Integrated
Care System
Nottingham & Nottinghamshire

POPULATION HEALTH MANAGEMENT

Diabetes

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Contents

This piece of work would not of been possible without the help and support of Nottingham/Nottinghamshire ICS, system leaders (health/care) and partnership organisations.

We wish to thank the Diabetes Work stream for allowing us to utilise and apply our six step PHM approach and for working in partnership with the PHM team to develop this prototype model for diabetes across Nottingham/Nottinghamshire.

A special thank you to our Principal Analyst, the data and analytical teams across the ICS, this project came into true fruition once the aggregated data instigated a different way of thinking, whilst painting a PHM picture of our population.

Particular acknowledgement must go to Imperial College Health Partners for their input, support and development of the evidence based interventions through numerous literature reviews.

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3I's	Infrastructure, Intelligence, Intervention
BAME	Black and Minority, Ethnicity
BMI	Body Mass Index
BNF	British National Formulary
CCG	Clinical Commissioning Group
CCM	Chronic Care Model
CHD	Chronic Heart Disease
CIS	Clinical Information System
CKD	Chronic Kidney Disease
DAFNE	Dose Adjustment for Normal Eating
DESMOND	Diabetes Education and Self-Management for Ongoing and Newly Diagnosed
DKA	People with diabetes Ketoacidosis
DM	Diabetes Mellitus
DPP	Diabetes Prevention Programme
DSN	Diabetes Specialist Nurse
e-Healthscope	Electronic Health (technology)
EoL	End of Life
FIIT	Flexible Intensive Insulin Therapy
GP	General Practitioner
HeLP	Health Effectiveness Life Planning
ICHP	Imperial College Health Partners
ICP	Integrated Care Provider

ICS	Integrated Care System
IMD	Index of Multiple Deprivation
JSNA	Joint Strategic Needs Assessment
LTC	Long Term Condition
MDFCS	Multidisciplinary Foot Care Service
Mi	Myocardial infarction
NHS	National Health Service
NHSE	National Health Service Executive
NICE	National Institute of Clinical Excellence
ONS	Office National Statistics
PCN	Primary Care Network
PH	Public Health
PHE	Public Health England
PHM	Population Health Management
QALY	Quality Adjusted Life Year
QOF	Quality and Outcomes Framework
QoL	Quality of Life
RCT	Randomised Controlled Trial
SE	Structured Education
SEP	Structured Education Programme
T1DM	Type 1 Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus

This document aims to provide organisations with our planned approach in enabling our systems to achieve and deliver the visions and aims of fully integrating health and care across Nottingham/Nottinghamshire. Using localised data, evidence based literature reviews and offering impactable interventions to enable deliver of high quality services with the best possible outcomes to our population.

Significant work has been undertaken to identify, articulate and quantify the specific gaps in health and wellbeing; care and quality; and our baseline financial position. Creating a healthier population is at the heart of our plan. Our vision is for our community to be happier, healthier and to live longer in good health. To do this we must embrace the opportunities that working together can deliver. We must look to emerging technologies and finding new and better ways of working that can eliminate duplication and waste and we must develop and support a motivated, highly skilled and professional workforce to serve Nottingham and Nottinghamshire.

In order to meet the ambitious vision of the ICS, we must also look at the social determinants of health and wellbeing. Our aim is to help people to be, stay or regain good health and wellbeing. To do this we must take a preventative approach and build strong and joined-up community services. Working together in this way will allow us to look across the system at how services are provided and identify opportunities to add value, improve outcomes and eliminate duplication and reduce costs.

The Population Health Management programme will be at the heart of driving this transformational approach in Nottingham and Nottinghamshire. The programme will bring key partners together to use local, joined-up data to help identify gaps in pathways for different segments of our population, and agree outcomes and design interventions tailored to our local people and communities.

Our current approach is underpinned by a rigorous programme structure, utilising a wide range of experts, internal and external, both clinical and non-clinical, to understand our population's current needs, activity, cost and outcomes. The group has agreed that the initial focus will be on the population segment of people with Long Term Conditions. Through further sub-segmentation and risk stratification of this cohort, the programme will lead the delivery of standardised, evidence-based pathway redesign approach, with appropriate interventions to achieve the aims of the ICS outcomes framework, and in turn to meet the needs of our population at a Primary Care Network level. There will be a clear process for monitoring and evaluating change within the programme framework.

We will quantify the financial impact of the interventions proposed by the programme as part of the evaluation criteria for agreeing these. The approach taken will identify opportunities to address gaps in care, reduce acute emergency activity which is avoidable and which does represents the optimal value-for-money, and shift resource into proactive, targeted out-of-hospital interventions to keep our population well. Ultimately this will underpin our system strategy to achieve financial sustainability and reduce pressure with the hospitals acute sector.

Our Population Health Management approach will focus mainly on our Type 2 diabetes population: Healthy not diagnosed with diabetes, pre-diabetes, diabetes and those with the highest/greatest needs.

PHM Team
Nottingham/Nottinghamshire ICS

The NHS Long Term Plan sets out in some detail a vision of what the future will look like in the context of new models of care. Population Health Management, and our local approach to PHM, underpins the strategic direction at both Local and National levels through fully understanding the health and care needs of our population; size, demographics, socio economic factors, etc. which in turn becomes the engine that feeds all ICS work streams in delivering the priorities and improving services, health and wellbeing of our population.

Population Health Management, and our local approach to PHM, underpins the strategic direction at both Local and National levels through fully understanding the health and care needs of our population; size, demographics, socio economic factors, etc. which in turn becomes the engine that feeds all ICS work streams in delivering the priorities and improving services, health and wellbeing of our population.

National strategic drivers
NHSE - Long Term Plan; NHSE – New Models Team; NHSE – Primary Care - Maturity Matrix; Right Care
Local strategic drivers
ICS Priorities; JSNA

Our response to the NHS Long Tern Plan and the five ICS priority areas where we believe we can make the biggest impact on improving services and improving the health and wellbeing of the population are as follows:

- Promote wellbeing, prevention, independence and self-care
- Support people to stay healthy and independent, and prevent avoidable illness
- Support stronger communities that can share responsibility for the people who live there
- Signpost people to good advice and information
- Strengthen primary, community, social care and carer services.

Triple Aims:
The overall objective of the triple aim is to develop a high quality, financially sustainable service to achieve:

- Better outcomes
- Better experiences for people and staff
- Better use of resources

PHM looks to improve population health by **data driven planning** and **delivery of proactive care** to achieve maximum impact. It includes **segmentation, stratification and impactability modelling** to identify local 'at risk' cohorts – and in turn, design and target interventions to prevent ill-health and to improve care and support for people with ongoing health conditions and reduce unwarranted variations in outcomes.

Population Health - National Definition (PH)
"Population Health is an approach aimed at improving the health of an entire population. It is about improving the physical and mental health outcomes and wellbeing of people, whilst reducing health inequalities within and across a defined population. It includes action to reduce the occurrence of ill-health, including addressing wider determinants of health, and requires working with communities and partner agencies".

Population Health Management (PHM) - National Definition
"Population Health Management improves population health by data driven planning and delivery of care to achieve maximum impact. It includes segmentation, stratification and impactabilty modelling to identify local 'at risk' cohorts - and, in turn, designing and targeting interventions to prevent ill-health and to improve care and support for people with ongoing health conditions and reducing unwarranted variations in outcomes".

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'Population Health Management improves population health (the health of an entire population) by data-driven planning and deliver of proactive care to achieve maximum impact' .

Andi Orlowski ICHP London.

Population Health Management vs previous approaches:

- Public Health has looked at promoting, protecting and prolonging healthy life through coordinated programmes (normally offered to the whole population)

Population health management focuses on:

- Key outcomes for identified groups or segments (age, morbidity, ethnicity, gender, deprivation)

- Healthy populations as much as those who are sick

- Resource Planning that includes the wider determinants of health

- Risk management approach promoting well-being, preventing ill health

What makes us healthy?

AS LITTLE AS 10% of a population's health and wellbeing is linked to access to health care.

We need to look at the bigger picture:

Good work · Our surroundings · Money & resources · Housing · The food we eat · Education & skills · Transport · Family, friends & communities

But the picture isn't the same for everyone.

The healthy life expectancy gap between the most and least deprived areas in the UK is: 19 YEARS

The Health Foundation

References available at www.health.org.uk/healthy-lives-infographics
© 2017 The Health Foundation.

In light of the challenges we face as a health and care system we have set an ambitious vision, adopted the triple aim framework and embraced a Population Health Management (PHM) approach

Our Vision

Across Nottinghamshire, we seek to both increase the duration of people's lives and to improve those additional years, allowing people to live longer, happier, healthier and more independently into their old age.

Our Triple Aim

To help us address the challenges we face and optimise the performance of our health and care system, we have adopted the triple aim framework - the guiding principles for a truly integrated health and care system:

- **Improving the health and wellbeing of our population**

- **Improving the overall quality of care and life our service users and carers are able to have and receive**

- **Improving the effective utilisation of our resources**

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- Improving the effective utilisation of our resources

This means that as we develop and redesign our health and care system we will simultaneously pursue all three of these dimensions.
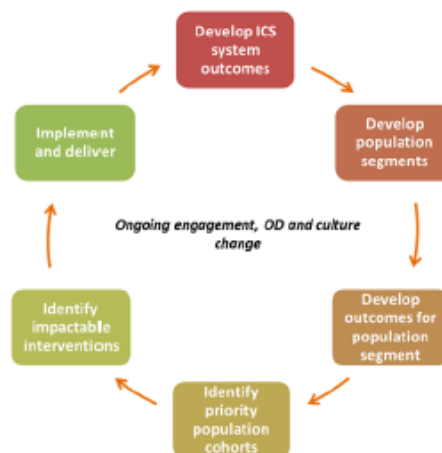
Our Approach to Population Health Management (PHM)

To underpin the delivery of our Vision and Triple Aim and address the key challenges we face, we have embraced a Population Health Management (PHM) approach across our ICS. PHM looks to improve population health by **data driven planning** and **delivery of proactive care** to achieve maximum impact. It includes **segmentation, stratification and impactability modelling** to identify local 'at risk' cohorts – and in turn, design and target interventions to prevent ill-health and to improve care and support for people with ongoing health conditions and reduce unwarranted variations in outcomes.

This approach is different from those we have taken before:

- It has a **system wide outcome** focus driven by need and not by existing services – key outcomes are focused on for identified groups, often these groups share more specific common characteristics, not just a disease diagnosis.
- It equips us to take a **systematic risk-stratification approach** – addressing inequalities in care and intervening more actively to promote wellbeing and mitigate further upward risk, complexity and ill health-drawing on different levels of skills and expertise
- It helps us address value when resourcing care. It allows us to **choose the most efficient intervention** and identify who would benefit most across the care pathway, while also enabling us to compare entire pathways.
- It focuses resource planning on **wider or social determinants of health**, and requires us to look at the healthy population, where in the past we may have focused more on the sick or those that already consume health care resources

Overview of our PHM Approach focused on outcomes

Risk Stratification Triangle for Population Segments/Cohorts

	Description	Aim
Very Complex	Patients with very complex ongoing care needs or with limited life expectancy/end of life	Support patients to have a positive experience and reduce impact of high cost resources e.g. increase patients dying at home
Complex	Patients with long-term and complex conditions including cancer – will benefit from additional level of support to prevent escalation and advancement of condition	Support people to manage conditions – through case management – and avoid unnecessary higher acuity and higher cost services
Emerging Need	People presenting with risk factors as a result of lifestyle, condition or circumstance	Enable people to self manage conditions to prevent escalation of disease as well as higher acuity services
Healthy	People with minor or no condition and low risk factors. Where a condition exists it is easily managed	Keep patients healthy and informed about alternative mechanisms. Increase early intervention

Underpinned by linked health and care data sets and analytical methods

The Nottingham/Nottinghamshire footprint has over many years evolved and embedded various aspects of transformation using a number of mechanisms. In order to measure the success of these programmes and understand future areas of focus a number of evaluations have been commissioned which included some elements of evaluation of integrated care. All evaluations carried out (including an internal baselining exercise carried out by the ICS teams) support a general consensus that integrated care is in general working well, but is disproportionate in delivery, vision and outcomes across the Nottinghamshire footprint.

The following findings were identified in each of the evaluations:-

- Variation in patient and citizen outcomes

- Variation in risk stratification approach

- Limited focus on prevention and upstream health and care management

- Incompatible systems data/information exchange between different healthcare professionals and providers

- Financial variation in integration and how funds are distributed/shared between organisations and providers

- Limited system oversight

Based and building upon the evaluations undertake across Nottingham/Nottinghamshire and with support from the Leadership Board and Clinical Reference Group, an Expert Advisory Group was established and collectively agreed an initial focus on a specific population cohort (Long Term Conditions/diabetes) following a cradle to grave approach with the aim of:-

- Understanding the current diabetes population baseline, agreeing the scope, inclusive of all health, care and socio-economic factors to segment the population within the (LTC/diabetes) cohort.

- Segmenting the population by the utilisation, needs and desired outcomes of the population with consideration of national and local requirements

- Baselining the activity on the population once segmented.

- Baselining the spend on the population once segmented.

- Identifying true variation based on the segmentation and developing infrastructure, intelligence and interventions that supports the mitigation of unwarranted variation.

- Agreeing and recommending system standard cohort outcomes (health and care), ensuring these align and meet the whole ICSs system outcomes framework and best practice guidance.

- Developing and agree risk stratification/algorithms (low, medium and high) criterion that can be adopted to meet the whole diabetes population health's system outcomes framework.

- Identifying and recommending system level, measurable indicators.

- Develop and agree a fully informed, segmented, stratified blue print prototype approach for the diabetes work stream that can be adopted, with a set of agreed impactable interventions based on literature reviews and localised data evidence that enables informed commissioning intentions across our populations.

Development of our Population Health Management (PHM) six step approach – applied to diabetes:-

- Adapted from the National PHM Flat pack
- Based on the 3i's (infrastructure to succeed)
- Principles of Bridges to Health
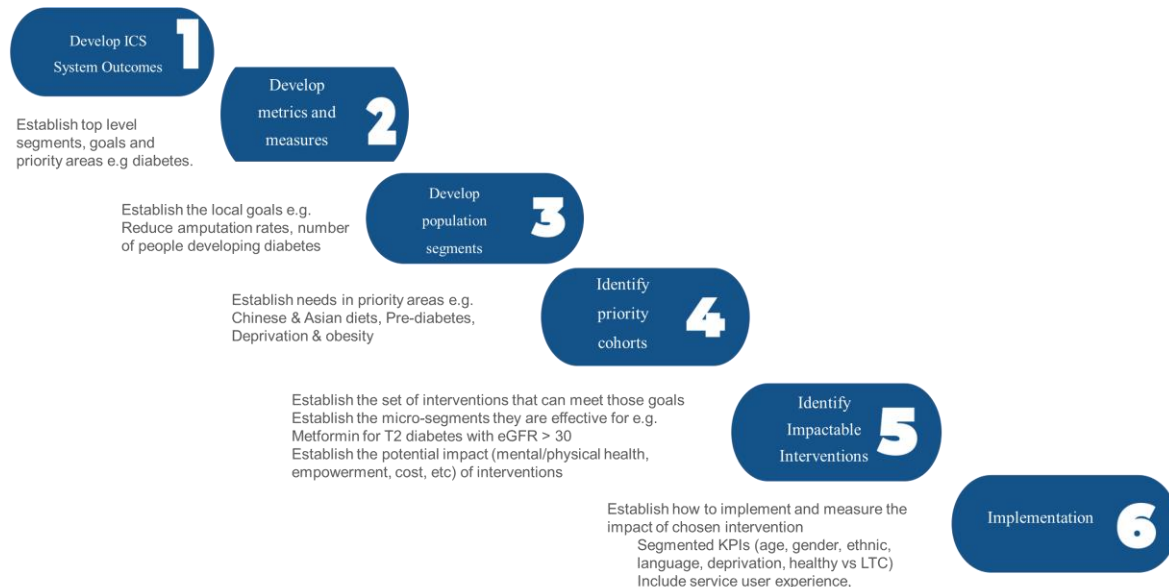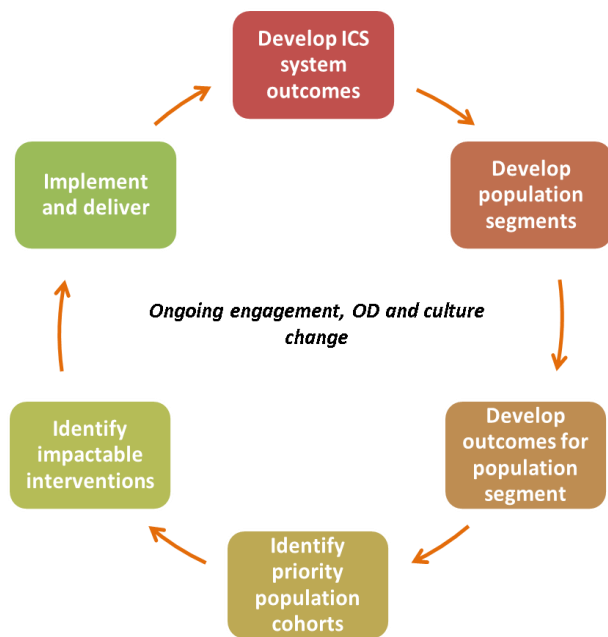
The prospect of integrated healthcare will necessitate greater collaboration between partner organisations and more significant patient engagement. Integrated Care Services, Integrated Care Providers and Primary Care Networks working collectively to both reduce community health risk factors and provide co-ordinated illness care will be crucial to the success of the system It is therefore a fundamental task that the system should develop a common set of high level goals/outcomes in which to deliver for its population.

In October 2019 the ICS Board agreed the ICS Outcomes Framework.
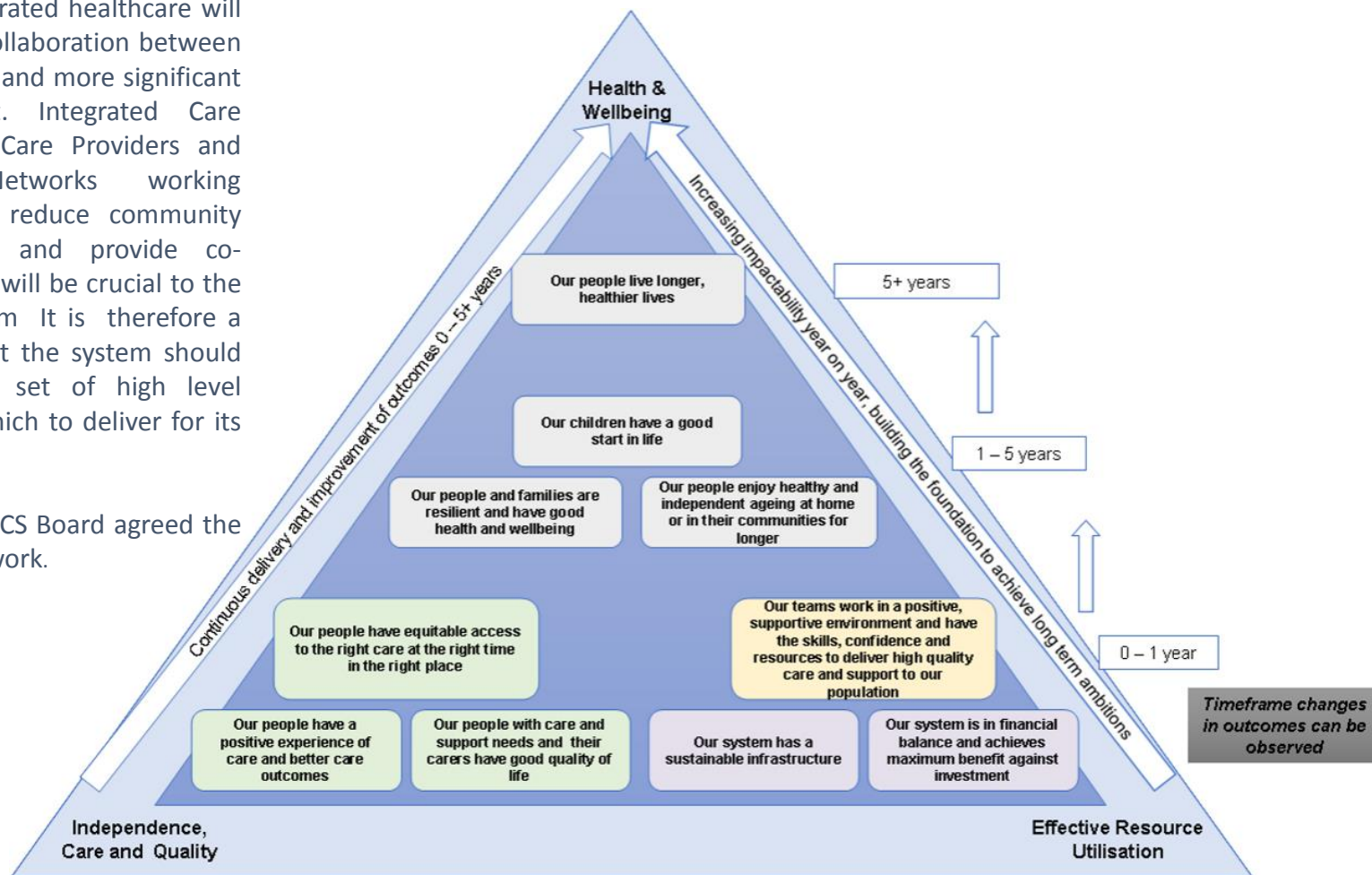
PHM requires developing population health outcomes and measures that address the relationships between epidemiological measures (such as risk exposures, incidence, and mortality rates) and multi-domain measures of population health status. Many health care delivery systems are shifting from a focus on the diagnosis and treatment of disease to a population health management approach that emphasises wellness.

To achieve the potential of the diabetes population health by establishing local goals that align to the ICS outcomes framework that clearly define the *purpose* of a set of measures, distinguishing between outcomes for which all share responsibility and actions to improve health for which the health care sector, public health agencies, and others should be held accountable.

An agreed set of local outcomes were developed in partnership with the Diabetes work stream to meet both strategic system and local priorities.

| ICS System Level Outcome(s)	Diabetes outcome (s)
Increase in Life Expectancy **Increase in Healthy Life expectancy** **Reduction in illness and Disease prevalence** **Reduction in premature mortality**	Reduction in percentage of adults classified as obese or overweight Reduction in Incidence (number of new cases) of Type 2 diabetes
Reduction in illness and disease prevalence **Increase in early identification and diagnosis**	Increase in early identification and diagnoses of Diabetes Increase in the number of newly diagnosed people with diabetess who achieve remission
Reduction in premature mortality **Reduction in years of life lost** **Increase in the number of people who have support to self-care and self-manage**	Increase in number of newly diagnosed people with diabetess who achieve optimal glucose control Increase in the number of people with diabetes having a care plan (EOLC)
Increase in appropriate access to primary and community based health and care services **Reduction in premature mortality**	Achievement of three treatment targets (HBA1c, Blood pressure and Cholesterol) Completion of all 9 care processes Reduction in and length of stay for people with diabetes
Reduction in avoidable and unplanned admissions to hospital **Increase in healthy life expectancy** **Increase in Quality of life for people with care needs**	Reduction in major and minor lower limb amputations Reduction in maternal and perinatal morbidity Reduction in visual loss from diabetes Improving kidney care – diabetes is the leading cause of end stage renal failure Reducing admissions for metabolic decompensation and length of stay for people with diabetes

Population segmentation is a methodology that supports patient centred care. Rather than focus on diagnosis and single condition diseases, the population (data) is segmented so we can understand the holistic needs of individual people within the cohorts identified. The focus is on the person and not the various *institutions* with which the patient may come into contact. Population segmentation includes everyone in the population. While there may well be a legitimate need to prioritise resources where need is greatest, this is not to ignore other population segments where there exist legitimate claims for resource allocation. Population segmentation is inclusive and includes healthy populations, multi-morbid populations as well as those nearing end of life.

At its heart population segmentation is a methodology for better planning and specifically the planning of targeted resources to support transformation.

Developing this methodology for our diabetes population based on age, gender and categories of socio-economic status (segment):-

- Type 2 Diabetes
- Diabetes with complications (blind, amputation, renal failure)
- Poorly controlled diabetes
- Stable well controlled diabetes
- Pre- diabetes
- Obesity
- Healthy
- Prevent clients, people moving up a level of need

*Cross cutting segments - Our population will rarely remain static. The movement between segments can be explored via regression analysis technique to enable the system to identify whether specific characteristics can act as a predictor of increasing risk. This enables the system to target where it needs to respond/shift resources.
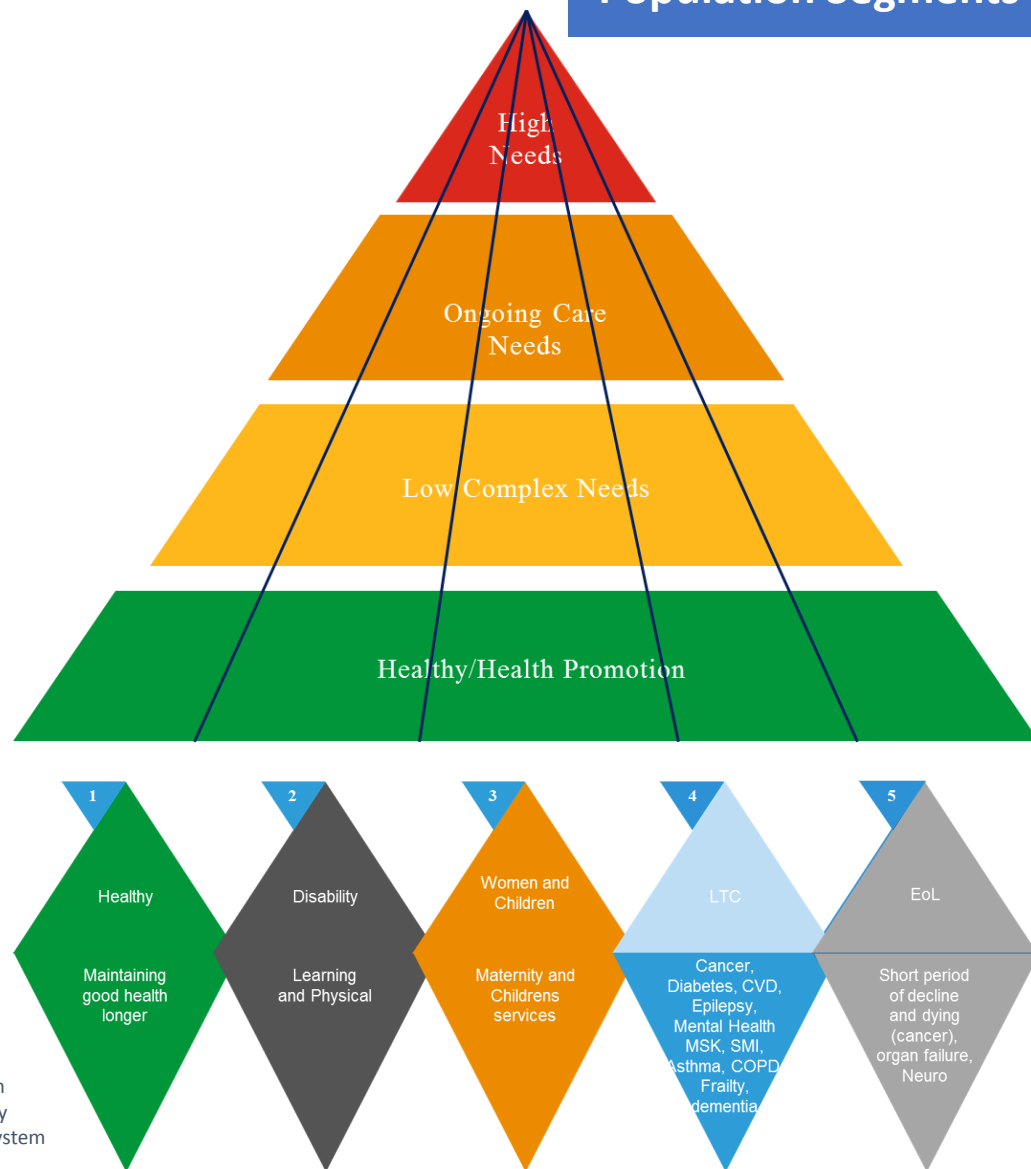
Identifying and establishing a process to assign a risk status to our people with diabetes population, then using this information to direct care and improve overall health outcomes.

Our ultimate goal of stratifying and segmenting people into distinct groups of similar complexity and care needs. A "one-size-fits-all" model, where the same level of resources is offered to every patient, is clinically ineffective and prohibitively expensive. To maximize efficiency and improve outcomes it is best practice to analyse the patient population and customize care and interventions based on identified risks and costs.

Approaching our population in this manner creates the framework to begin identifying the data requirements needed to support our population at each level of the pyramid.

High Needs
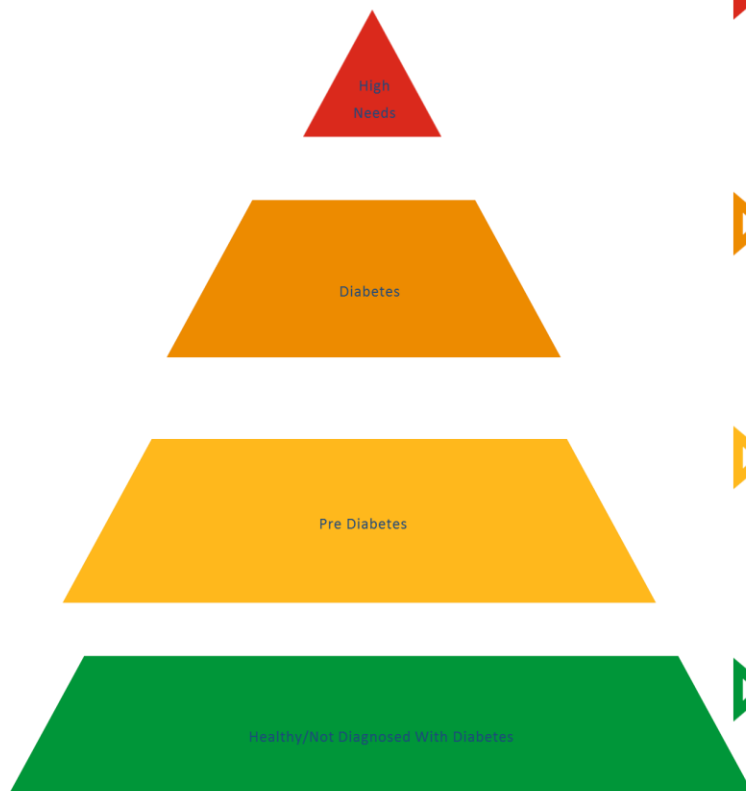
- Diagnosed with T2 Diabetes
- BMI > 30
- No energy/strength to perform activities; Shopping, cleaning, driving, walking..
- Not achieving optimal glucose control/remission
- Undertakes fasting for cultural or religious beliefs
- 1 or more health or care condition
- Mental health,
- Renal Disease , CKD, frail etc

- Not achieving 2 or more optimal Blood pressure > Cholesterol, HBa1c
- Smoker /social substance misuse
- Drinks >14 units of alcohol in a week daily
- Pregnant/History of gestational diabetes
- Not up to date/partially up to date with imms and vacs/screenings

Diabetes

- Diagnosed with T2 Diabetes
- BMI 25 – 29.9+
- HbA1c>48
- Limited energy/strength to perform activities; Shopping, cleaning, driving, walking..
- Not achieving optimal glucose control/remission and or using insulin or other technologies
- Undertakes fasting for cultural or religious beliefs
- 1 or more health or care condition (Mental health, Renal Disease , CKD etc)

- Not achieving 1 optimal
- Blood pressure, Cholesterol, HBa1c,% Patients with GFR >30
- Eye Care/Optical screenings
- Smoker /social substance misuse
- Drinks >14 units of alcohol within short period of time/Daily
- Pregnant/History of gestational diabetes
- Not up to date/partially up to date with imms and vacs and screenings

Pre Diabetes

- BMI 25 – 29.9+
- Limited energy/strength to perform activities; Shopping, cleaning, driving, walking..
- Family history of T1 or T2 diabetes
- Ethnicity South Asian, African and African Caribbean.

1 or more health or care condition (Mental health, Renal Disease , CKD etc), High Blood pressure, Cholesterol)

- Smoker /social substance misuse
- Drinks >14 units of alcohol in a week regularly
- Pregnant/History of gestational diabetes

Healthy/Not Diagnosed With Diabetes

- BMI of 18.5 – 25.9
- Active (good energy and strength to perform general physical activities. Shopping, cleaning, driving, walking..
- Drinks <14 units of alcohol on a weekly basis.
- No known health conditions
- Non smoker, does not use harmful substances (drugs

To deliver impactable interventions, It is imperative that we build from the learning of the analytics to align this with qualitative information to make decisions on the services provided to the public; identifying effective, evidence-based interventions and implementing them.

Our approach has been complimented by Imperial College Health Partners, which has enabled a full literature review (Appendix 1) and evidence based development of localised impactable interventions across the ICS, ICP's and PCN's diabetes demography (Nottingham/Nottinghamshire).

Consideration has been taken regarding all aspects of the health and care economy, based on the agreed outcomes framework and aligned locally to patient need, with a particular focus on diabetes:

• Amputations, visual loss and chronic kidney disease as complications
• Markers of control including HbA1c, cholesterol levels, blood pressure and obesity
• Structured education as an intervention
• Admissions and patient satisfaction

Rather than identifying people based solely on previous cost or utilization history, the concept of introducing impactable interventions is to consider how people will likely respond to interventions and what strategies are needed to effectively engage them in care. This principle not only helps programs refine how they identify high-need, high-cost populations, but also for identifying those who are defined as "rising risk" — individuals who are not yet considered "high-risk," but are on a trajectory to becoming so.

The key to understanding and realise opportunities which population health management can address across Nottingham/Nottinghamshire will be high quality analysis of Local and National information (JSNAs, insight teams, police, housing, social care, Public Health etc) aggregated from individual patient-level data sets and our ability to break this down into local levels; community, PCN etc, and the insight that this can provide. This will enable evidence-based interventions to be identified, designed and implemented at an appropriate scale, and tailored and targeted to specific cohorts of the segmented population. It will also allow ongoing regular monitoring and evaluation of the achievement of outcomes.

Variation between PCN/Neighbourhoods

OVERALL POPULATION PROFILE

Population Profile: Age

Age Profile by PCN Neighbourhood
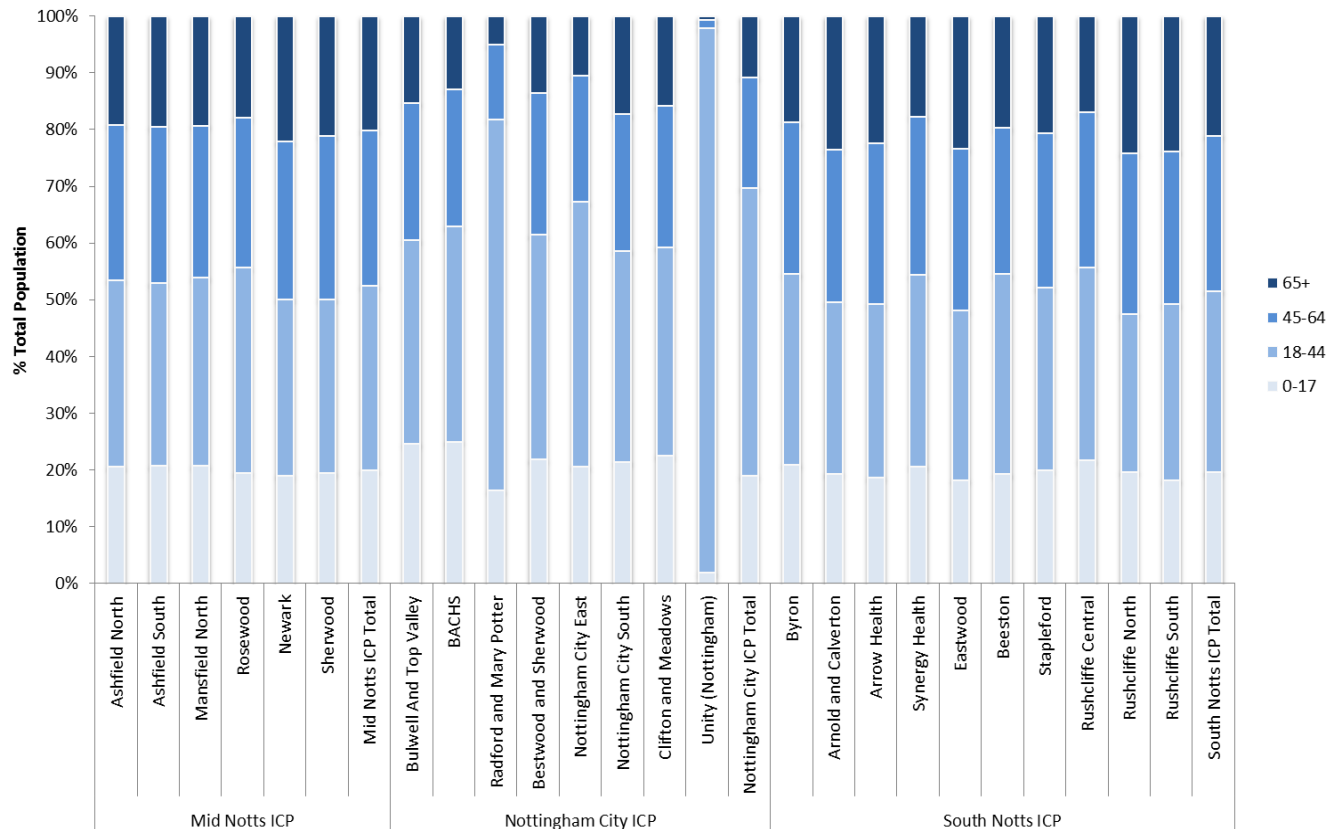
- The Age Profile varies between PCNs and ICPs.

- The % of people aged 65 and over is:

- Mid-Notts: 20%

- Nottingham: 11%

- South Notts: 21%

- 51% of Nottingham City population is in 18 – 44 age group

Population Profile: Gender

Gender Profile by PCN Neighbourhood
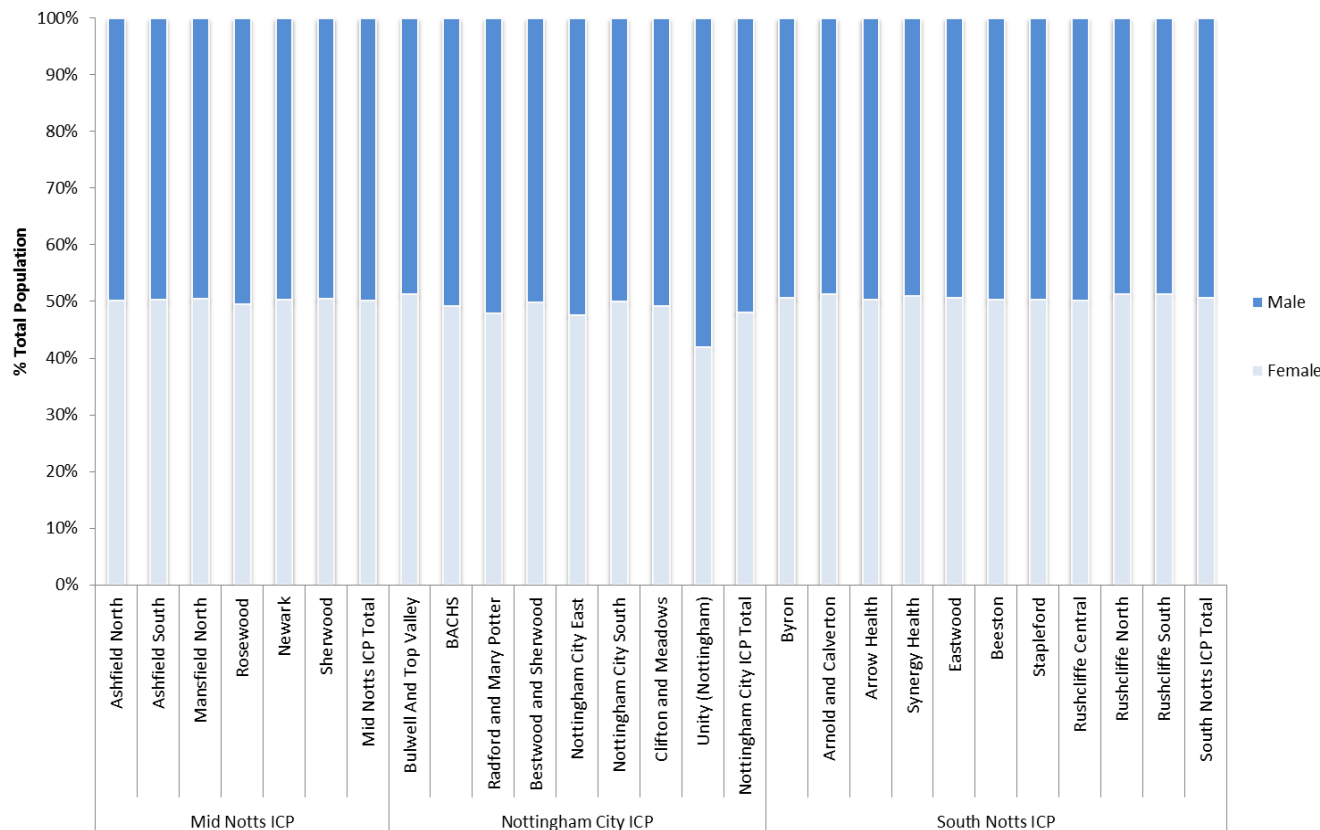
- Data suggests that there is little variation between PCNs and ICPs on Gender.

Population Profile: Deprivation

Deprivation Profile (IMD 2019) by PCN Neighbourhood
Quintile 1 is the Most Deprived
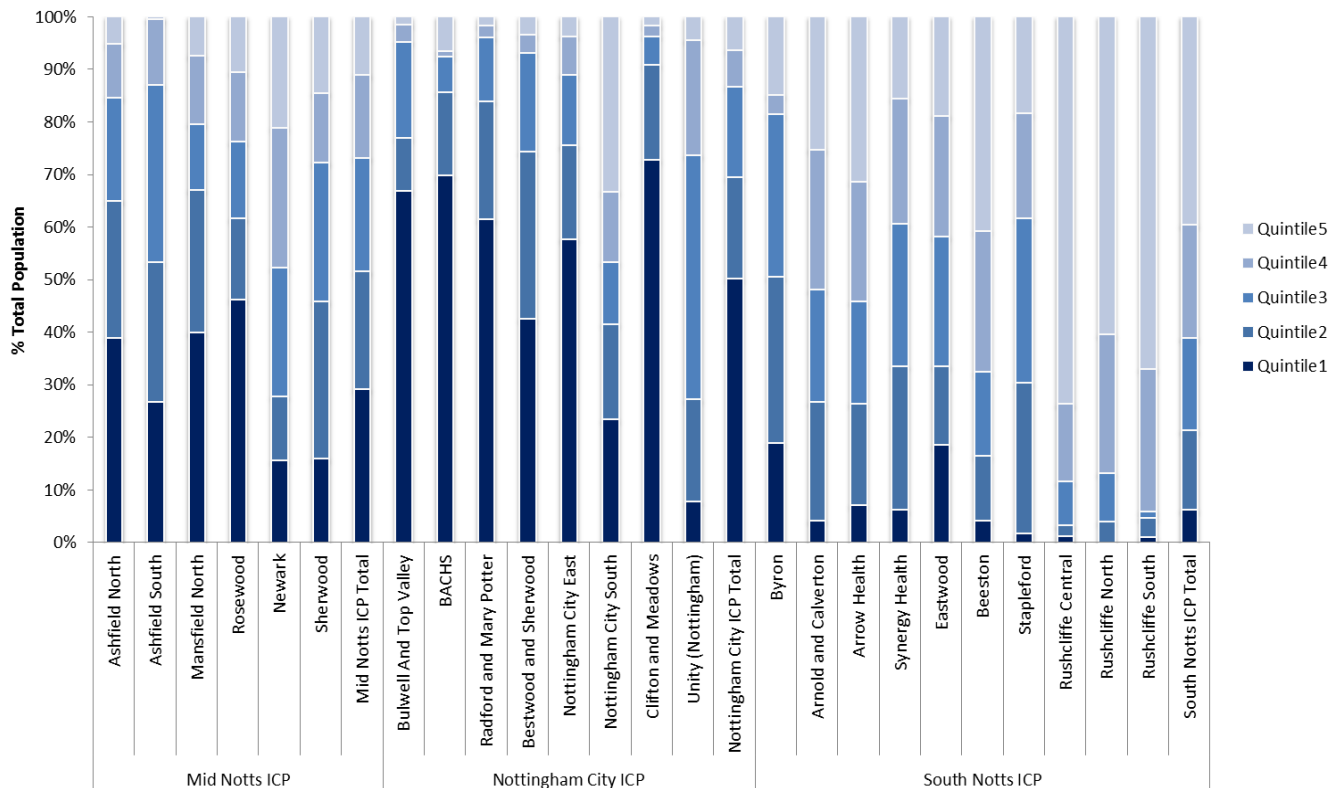
- Higher deprivation is associated to higher morbidity and lower life expectancy

- The overall Deprivation Profile varies between PCNs and ICPs

- The % of GP registered people who live in 20% most deprived areas is:

- Mid-Notts: 29%
- Nottingham: 50%
- South Notts: 6%

Number of Long Term Conditions (Disease Registers) by PCN Neighbourhood
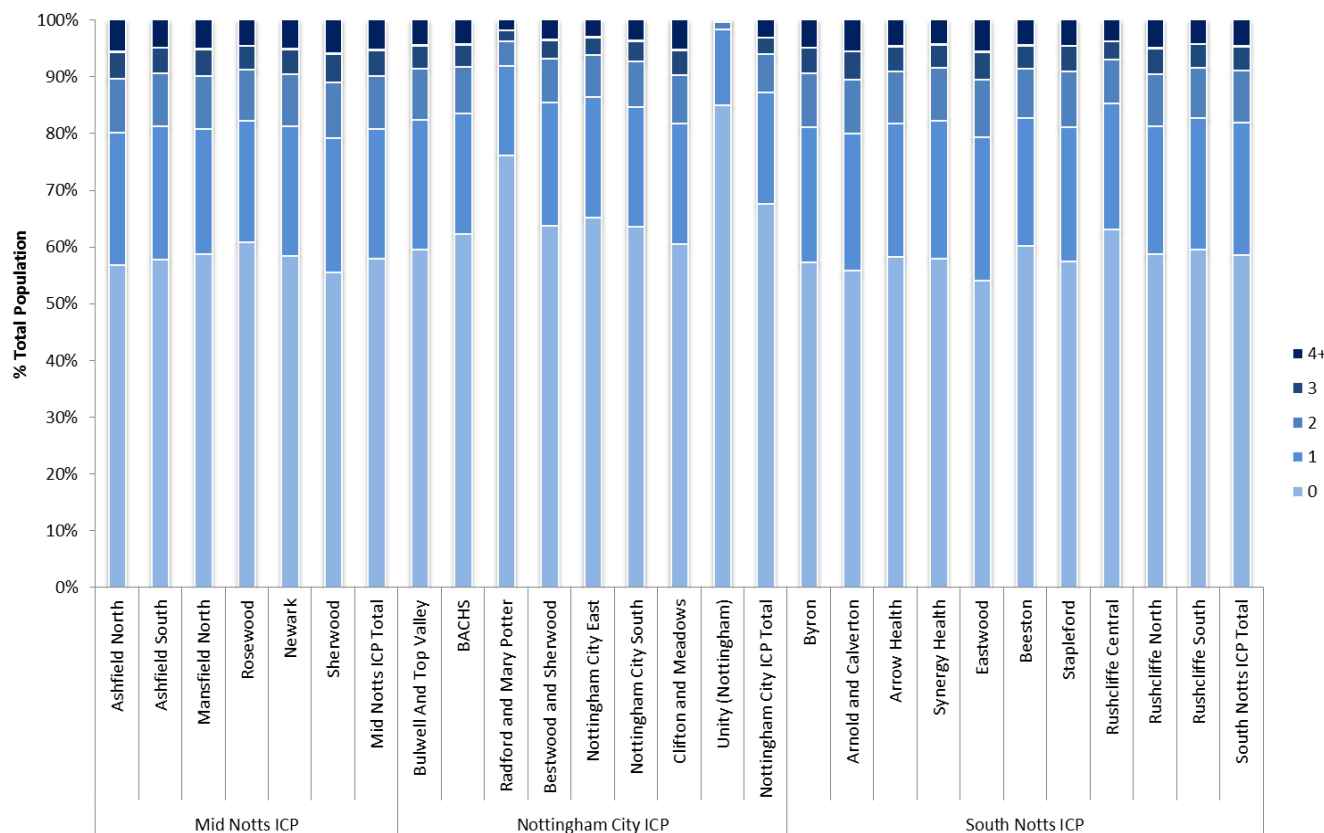
- The number of LTCs a patient has is associated to higher healthcare utilisation

- The LTC Profile varies between PCNs and ICPs

- The % of GP registered people who have 3 or more LTCs is:

- Mid-Notts: 10%
- Nottingham: 6%
- South Notts: 9%

Population Profile: Ethnicity

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Ethnicity Profile by PCN Neighbourhood
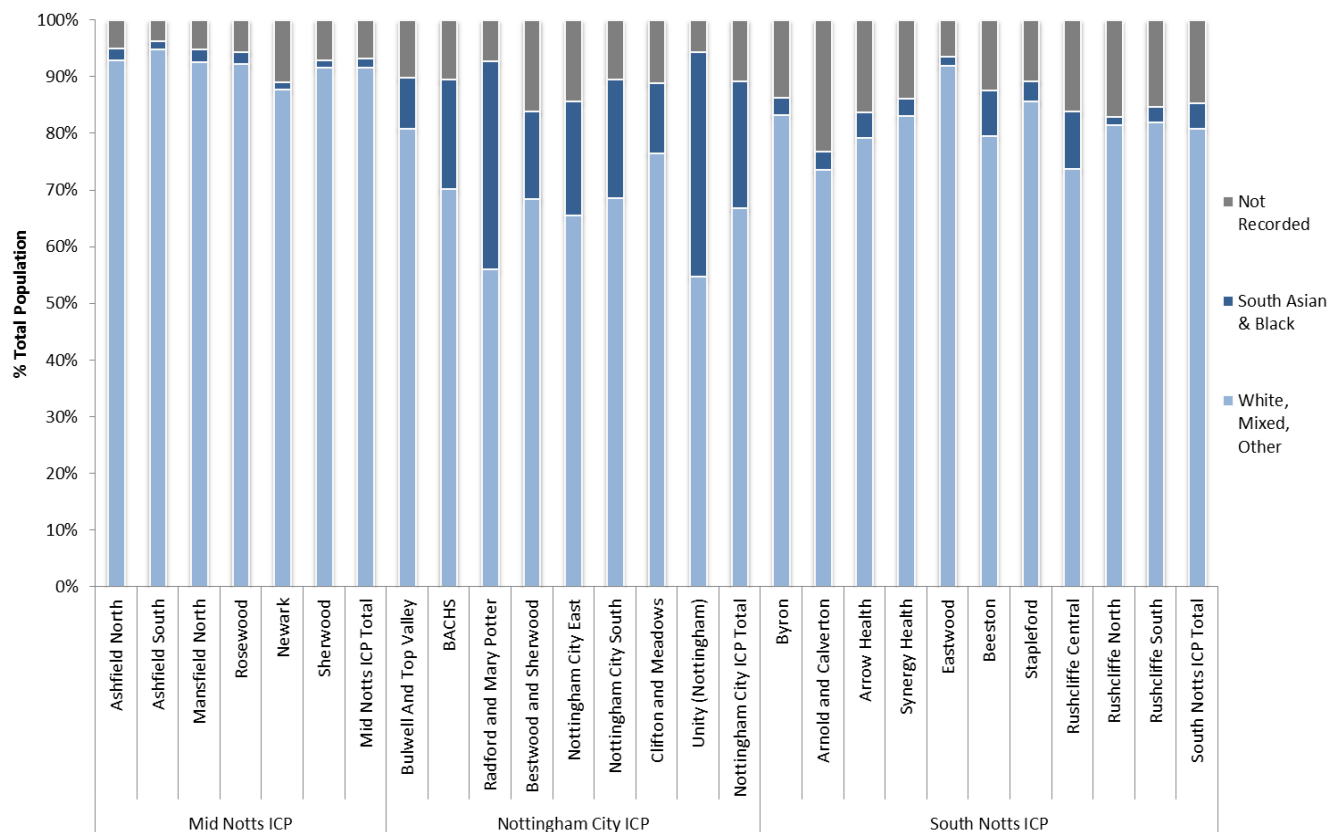
- People from Black and Minority Ethnic (BAME) backgrounds are at higher risk of developing Type 2 diabetes

- The Ethnicity Profile varies between PCNs and ICPs

- The % of GP registered people who are BAME is:

- Mid-Notts: 3%
- Nottingham: 31%
- South Notts: 7%

Diabetes: Type 1 vs Type 2

Type 1

- Type 1 affects 8% of people with diabetes

- Across the Nottingham and Nottinghamshire ICS there are 5,520 people aged 15 and over diagnosed with Type 1 (0.6% prevalence)

- **Mid-Notts**: 1,940 (0.7%)

- **Nottingham City**: 1,720 (0.5%)

- **South Notts**: 1,860 (0.6%)

Type 2

- Type 2 affects about 90% of people with diabetes

- Across the Nottingham and Nottinghamshire ICS there are 55,210 people aged 15 and over diagnosed with Type 2 (6.1% prevalence)

- **Mid-Notts**: 19,570 (7.1%)

- **Nottingham City**: 17,090 (5.4%)

- **South Notts**: 18,550 (5.9%)

Type 2 Diabetes Population Profile: ICS

Nottingham & Nottinghamshire ICS: People with Type 2 Diabetes by Age Group

Nottingham & Nottinghamshire Population with Type 2 Diabetes Profile (Oct 2019)
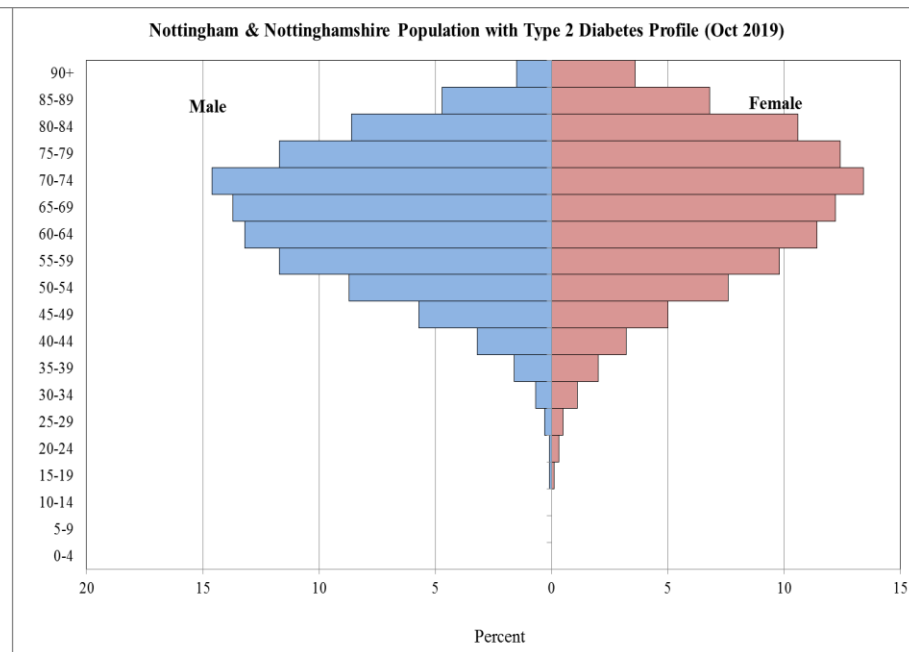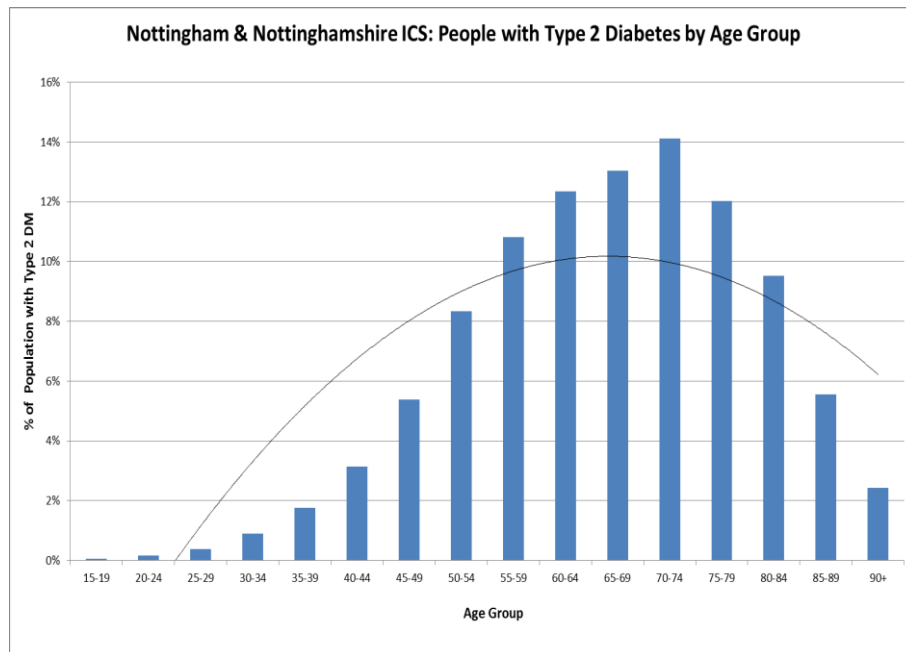
Type 2 Diabetes is more prevalent in Men (56%) than Women (44%).
The condition is also more prevalent in older age groups and tends to increase with age.

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Type 2 DM Age Profile by PCN Neighbourhood
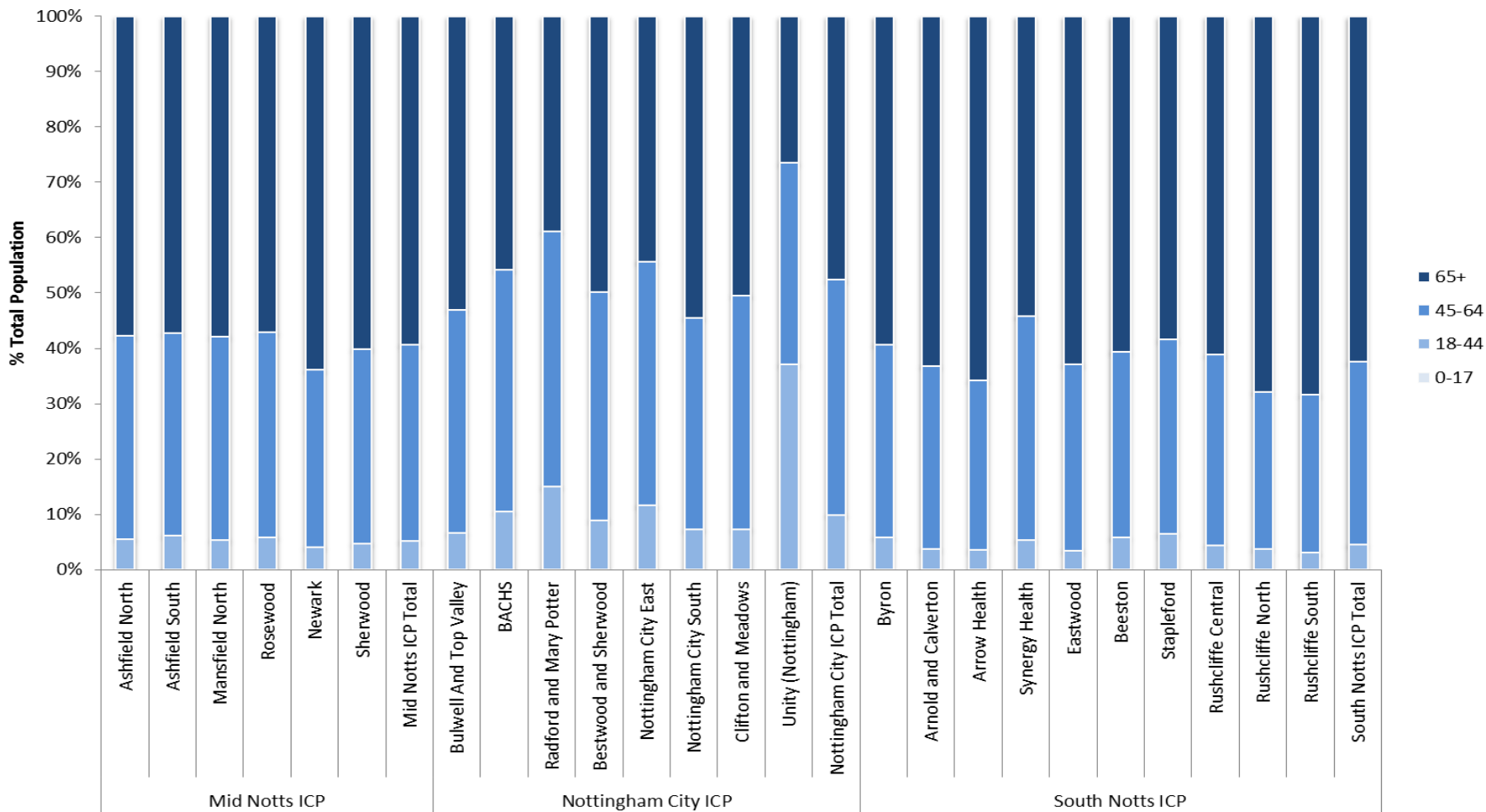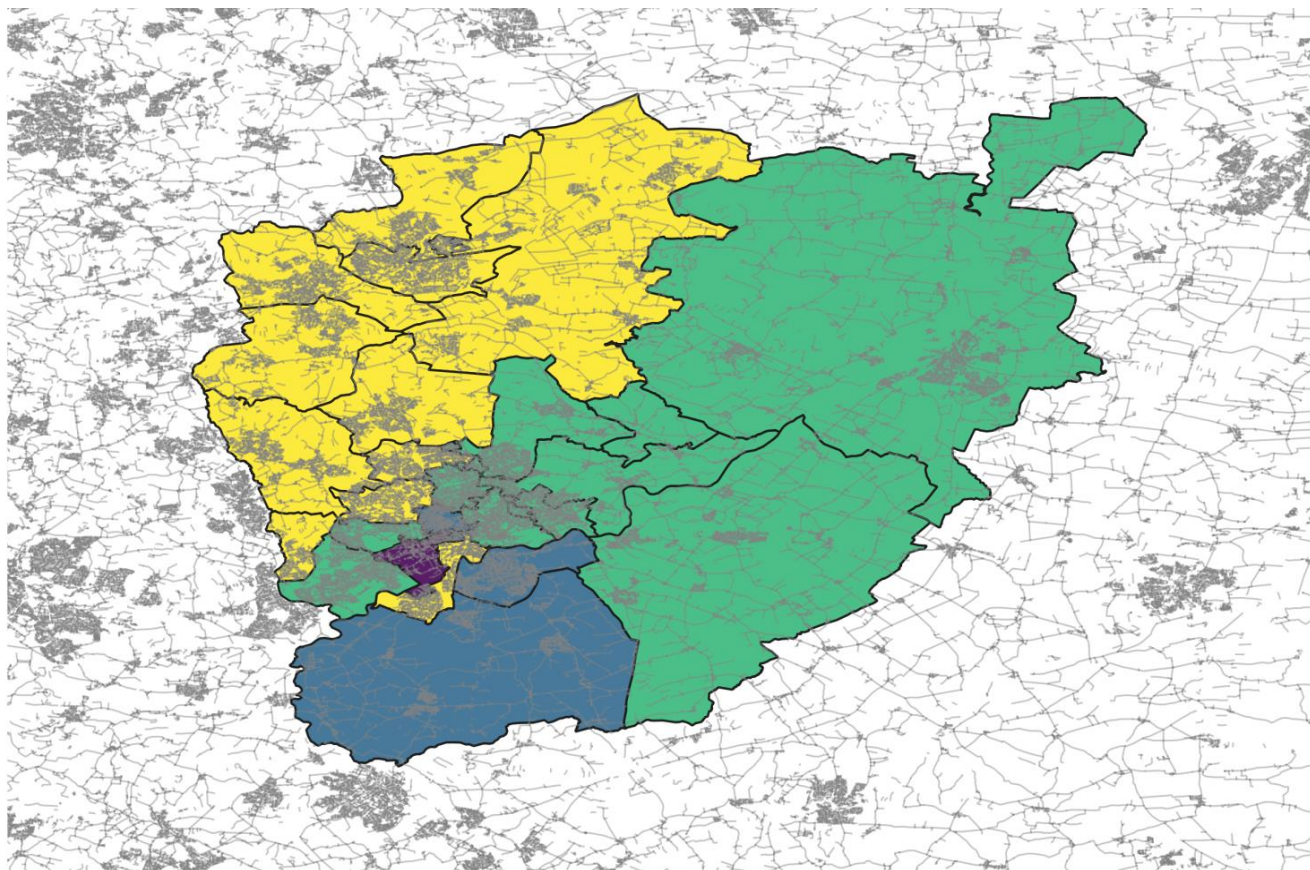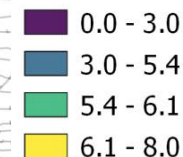
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Contains National Statistics data Crown Copyright and Database Right (2019)
Contains Nottinghamshire County Council Public Health Analysts Information (2019)
Contains eHealthScope GPRCC Data (2019)
Produced by Nottingham and Nottinghamshire CCGs Information Team

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Type 2 Diabetes Recorded Prevalence by PCN/Neighbourhood
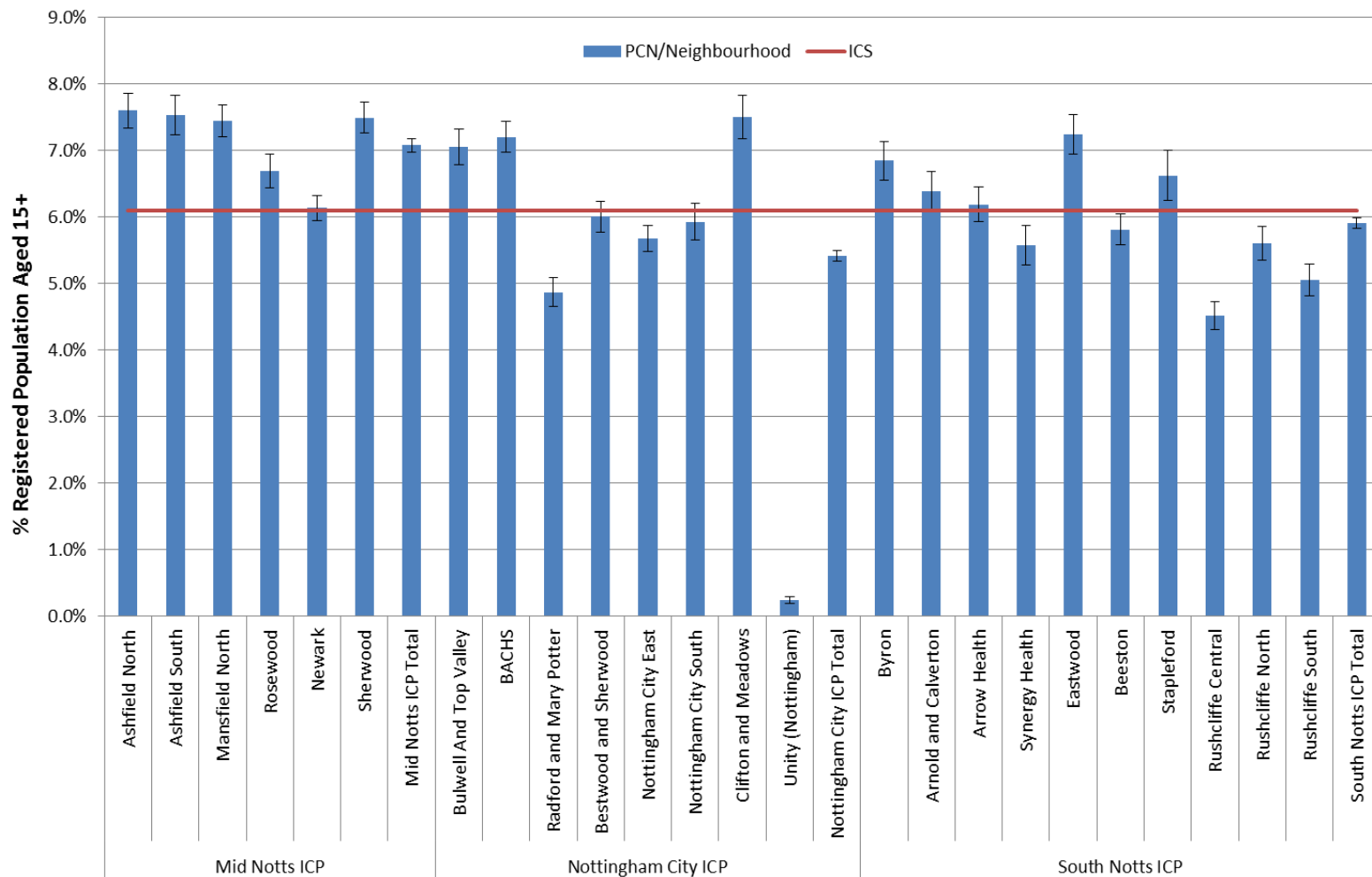
Expected Prevalence

Type 2 Diabetes Expected Prevalence by PCN/Neighbourhood
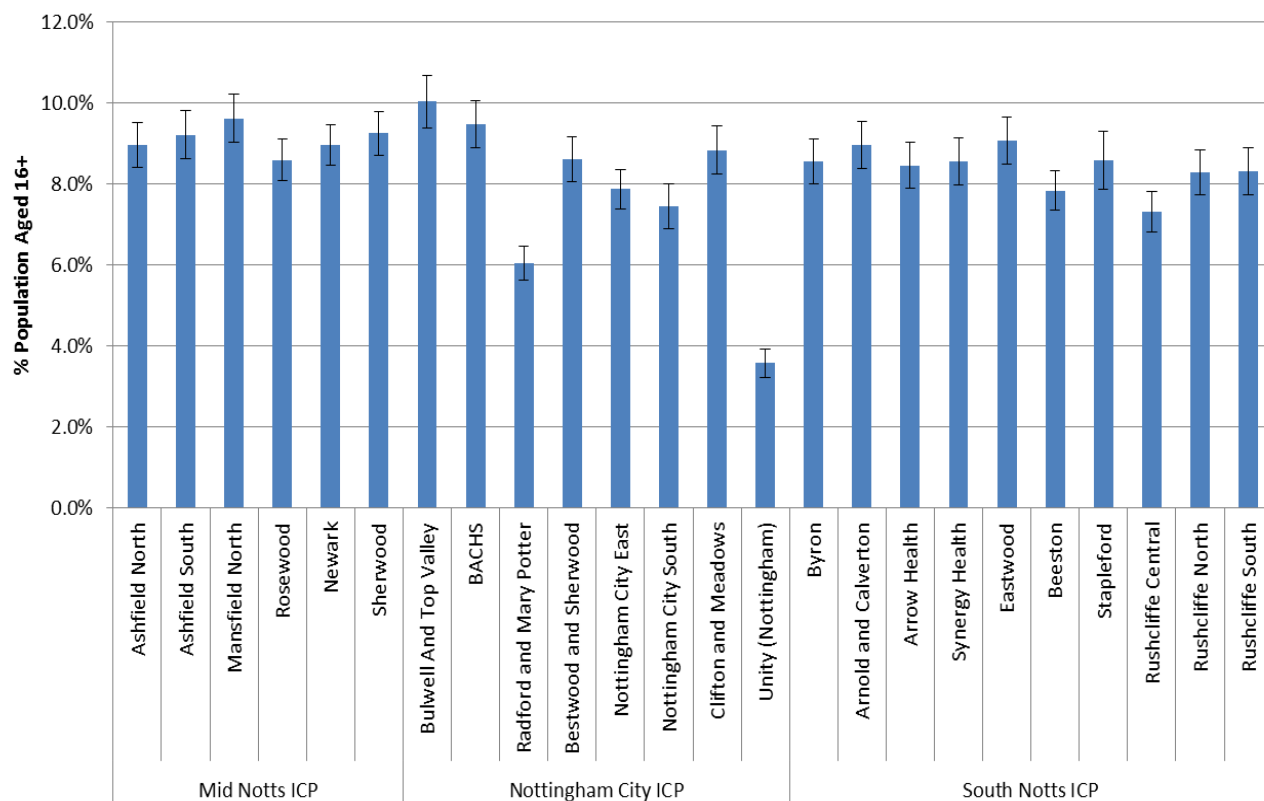
- Using Public Health England diabetes prevalence model, Nottinghamshire County Council Public Health Team have estimated the expected prevalence of T2DM at PCN/Neighbourhood level

- This model is based on age, gender, ethnicity and deprivation

- It is estimated that between 15% and 39% of people with Type 2 Diabetes have not been diagnosed

- According to Public Health models, the larger gaps are estimated to be in Nottingham City and Rushcliffe localities, although these estimates have a certain degree of uncertainty

Source of estimates: Nottinghamshire County Council Public Health Intelligence Team

Type 2 Diabetes Risk Factors

- Logistic regression analysis carried out on local primary care data has confirmed the risk factors known from national and international evidence Obese people (BMI >=30) are 4 times more likely to be diagnosed with Type 2 DM than people with an healthy weight (BMI < 25)

- People with a family history of diabetes are two times more likely to develop the disease

- People in the least deprived areas are 45% less likely to be diagnosed

- People with hypertension are 3 times more likely to develop the condition

- Males are 50% more at risk than females

- People aged 65 and over are twice more likely to be diagnosed with diabetes than people aged 45-64

- People from black and minority ethnic groups (BAME) are overall a 40% higher risk than white people. The highest risk is with Indian, Pakistani and Bangladeshi groups

Risk Factor	Adjusted Odds Ratio	95% Lower Confidence Interval	95% Upper Confidence Interval	P Value
Family History of Diabetes				
No (reference)	1.00			
Yes	2.07	2.02	2.11	<0.001
BMI				
Healthy Weight (reference)	1.00			
Underweight	0.67	0.61	0.74	<0.001
Overweight	1.83	1.78	1.88	<0.001
Obese	3.98	3.87	4.09	<0.001
Age Group				
0-17	0.00	0.00	0.01	<0.001
18-44	0.20	0.19	0.20	<0.001
45-64 (reference)	1.00			
65 and over	2.18	2.13	2.22	<0.001
Gender				
Female (reference)	1.00			
Male	1.54	1.51	1.57	<0.001
Deprivation (IMD 2019)				
Quintile 1 (Most Deprived: reference)	1.00			
Quintile 2	0.84	0.82	0.86	<0.001
Quintile 3	0.73	0.71	0.75	<0.001
Quintile 4	0.64	0.62	0.66	<0.001
Quintile 5 (Least Deprived)	0.56	0.55	0.58	<0.001
Ethnic Group				
White (reference)	1.00			
BAME	1.40	1.37	1.43	<0.001
Hypertension				
No (reference)	1.00			
Yes	3.08	3.02	3.15	<0.001

Estimating the Impact of Obesity on Diabetes Prevalence

Expected Number of People with Diabetes
Nottingham and Nottinghamshire ICS

— Obesity levels maintained   – – Obesity levels decrease by 2% every 5 years

Source: PHE, NCIN
Estimating the impact of obesity on diabetes prevalence (2016)
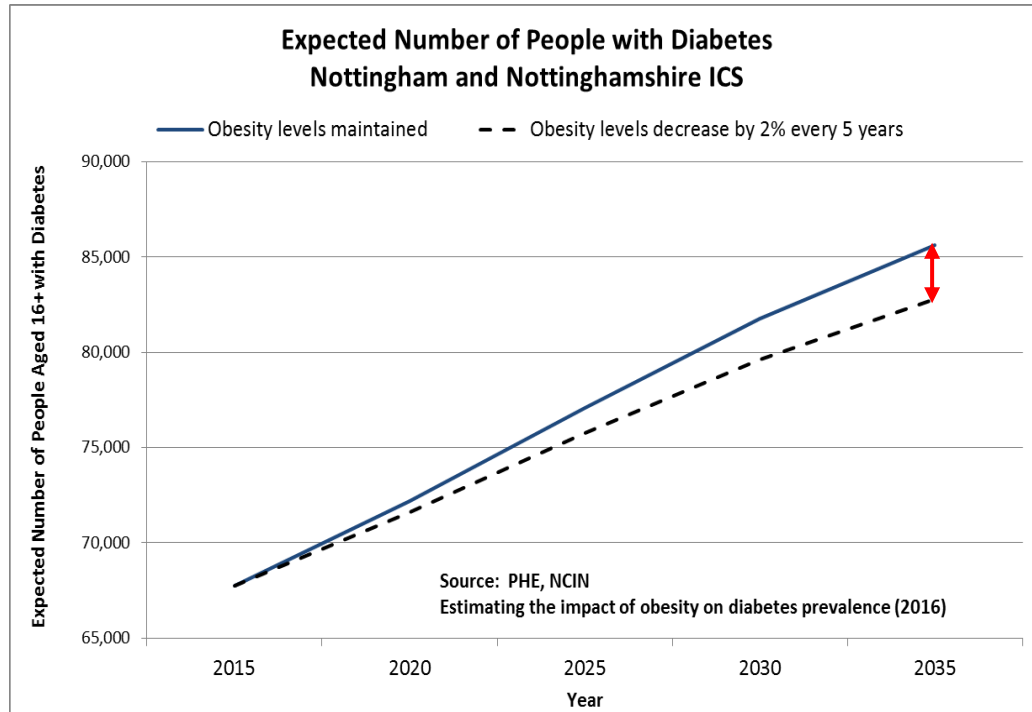
A reduction of 2,150 cases over a 10 year period could potentially lead to savings of £3.7 million, based on current costs. This estimate only includes Prescribing and Hospital Outpatient and Inpatient costs.

- Public Health England (National Cardiovascular Intelligence Network) diabetes prevalence model estimates the number of people aged 16 years and over who have diabetes (diagnosed and undiagnosed).

- The prevalence model adjusts for the age, sex, ethnic group and deprivation pattern of the local population. Office for National Statistics population projections were used as a basis to produce the population estimates.

- If obesity levels were to decline by 2% every 5 years (4% in 10 years), the model estimates that over a 10 year period there would be 2,150 fewer people with diabetes in Nottingham and Nottinghamshire compared to if obesity levels remained the same.

In Nottingham and Nottinghamshire, 85% of people with Type 2 Diabetes have at least 1 other long term condition; 53% have 2 or more.

The most common co-morbidities for people with Type 2 diabetes are:

- Hypertension; Depression; CHD; CKD; Asthma; Cancer.

Co-morbidities for patients with Type 2 Diabetes: Nottingham City ICP

Condition	%
Hypertension	58%
Depression	23%
CHD	17%
Asthma	14%
CKD	10%
Cancer	9%
AtrialFib	7%
COPD	7%
Stroke	5%
SevereFrailty	5%
HeartFailure	5%
Dementia	3%
TIA	3%
PAD	3%
Osteoporosis	3%
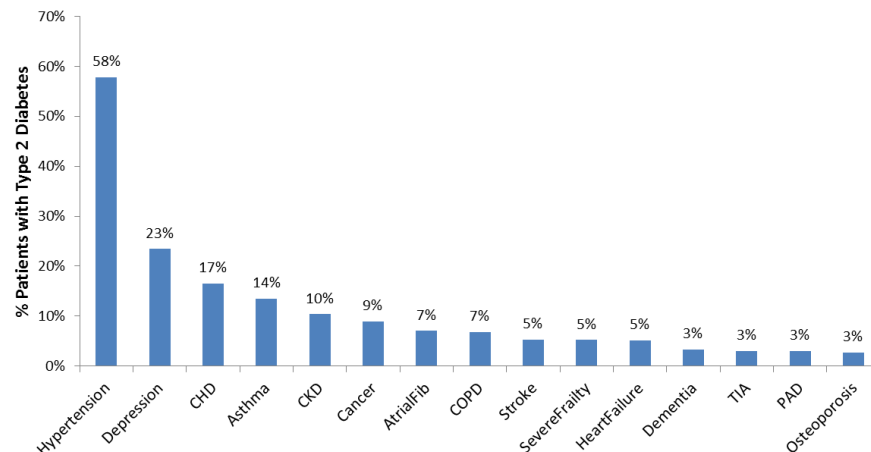
Co-morbidities for patients with Type 2 Diabetes: Mid Notts ICP

Condition	%
Hypertension	60%
Depression	24%
CKD	19%
CHD	19%
Asthma	12%
Cancer	12%
AtrialFib	9%
COPD	8%
SevereFrailty	7%
Stroke	6%
HeartFailure	6%
Osteoporosis	4%
TIA	4%
PAD	3%
Dementia	3%
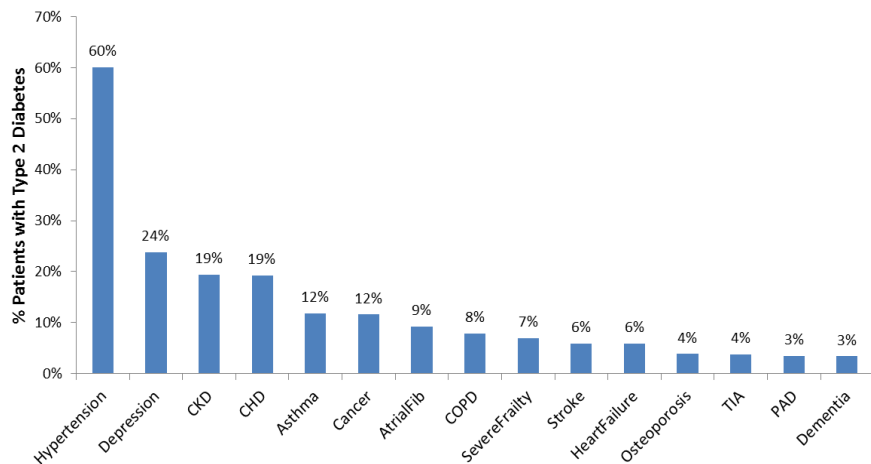
Co-morbidities for patients with Type 2 Diabetes: South Notts ICP

Condition	%
Hypertension	60%
Depression	23%
CKD	17%
CHD	17%
Asthma	13%
Cancer	12%
AtrialFib	10%
SevereFrailty	9%
COPD	6%
Stroke	6%
HeartFailure	6%
TIA	4%
Dementia	4%
PAD	3%
Osteoporosis	3%
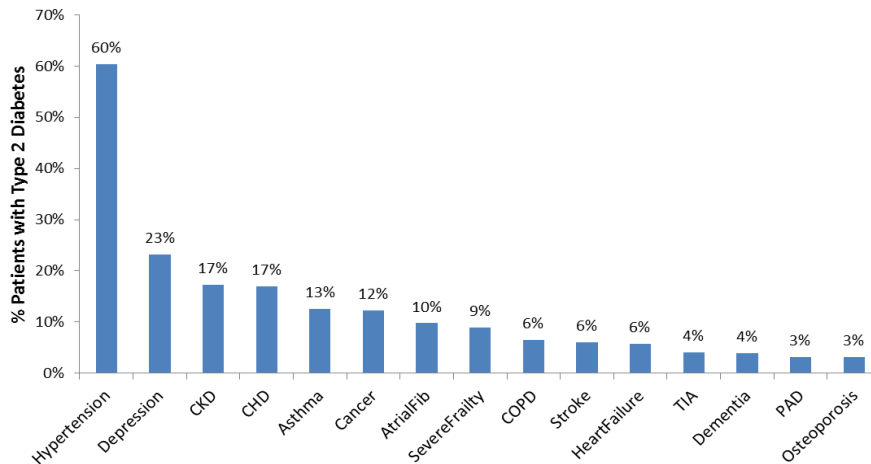
Completion of 8 Care Processes

Type 2 Diabetes: Completion of All 8 Care Processes

—— ICS Average

% People with Type 2 DM with all 8 Care Processes Completed

Categories (left to right): Ashfield North, Ashfield South, Mansfield North, Rosewood, Newark, Sherwood, Mid Notts ICP Total, Bulwell And Top Valley, BACHS, Radford and Mary Potter, Bestwood and Sherwood, Nottingham City East, Nottingham City South, Clifton and Meadows, Unity (Nottingham), Nottingham City ICP Total, Byron, Arnold and Calverton, Arrow Health, Synergy Health, Eastwood, Beeston, Stapleford, Rushcliffe Central, Rushcliffe North, Rushcliffe South, South Notts ICP Total

Groupings: Mid Notts ICP, Nottingham City ICP, South Notts ICP

NICE Guidelines recommend that all people with diabetes should receive the following healthcare checks at least once a year:

1. HbA1c Test

2. Blood pressure measurement

3. Cholesterol test

4. Eye screening

5. Fool Examination

6. Kidney function

7. Urinary albumin

8. BMI measurement

9. Smoking review

Across the ICS only 51% of people with Type 2 DM had all the first 8 checks recorded:

- Mid-Notts: 50%

- Nottingham City: 40%

- South Notts: 62%

GP Practices can get a list of their people whose care processes have not been recorded from the eHealthScope (Workflow):
https://ehsweb.nnotts.nhs.uk/Default.aspx?tabid=313

Type 2 Diabetes: Achievement of All 3 Treatment Targets

GP Practices can get a list of their people whose targets have not been achieved from the eHealthScope (Workflow):
https://ehsweb.nnotts.nhs.uk/Default.aspx?tabid=313
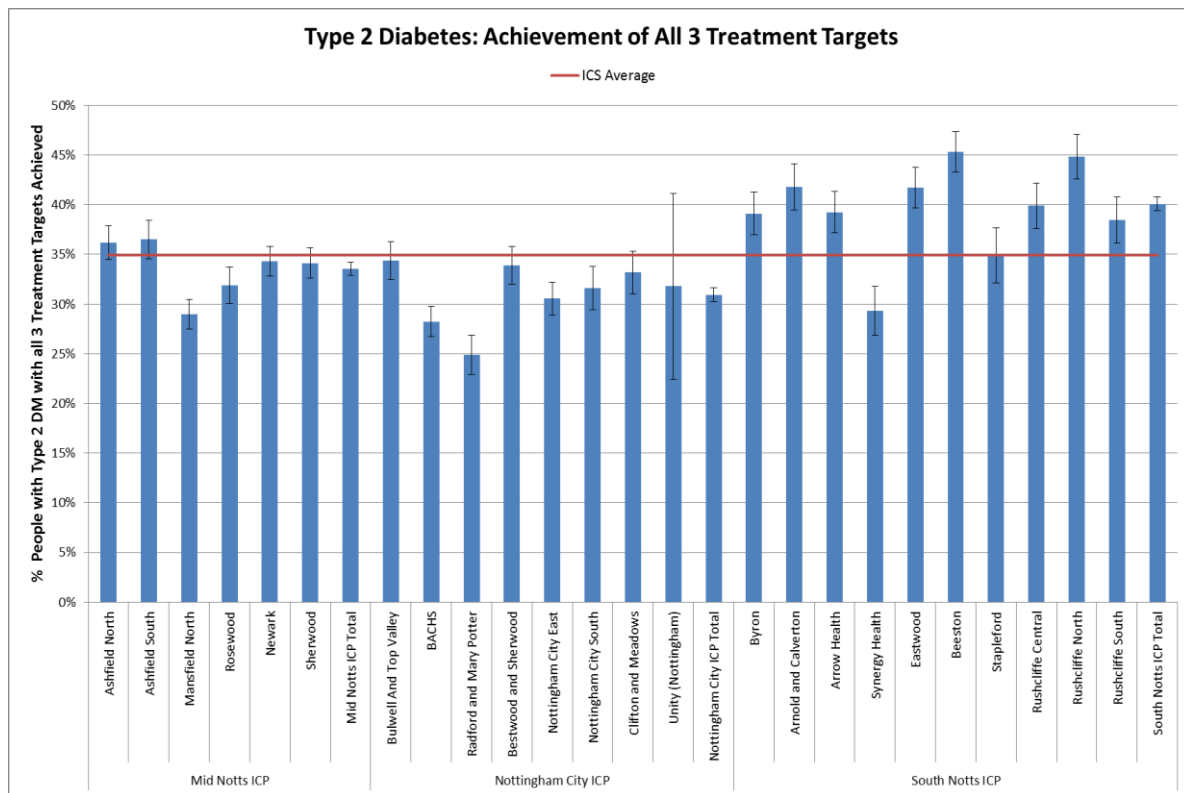
Nice Guidelines recommend treatment targets for glucose control, blood pressure and cholesterol. The targets are:

1. HbA1c level of 58.0 mmol/mol or less

2. Blood pressure reading of less than 140/80

3. Total cholesterol level of below 5 mmol/l

Achievement of these targets reduce the risk of future complications.

Across the ICS, all 3 targets where achieved for 35% of people:

- Mid-Notts: 34%

- Nottingham City: 31%

- South Notts: 40%

Diabetes Structured Education

Type 2 Diabetes: Patients offered Diabetes Structured Education
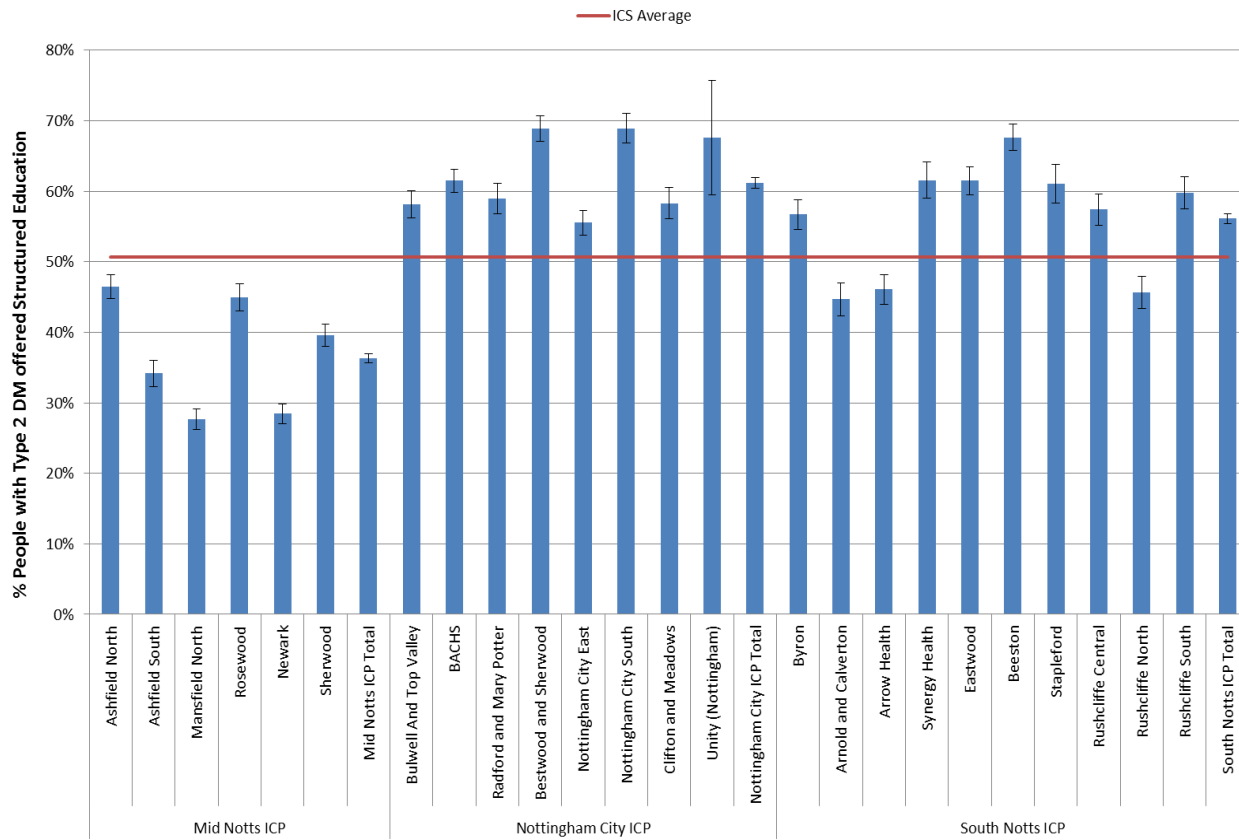
NICE Guidelines recommend that people with diabetes are offered a structured education course to help improve their understanding of diabetes and how to manage it in everyday life.

Across the ICS, 51% of people with type 2 diabetes have been offered at some point diabetes education.

- Mid-Notts: 36%

- Nottingham City: 61%

- South Notts: 56%

*Information on uptake, however, is not readily available yet.

The following pages show overall statistics (numbers and proportions) for people diagnosed with type 2 diabetes at PCN/Neighbourhood and ICP level for the three Nottingham/Nottinghamshire ICPs.

These statistics cover:

- **Demographics**
- **Clinical information**
- **Ethnicity and Socio-economic information**

*These Heat Maps are meant to highlight patterns (high to low) across the ICS rather than provide any form of RAG (red/amber/green) ratings or statistically significant variation. They are based on a 3-colour gradient scale. The darker blue is for the lowest value, the white for the mid-point (50 percentile) and the darker red is for the highest value (across all PCNs within in the ICS). All other values will have a lighter shade of either blue or red depending on their percentile as shown on the colour matrix below:

Mid Nottinghamshire's Statistics

Heat Maps

Key:
- ■ Mid-Nottingham
- ■ Nottingham: 11%
- ■ South Nottingham

Demographics

Mid Nottinghamshire

PCN Neighbourhood	Ashfield North	Ashfield South	Mansfield North	Rosewood	Newark	Sherwood	Mid Notts ICP Total
Registered Population Aged 15+	42,433	32,191	48,375	38,800	64,029	50,246	276,074
Number Diagnosed Type 2	3,229	2,427	3,610	2,600	3,938	3,770	19,574
% Diagnosed Type 2	7.6%	7.5%	7.5%	6.7%	6.2%	7.5%	7.1%
Age 15-24 only	0.1%	0.2%	0.1%	0.3%	0.1%	0.2%	0.2%
Age 25-64 only	42%	43%	42%	43%	36%	40%	41%
Males	56%	55%	56%	55%	58%	56%	56%
Diabetes Family History	34%	30%	37%	26%	28%	31%	31%
Recorded Overweight or Obese	86%	85%	87%	88%	85%	87%	86%
BMI Not Recorded	0.1%	0.2%	0.2%	0.4%	0.6%	0.2%	0.3%
Current Smoker	15%	15%	16%	16%	13%	14%	15%
Alcohol Misuse	5%	4%	7%	4%	7%	6%	6%

Clinical Information

PCN Neighbourhood	Ashfield North	Ashfield South	Mansfield North	Rosewood	Newark	Sherwood	Mid Notts ICP Total
Registered Population Aged 15+	42,433	32,191	48,375	38,800	64,029	50,246	276,074
Number Diagnosed Type 2	3,229	2,427	3,610	2,600	3,938	3,770	19,574
Hyper-tension Register	61%	57%	62%	57%	62%	60%	60%
CHD Register	18%	18%	19%	20%	19%	21%	19%
High Cholesterol	8%	6%	8%	7%	9%	8%	8%
CKD Register	18%	21%	19%	12%	21%	24%	19%
Heart Failure Register	8%	5%	4%	5%	7%	6%	6%
Stroke/TIA Register	9%	9%	7%	8%	9%	10%	8%
Offered Structured Education	46%	34%	28%	45%	28%	40%	36%
All 3 Treatment Targets Achieved	36%	37%	29%	32%	34%	34%	34%
All 8 Care Processes Completed	53%	39%	47%	47%	52%	56%	50%

Socio-Economic Deprivation
% Living in most deprived areas

Mid Nottinghamshire

PCN Neighbourhood	Ashfield North	Ashfield South	Mansfield North	Rosewood	Newark	Sherwood	Mid Notts ICP Total
Registered Population Aged 15+	42,433	32,191	48,375	38,800	64,029	50,246	276,074
Number Diagnosed Type 2	3,229	2,427	3,610	2,600	3,938	3,770	19,574
Recorded BAME	3%	3%	3%	4%	3%	2%	3%
Income Deprivation	35%	24%	25%	34%	17%	15%	24%
Employment Deprivation	45%	31%	54%	54%	15%	39%	39%
Adult Skills & Training Deprivation	56%	40%	59%	59%	16%	43%	44%
Crime Deprivation	24%	17%	16%	30%	9%	5%	16%
Outdoor Living Environment Deprivation	1%	1%	2%	5%	9%	0%	3%
Health & Disability Deprivation	54%	32%	52%	58%	12%	26%	38%

In Summary

GP people not diagnosed with Diabetes	GP people diagnosed with Type 2 Diabetes	people diagnosed with Diabetes: Complex
• 51% of population without diabetes are overweight or obese • 19% smoke • 13% on hypertension register • 10% high cholesterol • 3% on CKD Register	• 7.1% of population aged 15+ diagnosed with T2 diabetes; 31% family history of diabetes • 36% offered Structured Education Programme • 33% achieving all 3 treatment targets (HbA1c, Hypertension, Cholesterol) • 15% smoke; 86% overweight or obese; 19% on CKD register • 24% live in areas of high 'income deprivation'; 39% in areas of high 'employment deprivation'; 45% in areas of high 'adult skills deprivation'	• 55% of people with T2 diabetes have 2 or more comorbidities • Slightly higher number of emergency hospital admissions where Diabetes is primary diagnosis • Higher spend on GP prescribing (both insulin and anti-people with diabetes drugs) • Lower Outpatient activity and spend (including Foot Clinics) • Admissions for amputations and renal compensation similar to ICS rate

Nottingham City Statistics

Heat Maps

Demographics

PCN Neighbourhood	Bulwell And Top Valley	BACHS	Radford and Mary Potter	Bestwood and Sherwood	Nottingham City East	Nottingham City South	Clifton and Meadows	Unity (Nottingham)	Nottingham City ICP
Registered Population Aged 15+	35,120	46,427	38,776	40,694	53,905	30,102	25,669	44,150	314,843
Number Diagnosed Type 2	2,484	3,354	1,893	2,450	3,074	1,793	1,933	107	17,088
% Diagnosed Type 2	7.1%	7.2%	4.9%	6.0%	5.7%	6.0%	7.5%	0.2%	5.4%
Age 15-24 only	0.2%	0.4%	1.1%	0.1%	0.3%	0.2%	0.2%	9.3%	0.4%
Age 25-64 only	47%	54%	60%	50%	56%	45%	49%	61%	52%
Males	53%	55%	52%	55%	55%	56%	52%	65%	54%
Diabetes Family History	30%	34%	34%	42%	32%	33%	32%	46%	34%
Recorded Overweight or Obese	86%	84%	82%	84%	84%	82%	86%	82%	84%
BMI Not Recorded	0.8%	1.1%	1.0%	0.7%	1.1%	0.3%	0.4%	0.9%	0.8%
Current Smoker	18%	18%	18%	16%	19%	12%	16%	10%	17%
Alcohol Misuse	4%	5%	1%	4%	3%	3%	6%	1%	4%

Clinical Information

PCN Neighbourhood	Bulwell And Top Valley	BACHS	Radford and Mary Potter	Bestwood and Sherwood	Nottingham City East	Nottingham City South	Clifton and Meadows	Unity (Nottingham)	Nottingham City ICP
Registered Population Aged 15+	35,120	46,427	38,776	40,694	53,905	30,102	25,669	44,150	314,843
Number Diagnosed Type 2	2,484	3,354	1,893	2,450	3,074	1,793	1,933	107	17,088
Hyper-tension Register	60%	58%	55%	56%	55%	59%	62%	47%	58%
CHD Register	18%	17%	16%	16%	15%	18%	17%	7%	17%
High Cholesterol	7%	9%	9%	8%	8%	9%	8%	12%	8%
CKD Register	11%	13%	6%	10%	8%	9%	15%	0%	10%
Heart Failure Register	6%	6%	4%	5%	5%	4%	6%	0%	5%
Stroke/TIA Register	7%	8%	7%	8%	7%	8%	8%	6%	8%
Offered Structured Education	58%	62%	59%	69%	56%	69%	58%	68%	61%
All 3 Treatment Targets Achieved	34%	28%	25%	34%	31%	32%	33%	32%	31%
All 8 Care Processes Completed	44%	31%	24%	49%	43%	54%	37%	45%	40%

Socio-Economic Deprivation % Living in most deprived areas

Integrated Care System
Nottingham & Nottinghamshire

Nottingham City

PCN Neighbourhood	Bulwell And Top Valley	BACHS	Radford and Mary Potter	Bestwood and Sherwood	Nottingham City East	Nottingham City South	Clifton and Meadows	Unity (Nottingham)	Nottingham City ICP
Registered Population Aged 15+	35,120	46,427	38,776	40,694	53,905	30,102	25,669	44,150	314,843
Number Diagnosed Type 2	2,484	3,354	1,893	2,450	3,074	1,793	1,933	107	17,088
Recorded BAME	15%	28%	66%	29%	37%	34%	21%	42%	32%
Income Deprivation	65%	67%	54%	53%	55%	26%	61%	16%	56%
Employment Deprivation	64%	63%	48%	44%	56%	29%	62%	18%	54%
Adult Skills & Training Deprivation	63%	66%	53%	32%	46%	28%	78%	15%	53%
Crime Deprivation	36%	49%	58%	28%	29%	9%	26%	18%	35%
Outdoor Living Environment Deprivation	56%	89%	96%	79%	83%	79%	48%	63%	77%
Health & Disability Deprivation	60%	71%	59%	52%	62%	36%	74%	36%	60%

Integrated Care System
Nottingham & Nottinghamshire

GP people not diagnosed with Diabetes	GP people diagnosed with Type 2 Diabetes	people diagnosed with Diabetes: Complex
• 39% of population without diabetes are overweight or obese • 20% smoke • 9% on hypertension register • 7% high cholesterol • 1% on CKD Register	• 5.4% of population aged 15+ diagnosed with T2 diabetes; 34% family history of diabetes • 61% offered Structured Education Programme • 32% achieving all 3 treatment targets (HbA1c, Hypertension, Cholesterol) • 17% smoke; 84% overweight or obese; 10% on CKD register • 56% live in areas of high 'income deprivation'; 54% in areas of high 'employment deprivation'; 53% in areas of high 'adult skills deprivation'	• 49% of people with T2 diabetes have 2 or more comorbidities • Slightly higher number of emergency hospital admissions where Diabetes is primary diagnosis • Lower spend on GP prescribing • Higher Outpatient activity and spend (including Foot Clinics) • Admissions for amputations and renal compensation higher than ICS rate

South Nottingham Statistics

Heat Maps

Demographics

PCN Neighbourhood	Byron	Arnold and Calverton	Arrow Health	Synergy Health	Eastwood	Beeston	Stapleford	Rushcliffe Central	Rushcliffe North	Rushcliffe South	South Notts ICP
Registered Population Aged 15+	30,196	28,141	34,851	24,331	31,392	39,585	17,749	39,613	33,206	34,362	313,426
Number Diagnosed Type 2	2,071	1,800	2,162	1,358	2,277	2,306	1,177	1,794	1,865	1,744	18,554
% Diagnosed Type 2	6.9%	6.4%	6.2%	5.6%	7.3%	5.8%	6.6%	4.5%	5.6%	5.1%	5.9%
Age 15-24 only	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.3%	0.3%	0.1%	0.1%	0.1%
Age 25-64 only	41%	37%	34%	46%	37%	40%	41%	38%	32%	31%	37%
Males	54%	56%	58%	57%	57%	56%	58%	58%	60%	57%	57%
Diabetes Family History	28%	30%	22%	27%	43%	30%	30%	34%	41%	26%	31%
Recorded Overweight or Obese	87%	83%	83%	85%	86%	83%	84%	80%	85%	84%	84%
BMI Not Recorded	0.2%	0.3%	0.1%	0.2%	0.4%	0.3%	0.4%	0.4%	0.1%	0.2%	0.3%
Current Smoker	12%	9%	10%	12%	12%	12%	12%	9%	10%	9%	11%
Alcohol Misuse	6%	9%	6%	9%	9%	7%	5%	9%	14%	12%	9%

Clinical Information

PCN Neighbourhood	Byron	Arnold and Calverton	Arrow Health	Synergy Health	Eastwood	Beeston	Stapleford	Rushcliffe Central	Rushcliffe North	Rushcliffe South	South Notts ICP
Registered Population Aged 15+	30,196	28,141	34,851	24,331	31,392	39,585	17,749	39,613	33,206	34,362	313,426
Number Diagnosed Type 2	2,071	1,800	2,162	1,358	2,277	2,306	1,177	1,794	1,865	1,744	18,554
Hyper-tension Register	59%	61%	63%	60%	59%	59%	59%	61%	62%	61%	60%
CHD Register	15%	17%	17%	15%	17%	17%	16%	19%	19%	16%	17%
High Cholesterol	8%	7%	7%	8%	9%	8%	9%	7%	8%	9%	8%
CKD Register	18%	21%	20%	18%	18%	9%	10%	17%	20%	20%	17%
Heart Failure Register	4%	4%	6%	5%	8%	6%	6%	6%	6%	6%	6%
Stroke/TIA Register	9%	10%	8%	9%	9%	9%	8%	10%	9%	8%	9%
Offered Structured Education	57%	45%	46%	62%	61%	68%	61%	57%	46%	60%	56%
All 3 Treatment Targets Achieved	39%	42%	39%	29%	42%	45%	35%	40%	45%	38%	40%
All 8 Care Processes Completed	61%	56%	52%	53%	66%	70%	59%	54%	76%	71%	62%

Socio-Economic Deprivation % Living in most deprived areas

South Nottingham

PCN Neighbourhood	Byron	Arnold and Calverton	Arrow Health	Synergy Health	Eastwood	Beeston	Stapleford	Rushcliffe Central	Rushcliffe North	Rushcliffe South	South Notts ICP
Registered Population Aged 15+	30,196	28,141	34,851	24,331	31,392	39,585	17,749	39,613	33,206	34,362	313,426
Number Diagnosed Type 2	2,071	1,800	2,162	1,358	2,277	2,306	1,177	1,794	1,865	1,744	18,554
Recorded BAME	4%	5%	9%	6%	2%	14%	6%	22%	2%	3%	7%
Income Deprivation	21%	4%	9%	9%	21%	7%	11%	1%	0%	1%	9%
Employment Deprivation	33%	8%	16%	18%	29%	8%	8%	1%	0%	4%	13%
Adult Skills & Training Deprivation	21%	17%	15%	11%	31%	5%	8%	1%	4%	5%	12%
Crime Deprivation	21%	0%	2%	1%	15%	1%	8%	1%	0%	1%	5%
Outdoor Living Environment Deprivation	0%	2%	14%	5%	0%	16%	13%	6%	1%	3%	6%
Health & Disability Deprivation	25%	4%	9%	5%	27%	2%	6%	2%	0%	1%	9%

In Summary

| GP people not diagnosed with Diabetes	GP people diagnosed with Type 2 Diabetes	people diagnosed with Diabetes Complex
• 48% of population without diabetes are overweight or obese • 14% smoke • 13% on hypertension register • 12% high cholesterol • 3% on CKD Register	• 5.9% of population aged 15+ diagnosed with T2 diabetes; 31% family history of diabetes • 56% offered Structured Education Programme • 40% achieving all 3 treatment targets (HbA1c, Hypertension, Cholesterol) • 11% smoke; 84% overweight or obese; 17% on CKD register • 9% live in areas of high 'income deprivation'; 13% in areas of high 'employment deprivation'; 12% in areas of high 'adult skills deprivation'	• 54% of people with T2 diabetes have 2 or more comorbidities • Lower number of emergency hospital admissions where Diabetes is primary diagnosis • Lower spend on GP prescribing • Higher Outpatient activity and spend (including Foot Clinics) • Admissions for amputations and renal compensation lower than ICS rate

GP Prescribing and Hospital Activity

GP Prescribing Spend

GP Prescribing Costs for Diabetes Drugs (BNF Chapter 6.1)
12-Month Period (July 2018 - June 2019)
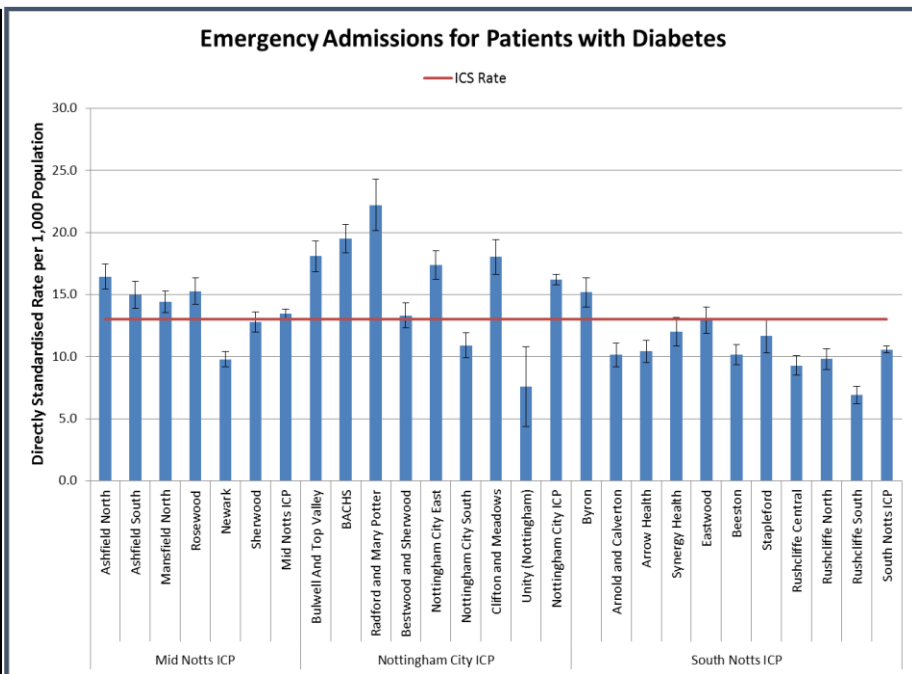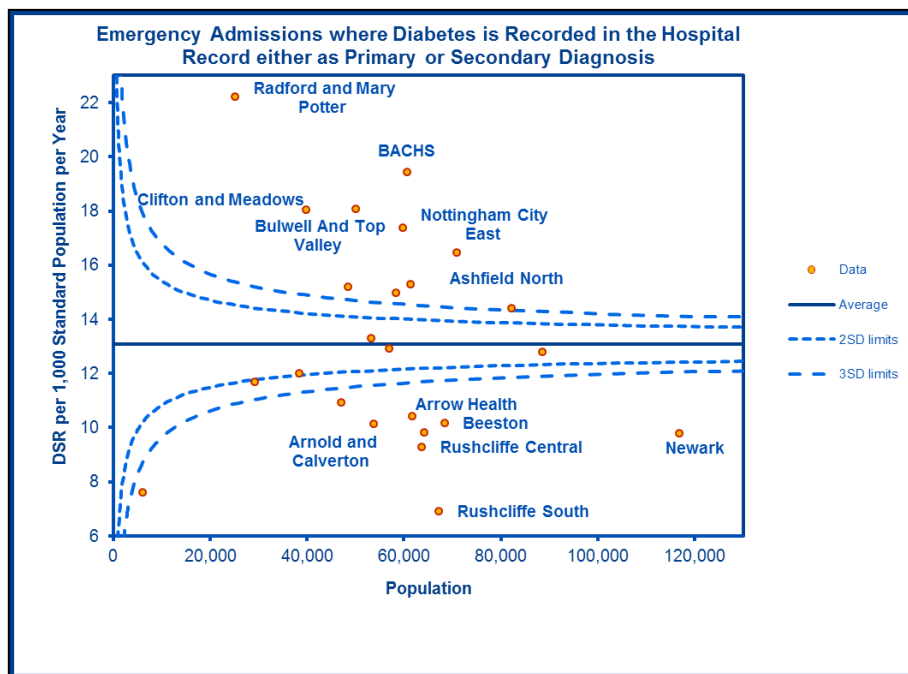Average Cost per Patient with Diabetes
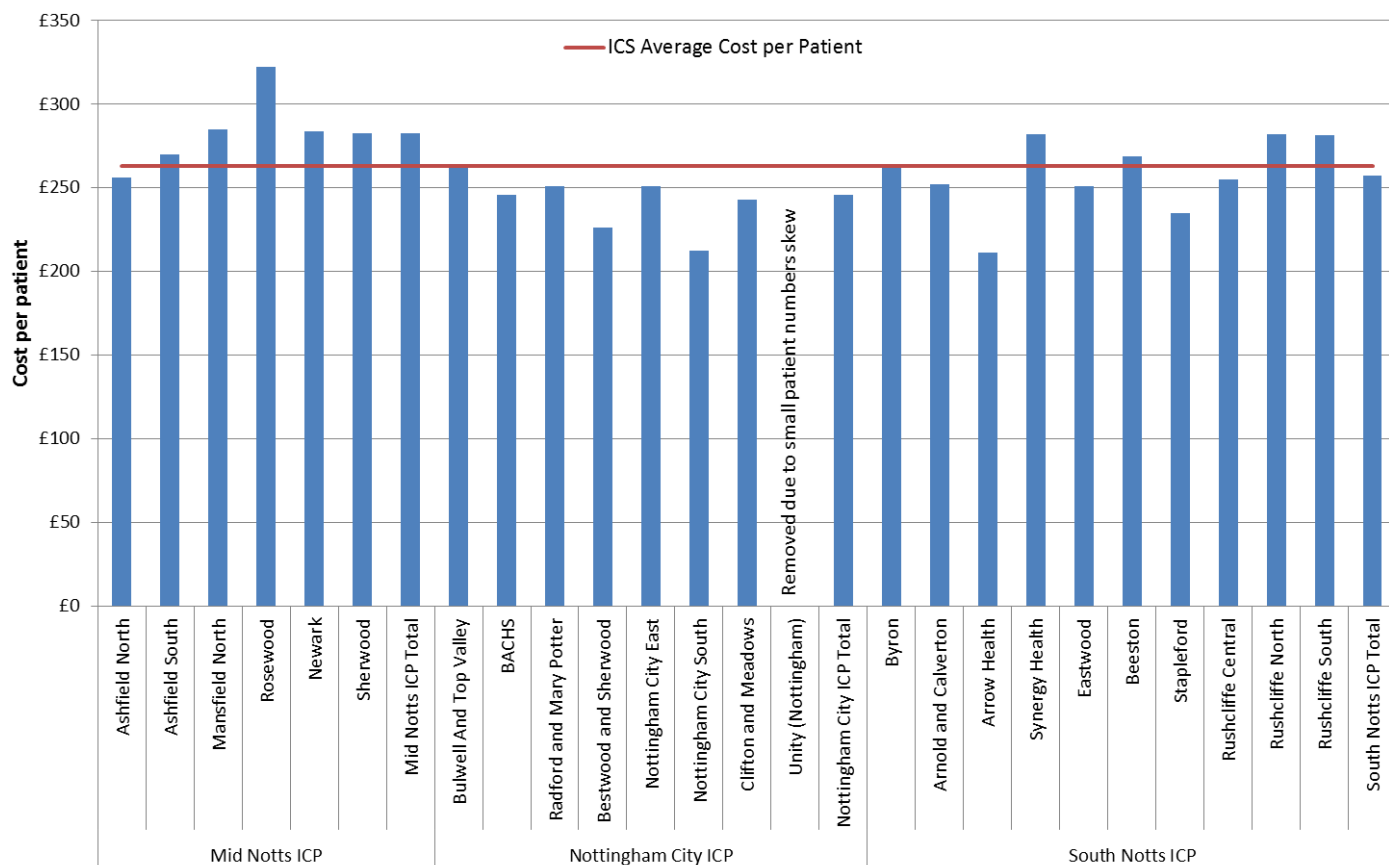
The annual cost of diabetes drugs (BNF Chapter 6.1) paid by Nottingham and Nottinghamshire CCGs is just over £16 million.

The average cost per person in some PCNs / Neighbourhoods in Mid-Notts and South-Notts appear to be higher than the overall ICS average

Source: OpenPrescribing.net

Hospital Emergency Admissions for people with Diabetes (2018/19)

Emergency Admissions where Diabetes is Recorded in the Hospital Record either as Primary or Secondary Diagnosis

Emergency Admissions for Patients with Diabetes

- Analysis of age and gender directly standardised rates shows large variation in hospital activity rates between PCNs/Neighbourhoods

- Directly standardised rates, however, only take into account age, gender and population size.

- There are many other factors that may explain variation, such as: deprivation, morbidity, long term conditions, distance from hospital, multiple admissions/high impact users and end of life

Logistic regression analysis of hospital and GP linked data has identified a number of factors that are associated to emergency admissions:

- people living in Care Homes are 4 times more likely to be admitted than people who do not

- people with 3 or more comorbidities / long term conditions (in addition to Diabetes) are 5 to 6 times more likely to be admitted

- The number of LTCs is associated to age but it is a stronger predictor than age alone

- Gender does not appear to be a significant factor

- People from black and minority ethnic backgrounds (BAME) are slightly less likely to be admitted (17%) than white groups

- people living in the least deprived areas are 17% less likely to be admitted than those living in the most deprived areas

- When not all three treatment targets are achieved, there is a 20% higher risk of emergency admissions

Risk Factor	Adjusted Odds Ratio	95% Lower Confidence Interval	95% Upper Confidence Interval	P Value
Care Home Resident				
No (reference)	1.00			
Yes	4.19	3.63	4.84	<0.001
Number of Comorbidities				
0	1.00			
1	1.35	1.25	1.45	<0.001
2	2.31	2.14	2.50	<0.001
3+	5.58	5.19	6.00	<0.001
Age Group				
0-17	18.39	5.93	57.03	<0.001
18-44	1.52	1.39	1.66	<0.001
45-64 (reference)	1.00			
65 and over	1.19	1.14	1.25	<0.001
Gender				
Female (reference)	1.00			
Male	0.98	0.94	1.02	0.24
Deprivation (IMD 2019)				
Quintile 1 (Most Deprived: reference)	1.00			
Quintile 2	0.94	0.89	1.00	0.05
Quintile 3	0.88	0.83	0.94	<0.001
Quintile 4	0.86	0.80	0.92	<0.001
Quintile 5 (Least Deprived)	0.83	0.77	0.90	<0.001
Ethnic Group				
White (reference)	1.00			
BAME	0.83	0.78	0.87	<0.001
All Three Treatment Targets Met				
Yes (reference)	1.00			
No	1.23	1.18	1.29	<0.001

Integrated Care System
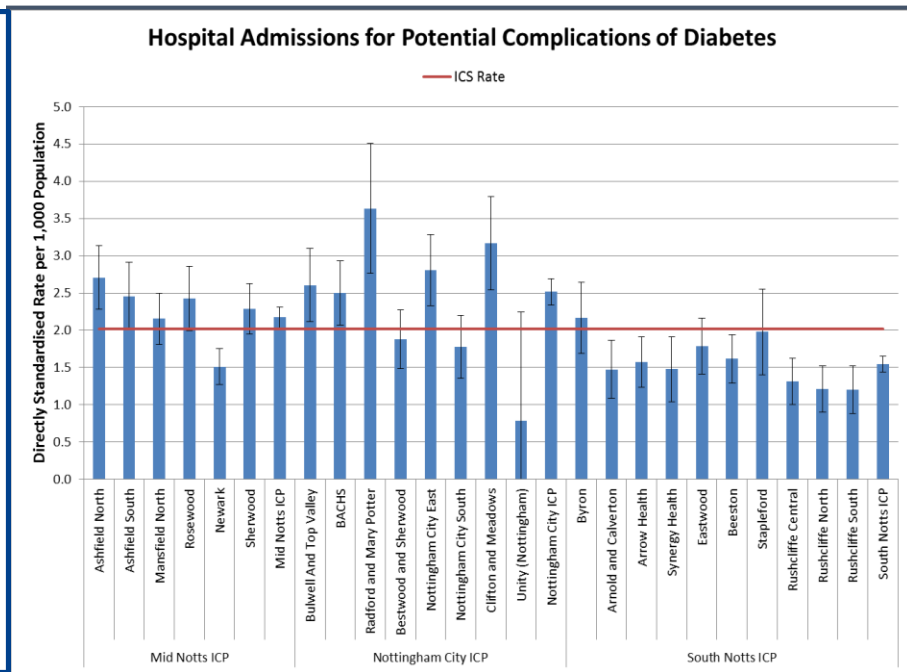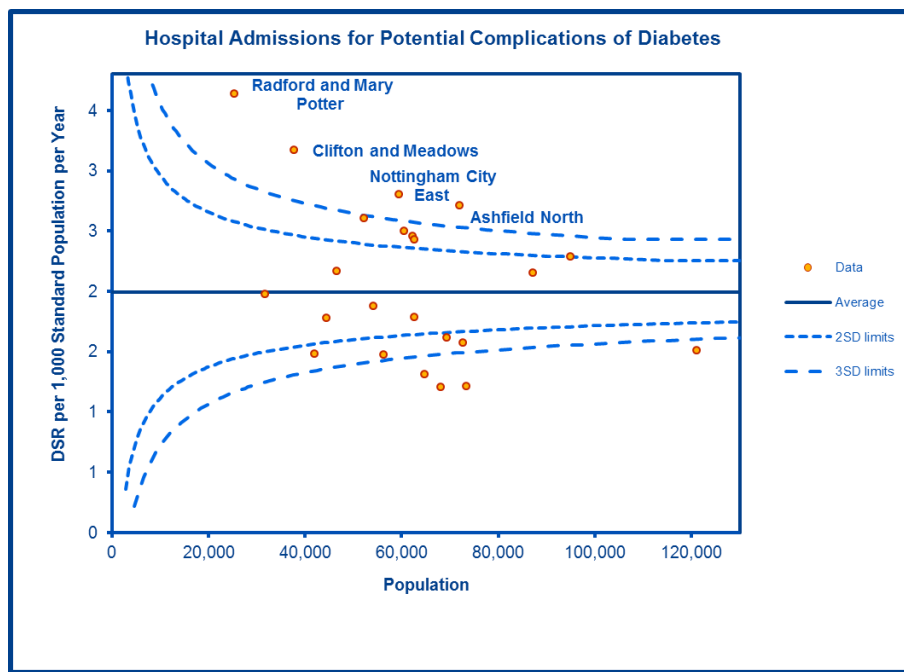Nottingham & Nottinghamshire

- Once we take into account the number of Long Term Conditions (LTC), Care Home residency, Deprivation, Ethnicity and achievement of the treatment targets in addition to Age and Gender, variation between PCNs appears to be significantly reduced.

- The "Forest" Plot on the right shows variation in odds ratios (relative risk of admission) for all PCN/Neighbourhoods.

- When the black horizontal line (confidence interval) crosses the vertical red dotted line representing the model reference group (baseline), the difference with the reference group is not statistically significant.

- It can be seen that the confidence interval (black horizontal lines) crosses the vertical dotted red line (reference group) for most PCNs/Neighbourhoods (apart from five).

- This suggests that most of the variation in the "risk" of admission may be explained by a combination of "chance" and one or more of the above mentioned factors.

Emergency Hospital Admissions for Patients with T2 Diabetes
PCN/Neighbourhood Odds Ratios with Confidence Intervals
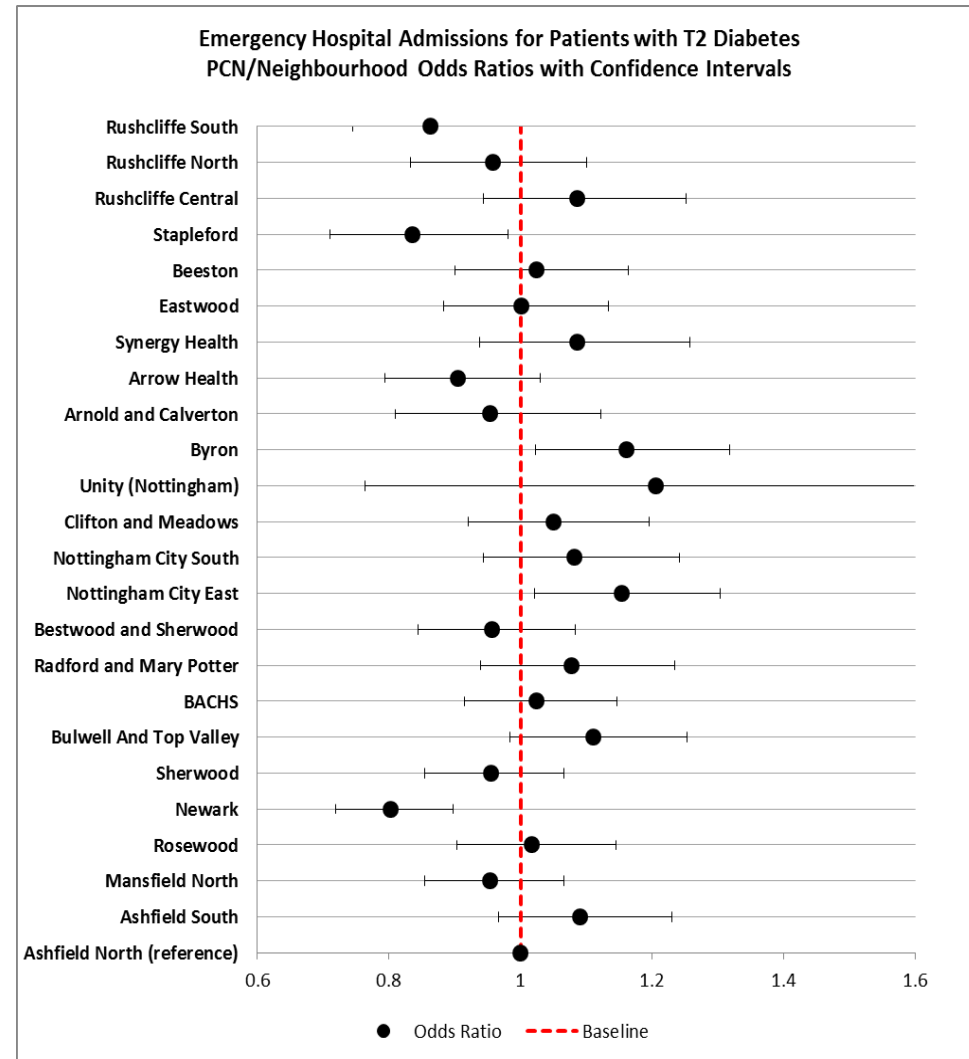
Hospital Admissions for potential complications of Diabetes (2018/19)

Complications of Diabetes include: Stroke, MI, CHD, Lower limbs ulcers/wounds, Kidney failure, Retinal disorders

The age and gender standardised rate in Nottingham City ICP is higher than the overall ICS rate

The rate in South Notts is lower than the overall ICS rate

The rates in Mid-Notts is not different from the ICS rate

*these rates are only adjusted by age and gender and therefore do not take into account other potential confounders such as deprivation

The following pages are a **summary** of the work Imperial College Health Partners have undertaken in conjunction with the PHM team on behalf of Nottingham/Nottinghamshire ICS.

The full systematic literature review and supporting documents are available to down load (see Appendix 1).

Population-level interventions to improve health in people with diabetes in Nottinghamshire

January 2020

Interventions

1. Structured education
   a) Diabetes Prevention Programme (DPP)
   b) Traditional programmes (DESMOND, DAFNE, X-PERT)
   c) Web-based structured education (DDM, My Diabetes My Way, Changing Health, POWeR, HeLP-Diabetes) Multidisciplinary foot care services
2. Other lifestyle interventions
3. Multidisciplinary footcare services
4. Retinopathy screening
5. Bariatric surgery

Interventions: Summary

Diabetes Prevention Programme	Structured Education	Web-based structured education
NHS Diabetes Prevention Programme (NHS DPP) identifies those at high risk and refers them onto a behaviour change programme. The NHS DPP is a joint commitment from NHS England, Public Health England and Diabetes UK. A commitment to develop digital access is part of the NHS Long-Term Plan.	Structured education programmes teach people newly diagnosed with diabetes about the disease, its treatment, and healthy lifestyles. Examples include DESMOND for people with type 2 diabetes, and DAFNE for people with type 1 diabetes. They are delivered face-to-face, classroom style and typically have low uptake rates.	These are a new generation of structured education programmes that are web-based using the internet and smart-phone apps, along with face-to-face engagement. They have higher uptake rates and report significant remission rates but are less robustly evaluated as they are relatively new.

Interventions: Summary

Multidisciplinary foot care services	Retinopathy screening	Bariatric surgery
Organisational reconfigurations to streamline case finding and patient pathways. These will make better use of the skills of diabetologists, specialist nurses, surgeons, podiatrists and others to improve the outcomes for people with diabetes with foot problems.	Digital retinopathy screening began in England in 2003 and was nationally implemented by 2008. About 80% of people with diabetes are screened nationally every year. The screening programme appears to have reduced the rate of sight impairment due to diabetes by about 20%.	Bariatric surgery is used to limit a person's food intake and / or its absorption. They are costly procedures but are very effective at reducing weight and have a significant associated remission rate. Types of bariatric surgery include gastric bypass procedures like 'Roux-en-Y', sleeve gastrectomy, adjustable gastric bands or small bowel bypasses.

DPP Summary

The Diabetes Prevention Programme DPP encompasses the NICE recommendations surrounding the prevention of diabetes.

For every **1,000 people** referred, there will be **13 fewer people with diabetes 5-years later.** This gives the number needed to treat **(NNT) as 77**.

Online access is being piloted and appears to **increase uptake** from about **50%** to **68%**.

It is typically **cost-effective after 6-years***, but in as little as **3 years** in the **severely obese.** At 20 years, the **cost per QALY gained is -£2,616** (there is both a QALY and financial gain).

It is typically **cost-saving** from **11 years**, but in as little as **3 years** in the **severely obese**.

The **return on investment** at 20-years is about **£1:25** per pound spent but is as high as **£3** in **the severely obese**.

* At a threshold of £20,000 per QALY.

Summary of Traditional Structured Education

The impact of structured education (SE) (DESMOND) on measures of control in people with **type 2 diabetes** is **small and uncertain**, but there is a **significant increase in knowledge about diabetes**. It is cost-effective* but modelling suggests SE is **takes more than 10 years to become cost-saving**.

The **impact** of SE on measures of control in people with **type 1 diabetes** (DAFNE) is **significant**, **cost-effective*** and **cost-saving at 4-years**.[1]

The **X-Pert** SE package for people with type 1, type 2 and pre-diabetes has a **significant impact on control,** is **cost-effective,** but is **not cost-saving**.*

- At a willingness to pay threshold of £20,000 per QALY.
1. Diabetes UK, 2014. THE COST OF DIABETES REPORT. Diabetes UK, London.

Summary of Web-based Tools

Web-based structured education interventions give a very high return on investment.
The cost is relatively low and uptake relatively high.
These applications are still fairly new, so the body of evidence is still small, but very promising.

Web apps can be used at any time, and so may be particularly useful for people of working age who may have difficulty attending face-to-face sessions in working hours.

Returns on investment at 5-years is £2.35 and at 10-years is £5.17.

Cost-effectiveness data is limited, but the HeLP intervention was highly cost effective at 1-year with a cost of £5,500 per QALY gained.

Further Lifestyle Interventions

Lifestyle changes can be used to prevent and manage diabetes or even cause remission.

The DiRECT trial investigates the effect of total diet replacement, exercise and long-term support on the potential for diabetes remission is the DiRECT trial. [1].

The intervention consists of:

- A **total diet replacement** of about **850 calories per day** (Counterweight-Plus).
- Followed by a stepped food reintroduction,
- A goal **of 15,000 steps per day** and
- **Long-term support** for weight loss maintenance.

Other lifestyle interventions such as smoking cessation and social interventions, have been demonstrated to help the prevention of diabetes.

1. Lean, M.E., Leslie, W.S., Barnes, A.C., Brosnahan, N., Thom, G., McCombie, L., Peters, C., Zhyzhneuskaya, S., Al-Mrabeh, A., Hollingsworth, K.G., Rodrigues, A.M., Rehackova, L., Adamson, A.J., Sniehotta, F.F., Mathers, J.C., Ross, H.M., McIlvenna, Y., Stefanetti, R., Trenell, M., Welsh, P., Kean, S., Ford, I., McConnachie, A., Sattar, N., Taylor, R., 2018. Primary care-led weight management for remission of type 2 diabetes (DiRECT): an open-label, cluster-randomised trial. Lancet 391, 541–551. https://doi.org/10.1016/S0140-6736(17)33102-1

Lifestyle interventions:
Costs and Return on Investment

The DiRECT study suggests the cost burden of diabetes per year per person is £3,455 inflated to 2019 costs.

The cost of one year of remission using the DiRECT intervention with total food replacement and follow-up support is £2,661 inflated to 2019 costs.

This would be a net gain of £794 per year, per remission.[2]

1. McDaid, D., 2018. Using economic evidence to help make the case for investing in health promotion and disease prevention (Policy Brief). World Health Organisation, HEALTH SYSTEMS FOR PROSPERITY AND SOLIDARITY.
2. Xin, Y., Davies, A., McCombie, L., Briggs, A., Messow, C.-M., Grieve, E., Leslie, W.S., Taylor, R., Lean, M.E.J., 2019. Within-trial cost and 1-year cost-effectiveness of the DiRECT/Counterweight-Plus weight-management programme to achieve remission of type 2 diabetes. Lancet Diabetes Endocrinol 7, 169–172. https://doi.org/10.1016/S2213-8587(18)30346-2

Summary of Lifestyle Interventions

Lifestyle intervention are partly incorporated into the structured education programmes.

Here we have included data on the 'DiRECT' trial which used the CounterWeight-Plus food replacement products.

The DiRECT trial had a **high impact on outcomes**, but due to the **high cost of the Counterweight-Plus food replacement**, the **return on investment** is less than £1 per £1 spent until 10 years, when the ROI was £1.15.

Multidisciplinary Foot Care Services Summary

MDFCS are very effective at reducing amputation rates and are targeted at a restricted population with people with diabetes foot problems in particular.

In people with diabetes with an ulcer, only 49 have to be treated to prevent a first amputation at 5-years.

There is no cost effectiveness analysis applying to England, but our modelling suggests the return on investment is greater than £1 for every £1 invested by 5-years.

Summary of Retinopathy Screening

Retinopathy screening **is cost-effective** but **does not give a significant return on investment** as it is **repeated annually**.

It has already been implemented, but the **uptake in Nottingham City is relatively low**, so there is scope to improve attendance.

A modelling study suggested that a **3-year screening interval** was the one **most likely to be cost-effective**.

Measures to target those most at risk, particularly **people who have missed two annual screens**, may improve outcomes.

Summary of Bariatric Surgery

Bariatric surgery is very **cost-effective** at £7,129 per QALY gained, but is very **expensive** meaning that it takes many years to provide a return on investment (19 years).

Recommendations

All of the interventions described here are cost-effective and are therefore worth doing.

To maximise **return on investment** and **health improvement**, the following should be prioritised:

- **Web-based structured education**. This offers the highest return on investment and are very cost-effective.

- **Multidisciplinary foot-care services**. They have a rapid return on investment, and whilst a comprehensive UK cost-effectiveness analysis is lacking, it is very likely to be very cost-effective given the observed savings when implemented at pilot sites.

- **Take steps to improve uptake rates** for **structured education** everywhere, and **retinopathy screening** in Nottingham City in particular by:
    - Addressing **competing time pressures**. (Out-of-hours and weekend services, web-based structured education);
    - Address **transport difficulties**. (locating services closer to users, mobile screening units);
    - **Culturally adapt provision**. (Review translation service provision, web-apps in locally used languages, consult with the local community).

- For **retinopathy screening**, identify and target those people with diabetes who have **missed two consecutive years of screening** for more **intensive reminders and engagement**.

Amputations

In general, Clinical Commissioning Groups are experiencing a decrease in major amputations and an increase in minor amputations.

The recommendations relevant to amputations are:

Web-based structured education

Web-based structured education offers the highest returns on investment compared to other structured education. This is largely because of greatly increased accessibility and low cost of delivery.

Multidisciplinary foot care services

Multidisciplinary foot care services offer significant returns on investment as they are targeted at people with diabetes with foot ulcers who have a high risk of amputation. Organisational reconfigurations to streamline case finding and patient pathways will make better use of the skills of specialist staff to improve the outcomes for people with diabetes with foot problems.

Structured education

Taking steps to improve uptake of traditional structured education services can improve outcomes in those unable to use web-based structured education.

Vision Loss

Although in 2018, the estimated percentage of people with diabetes living with retinopathy, and severe retinopathy was lower in Nottinghamshire compared to England, all seven local authorities in Nottinghamshire fell below the national average for all forms of retinopathy.

In Nottingham city in particular, there is a low uptake of screening due to age, deprivation, distance and ethnicity.

Therefore, we recommend the following for vision loss and increasing uptake of screening.

Web-based structured education

Web-based structured education offers the highest returns on investment compared to other structured education. This is largely because of greatly increased accessibility and low cost of delivery.

Retinopathy screening

Retinopathy screening is cost-effective. With screening, a modest improvement in the rate of blindness can be seen.

Structured education

Taking steps to improve uptake of traditional structured education services can improve outcomes in those unable to use web-based structured education.

Chronic Kidney Disease

The prevalence of chronic kidney disease amongst people with diabetes in Nottinghamshire in 2017/18 was higher than for the average in England. NHS Nottingham City was the only CCG in England that fell below the England average.

Web-based structured education

Web-based structured education offers the highest returns on investment compared to other structured education. This is largely because of greatly increased accessibility and low cost of delivery.

Structured education
Taking steps to improve uptake of traditional structured education services can improve outcomes in those unable to use web-based structured education.

Appendix 1: Resources

- Public Health Local PCN Profiles: https://www.nottinghaminsight.org.uk/themes/health-and-wellbeing/primary-care-network-profiles/

- Nottinghamshire _PCN_Diabetes _Profiles: http://www.nottinghamnortheastccg.nhs.uk/wp-content/uploads/2020/02/Nottinghamshire_PCN_Diabetes_Profiles.pdf

- Population-level Interventions to Improve Health Care in People with Diabetes in Nottinghamshire – Full Version (January 2020): http://www.nottinghamnortheastccg.nhs.uk/wp-content/uploads/2020/02/Population-level-Interventions-to-Improve-Health-Care-in-People-with-Diabetes-in-Nottinghamshire-Jan-2020.pdf

- Supporting Document - Population-level Interventions to Improve Health Care in People with Diabetes in Nottinghamshire – Full Version (January 2020): http://www.nottinghamnortheastccg.nhs.uk/wp-content/uploads/2020/02/Supporting-document-Population-level-interventions-to-Improve-Health-Care-in-People-with-Diabetes-in-Nottinghamshire-Jan-2020.pdf

- ICHP Impactable Interventions - Short Summary (January 2020): http://www.nottinghamnortheastccg.nhs.uk/wp-content/uploads/2020/02/ICHP-Impactful-Diabetes-Summary.pdf

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