios, Type 1

The additional risk of cardiovascular complications is higher than previously reported due to the impact of the methodology change (see slide 9). A 95% confidence interval is presented for the size of the additional risk.

Figure 1: Additional risk[a] of cardiovascular complication among people with Type 1 diabetes, 2010-11 to 2014-15 audits



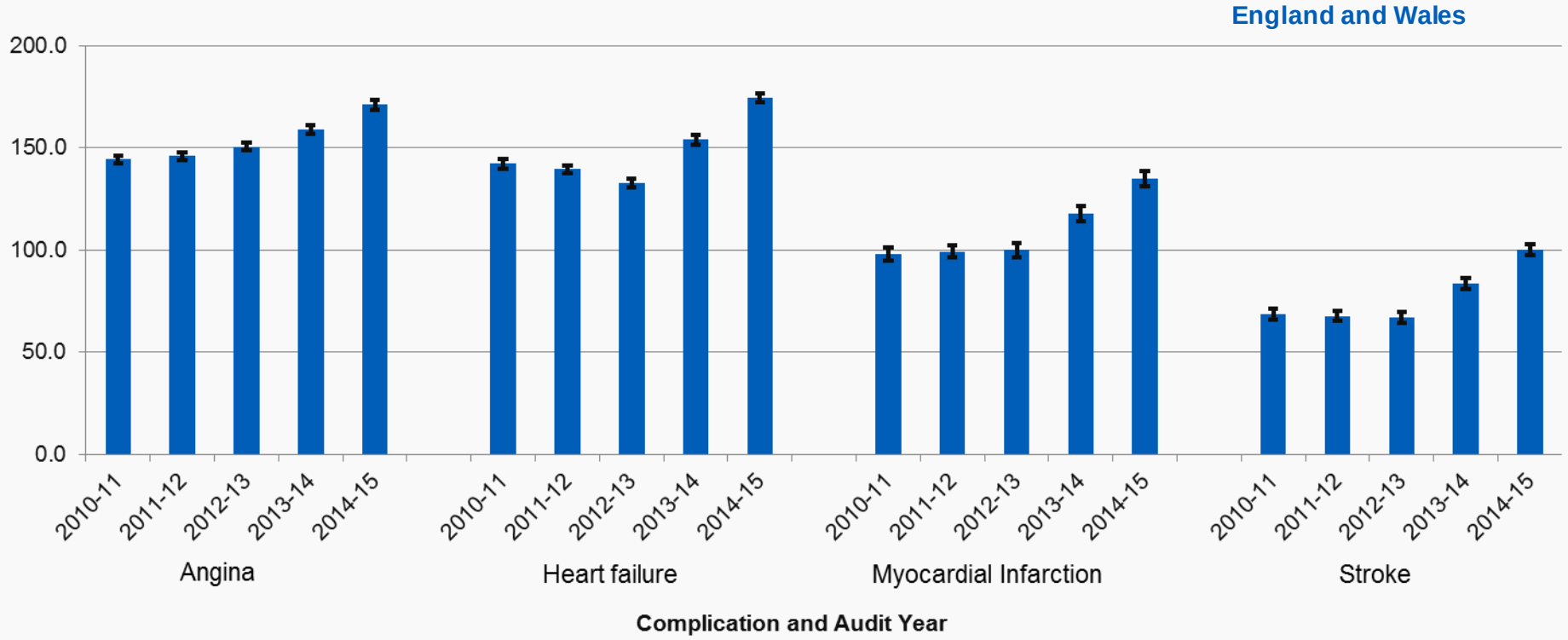
[a] The additional risk due to diabetes, based on the standardised ratio for each complication.

[b] Complications in the financial year following the audit period.

Cardiovascular Complication Ratios, Type 2

The additional risk of cardiovascular complications is higher than previously reported due to the impact of the methodology change (see slide 9) and is increasing across all complications. A 95% confidence interval is presented for the size of the additional risk.

Figure 2: Additional risk[a] of cardiovascular complication among people with Type 2 and other diabetes, 2010-11 to 2014-15 audits



[a] The additional risk due to diabetes, based on the standardised ratio for each complication.
[b] Complications in the financial year following the audit period.

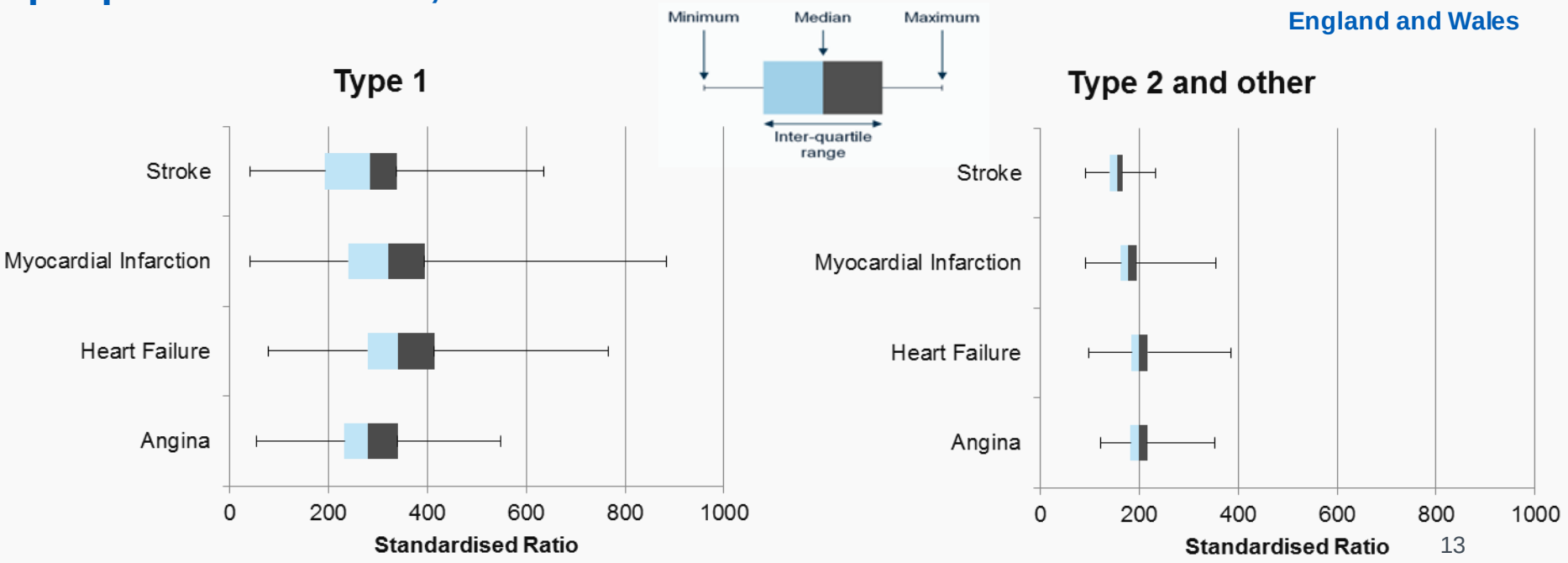
Cardiovascular Complication Ratios – Locality Variation

Figure 3 shows the variation in the complication ratios among the Clinical Commissioning Groups (CCGs) and Local Health Boards (LHBs) of England and Wales.

All the ranges are wide; there is a much wider range of ratios for people with Type 1 diabetes than for Type 2 and other diabetes, which partly reflects the smaller number of people with Type 1 diabetes at a local level. These charts also illustrate how the median risk of all cardiovascular complications is higher for Type 1 than for Type 2 and other.

There are substantial differences at a local level in standardised cardiovascular complication ratios.

Figure 3: The range of CCG/LHB cardiovascular complication ratios for people with diabetes, 2012-13 to 2014-15 audits



Cardiovascular Complications - Hospital Admissions

Table 3 shows the rate of admission to hospital between 1st April 2015 and 31st March 2016 for cardiovascular disease in people with diabetes – defined as individuals who have appeared in the NDA at any time up to the 2014-15 audit.

People with diabetes comprise about 5% of the adult population yet account for 25-30% of admissions for cardiovascular complications.

Table 3: Number of hospital admissions and NDA related hospital admissions for cardiovascular complications, 2015-2016 HES/PEDW

England and Wales

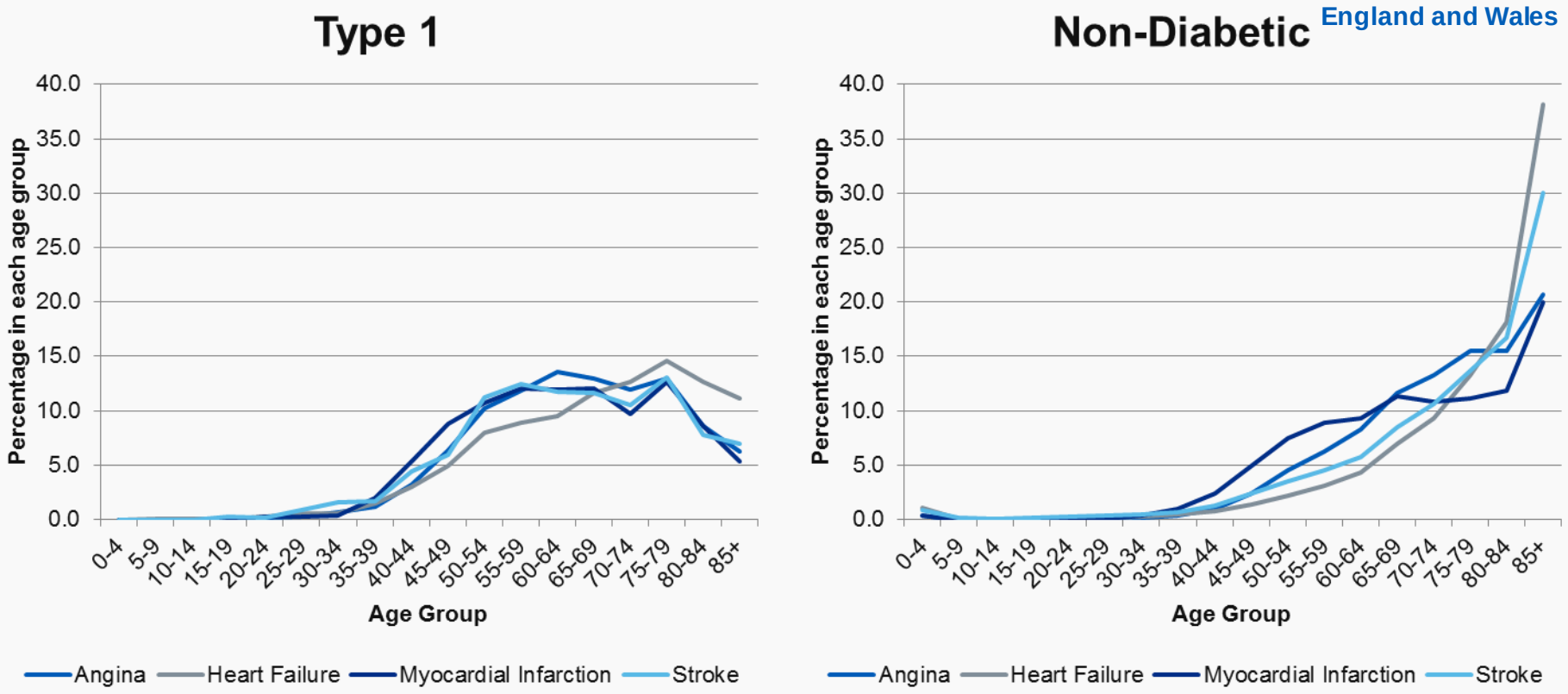
Complication[a]	Non-Emergency Admissions			Emergency Admissions		
	Number of all non emergency admissions	Number of non emergency admissions for NDA population	Percentage of non emergency admissions for NDA population	Number of all emergency admissions	Number of emergency admissions for NDA population	Percentage of emergency admissions for NDA population
Angina	224,091	63,501	28.3	256,250	78,151	30.5
Myocardial Infarction	16,732	4,079	24.4	87,849	21,399	24.4
Heart Failure	107,820	32,802	30.4	356,081	115,695	32.5
Stroke	31,670	7,286	23.0	126,590	29,392	23.2

[a] The complication was not necessarily the primary reason for admission

Cardiovascular Complications - Age at Hospital Admission, Type 1

People with Type 1 diabetes admitted to hospital with cardiovascular complications are younger than those without diabetes.

Figure 4: Age distribution of people admitted to hospital with cardiovascular complications, by those with Type 1 diabetes and those without diabetes, 2014-15 audit

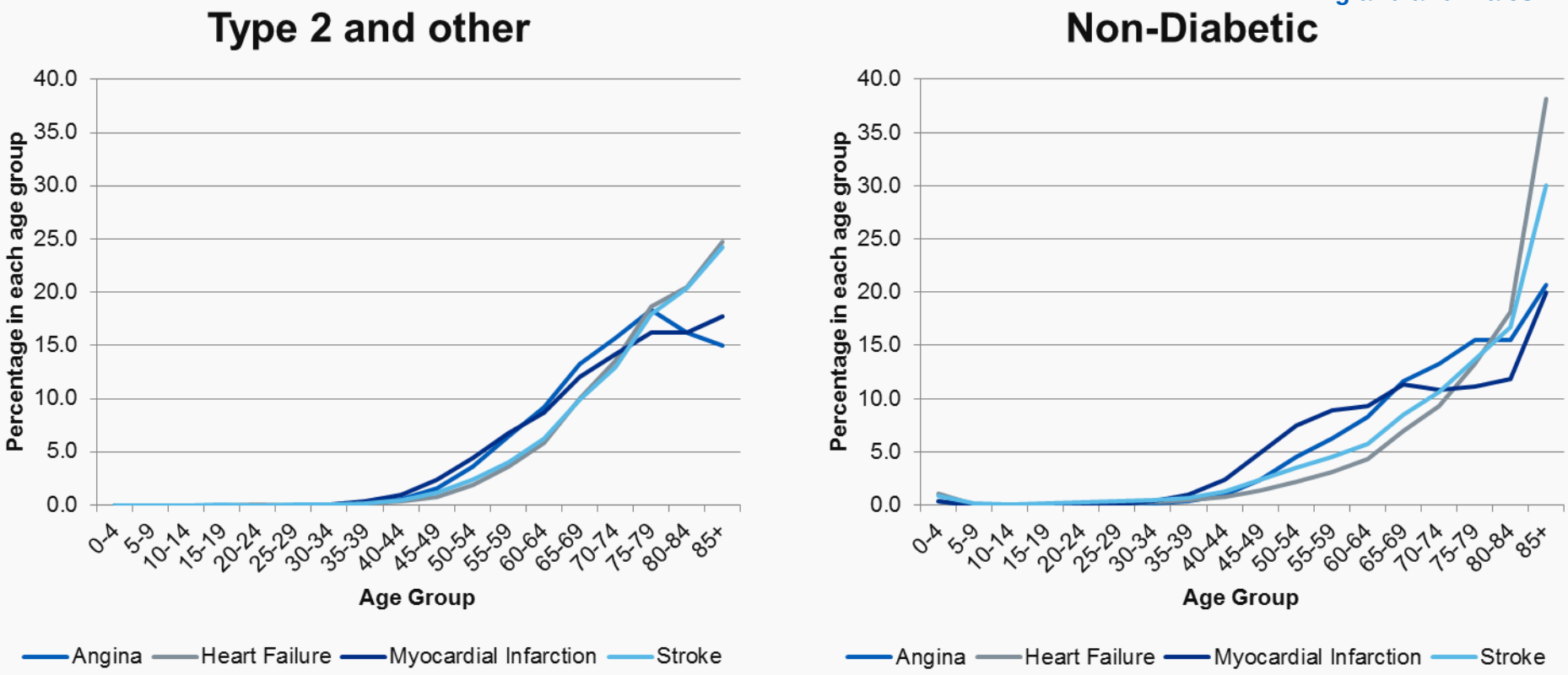


Cardiovascular Complications - Age at Hospital Admission, Type 2

People with Type 2 diabetes admitted to hospital with cardiovascular complications are of similar age to those without diabetes.

Figure 5: Age distribution of people admitted to hospital with cardiovascular complications, by those with Type 2 and other diabetes and those without diabetes, 2014-15 audit

England and Wales



Cardiovascular Hospital Bed Days

Table 4 shows hospital bed days between 1st April 2015 and 31st March 2016 for people admitted for cardiovascular disease, for all people, and those with diabetes – defined as individuals who have appeared in the NDA at any time up to the 2014-15 audit.

Hospital bed days for cardiovascular conditions are significantly over-represented by people who have diabetes.

Table 4: Percentage of hospital bed days and NDA related hospital bed days for cardiovascular complications, 2015-2016 HES/PEDW

England and Wales

Complication[a]	Non-Emergency Admissions			Emergency Admissions		
	Total number of bed days	Number of bed days for NDA population	Percentage of bed days for NDA population	Total number of bed days	Number of bed days for NDA population	Percentage of bed days for NDA population
Angina	336,590	95,706	28.4	1,515,503	488,555	32.2
Myocardial Infarction	111,078	33,025	29.7	623,464	183,504	29.4
Heart Failure	474,266	139,058	29.3	3,430,663	1,119,689	32.6
Stroke	421,016	90,458	21.5	1,498,617	354,864	23.7

[a] The complication was not necessarily the primary reason for admission

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2. Diabetes Specific Complications

Diabetes Specific Complications Prevalence, Amputations and End Stage Kidney Disease (ESKD)

From the NDA 2014-15, a total of 171,678 people with Type 1 diabetes, and 1,863,871 people with Type 2 and other diabetes, were alive on 31st March 2015 and were included in the analysis of diabetic complications.

Table 5 shows the prevalence of the amputation and ESKD diabetes specific[a] complications recorded between 1st April 2015 and 31st March 2016 in Hospital Episode statistics (HES) or Patient Episode database for Wales (PEDW).

Table 5: One year prevalence of diabetes specific complications, 2014-2015 audit

Complication[a]	Type 1		Type 2 and Other	
	Number of people experiencing the complication	Prevalence percentage (not adjusted for the ethnicity, age and sex structure of the population)	Number of people experiencing the complication	Prevalence percentage (not adjusted for the ethnicity, age and sex structure of the population)
Major Amputation	198	0.1	1,322	0.1
Minor Amputation	530	0.3	2,918	0.2
Renal Replacement Therapy (ESKD)[b]	1,835	1.1	11,006	0.6

[a] Complications in the financial year following the audit period.

[b] Very small numbers of amputations and ESKD will be due to non-diabetic disease.

Chronic Kidney Disease (CKD), 2015-16

NDA data include both Urine Albumin and the calculated Glomerular Filtration Rate (GFR) so all stages of CKD can be identified. Most patients in groups 3 and 4 will require kidney specific treatment interventions; those in group 5 will die without dialysis or transplantation (RRT).

Table 6: CKD stages for people in the 2015/16 audit

England and Wales

	GFR (ml/min/ 1.73m²)	People with diabetes experiencing CKD stages					
		Type 1			Type 2		
		Number of people	Percentage (with CKD data present)	Average age (years)	Number of people	Percentage (with CKD data present)	Average age (years)
No CKD	-	26,805	35.2	41.8	267,728	20.9	58.8
CKD1 Kidney damage with normal/increased GFR	90+	13,635	17.9	43.6	168,977	13.2	59.5
CKD2 Kidney damage with mild reduction GFR	60-89	27,124	35.6	55.3	590,652	46.1	68.0
CKD3a Moderate reduction GFR	45-59	4,817	6.3	65.4	156,829	12.3	75.2
CKD3b Worsening reduction GFR	30-44	2,379	3.1	66.1	73,151	5.7	77.7
CKD4 Severe reduction GFR	15-29	892	1.2	62.1	18,039	1.4	77.3
CKD5 Kidney failure or ESKD or RRT	0-14	540	0.7	55.6	4,479	0.3	70.4
Unknown (records with missing CKD data[a])	-	141,251	-	-	1,172,803	-	-

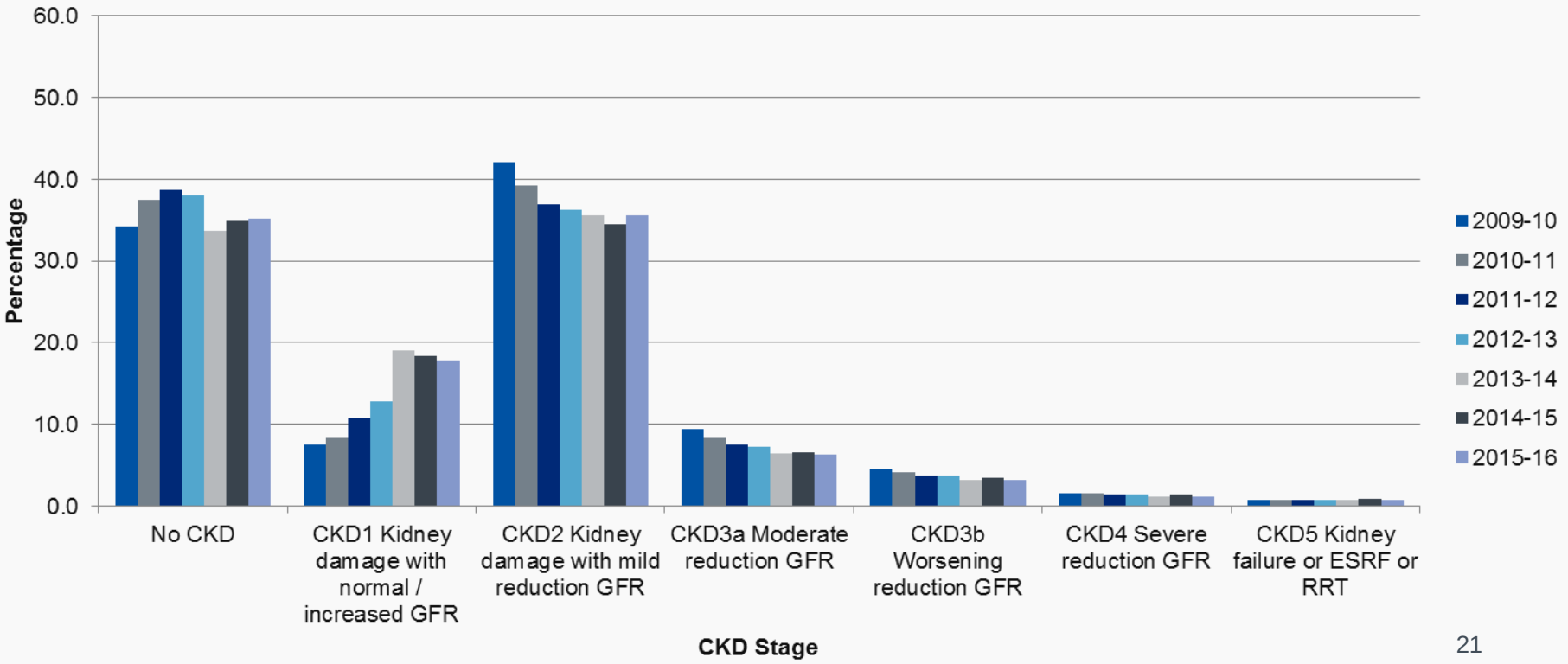
[a] GFR can only be calculated where serum creatinine level (mmol/l), age, sex and ethnicity are all present in the data

Chronic Kidney Disease, Type 1

The steady decline in more advanced CKD (CKD stages 3-5) seen in recent years continues. The rising/consistent levels of CKD stages 1 and 2 suggests that early detection and intervention may be a factor in the improvement.

Figure 6: Percentage of people with Type 1 diabetes at each CKD stage by audit year

England and Wales

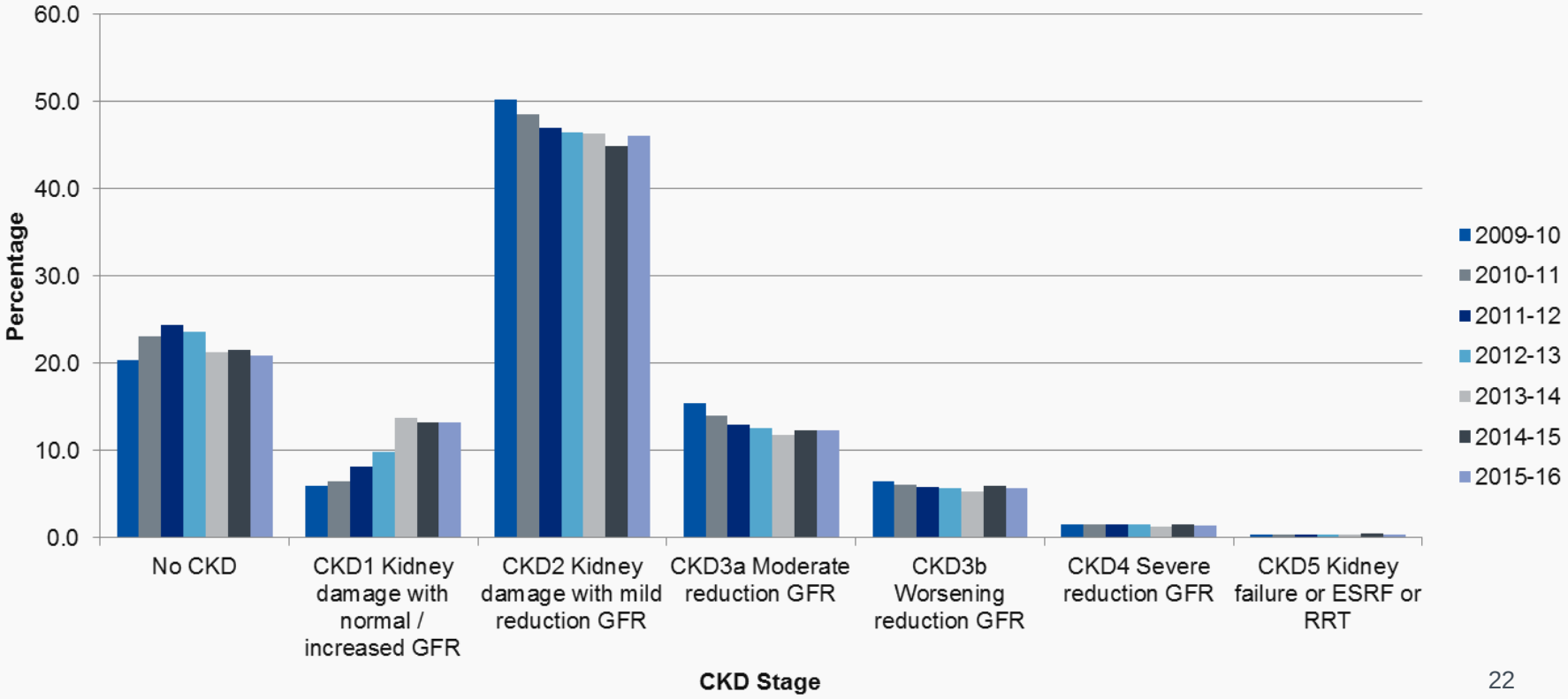


Chronic Kidney Disease, Type 2

As seen in people with Type 1 diabetes, the steady decline in CKD stages 3-5 and the rising/consistent levels of CKD stages 1 and 2 suggests that early detection and intervention may be a factor in the improvement.

Figure 7: Percentage of people with Type 2 and other diabetes at each CKD stage by audit year

England and Wales



Renal Replacement Therapy Complication Ratios

These complication ratios compare the prevalence of RRT during a one-year follow-up period for people in the 2014-15 NDA with the prevalence of RRT for people who have never appeared in the NDA.

The risk of ESKD is 19 times greater for people with Type 1 diabetes and 4.5 times greater for people with Type 2 diabetes.

Table 7: Standardised ratios for RRT, 2014-2015 audit

England and Wales

Complication[a]	Type 1			Type 2 and Other		
	Total Expected[b]	Observed	Standardised Ratio[b]	Total Expected[b]	Observed	Standardised Ratio[b]
RRT (ESKD)[c]	97	1,830	1,886	2,453	10,983	448

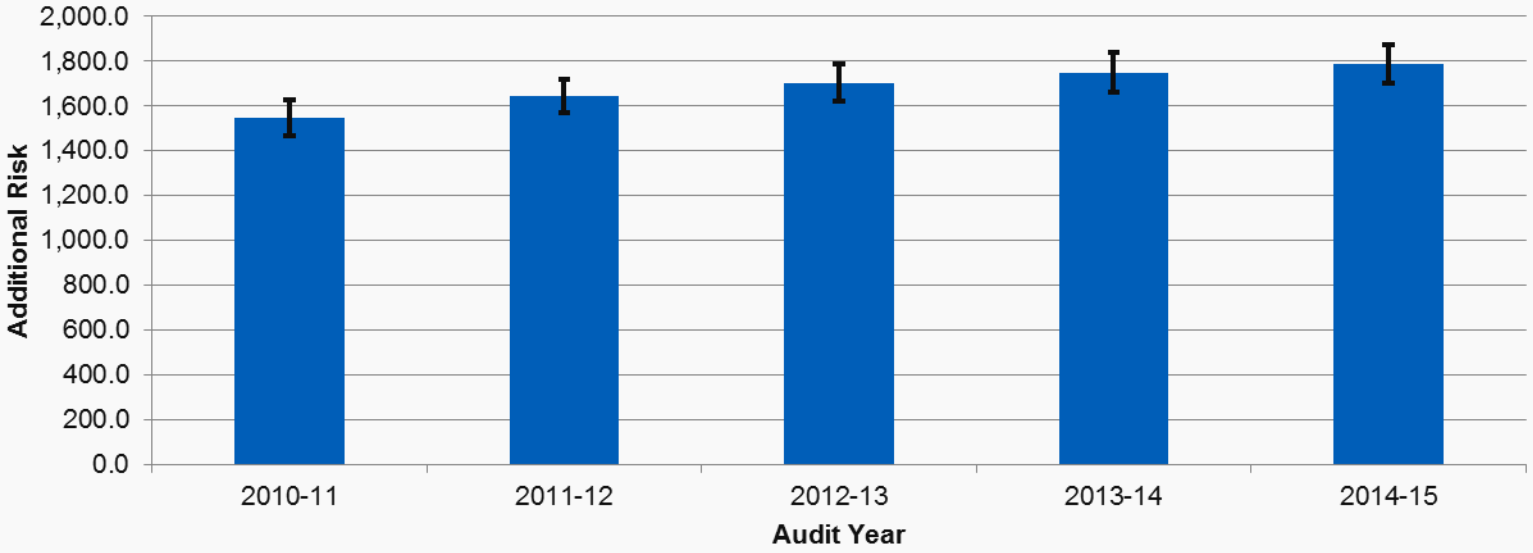
[a] Complications in the financial year following the audit period.
[b] Based on the prevalence in the population who have never appeared in the NDA. This may include people with diabetes who have never appeared in the NDA. Standardised by age, sex and locality.
[c] The ICD-10 diagnosis and OPCS procedure codes used to identify the RRT complication have changed since the NDA 2012-13 Report 2 and are therefore not comparable.

RRT Complication Ratio, Type 1

Although the proportion of people with Type 1 diabetes reaching CKD stage 5 is falling, the risk is still substantially greater relative to people without diabetes, and because of the increasing prevalence of diabetes the absolute numbers are increasing. A 95% confidence interval is presented for the size of the additional risk.

Figure 8: Additional risk of RRT among people with Type 1 diabetes, 2010-11 to 2014-15 audits

England and Wales



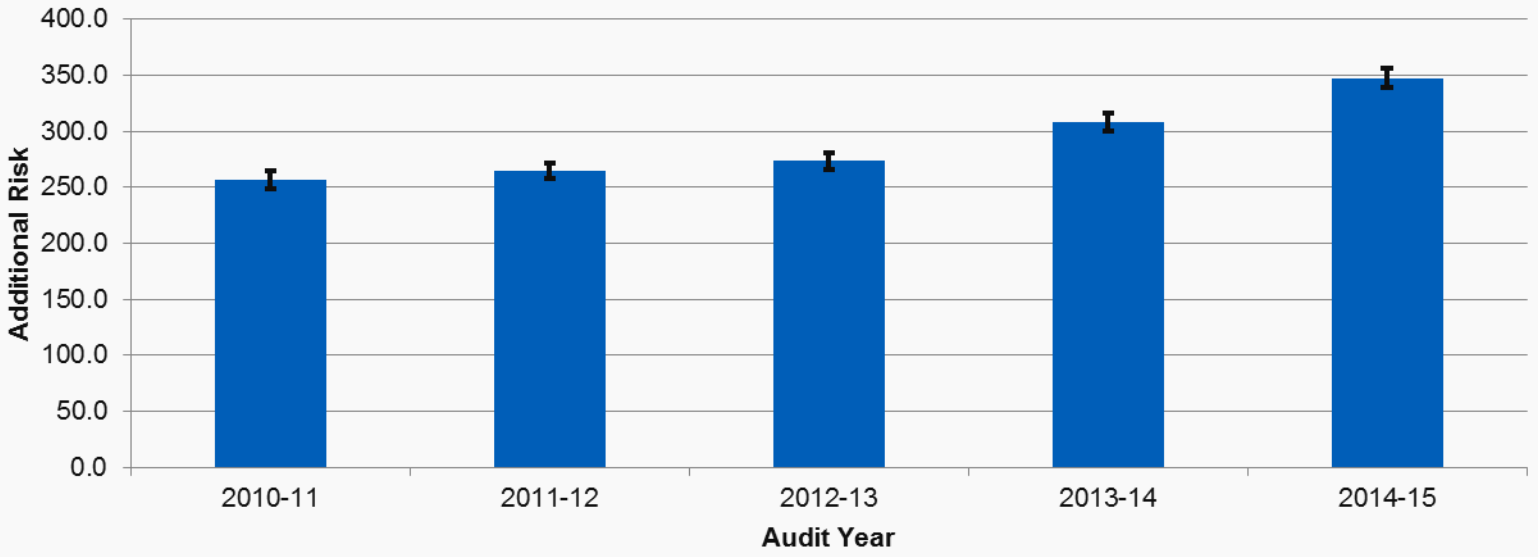
[a] The additional risk due to diabetes, based on the standardised ratio for each complication.
[b] Complications in the financial year following the audit period.

RRT Complication Ratio, Type 2

Although the proportion of people with Type 2 and other diabetes reaching CKD stage 5 is falling, the risk is still substantially greater relative to people without diabetes, and because of the increasing prevalence of diabetes the absolute numbers are increasing. A 95% confidence interval is presented for the size of the additional risk.

Figure 9: Additional risk of RRT among people with Type 2 and other diabetes, 2010-11 to 2014-15 audits

England and Wales



[a] The additional risk due to diabetes, based on the standardised ratio for each complication.
[b] Complications in the financial year following the audit period.

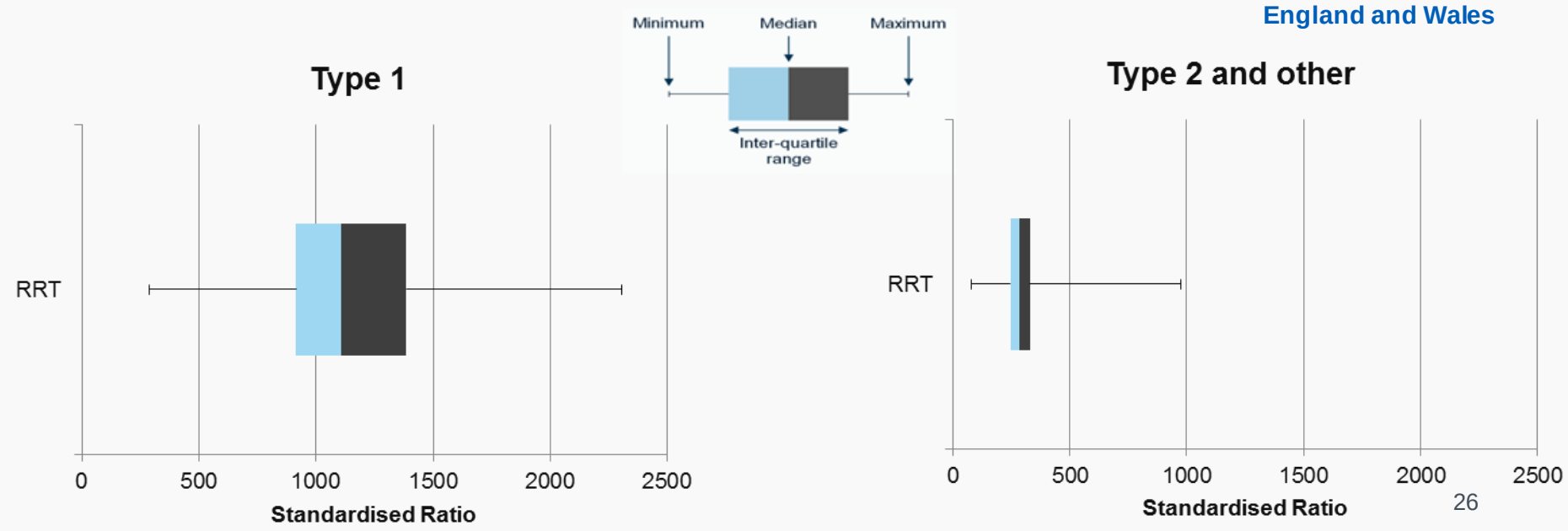
RRT Complication Ratio – Locality Variation

Figure 10 shows the variation in the RRT complication ratio among the CCGs and LHBs of England and Wales. Local standardisation means that social deprivation and ethnicity variations should be accounted for.

There is a much wider range of ratios for people with Type 1 diabetes than for those with Type 2 and other diabetes, which partly reflects the smaller number of people with Type 1 diabetes at a local level. These charts also show that the median risk of RRT is higher for Type 1 than for Type 2 and other.

There are substantial differences at a local level in standardised RRT ratios.

Figure 10: The range of CCG/LHB RRT complication ratios for people with diabetes, 2012-13 to 2014-15 audits



Amputation Prevalence in People with All Types of Diabetes by Age

The absolute numbers of amputations in people with diabetes are relatively small but they represent around half of all admissions to hospital for amputation (see slide 30).

Table 8: One year diabetes related amputation prevalence, by age, 2014-15 audit

England and Wales

Complication[a]	Age Range (years)	Number of People with Diabetes	Number of People with Diabetes Experiencing Amputation	Prevalence Percentage
Major Amputation	0-64	935,957	623	0.07
	65-79	739,868	681	0.09
	80+	292,981	211	0.07
Minor Amputation	0-64	935,957	1,593	0.17
	65-79	739,868	1,345	0.18
	80+	292,981	503	0.17

[a] Complications in the financial year following the audit period.

Major Amputation Prevalence in People with All Types of Diabetes by Age and Duration

Duration of diabetes since diagnosis supersedes age as the dominant risk factor for major amputations. Prevalence is broadly the same for duration irrespective of age. Ethnicity variations are not accounted for in this data.

Table 9: One year diabetes related amputation prevalence, by age and duration, 2014-2015 audit

England and Wales

	Age Range (years)	Duration Since Diabetes Diagnosis (years)	Number of people with diabetes	Number of people with diabetes experiencing amputation	Prevalence percentage
Major amputation[a]	0-64	0-4	387,847	94	0.02
		5-9	245,751	96	0.04
		10-19	200,427	228	0.11
		20-29	42,285	94	0.22
		30-39	16,809	35	0.21
		40+	9,116	25	0.27
	65-79	0-4	219,054	101	0.05
		5-9	205,293	104	0.05
		10-19	231,947	244	0.11
		20-29	46,277	130	0.28
		30-39	9,036	24	0.27
		40+	7,017	27	0.38
	80+	0-4	67,171	29	0.04
		5-9	76,561	36	0.05
		10-19	105,931	74	0.07
		20-29	25,770	37	0.14
		30-39	4,872	12	0.25
		40+	2,584	8	0.31

[a] Complications in the financial year following the audit period.

Minor Amputation Prevalence in People with All Types of Diabetes by Age and Duration

As with major amputations, duration of diabetes since diagnosis is the dominant risk factor for minor amputations. Ethnicity variations are not accounted for in this data.

Table 10: One year diabetes related amputation prevalence, by age and duration, 2014-2015 audit

England and Wales

	Age Range (years)	Duration Since Diabetes Diagnosis (years)	Number of people with diabetes	Number of people with diabetes experiencing amputation	Prevalence percentage
Minor amputation[a]	0-64	0-4	387,847	181	0.05
		5-9	245,751	256	0.10
		10-19	200,427	648	0.32
		20-29	42,285	258	0.61
		30-39	16,809	86	0.51
		40+	9,116	64	0.70
	65-79	0-4	219,054	139	0.06
		5-9	205,293	188	0.09
		10-19	231,947	532	0.23
		20-29	46,277	264	0.57
		30-39	9,036	63	0.70
		40+	7,017	51	0.73
	80+	0-4	67,171	57	0.08
		5-9	76,561	82	0.11
		10-19	105,931	174	0.16
		20-29	25,770	101	0.39
		30-39	4,872	32	0.66
		40+	2,584	19	0.74

[a] Complications in the financial year following the audit period.

Hospital Admissions for Diabetes Specific Complications

People with diabetes comprise about 5% of the adult population yet account for 40-70% of admissions for amputations and RRT.

More than 4 out of 10 of all admissions for major amputations and almost 3 out of 4 of all emergency admissions for minor amputations are in people with diagnosed diabetes.

Table 11: Number of hospital admissions and NDA related hospital admissions for diabetes specific complications, 2015-2016 HES/PEDW

England and Wales

Complication[a]	Non-Emergency Admissions			Emergency Admissions		
	Number of all non emergency admissions	Number of non emergency admissions for NDA population	Percentage of non emergency admissions for NDA population	Number of all emergency admissions	Number of emergency admissions for NDA population	Percentage of emergency admissions for NDA population
Major Amputation	1,359	563	41.4	1,961	858	43.8
Minor Amputation	4,424	2,098	47.4	2,850	2,077	72.9
RRT	61,641	21,398	34.7	61,686	26,139	42.4

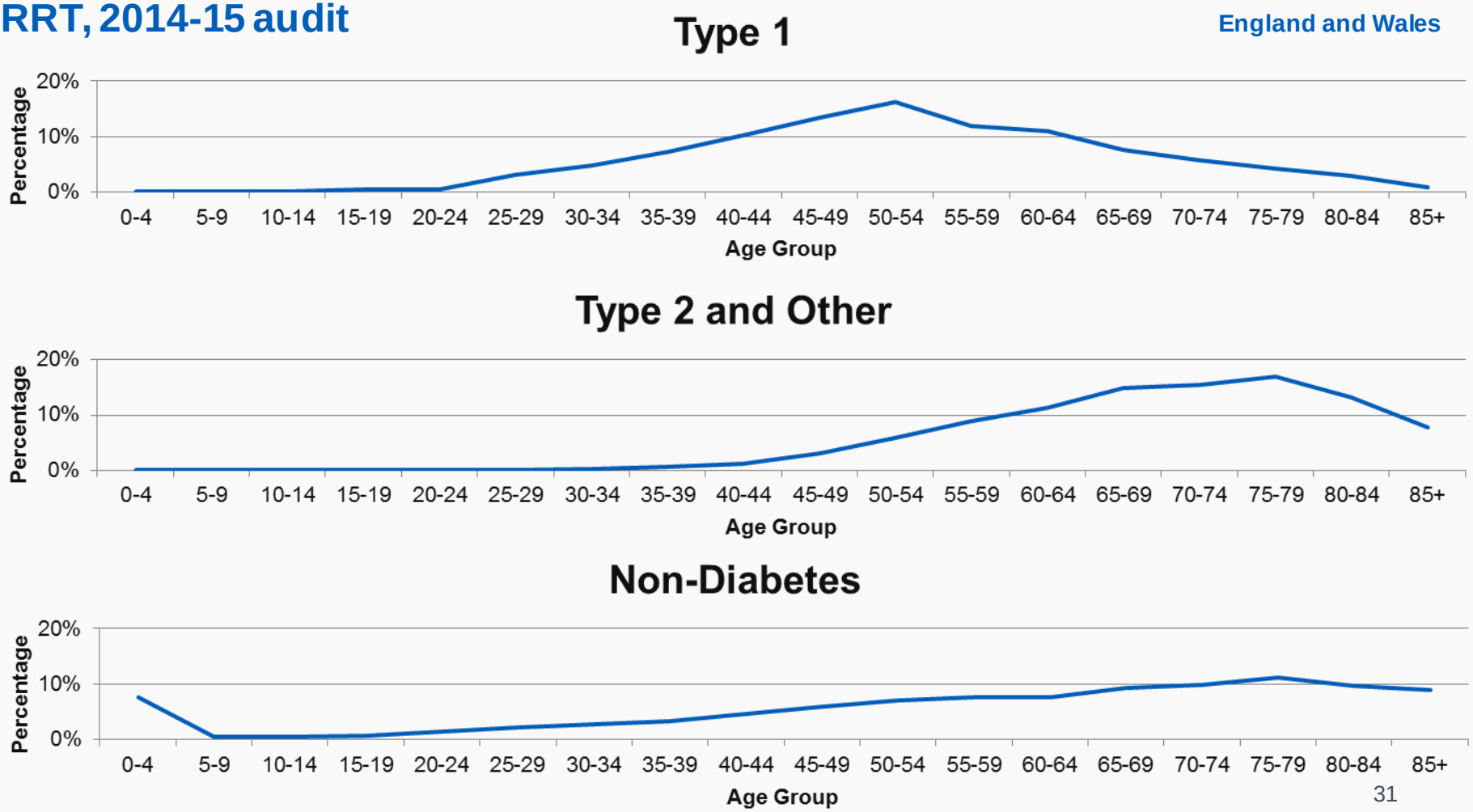
[a] The complication was not necessarily the primary reason for admission
[b] Complications in the financial year following the audit period.

Diabetes Specific Hospital Admission Characteristics

People with diabetes requiring RRT are younger (especially Type 1) than those without diabetes.

Figure 11: Age distribution of people with and without diabetes admitted for RRT, 2014-15 audit

England and Wales



[a] Complications in the financial year following the audit period.

Diabetes Specific Hospital Bed Days

Table 12 shows hospital bed days for people admitted for amputations or RRT between 1st April 2015 and 31st March 2016 for the known diabetic population – defined as individuals who have appeared in the NDA at any time up to the 2014-15 audit – alongside the total number of bed days for these admissions in all people.

People with diabetes represent about 5% of the adult population but account for more than 40% of bed days for amputation and RRT.

Table 12: Number of hospital bed days and NDA related hospital bed days, 2015-2016 HES/PEDW

England and Wales

Complication[a]	Non-Emergency Admissions			Emergency Admissions		
	Total number of bed days	Number of bed days for NDA population	Percentage of bed days for NDA population	Total number of bed days	Number of bed days for NDA population	Percentage of bed days for NDA population
Major Amputation	28,275	13,495	47.7	59,158	27,566	46.6
Minor Amputation	20,787	14,118	67.9	52,289	38,371	73.4
RRT	184,502	70,862	38.4	529,885	235,014	44.4

[a] The complication was not necessarily the primary reason for admission

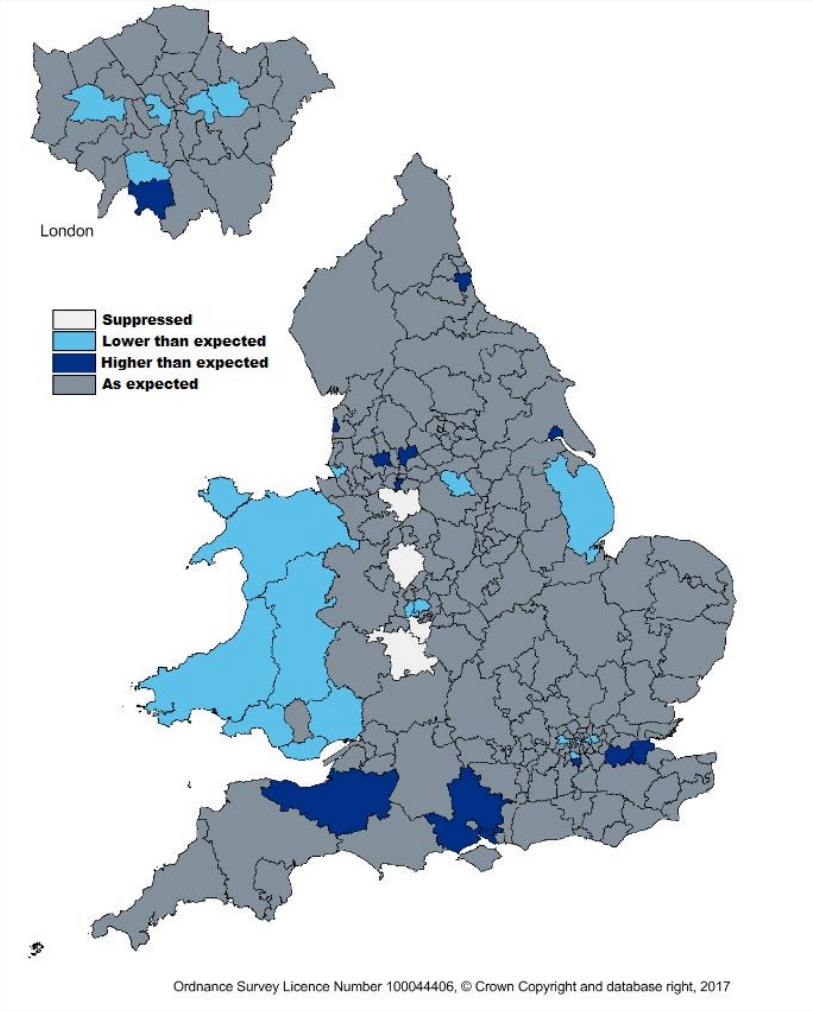
2.3 Diabetic Ketoacidosis (DKA)

DKA – Locality Variation, Type 1

Figure 12: Variation of DKA complication ratios compared to local complication rates in people with Type 1 diabetes, 2012/13 to 2014/15 audits

Areas with higher prevalence of DKA, after adjustment for age, sex and Index of Multiple Deprivation (IMD) quintiles, are shown in **dark blue** and those with a lower prevalence of DKA after adjustment are show in **light blue**.

The map shows the rates in the majority of CCGs in England 'as expected' while almost all Welsh LHBs have lower than expected ratios.



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3. Mortality

Causes of Death – People in the NDA

Although deaths from vascular disease are declining year on year, there is still a higher percentage of deaths due to vascular disease in people with diabetes than cancer.

Table 13: Causes of death for people in the NDA, 2005-2015

England and Wales

Year of Death	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of Deaths	13,725	27,054	36,606	53,762	64,434	74,362	78,053	87,779	93,684	95,818	102,010
All Cancers	23.7%	23.9%	23.7%	24.3%	24.7%	25.2%	26.0%	25.7%	25.4%	25.6%	24.4%
All Vascular Outcomes	41.5%	39.5%	38.8%	38.2%	37.8%	37.2%	35.3%	34.9%	34.4%	34.0%	33.4%
All Non-Cancer, Non-Vascular Outcomes	34.0%	35.5%	36.4%	36.5%	36.6%	36.7%	37.6%	38.4%	39.1%	39.2%	40.9%
All Unknown Causes	0.8%	1.0%	1.1%	1.0%	0.9%	1.0%	1.1%	1.1%	1.2%	1.2%	1.2%

Table 14: Further breakdown of 'All Vascular Outcomes' cause of death for people in the NDA, 2005-2015

England and Wales

Year of Death	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Coronary Heart Disease	24.6%	23.0%	22.1%	21.1%	20.7%	19.7%	18.5%	18.2%	17.6%	16.9%	16.4%
Cerebrovascular Disease	9.1%	9.0%	8.9%	9.0%	8.6%	8.8%	9.0%	8.9%	8.7%	9.2%	9.1%
Other Vascular Disease	7.7%	7.5%	7.9%	8.1%	8.4%	8.7%	7.8%	7.8%	8.0%	7.8%	7.9%

Causes of Death – General Population

Deaths due to vascular disease are also declining in the general population, however the percentage of deaths due to vascular disease is similar to the percentage due to cancer.

Table 15: Causes of death in the General Population, 2005-2015

England and Wales

Year of Death	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of Deaths	511,667	502,156	503,435	508,718	490,963	492,800	484,084	498,962	506,772	501,424	503,138
All Cancers	26.9%	27.6%	27.8%	27.7%	28.6%	28.7%	29.6%	29.1%	28.7%	29.3%	28.0%
All Vascular Outcomes	35.9%	34.9%	34.0%	33.2%	32.7%	32.3%	30.4%	30.1%	29.6%	29.3%	28.5%
All Non-Cancer, Non-Vascular Outcomes	34.9%	35.3%	35.9%	36.7%	36.7%	36.9%	37.8%	38.5%	39.4%	39.1%	41.0%
All Unknown Causes	2.2%	2.2%	2.3%	2.3%	2.0%	2.1%	2.2%	2.3%	2.3%	2.3%	2.4%

Table 16: Further breakdown of 'All Vascular Outcomes' cause of death in the General Population, 2005-2015

England and Wales

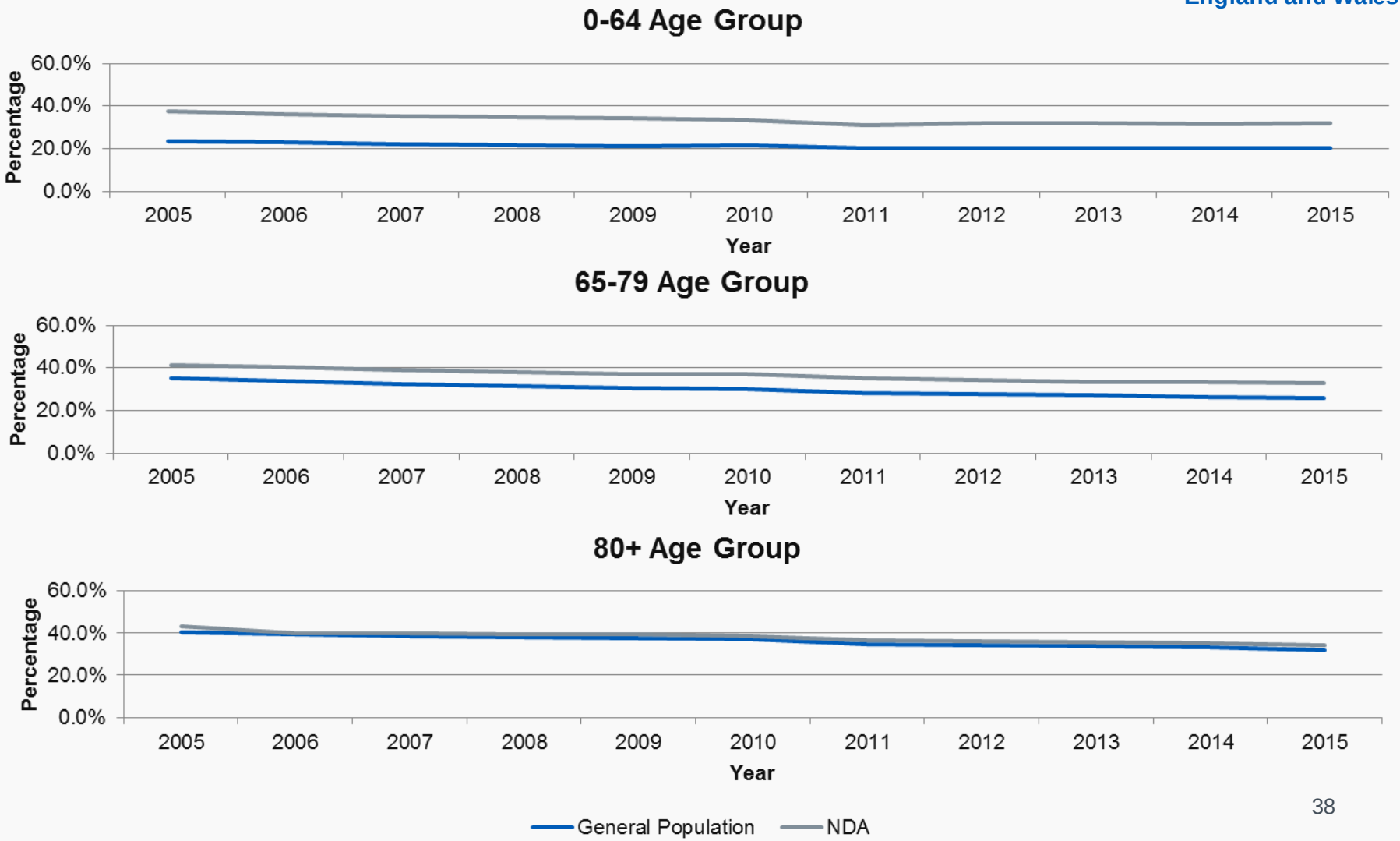
Year of Death	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Coronary eart Disease	17.2%	16.4%	15.9%	15.1%	14.7%	14.2%	13.3%	12.8%	12.6%	12.1%	11.5%
Cerebrovascular Disease	9.9%	9.7%	9.3%	9.2%	9.0%	8.9%	8.9%	8.9%	8.7%	8.9%	8.9%
Other Vascular Disease	8.8%	8.8%	8.8%	8.9%	9.1%	9.1%	8.2%	8.4%	8.3%	8.3%	8.2%

Vascular Deaths by Age

Up to the age of 80 years, there is a higher proportion of vascular deaths in people with diabetes than in the general population.

Figure 13: Vascular deaths by age, in the diabetic and general population

England and Wales

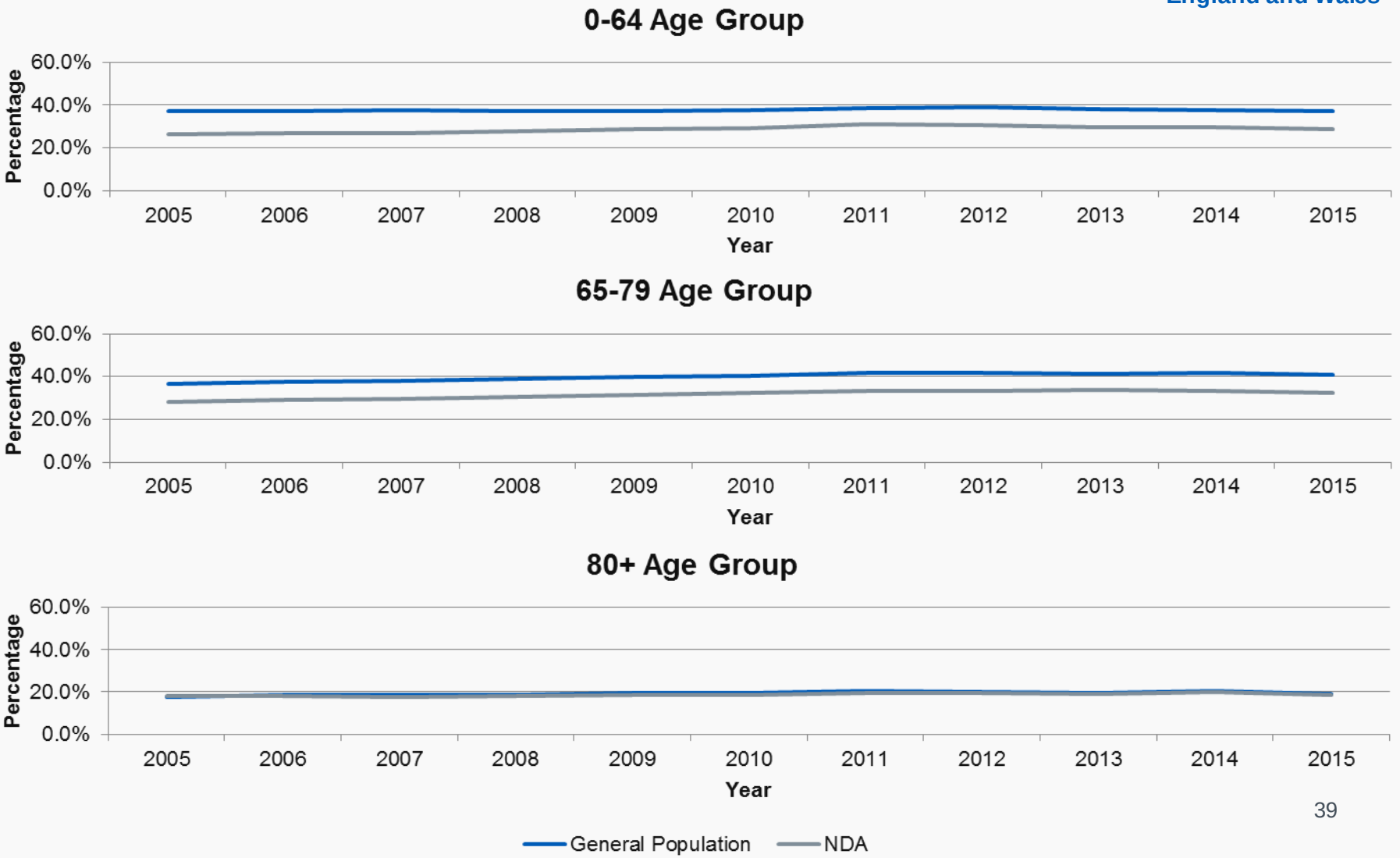


Cancer Deaths by Age

Up to the age of 80 years, there is a lower proportion of cancer deaths in people with diabetes than in the general population.

Figure 14: Cancer deaths by age, in the diabetic and general population

England and Wales



Mortality Ratios

All diabetes is associated with additional deaths. Type 1 diabetes has a particularly large influence.

Table 17: Mortality in people with diabetes, 2013-14 audit, deaths in 2015

England and Wales

		PYaR[a]	Expected Deaths[a]	Observed Deaths	SMR[a]	Lower 95% Confidence Limit	Upper 95% Confidence Limit	Additional risk of death among people with diabetes %
All Diabetes Types[b]	Persons	1,820,314	43,771	57,814	132	131	133	32.1
	Male	1,013,562	24,081	31,285	130	128	131	29.9
	Female	806,732	19,689	26,529	135	133	136	34.7
Type 1 Diabetes	Persons	161,871	987	2,248	228	218	237	127.8
	Male	91,147	591	1,251	212	200	224	111.5
	Female	70,721	396	997	252	237	268	152.1
Type 2 and Other Diabetes	Persons	1,620,784	42,072	54,026	128	127	129	28.4
	Male	905,000	23,127	29,190	126	125	128	26.2
	Female	715,780	18,945	24,836	131	129	133	31.1

[a] Please refer to the definitions section.

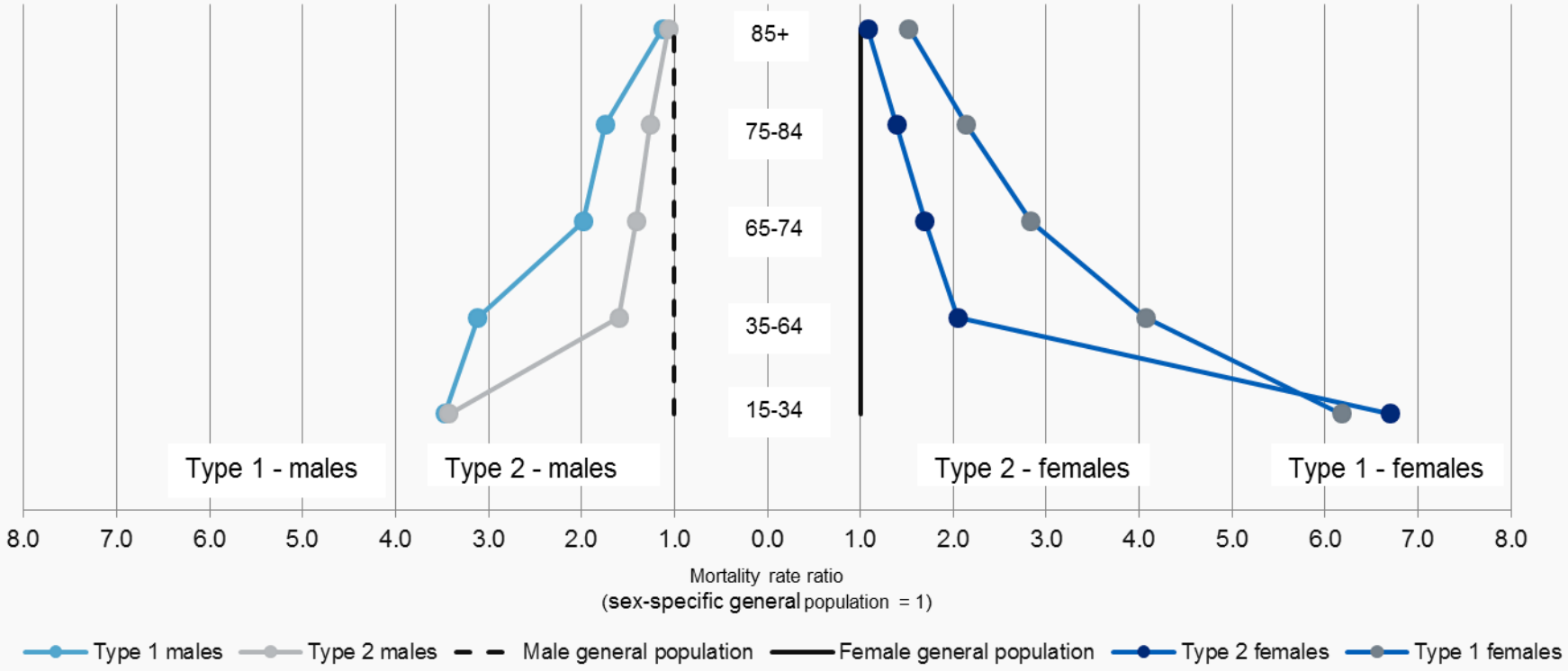
[b] All diabetes includes maturity onset diabetes of the young (MODY, other specified diabetes and not specified diabetes)

Age Specific Mortality Rate Ratios

The relative risk of death is increased at all ages, in both men and women, in younger people more than older people[a].

Figure 13: Age specific mortality rate ratios by type of diabetes and sex, 2013-14 audit, deaths in 2015

England and Wales



[a] Smaller numbers of deaths in the 15-34 year age group may affect ratios.

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Definitions, glossary, data sources and additional information

Definitions

Diabetes

Diabetes is a condition where the amount of glucose in the blood is too high because the pancreas doesn't produce enough insulin. Insulin is a hormone produced by the pancreas that allows glucose to be used as a body fuel and other nutrients to be used as building blocks. There are two main types of diabetes: Type 1 diabetes (no insulin); Type 2 diabetes (insufficient insulin)

Cardiovascular Complications

Angina is chest pain that occurs when the blood supply to the muscles of the heart is restricted. It usually happens because the arteries supplying the heart become hardened and narrowed.

Myocardial Infarction (MI), commonly known as a heart attack, is a serious medical emergency in which the supply of blood to the heart is suddenly blocked, usually by a blood clot.

Heart failure means that the heart is unable to pump blood around the body properly. It usually occurs because the heart has become too weak or stiff.

A **stroke** is a serious life-threatening medical condition that occurs when the blood supply to part of the brain is cut off.

Definitions

Diabetes Specific Complications

Chronic Kidney Disease (CKD) is a long-term condition where the kidneys don't work as well as they should. CKD can get gradually worse over time and eventually the kidneys may stop working altogether, but this is uncommon. It is generally diagnosed as a result of screening of people known to be at risk of kidney problems, such as those with high blood pressure or diabetes. End Stage Kidney Disease (ESKD) refers to Stage 5 CKD.

Urine Albumin - Albumin is a protein found in the blood. A healthy kidney does not let albumin pass into the urine. A damaged kidney lets some albumin pass into the urine.

Glomerular Filtration Rate (GFR) is a test to measure kidney function levels and determine the stage of kidney disease.

Renal Replacement Therapy (RRT) is therapy that replaces the normal blood-filtering function of the kidneys. RRT includes dialysis, hemofiltration and hemodiafiltration, which are various ways of filtration of blood with or without machine. It can also include kidney transplantation.

Amputation is the surgical removal of part of the body, such as an arm or leg.

Diabetic Ketoacidosis (DKA) is a serious problem that can occur in people with diabetes if their body starts to run out of insulin. This causes harmful substances called ketones to build up in the body, which can be life-threatening if not spotted and treated quickly.

Glossary

Confidence Interval

A confidence interval is a range of values that quantifies the imprecision in the estimate of a statistic. Specifically it quantifies the imprecision that results from random variation in the estimation of the value; it does not include imprecision resulting from systematic error (bias).

Population Years at Risk (PYaR)

The population-years-at-risk is the total amount of time during which the population is exposed to a risk. For example, during the one-year mortality follow-up period a person who survives the whole year contributes one year to the total PYaR; a person who dies after 3 months contributes only 0.25 years to the total PYaR.

Standardised Mortality Ratio (SMR)

The SMR is a form of indirect standardisation. The age specific mortality rates of a chosen standard population (usually the relevant national or study aggregate population) are applied to the age structure of the subject population to give an expected number of deaths. The observed number of events is then compared to the expected and is usually expressed as a ratio (observed/expected). For presentation purposes, the SMR is usually expressed per 100. By definition, the standard population will have a SMR of 100. SMRs above 100 indicate that the death count observed was greater than that expected from the standard mortality rate and SMRs below 100 that it was lower.

Glossary

Expected Deaths

The expected death count is that which would occur if the observed subject population experienced the standard population's age-specific mortality rates.

Standardised Ratio

The standardised ratio is a form of indirect standardisation. The age and sex specific rates for each complication of a chosen population (usually the relevant national or study aggregate population) are applied to the age and sex structure of the subject population to give an expected number of complications. The observed number of events is then compared to the expected and is usually expressed as ratio (observed/expected). For presentation purposes the standardised ratio is usually expressed per 100. By definition, the standard population will have a standardised ratio of 100. Standardised ratios above 100 indicate that the complication count observed was greater than that expected from the standardised complication rates and for standard ratios below 100 that it was lower.

Expected Complications

The expected complication count is that which would occur if the observed subject population experienced the standard population's age and sex specific complication rates.

Suppression

When the observed number of people with a particular complication in a CCG/LHB is between 1 and 5, the data for that particular complication for that CCG/LHB has been suppressed from publication for reasons of statistical and information governance.

Additional Information

The following documents are available from http://www.digital.nhs.uk/pubs/ndauditcm1315

- NDA Report 2b: Complications and Mortality (associations between disease outcomes and preceding care)
- Supporting data in Excel
  - Supporting Information – National tables and charts
  - CCG/GP practice level spreadsheet
- PowerPoint version of this report
- Data Quality Statement (pdf)
- Methodology (pdf)

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