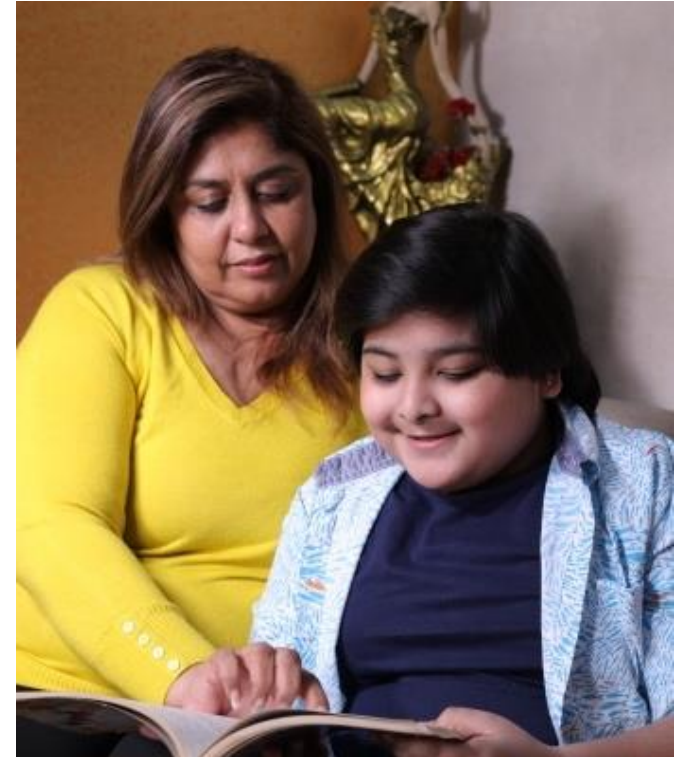


Obesity and T2DM in young people

Pooja Sachdev



Definitions

- BMI centile ≥ 85 and < 95 : Overweight
- BMI centile ≥ 95 (between 95 and 100): Obesity
- BMI centile ≥ 99.6
Severe obesity. *Note: this is a subset of "Obesity"*

<i>Adult BMI</i>	WHO Classification	Paediatric threshold (centile)
< 18.5	Underweight	2 nd
18.5-24.9	Normal weight	
25-29.9	Overweight	91 st
30-34.9	Class I obesity	98 th
35-39.9	Class II obesity	99.6 th
> 40	Class III obesity	$> +3.3$ SDS $> +3.5$ SDS

NCMP

- A child living with severe obesity (BMI SDS of 3.5) at the age of 4, who doesn't subsequently lose weight, has a life expectancy of 39 years⁴

Data Recording	
Measurement 1	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 2	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 3	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 4	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 5	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 6	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 7	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 8	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 9	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	
Measurement 10	
Recording Date	
Weight	
Length/Height	
BMI	
Location	
Health worker name	

BOYS UK Body mass index (BMI) 2-20 years

RCPCDH (DH) Department of Health
Royal College of Paediatrics and Child Health
Leading the way in children's health

The BMI centile is a simple and reliable indicator of thinness and fatness in childhood. Where severe over- or underweight is a concern, or where there is a need for monitoring over time, BMI can be calculated and plotted on this chart. It is important also to plot the height and weight separately on the main 2-18 chart. There is also a BMI centile look-up on the standard 2-18 chart for less complex cases.

BMI is calculated by dividing weight (in kg) by the square of height (in metres e.g. 1.32 m, not centimetres e.g. 132 cm).

A simple way to do this on a calculator or mobile phone is:

1. Enter the weight. 2. Divide by height. 3. Divide the result by height. The result can then be plotted on the chart below.

Please place six

Name: _____

NHS/CHI No: _____

Hospital No: _____

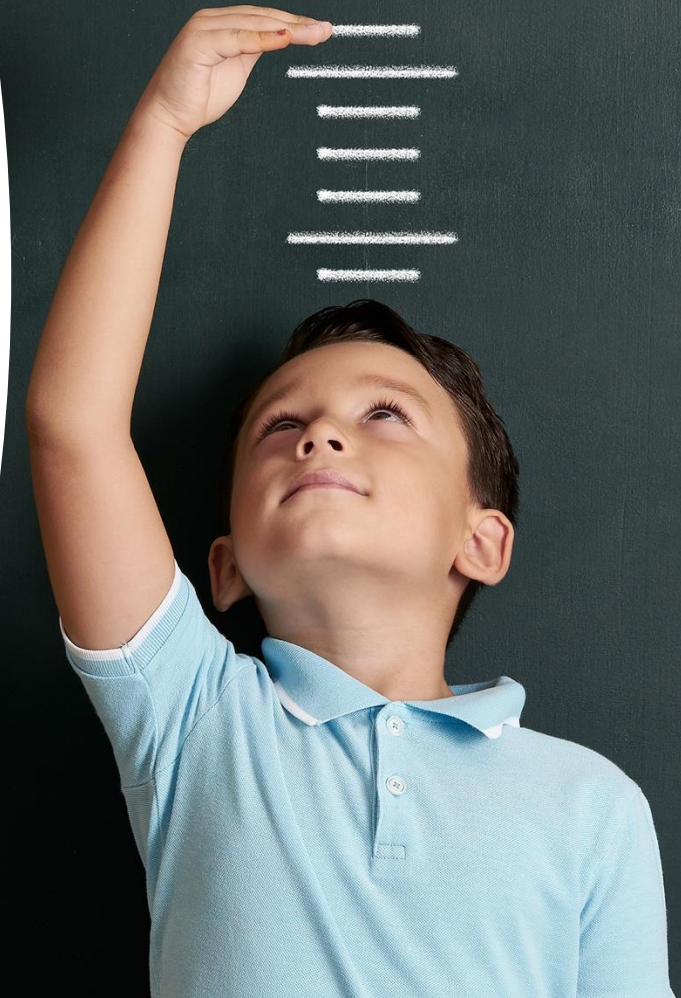
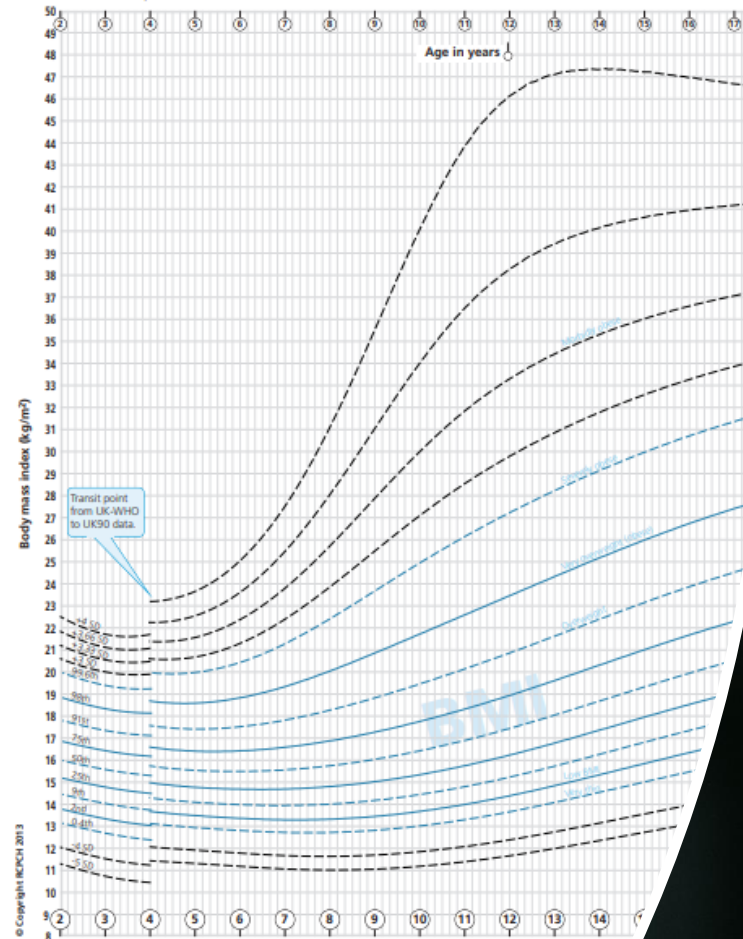
Date of Birth: _____

Overweight and obesity

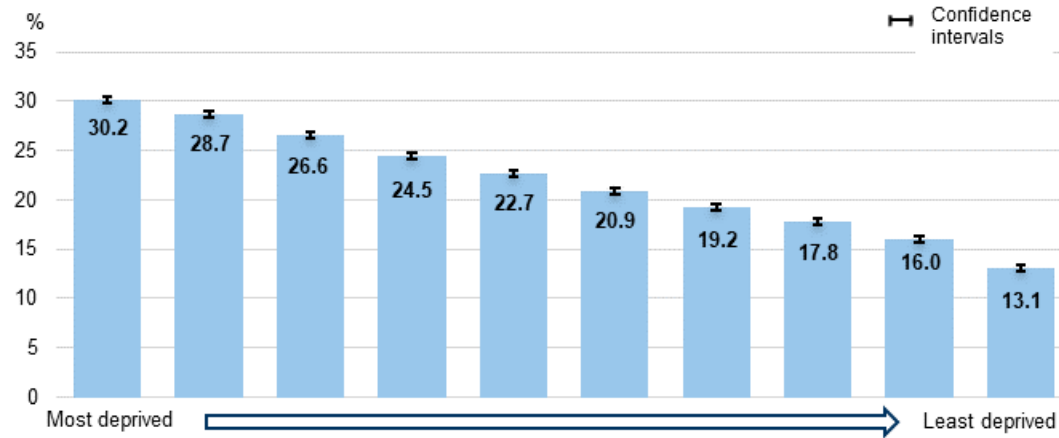
A BMI above the 91st centile suggests a child is very overweight (clinically obese) while a BMI below the 5th centile suggests a child is obese. In addition to the usual nine centile at +3, +3.33, +3.66 and +4 SD, which can be used in overweight treatment programs.

Thinness

A BMI below the 2nd centile is unusual and may simply reflect a small build. The chart also identifies those who are severely underweight. Children in these centiles are likely to have additional problems and a dietetic attention should be referred.

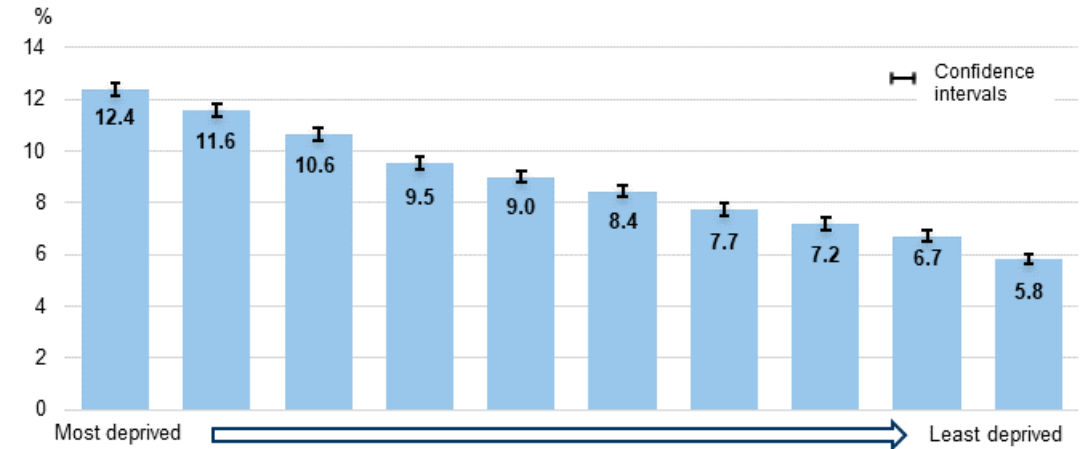


Obesity prevalence in Year 6 by IMD decile (based on postcode of child), 2022/23



For more information: Table 6a National Child Measurement Programme, England, 2022/23 School Year

Obesity prevalence in Reception by IMD decile (based on postcode of child), 2022/23

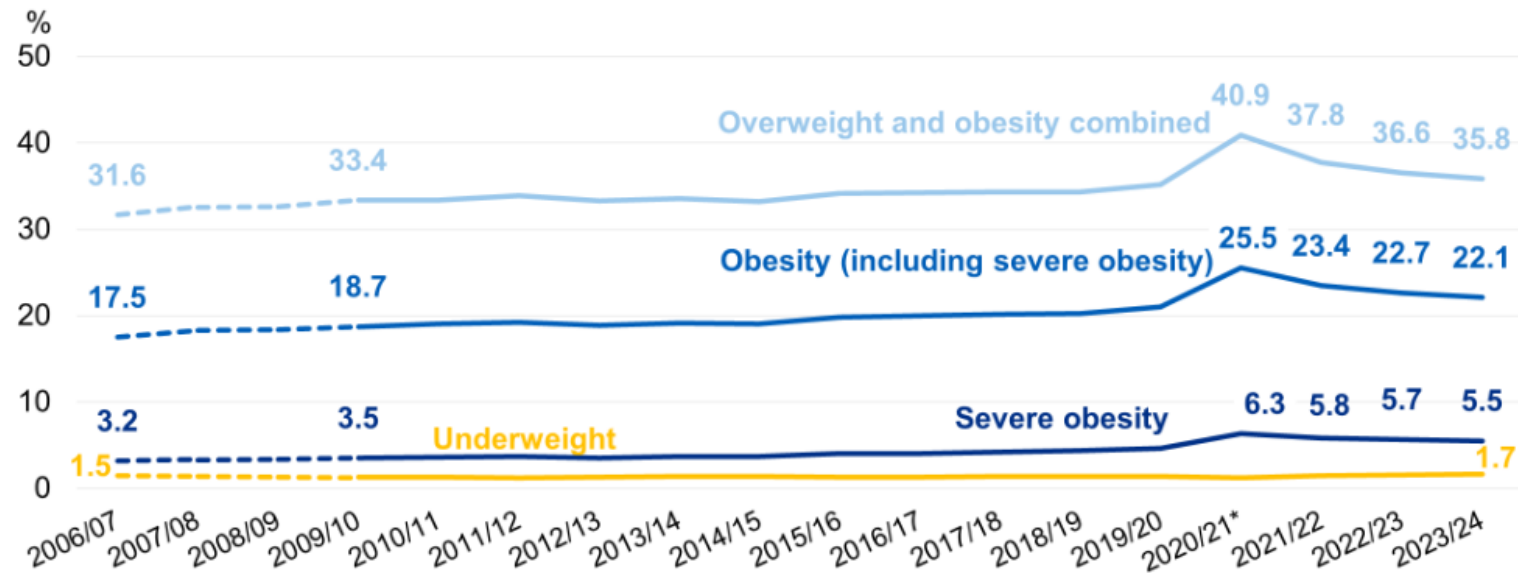


For more information: Table 6a National Child Measurement Programme, England, 2022/23 School Year

Obesity prevalence and deprivation

Time Series

BMI category prevalence in Year 6, 2006/07 to 2023/24



* Figures for 2020/21 are based on weighted data, see Methodology and Data Quality section in 2020/21 report for more information.

For more information: Table 2 National Child Measurement Programme, England, 2023/24 School Year

A collage of various ultra-processed foods. In the center is a hamburger with a sesame seed bun, lettuce, tomato, and cheese. To the right is a glass bowl of golden french fries. In the foreground, there are two donuts: one chocolate-glazed and one pink-glazed with white sprinkles. Behind the burger are several breadsticks. The background shows more food items, including what looks like a pizza or flatbread. The entire image is framed by blue geometric shapes on the left and right sides.

Ultra processed food

50-60% of UK diet is from UPF

Madruga M, Martínez Steele E, Reynolds C, Levy RB, Rauber F. Trends in food consumption according to the degree of food processing among the UK population over 11 years. Br J Nutr. 2023 Aug 14;130(3):476-483.

Appliance poverty in the UK

- 1.9 million people living without a cooker (1 in 20 earning under £35,000 a year)
- 2.8 million people living without a freezer
- 900,000 people living without a fridge
- 1.9 million people living without a washing machine

Obesity harms children and young people

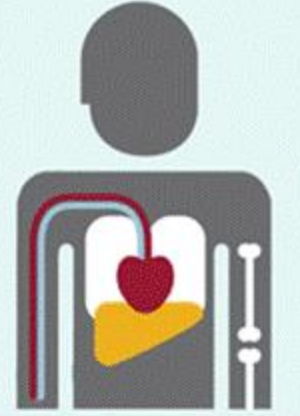


Emotional and
behavioural

- Stigmatisation
- bullying
- low self-esteem



School absence



- High cholesterol
- high blood pressure
- pre-diabetes
- bone & joint problems
- breathing difficulties



Increased risk of
becoming overweight
adults

Risk of ill-health and
premature mortality in
adult life

Strategies

- 2002: 5-a-day campaign
- 2006: Healthy start food vouchers
- 2007: Launch of Eatwell plate
- 2009: Change4Life launched
- 2011: CMO publishes activity guidance
- 2014: School Food Standards
- 2016: Childhood Obesity Plan for action (sugar tax and advertising restrictions)
- 2019 – Advancing our health in the 2020 (DH)
- 2019 ‘Whole systems approach to obesity’
- The NHS Long Term Plan
 - CYP Transformation programme
 - *‘Targeted funding will be available from 2021/22 to increase the capacity to treat obese children and the severe health complications related to their obesity’*



CEW Clinics

Ages 1–17.5 with obesity

BMI SDS ≥ 4 (age ≥ 12) or ≥ 5 (age 1–11)

Or BMI SDS ≥ 2.67 (or ≥ 2 for BAME) with one of the following:

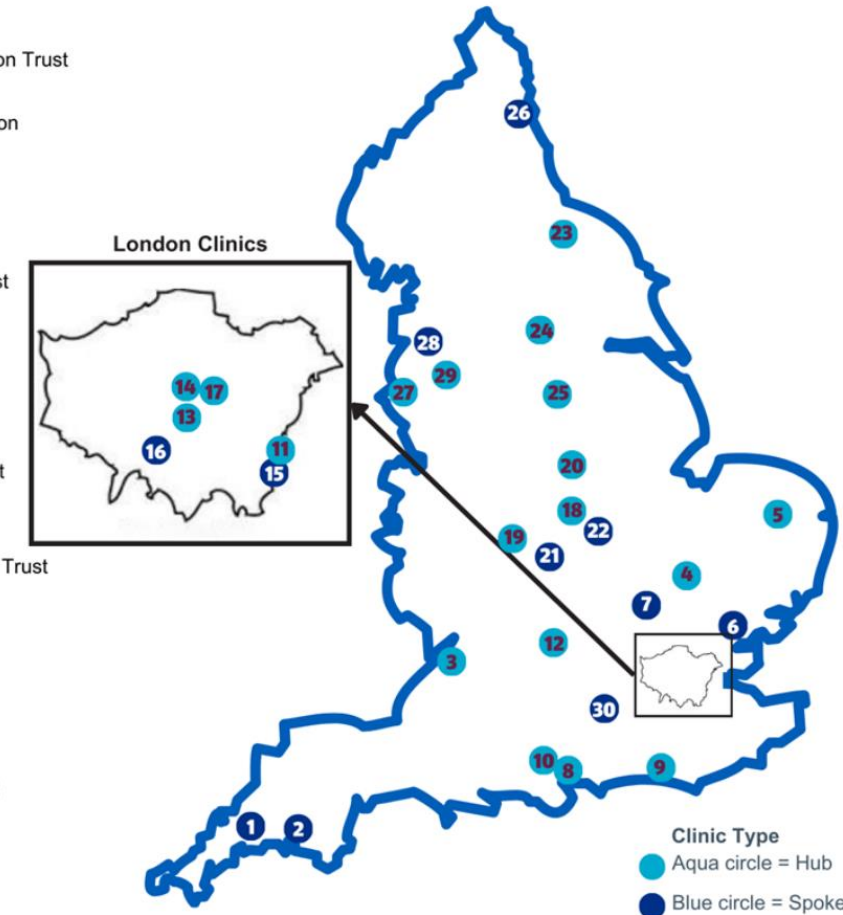
- Weight-related co-morbidity (e.g. MASLD, OSA, pre-diabetes...)
- Genetic/secondary cause of obesity
- On child protection plan
- Considered for bariatric surgery

Family and young person must be **willing to engage** (unless part of safeguarding)

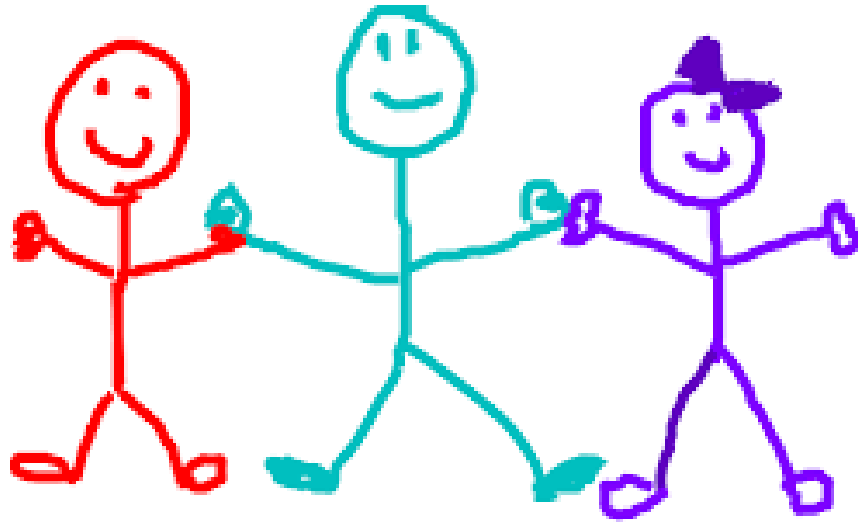


Complications from Excess Weight (CEW) Clinics

1. Royal Cornwall Hospitals Trust
2. University Hospital Plymouth NHS Trust
3. University Hospitals Bristol and Weston NHS Foundation Trust
4. Cambridge University Hospital Foundation Trust
5. Norfolk and Norwich University Hospital NHS Foundation
6. East Suffolk and North Essex NHS Foundation Trust
7. Bedfordshire Hospitals NHS Foundation Trust
8. Portsmouth Hospitals University NHS Trust
9. Brighton and Sussex University Hospitals NHS Trust
10. University Hospital Southampton NHS Foundation Trust
11. Dartford and Gravesham NHS Trust
12. Oxford Health NHS Foundation Trust
13. King's College Hospital NHS Foundation Trust
14. University College Hospital/GOSH
15. TBC Healthcare
16. St George's University Hospitals NHS Foundation Trust
17. Barts Health NHS Trust
18. University Hospitals of Leicester NHS Trust
19. Birmingham Women's and Children's NHS Foundation Trust
20. Nottingham University Hospitals
21. University Hospitals Coventry and Warwickshire
22. Kettering General Hospital NHS Foundation Trust
23. South Tees Hospitals NHS Foundation Trust
24. Leeds Teaching Hospitals NHS Trust
25. Sheffield Teaching Hospitals NHS Foundation Trust
26. Newcastle upon Tyne Hospitals NHS Foundation Trust
27. Alder Hey Children's NHS Foundation Trust
28. Lancashire Teaching Hospitals NHS Foundation Trust
29. Manchester University NHS Foundation Trust
30. Frimley Health NHS Foundation Trust



Patients



- 14-year-old 164kg
- 11-year-old 130kg
- 16-years-old 204kg
- 8 year old 80kg
- 4 year old 40kg

BMI SDS reduction of 0.25

- Decrease Systolic BP -3.2 mmHg (± 1.4)
- Diastolic BP -2.2 mmHg (± 1.1 mmHg)
- Triglycerides -6.9 (± 5.8 mg/dL) = 0.08 mmol
- Triglyceride/HDL (-0.3 ± 0.2)
- HDL Cholesterol +1.3 (± 1.2 mg/dL) = 0.03 mmol
- HOMA score -0.5 (± 0.3)

13 yr girl

50th centile for height
BMI = 40. Weight = 96 kg
Equivalent to reduction of
BMI= 38 & weight = 91 kg

Safeguarding within the context of obesity

- NICE and the RCPCH Child Protection Companion recognise 'nutritional neglect... from an unhealthy diet and lack of exercise leading to obesity
- **35%** children/families requiring specialist social worker input & support
- Child in Need
 - **10%** patient
- Child protection plans
 - **5%** patients



Context –NPDA Spotlight on T2

Diabetes

This article is more than 1 year old

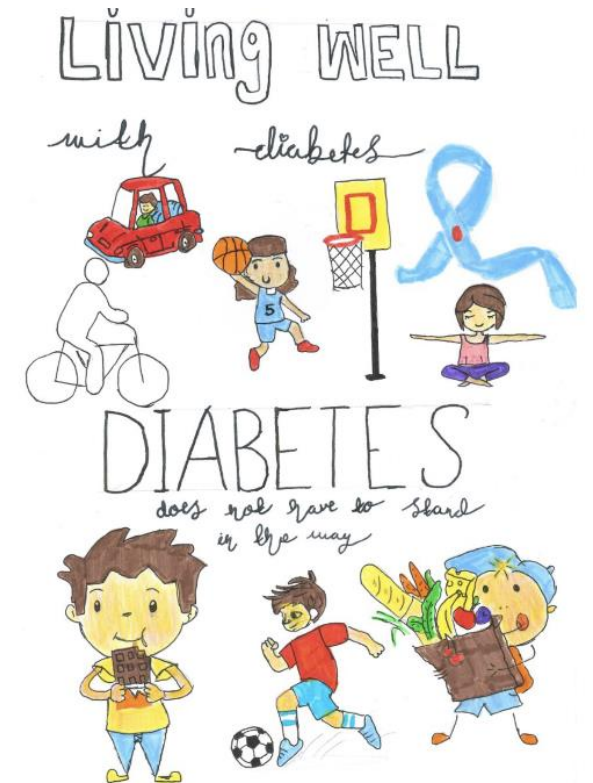
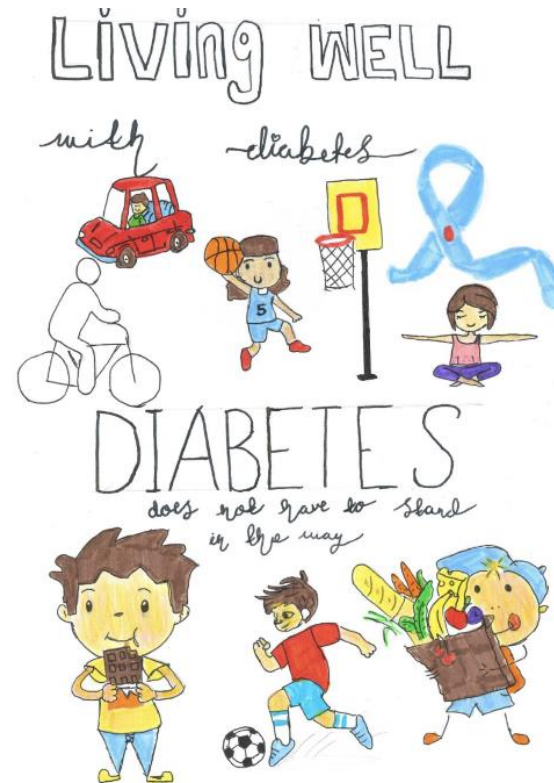
Child type 2 diabetes referrals in England and Wales jump 50% amid obesity crisis

Diabetes UK warns cost of living crisis could aggravate problem and accuses government of 'letting our children down'

Andrew Gregory

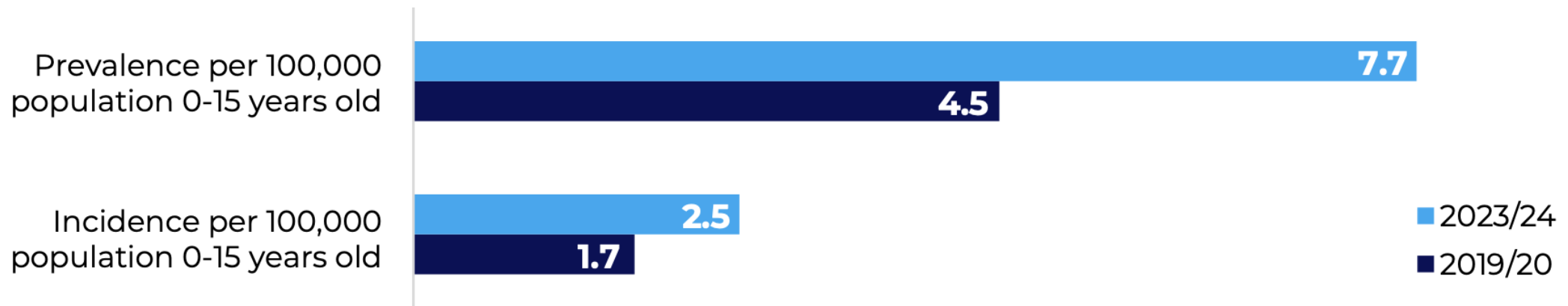
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Share



Incidence and prevalence T2D in CYP has increased

- The **number** of CYP with Type 2 diabetes **receiving care from a PDU** in England and Wales has **increased by 88%**, from **810 in 2019/20**, to **1,521 in 2023/24**.
- The **prevalence** of Type 2 diabetes (0-15 years) has increased to **7.7 per 100,000**, from **4.5 per 100,000 in 2019/20**. Currently, 4% of all diabetes in NPDA is T2D.
- The **incidence** of Type 2 diabetes (0-15 years) has increased to **2.5 per 100,000**, from **1.7 per 100,000 in 2019/20**.



Type 2 Diabetes in 0-15 yr olds is increasing worldwide (SWEET)

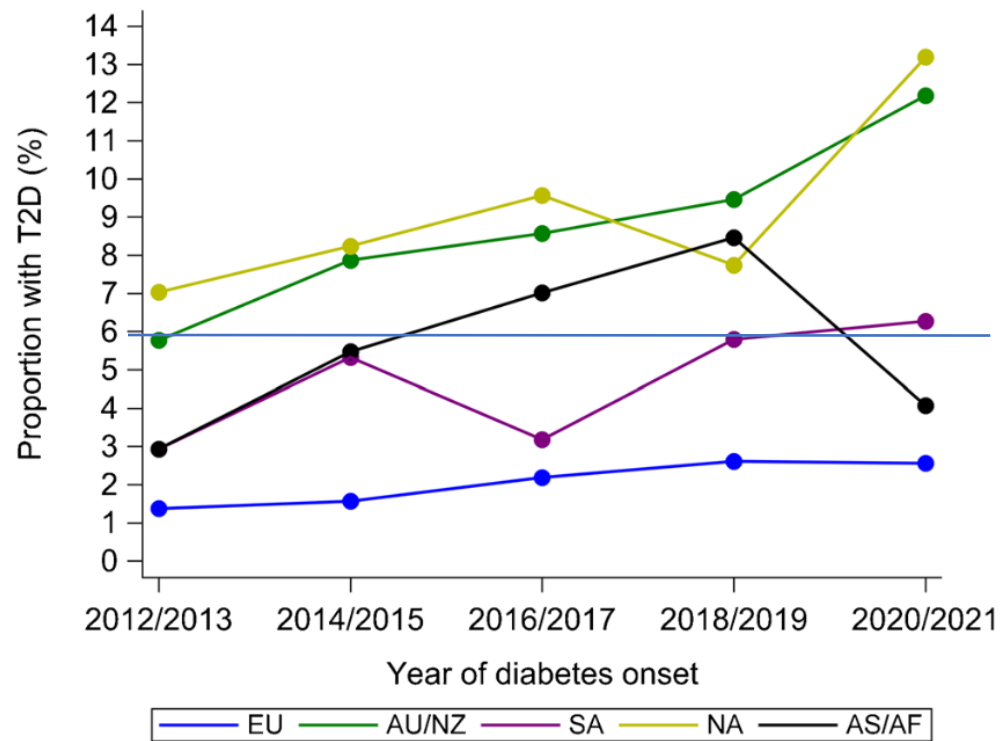
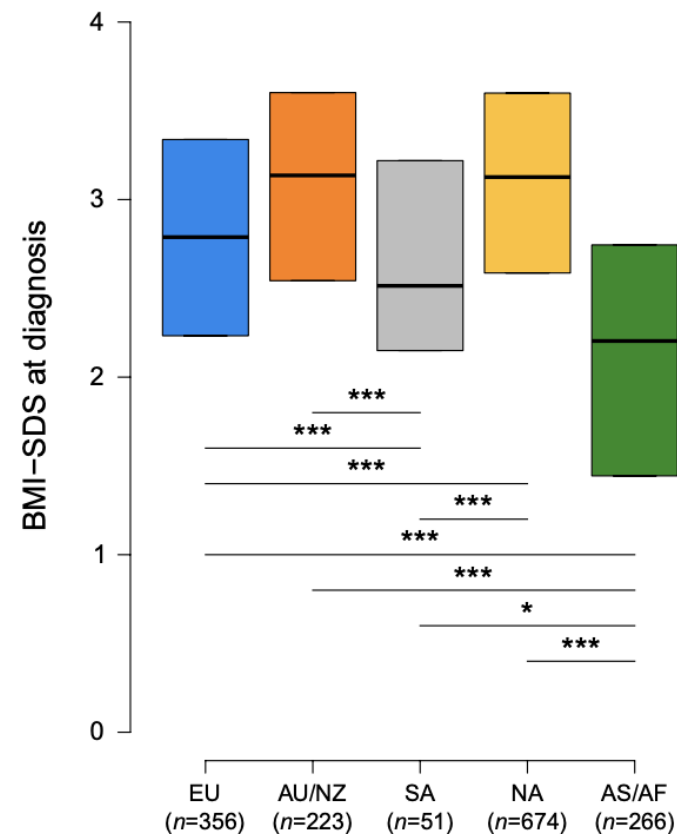


Fig. 3 Percentage of new patients with type 2 diabetes (T2D) among all diabetes cases by region and period of diagnosis



The SEARCH for Diabetes in Youth Study: Rationale, Findings, and Future Directions-

Diabetes Care.2014 Nov 8;37(12):3336–3344. doi: [10.2337/dc14-0574](https://doi.org/10.2337/dc14-0574)

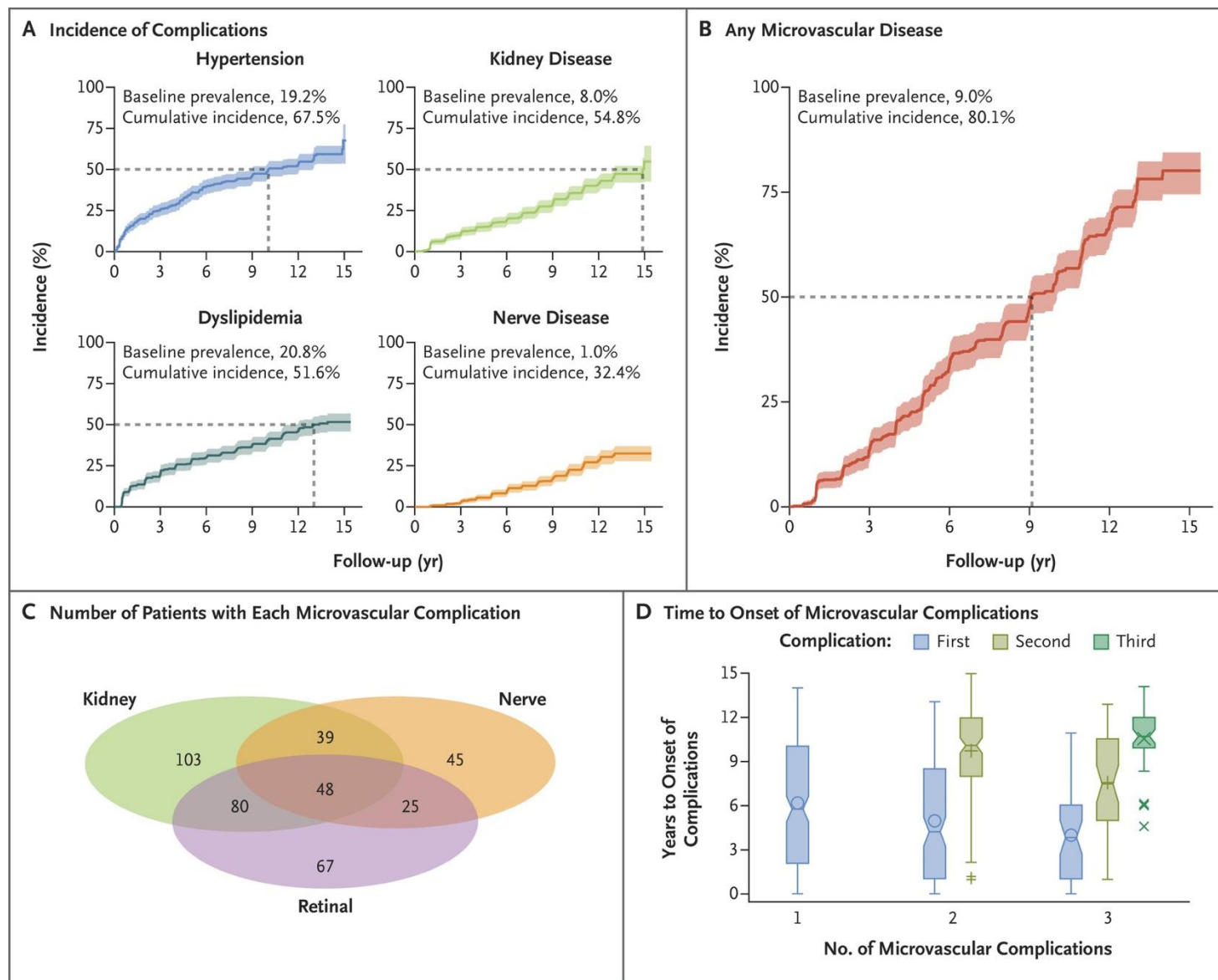
For youth with type 2 diabetes, nearly 20 percent developed a sign of kidney disease by the end of the study, compared to about 6 percent of youth with type 1 diabetes.

For youth with type 2, about 18 percent developed nerve disease, versus about 9 percent with type 1.

For youth with type 2, about 9 percent developed eye disease, compared to about 6 percent of youth with type 1.

Measures for two risk factors for heart disease (hypertension and arterial stiffness) were greater for youth with type 2 but close to equal for a third risk factor (cardiovascular autonomic neuropathy).

TODAY Study Group; Zeitler P, Hirst K, Pyle L, et al. “Long-Term Complications in Youth-Onset Type 2 Diabetes.” *N Engl J Med*. 2021;385:416–426. DOI: 10.1056/NEJMoa2100165 .

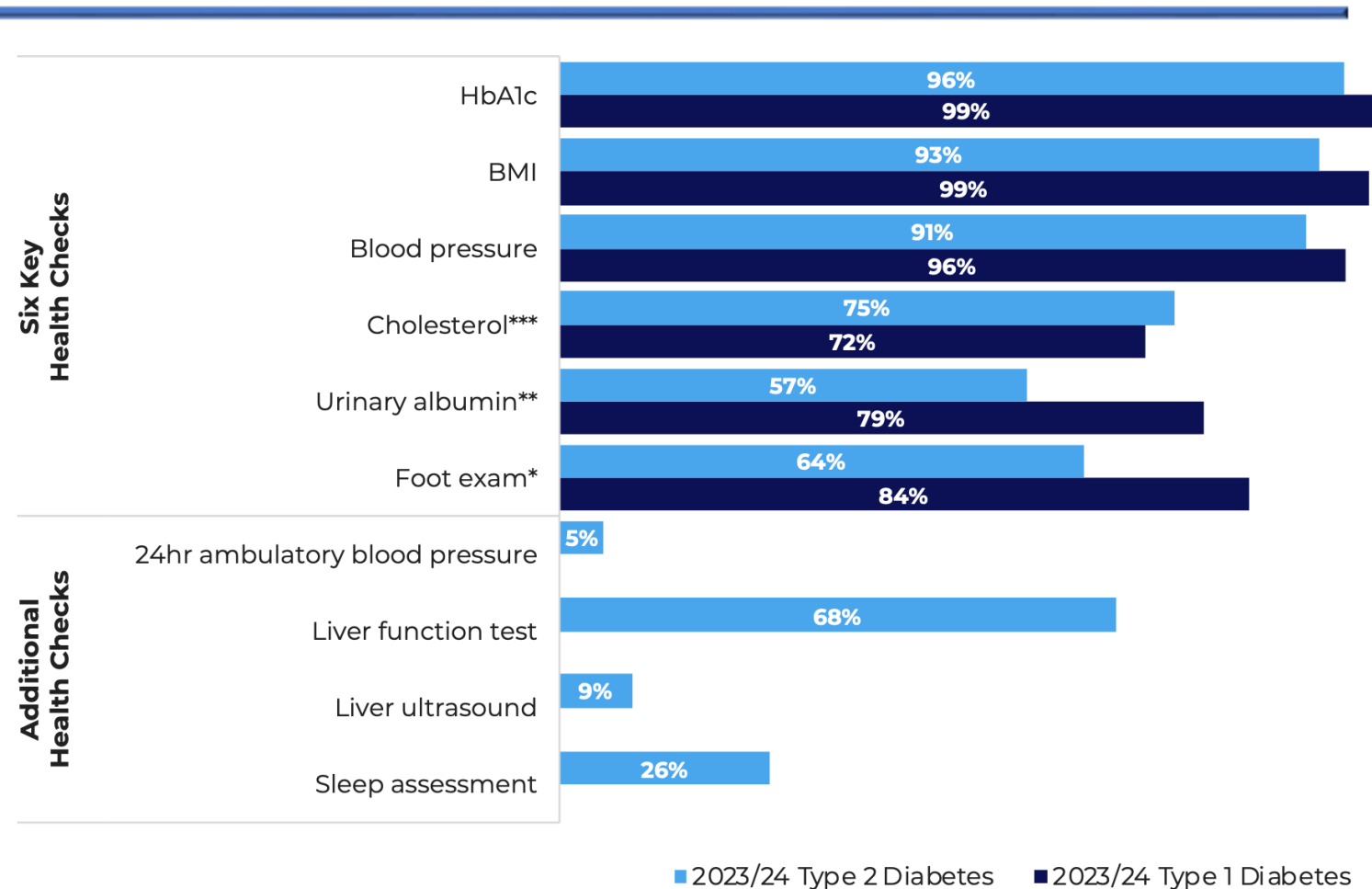


More complications in T2D vs T1D (2023/24)

TYPE 1 DIABETES		TYPE 2 DIABETES
28% (aged 12 and above) had a diastolic or systolic blood pressure in the hypertensive range (>98th centile after correction for age and gender), compared to 30% in 2022/23.		46% (all ages) had a diastolic or systolic blood pressure in the hypertensive range (>98th centile after correction for age and gender), compared to 47% in 2022/23.
19% (aged 12 and above) had a total blood cholesterol of 5mmol/l or higher, compared to 20% in 2022/23. <i>(Cholesterol is no longer included in the health checks specified for Type 1 diabetes by NICE, however the NPDA continues to report the outcomes of the cholesterol tests undertaken and submitted as some PDUs consider it to merit continuing scrutiny).</i>		32% (all ages) had a total blood cholesterol of 5mmol/l or higher, compared to 30% in 2022/23.
42% (all ages) were overweight or obese (BMI>85 th centile after correction for age and gender), compared to 42% in 2022/23.		94% (all ages) were overweight or obese (BMI >85th centile after correction for age and gender), compared to 94% in 2022/23.
11% (aged 12 and above) had an abnormal retinopathy screen, compared to 11% in 2022/23.		7% (aged 12 and above) had an abnormal retinopathy screen, compared to 6% in 2022/23.
10% (aged 12 years and above) had micro- or macro- albuminuria, compared to 10% in 2022/23.		21% (all ages) had micro- or macro-albuminuria, compared to 21% in 2022/23.

Health care checks

- Health check completion ranged from **17% to 100%** at PDU-level.
- Only **36%** of CYP with T2D < 12 years received all five key health checks; **41%** of CYP > 12 yrs had all six key health checks (vs 66% in T1D)
- HbA1c, BMI and BP slightly lower completion rates than T1D
- Urine albumin and foot exam lowest rate
- US liver, sleep test very low rates
- Similar between ethnicities/deprivation



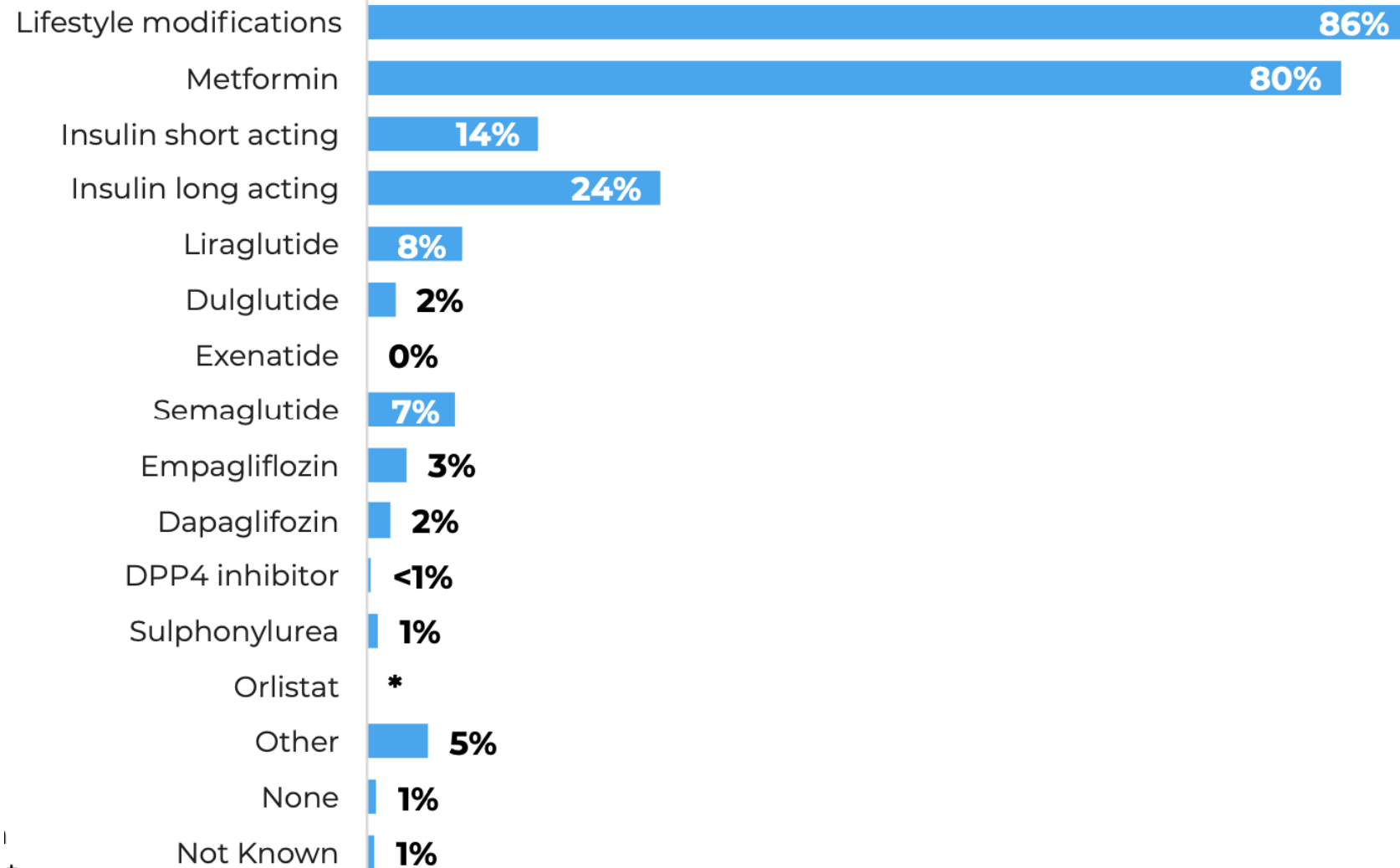
* CYP aged 12 and above

** CYP aged 12 and above for Type 1 diabetes, and all ages for Type 2 diabetes.

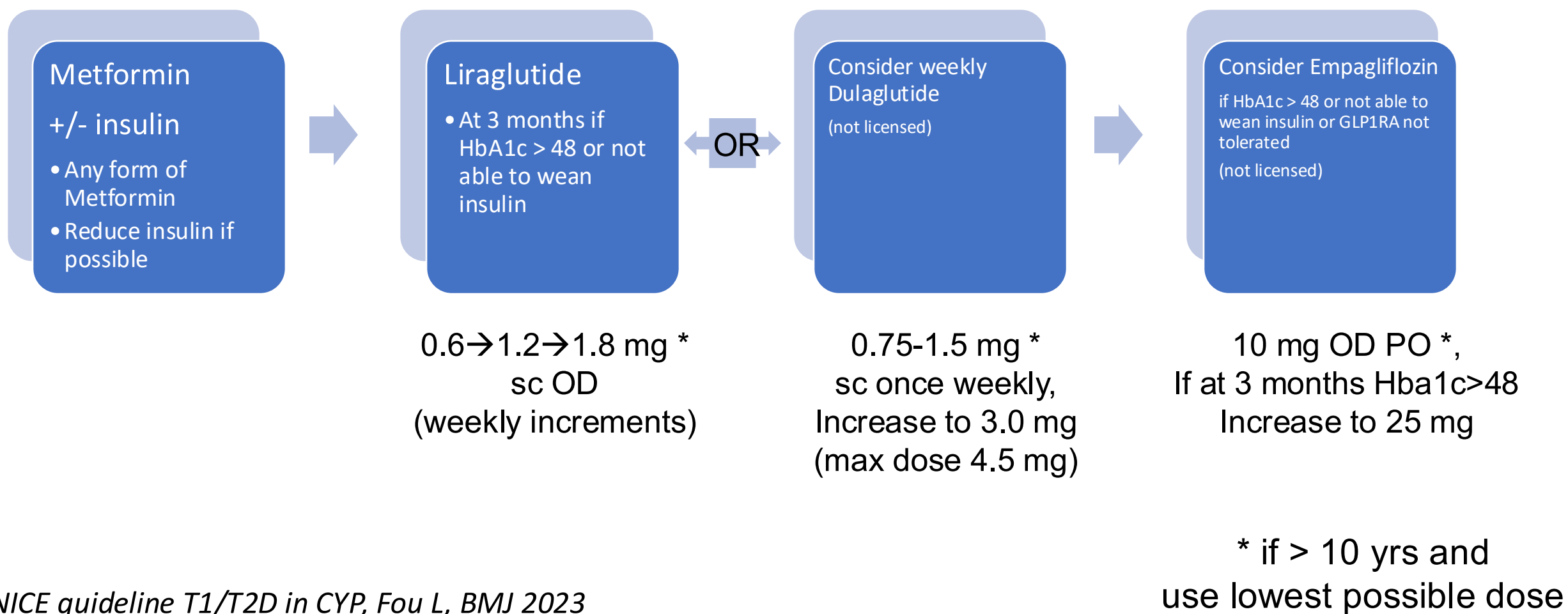
*** Cholesterol is only a key health check for CYP with Type 2 diabetes.

Medication

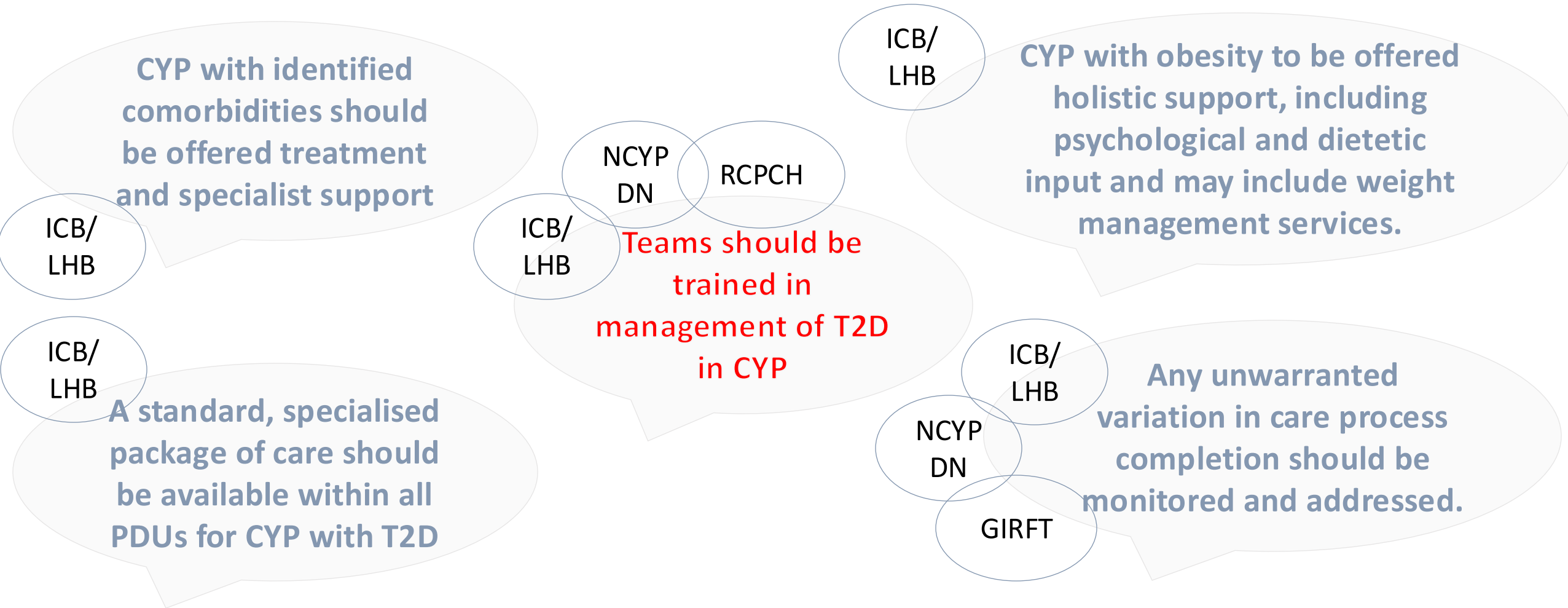
- 80% Metformin
- 25% long-acting insulin
- 17% GLP1 agonists (mostly liraglutide and semaglutide)
- 5% SGLT2 inhibitors



Algorithm for drug treatment in CYP with T2D



Recommendations



Current work streams

- National T2 Working Group-2019
- ACDC and T2 Working Group guidelines-2022-update due
- NHS-E e learning
- Peer support sessions for networks-2023
- APLS style Education and Training-2025
- Structured Education-SEREN, LDC
- Research –SURMOUNT-ADOLESCENTS -2, LEGEND, PIONEER TEENS



LEGEND Study

Low Energy diet in adolescents with type 2 Diabetes and obesity



- Same as DiRECT study but in young people
- Young people are different from adults
 - Will young people be motivated to try a low-calorie diet and join a study?
 - Will young people be able to stick to the low-calorie diet successfully?
 - Will weight loss through low-calorie diet lead to remission?
- With support from own diabetes team
- Feasibility-recruitment and retention

What would work?

Friends
support

'My parents making
sure I do it'

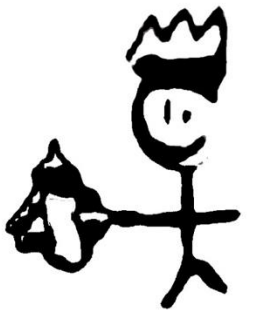
Having a variety of
options for meals

A countdown to
starting the diet

Allowed to be
home for the first
few days

A 'healthy food
celebration' at the
end

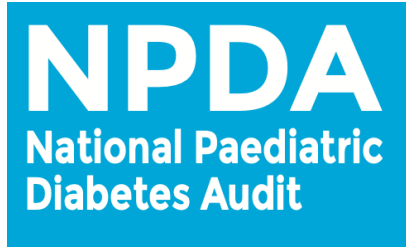
Rewards and reminders



Future

- Increasing numbers of patients.
- Importance of networks to ensure excellent MDT care provided close to home.
- Importance of investigations and screening
- Increasing availability / experience of oral hypoglycaemic agents and injectables.
- Lower threshold for referral / treatment of comorbidities.
- Possibility of Diabetes Remission

Acknowledgement



- All units for collecting data, YPAG, CYP
- HQIP – NPDA – RCPCH
- Prof Justin Warner, NPDA Clinical Lead
- Amani Krayem, NPDA Project Manager
- National Paediatric Diabetes Audit Project Board
- Dr Fiona Campbell, National Paediatric Diabetes Audit Methodology and Dataset Working Group
- Type 2 Diabetes Working Group
- SWEET Consortium and Rosaria Gesuita (Ancona, Italy)
- CYP Transformation team, NHS-E
- Slides from Dr Wood, CEW Fellow and Dr Evelien Gevers