

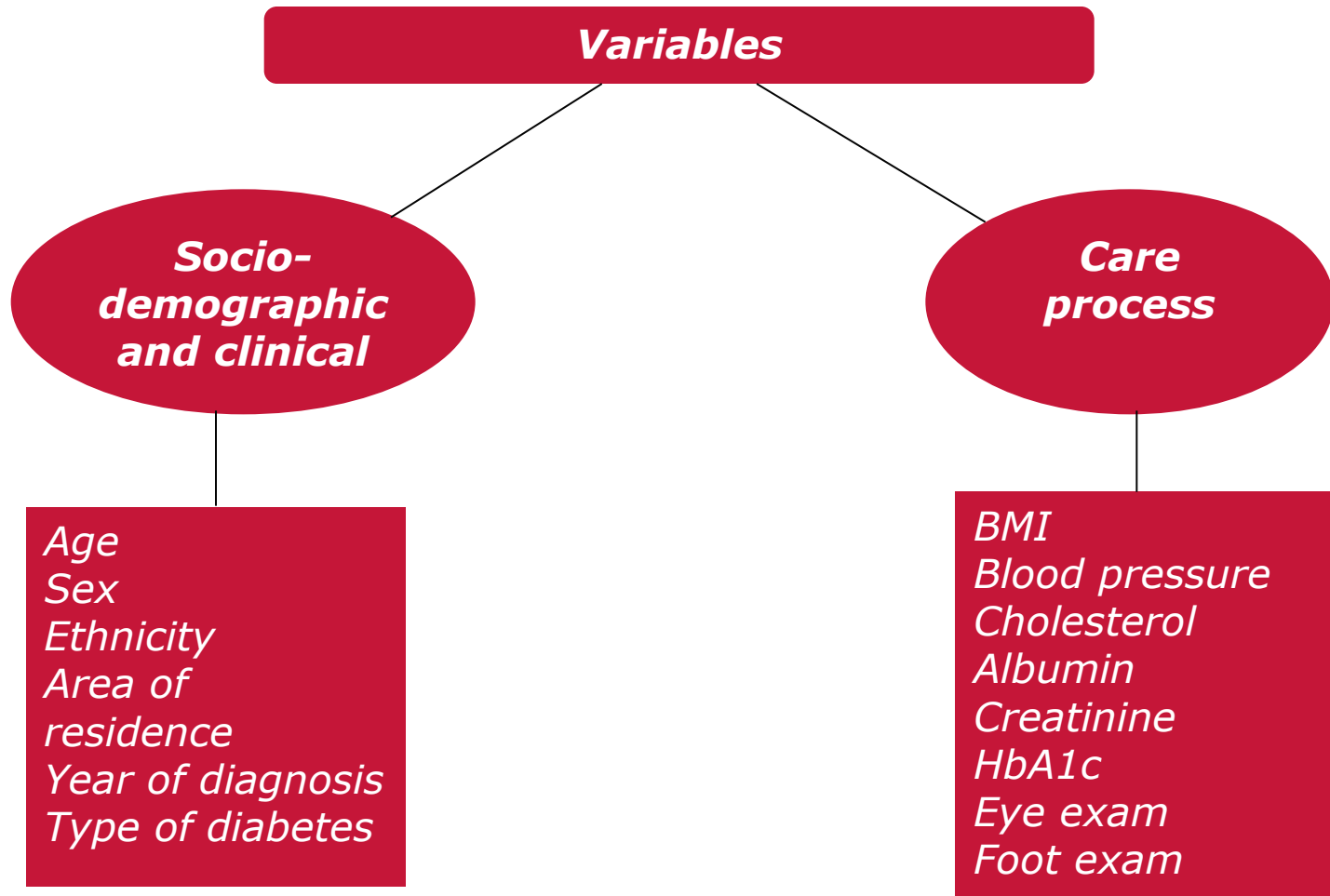
National Paediatric Diabetes Audit: 2010-11

Swarna Khare – 30/01/2013

National Paediatric Diabetes Audit: 2010-11

- The National Paediatric Diabetes Audit (NPDA) report highlights the main findings on the quality of care for infants, children and young people with diabetes in England and Wales.
- Since its commencement in 2003, data capture has dramatically improved. In 2003: 28 Paediatric diabetes units participated by submitting data on 9700 patients. The corresponding figures in 2010 were from 23,676 patients from 180 PDUs
- Data is collected on 40 socio-demographic variables and care process variables.

National Paediatric Diabetes Audit: 2010-11



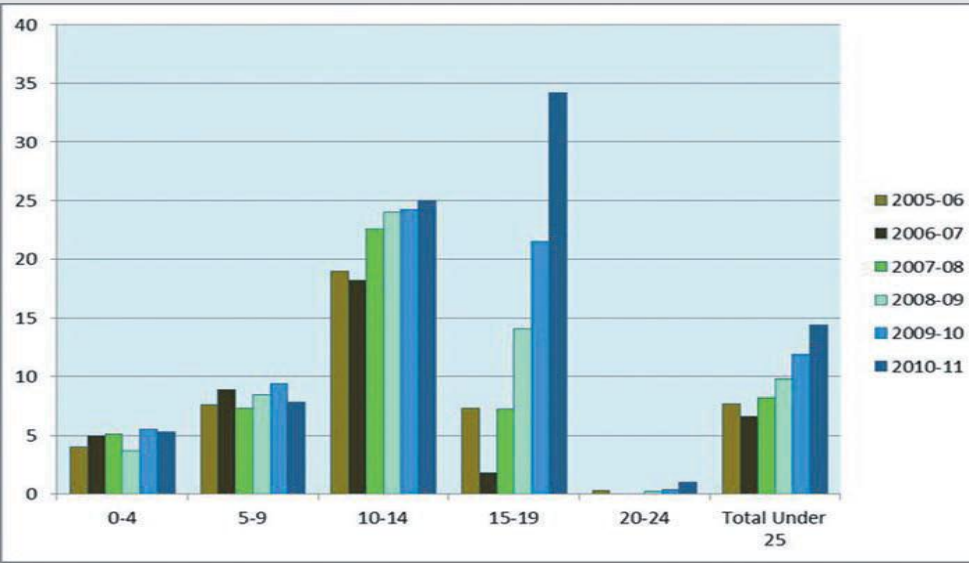
NPDA: 2010-11 – HbA1c analysis

- Two main sections: HbA1c and DKA
- Of all care processes, HbA1c was the one with the least missing information (<15%)
- NICE has also specified targets of HbA1c as indicators of good or poor control. The target band ranges are <7.5%, ≥7.5% to <9.5% and ≥9.5%.
- Only 16.4% of males and 15.1% of females achieve a target HbA1c of <7.5% nationally. The greatest number of patients have their HbA1c recorded as between 7.5% and 9.5%.
- Almost one third of infants, children and young people with diabetes have an HbA1c of ≥9.5%.

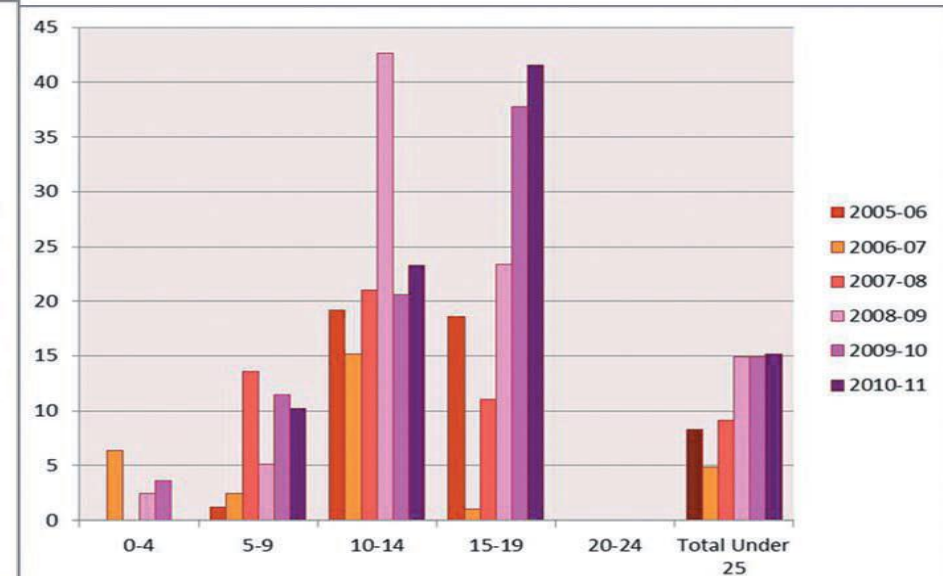
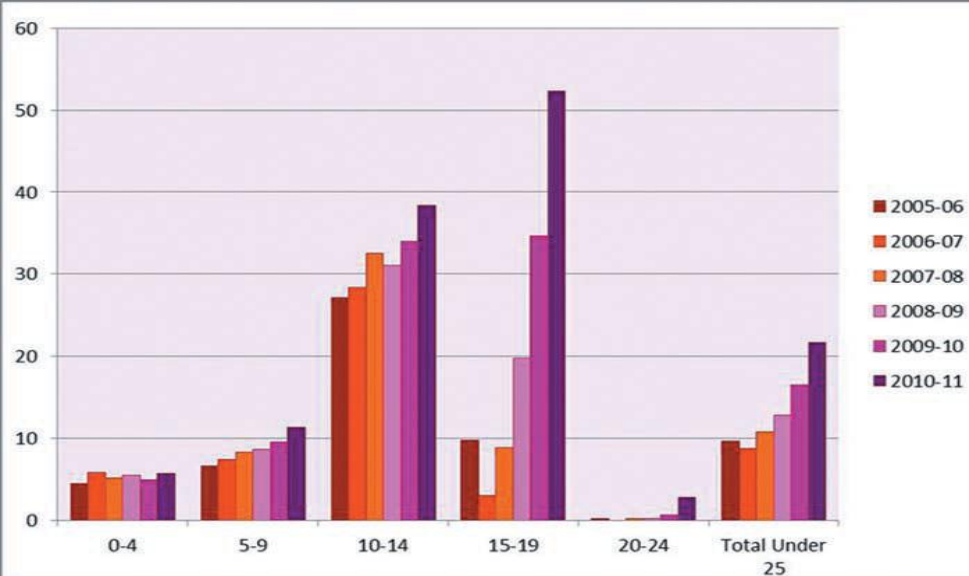
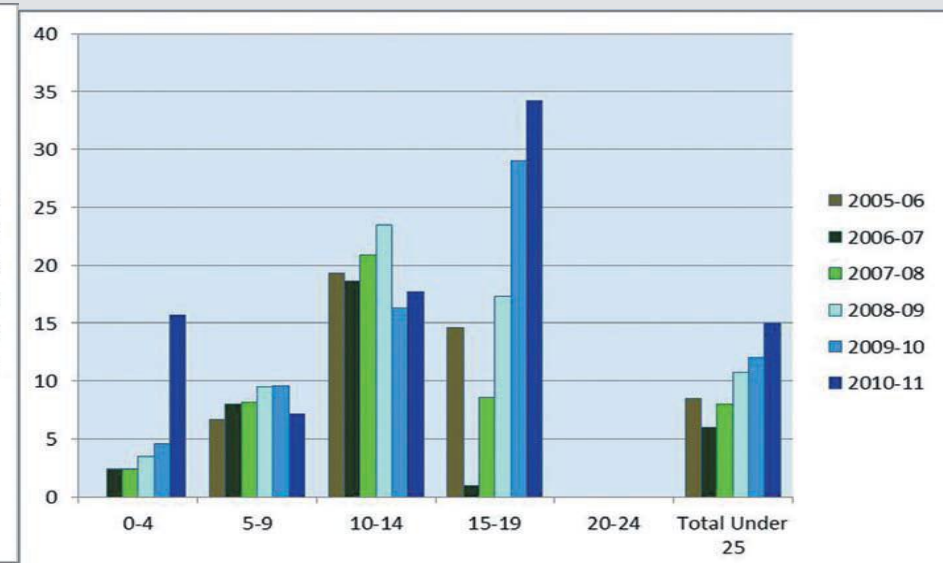
NPDA: 2010-11 – DKA analysis

- Diabetic ketoacidosis (DKA) is one of the acute complications of Type 1 diabetes mellitus. DKA is a severe metabolic derangement caused by insulin deficiency and fluid and electrolyte imbalance. Late diagnosis, improper or delayed treatment and improper monitoring increases the morbidity and mortality.
- DKA incidence was calculated per 100,000 people. Trends in DKA incidence over time were examined and it was found that DKA incidence has been increasing since 2005

England



Wales



NPDA 2010-11 – Conclusions

- There has been a steady improvement over time in performance of each care process. However the performance is still poor. In 2010-11 only **5.8%** of the children and young people aged 12-24 years had all care processes recorded.
- In comparison, The National Diabetes Audit 2010-11 for adults shows that, for England, **54.3%** of adults received all eight care processes, and that for Wales, **60.0%** of adults received all eight care processes.
- The proportion of patients with good diabetes control (HbA1c <7.5%) is also lower than those with higher HbA1c levels.
- There is a worrying increase in the numbers of infants, children and young people with diabetes being admitted with diabetic ketoacidosis.

RISK FACTORS FOR EMERGENCY HOSPITAL ADMISSION FOR DIABETIC KETOACIDOSIS: NATIONAL CROSS-SECTIONAL ANALYSIS

- Risk factors for emergency hospital admission for diabetic ketoacidosis: national cross-sectional analysis (2008-2010)

-Khare, S. and Soljak, M. (2013)

- Objectives:** To determine key demographic and cardiovascular risk factors that increase the likelihood of hospital admission with diabetic ketoacidosis (DKA) in children and young people with Type 1 Diabetes in England and Wales.

RISK FACTORS FOR EMERGENCY HOSPITAL ADMISSION FOR DIABETIC KETOACIDOSIS: NATIONAL CROSS-SECTIONAL ANALYSIS

- **Research design & methods:** We identified 2,944 children and young people with Type 1 diabetes as having had at least one DKA readmission between 2008 and 2010.
- We selected 12 independent variables including patient, care process and metabolic control factors. We initially explored univariate associations between potential risk factors and repeated DKA admissions in order to identify significant variables.
- Due to missing data in some variables, 50 datasets were imputed. We then fitted a Poisson Generalized Linear Multilevel Model (GLMM), with the variables of interest as the fixed effects and the paediatric diabetes unit of treatment as the random effects level, on each of the multiply imputed datasets and the results were combined using Rubin's rule.

RISK FACTORS FOR EMERGENCY HOSPITAL ADMISSION FOR DIABETIC KETOACIDOSIS: NATIONAL CROSS-SECTIONAL ANALYSIS

•Data Sources

- NPDA (2008-2010):

PDU

country of PDU (England or Wales)

patient age

sex

ethnicity

duration of diabetes

body mass index (BMI),

systolic and diastolic blood pressure

haemoglobin A1c (HbA1c)

cholesterol

the proportion of missing care processes

deprivation score

RISK FACTORS FOR EMERGENCY HOSPITAL ADMISSION FOR DIABETIC KETOACIDOSIS: NATIONAL CROSS-SECTIONAL ANALYSIS

•Data Sources

- HES (2008-2010)

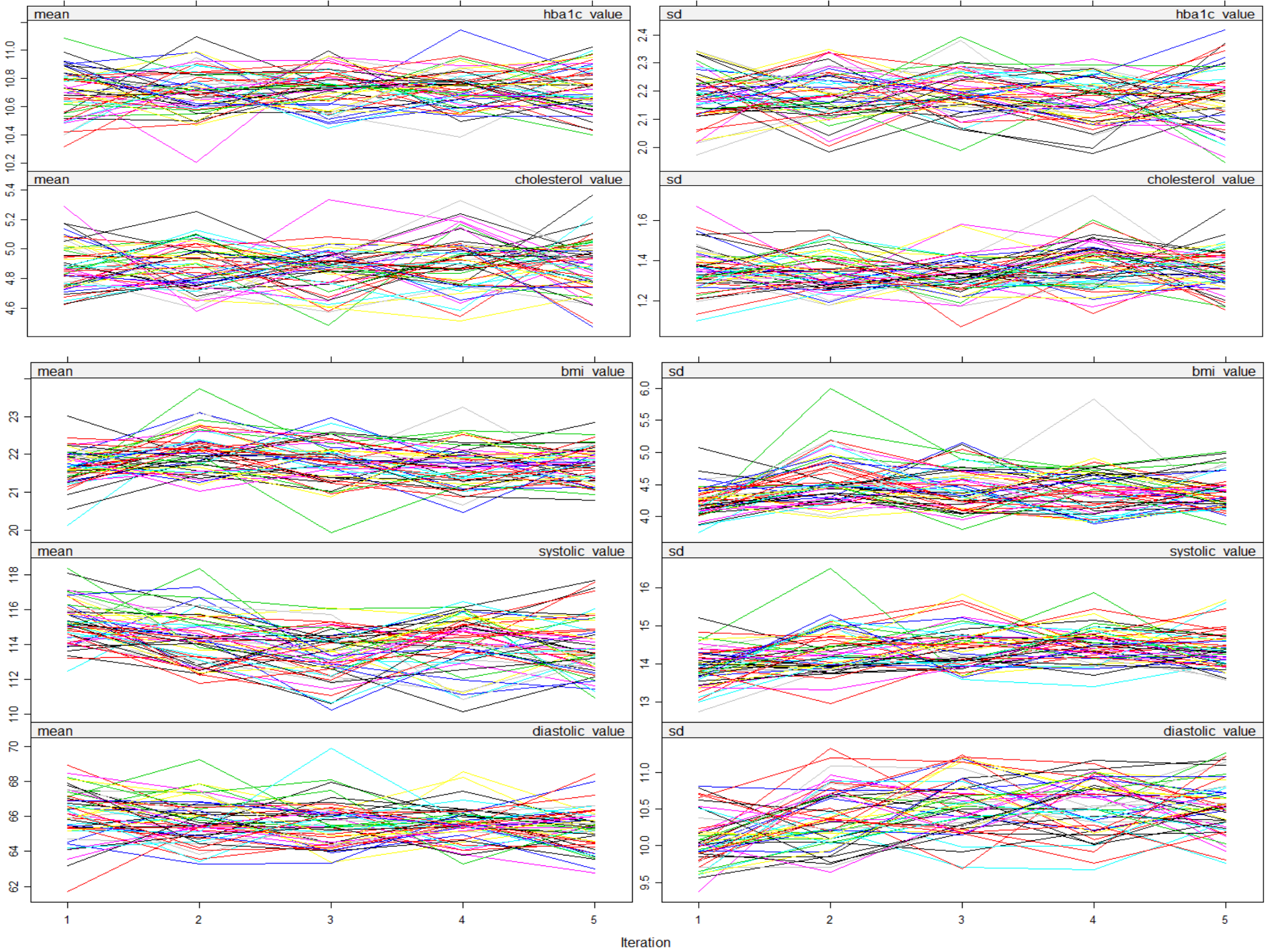
- PEDW (2008-2010)

- HES and PEDW data were combined for three years (2008-09, 2009-10 and 2010-11) to calculate the total number of DKA admissions that each patient had over this time period

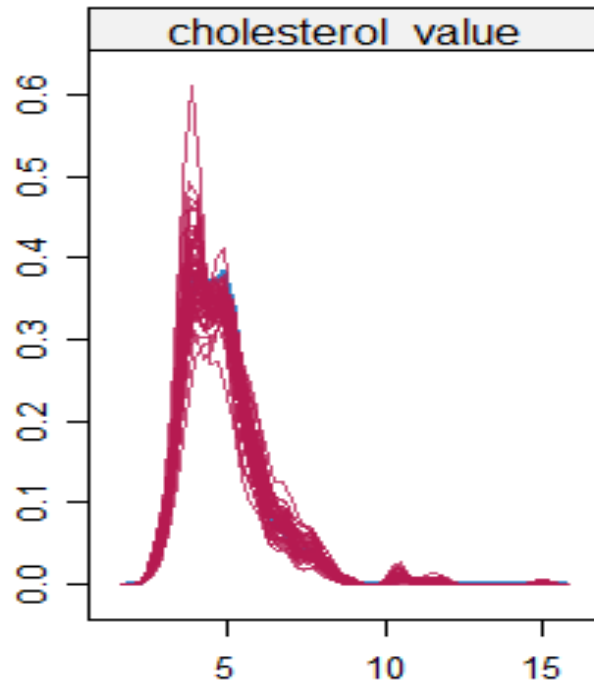
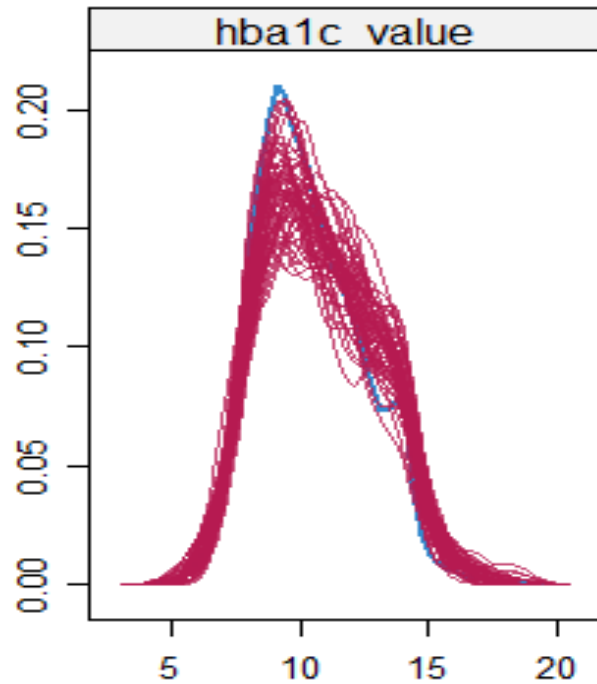
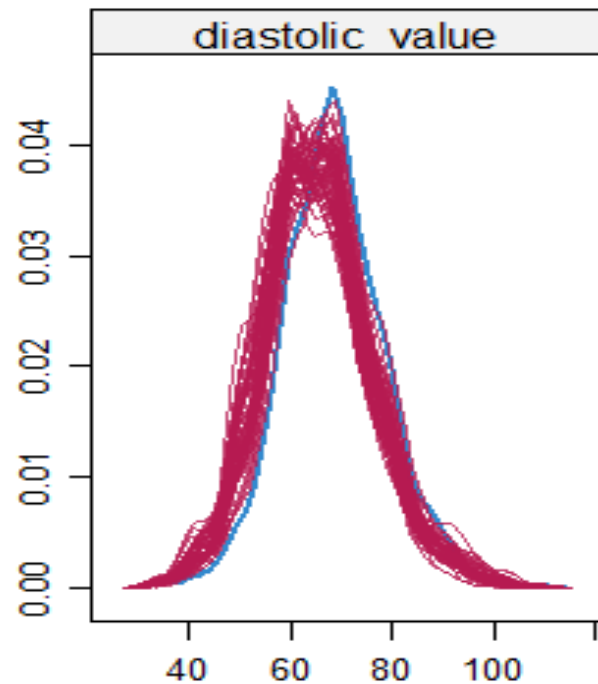
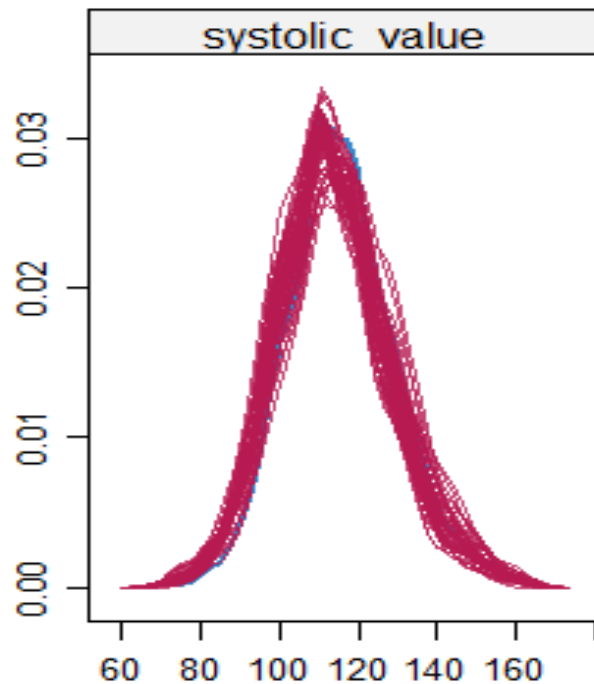
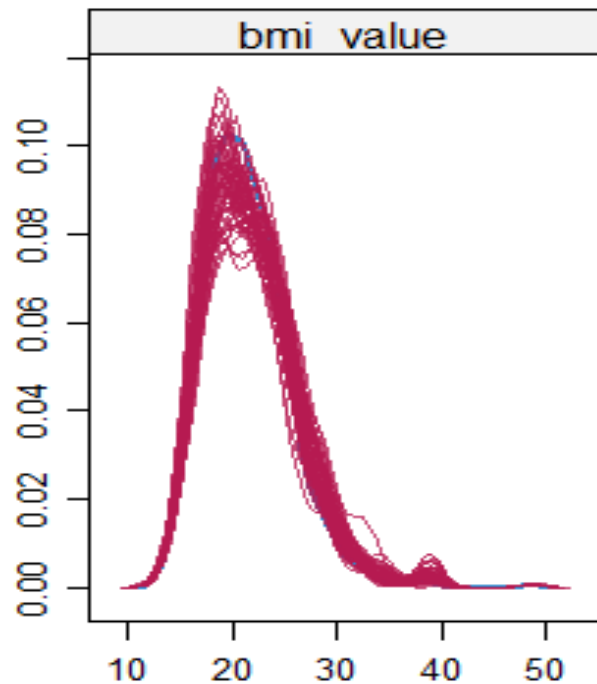
- Following this, all patients that were found to have had atleast one admission over the three years, were then linked with the NPDA (using their unique patient ID as provided by the NHS Information Centre) in order to obtain socio-demographic and care process data for these patients.

RISK FACTORS FOR EMERGENCY HOSPITAL ADMISSION FOR DIABETIC KETOACIDOSIS: NATIONAL CROSS-SECTIONAL ANALYSIS

- Missing data and statistical analysis
 - Proportion missing was 31% for BMI,
71% for cholesterol,
42% for blood pressure and
9% for HbA1c.
 - MICE multiple imputation package in R to create 50 multiply imputed datasets



Density



UNIVARIATE ANALYSIS

- A Poisson multilevel model (Generalized Linear Multilevel Model (GLMM)) was fitted to each variable with number of DKA admissions as the response and PDU as the random effects component
- The model was fitted to each imputed dataset and combined (Rubin's Rule)
- R using MICE package

	(95% confidence intervals)		
Sex: female (ref: male)	1.144(1.084, 1.207)	0.027	<0.001
Mixed Ethnicity (Ref: White)	1.036(0.858, 1.251)	0.096	0.712
Asian	0.824(0.685, 0.992)	0.094	0.041
Black	1.300(1.108, 1.525)	0.082	0.001
Other ethnic background	0.875(0.659, 1.163)	0.145	0.358
Ethnicity not stated	0.865(0.781, 0.957)	0.052	0.005
Age (years)	1.050 (1.042, 1.059)	0.004	<0.001
BMI	1.014 (1.005, 1.024)	0.005	0.002
Systolic BP (mmHg)	1.005 (1.002, 1.008)	0.001	0.003
Diastolic BP (mm Hg)	1.011 (1.007, 1.016)	0.002	<0.001
HbA1C (%)	1.109 (1.094, 1.124)	0.007	<0.001
Cholesterol (mmol/l)	1.118 (1.073, 1.165)	0.021	<0.001
Deprivation (IMD score)	1.004 (1.003, 1.006)	0.001	<0.001
Diabetes duration (years)	1.031 (1.024, 1.038)	0.004	<0.001
Proportion missing	0.980 (0.881, 1.089)	0.054	0.705

MULTIVARIATE ANALYSIS

- we fitted a Poisson GLMM with all the covariates listed in table 3 as fixed effects, and with PDU as the random effect.
- In this model sex, age, HbA1c, ethnicity (black), IMD score and the duration of diabetes were significantly associated with DKA admission rates.
- Reasons: BMI, BP and cholesterol are unstable measurements in children and due to presence of age in the model.
- As only six of the initial 12 covariates were found to be significant, another GLMM using the significant variables was refitted. The pooled fixed effects from 50 imputed datasets are shown next.

Full Multivariate Model (with all variables)			Multivariate model	
			(with only variables found significant in full model)	
	IRR	p-value	IRR	p-value
(Intercept)	0.44	<0.001	0.45	<0.001
	[0.29, 0.66]	**	[0.38,0.54]	**
age	1.02	<0.001	1.02 [1.01,1.03]	<0.001
	[1.01, 1.04]	**		**
factor(sex)2	1.11	<0.001	1.13 [1.07,1.20]	<0.001
	[1.04, 1.18]	**		**
Mixed	1.05	0.59	1.04 [0.86,1.25]	
	[0.87, 1.27]			
Asian	0.84	0.07	0.84 [0.70,1.01]	
	[0.70, 1.01]			
Black	1.2	0.03	1.19 [1.01,1.39]	<0.001
	[1.02, 1.41]	*		**
Other	0.86	0.3	0.86 [0.64,1.14]	
	[0.65, 1.14]			
Not Stated	0.91	0.07	0.91 [0.82,1.00]	
	[0.82, 1.01]			
factor(region)1	0.96	0.56		
	[0.83, 1.11]			
hba1c_value	1.07	<0.001	1.08 [1.0,1.10]	<0.001
	[1.05, 1.09]	**		**
bmi_value	1	0.49	-	-
	[0.98, 1.01]			
cholesterol_value	1.05	0.06	-	-
	[1.00, 1.11]			
systolic_value	1	0.22	-	-
	[0.99, 1.00]			
diastolic_value	1	0.06	-	-
	[1.00,1.01]			
imd	1	<0.001	1.00 [1.00,1.01]	<0.001
	[1.00, 1.01]	**		**
time.since.diagnosis	1.01	<0.001	1.01 [1.01,1.02]	<0.001
	[1.01, 1.02]	**		**
proportion.missing	1.07	0.26		

RISK FACTORS FOR EMERGENCY HOSPITAL ADMISSION FOR DIABETIC KETOACIDOSIS: NATIONAL CROSS-SECTIONAL ANALYSIS

- The most powerful predictor of DKA admission was black ethnicity (compared to white), female sex and poor diabetic control (HbA1c) followed by age, diabetes duration and deprivation (IMD score).
- The strong association of admission rate with HbA1c level but not other intermediate outcomes demonstrates its influence on acute as well as chronic complications.
- Age and gender were also strongly associated with DKA rates. Adolescence is often a 'risk taking' period of a young persons life which may explain the increased incidence during this vulnerable age range for young people with type 1 diabetes.
- Since deprivation is a significant factor, environmental factors-poverty and poorer education, may mediate acute complications of type 1 diabetes
- Ethnicity black was the strongest factor in DKA admissions and this is consistent with American literature which documents strong associations between Black ethnicity and chronic complications in type 1 diabetes which has been confirmed by a systematic review

**QUESTIONS?
&
SUGGESTIONS?**