

Annual report 2020-21: Care processes and outcomes

Appendix 1 - full audit analysis



NPDA National report 2020/21:

Care processes and outcomes

Appendix 1: Full audit analysis

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1. Characteristics, prevalence, and incidence

1.1 Audit cohort

A total of 31,615 children and young people with diabetes were included in the 2020/21 audit.

Table 1 shows the breakdown by age group and type of diabetes.

Table 1: Number of children and young people with diabetes by age-group and type of diabetes in 2020/21.

| | 0-4 years | 5-9 years | 10-14 years | 15-19 years++ | 20-24 years ++ | Total | % of cohort |
|-----------------------------------|-----------|-----------|-------------|---------------|----------------|--------|-------------|
| Type 1 diabetes | 1,570 | 6,331 | 12,598 | 9,372 | 21 | 29,892 | 94.6% |
| Type 2 diabetes | 0 | 17 | 367 | 589 | 0 | 973 | 3.1% |
| Cystic fibrosis-related diabetes | 17+ | | 87 | 88+ | | 192 | 0.6% |
| Monogenic forms of diabetes | 14 | 28 | 59 | 61 | 0 | 162 | 0.5% |
| Other specified diabetes mellitus | 29 | 55 | 128 | 97+ | | 309 | 1.0% |
| Not specified diabetes mellitus | 10 | 17 | 34 | 26+ | | 87 | 0.3% |

+ Results merged to mask number <5

++ The NPDA recognises that transition to adult diabetes services usually starts in a patient's late teenage years. The numbers presented in these columns represents the number still receiving care from a PDU and does not represent the total number of young people with diabetes in these age groups in England and Wales.

1.2 Characteristics of children and young people with Type 1 diabetes

1.2.1 Age and sex

Figure 1 shows the number of children and young people with Type 1 diabetes by sex and age in whole years at the beginning of the audit period. The distribution by age and sex is consistent with previous years. The number of children increases with age up to the age of 15, when many young people start to transition to adult services. Boys account for 52.7% of the sample.

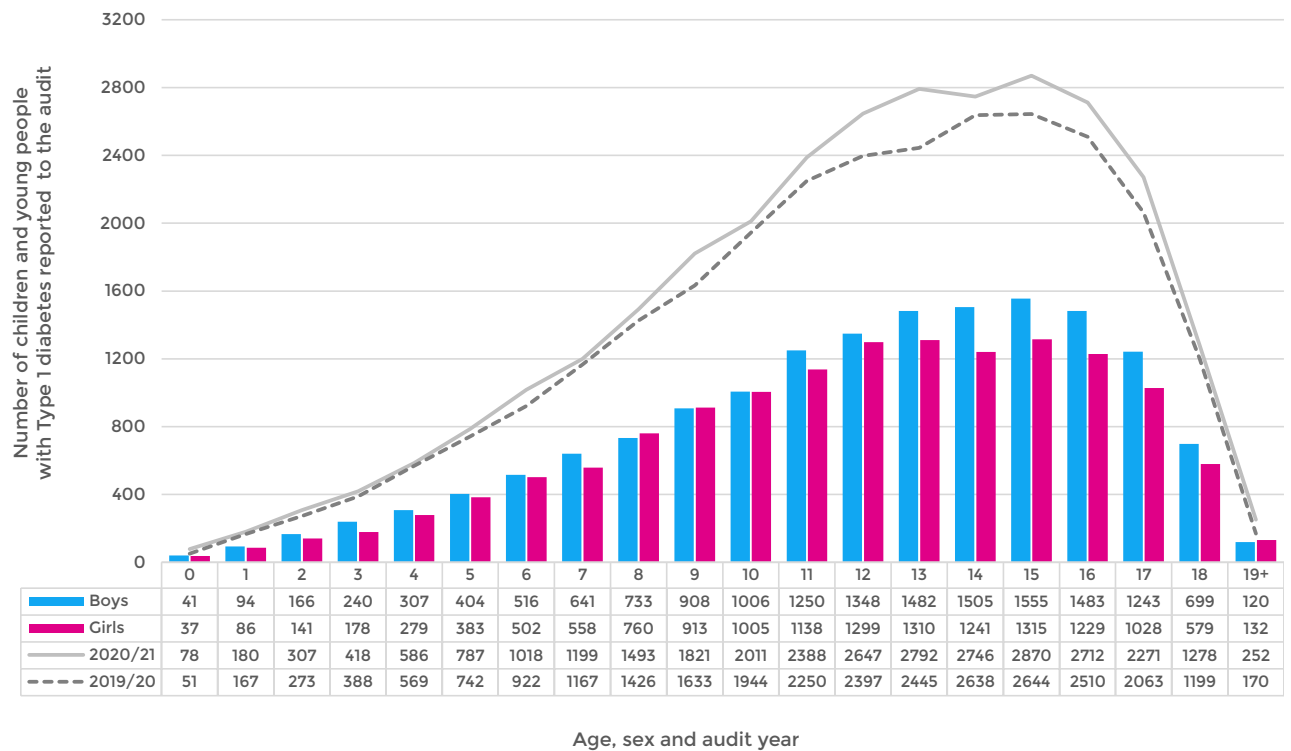


Figure 1: Total number of children and young people with Type 1 diabetes broken down by age and sex, 2019/20 – 2020/21

1.2.2 Regional distribution of children and young people with Type 1 diabetes

Table 2 shows the number of children and young people with Type 1 diabetes by age category included in the 2020/21 audit overall and by country and regional network. Children and young people were allocated to a region and country based on the last paediatric diabetes unit (PDU) that they attended within the audit year.

Table 2: Number of children and young people with Type 1 diabetes by country, region and age group, 2020/21

| Region/Country | 0-4 years | 5-9 years | 10-14 years | 15-19 years | 20-24 years | Total | (% of cohort) |
|------------------------------|-----------|-----------|-------------|-------------|-------------|--------|---------------|
| England and Wales | 1,570 | 6,331 | 12,598 | 9,372 | 21 | 29,892 | 100.0% |
| England | 1,496 | 6,033 | 11,905 | 8,974 | 21 | 28,429 | 95.1% |
| Wales | 74 | 298 | 693 | 398 | 0 | 1,463 | 4.9% |
| | | | | | | | |
| East Midlands | 113 | 449 | 870 | 672+ | | 2,104 | 7.0% |
| East of England | 194 | 699 | 1,350 | 1,007+ | | 3,252 | 10.9% |
| London and South East + | 327 | 1,381 | 2,762 | 2,106+ | | 6,579 | 22.0% |
| North East and North Cumbria | 94 | 358 | 709 | 524 | 0 | 1,685 | 5.6% |
| North West | 200 | 776 | 1,607 | 1,093 | 8 | 3,685 | 12.3% |
| South Central + | 143 | 630 | 1,145 | 871 | 0 | 2,790 | 9.3% |
| South West | 121 | 503 | 1,002 | 683+ | | 2,309 | 7.7% |
| West Midlands | 153 | 671 | 1,296 | 1,012+ | | 3,132 | 10.5% |
| Yorkshire and Humber | 142 | 566 | 1,164 | 1,019+ | | 2,893 | 9.7% |

+ Results merged to mask numbers <5

1.2.3 Ethnicity

The ethnic breakdown of the children and young people with Type 1 diabetes reported to the 2020/21 audit is shown in Table 3. Percentages are also shown excluding 'not stated' and 'unknown' categories to allow for comparison with the 2011 census data. The distribution of Type 1 diabetes by ethnic status is similar to the background population.

Table 3: Ethnic groups of children and young people with Type 1 diabetes in England and Wales, 2020/21

| | No. of children and young people with T1 diabetes | Total (% of cohort) | % of total with known and stated ethnicity | % of total population** |
|------------|---|---------------------|--|-------------------------|
| White | 23,715 | 79.3% | 83.3% | 86.0% |
| Asian | 1,991 | 6.7% | 7.0% | 7.5% |
| Black | 1,182 | 4.0% | 4.1% | 3.3% |
| Mixed | 903 | 3.0% | 3.2% | 2.2% |
| Other | 691 | 2.3% | 2.4% | 1.0% |
| Not stated | 799 | 2.7% | - | - |
| Not known | 611 | 2.0% | - | - |

*Percentage of total population in 2011 England and Wales Census

1.2.4 Deprivation

Table 4 shows the number and percentages of children and young people with Type 1 diabetes by deprivation quintile in 2020/21 based on patient postcode and the English (IMD, 2019) and Welsh (WIMD, 2019) indices of multiple deprivation. Percentages are also shown excluding missing values to allow for comparison with the breakdown of the general population aged 0 to 19 years old in England and Wales (ONS, 2019).

The deprivation breakdown shows a higher proportion of children and young people with Type 1 diabetes living in the most deprived quintile. This is consistent with the distribution of the general population aged 0 to 19 years old in England and Wales.

Table 4: Percentage and number of children and young people with Type 1 diabetes by deprivation quintile, 2020/21

| Deprivation quintile | Total | % of cohort | % of total with known deprivation | % of children and young people aged 0-19 yrs old (England and Wales)+ |
|-----------------------|-------|-------------|-----------------------------------|---|
| Most deprived | 6,786 | 22.7% | 22.7% | 23.7% |
| Second most deprived | 6,069 | 20.3% | 20.3% | 20.7% |
| Third least deprived | 5,659 | 18.9% | 19.0% | 19.0% |
| Second least deprived | 5,682 | 19.0% | 19.0% | 18.1% |
| Least deprived | 5,665 | 19.0% | 19.0% | 18.5% |
| Missing | 31 | 0.1% | - | - |

+Percentage of general population aged 0 to 19 years old in England and Wales. Calculations made using the "Lower layer Super Output Area population estimates" from the Office for National Statistics, mid-year 2020.

1.3 Prevalence and incidence of Type 1 diabetes

1.3.1 Prevalence

Figures 2 and 3 show the prevalence rates of Type 1 diabetes in children and young people aged 15 and below by sex and by age group, over the last seven audit years respectively.

The estimated prevalence rate of Type 1 diabetes in England and Wales was 204.5 per 100,000 of the general population. It was slightly higher among boys (208.3 per 100,000) compared to girls (200.4 per 100,000), with no appreciable change over the last seven audit years.

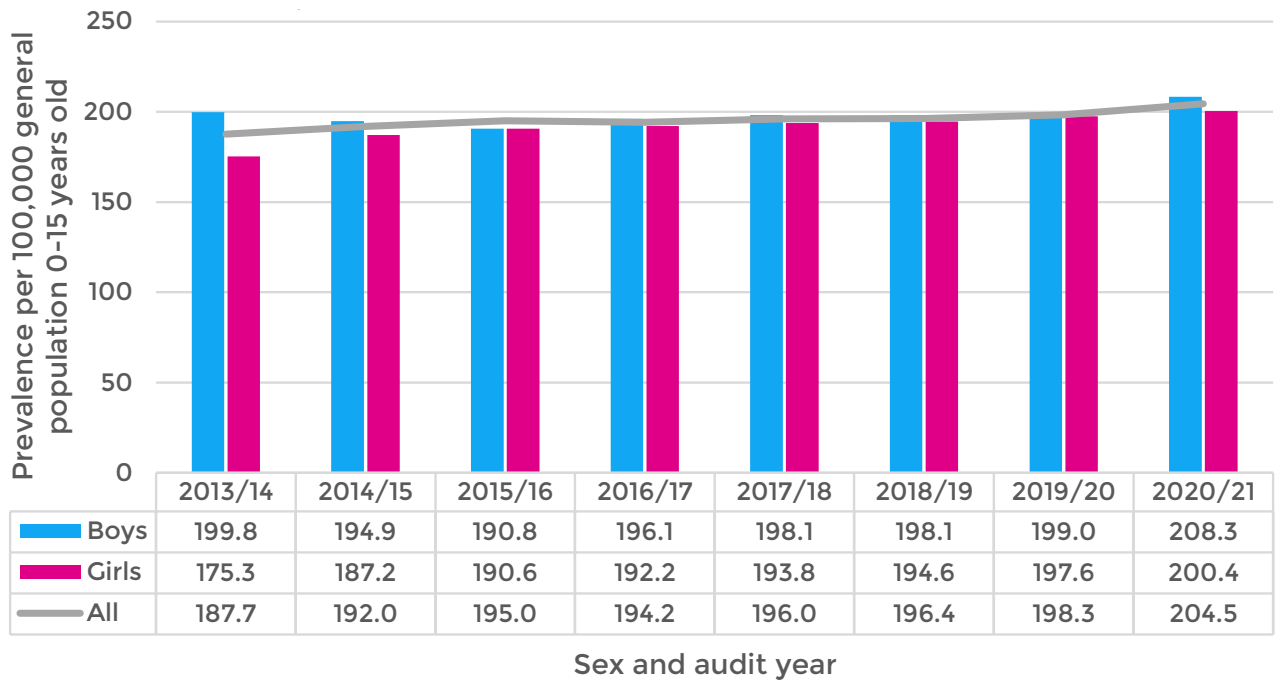


Figure 2: Prevalence of Type 1 diabetes per 100,000 general population among children aged 0-15 years by age and sex, 2013/14 to 2020/21.

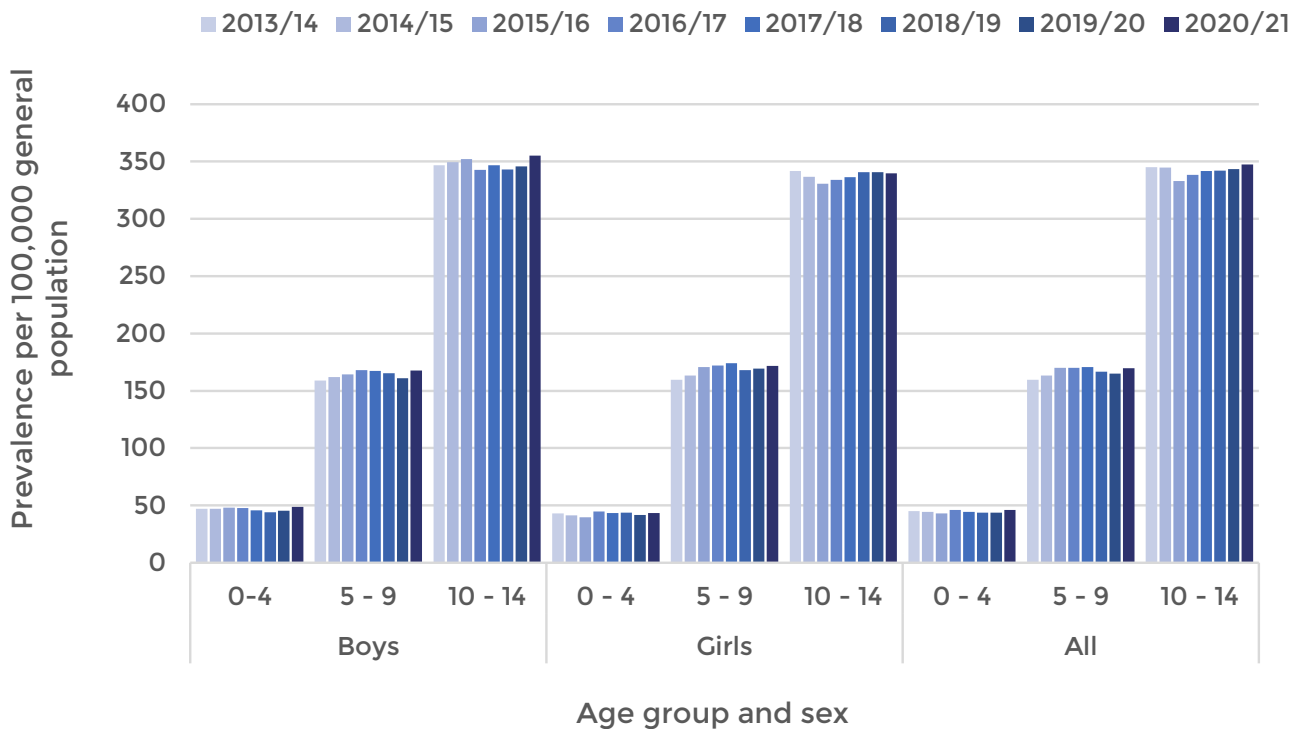


Figure 3: Prevalence of Type 1 diabetes per 100,000 general population by age group and sex, 2013/14 to 2020/21

1.3.2 Incidence

In 2020/21 there were 3,662 children and young people newly diagnosed with Type 1 diabetes, of whom 3,526 (96.3%) were aged 0-15 years old¹. This is 789 more than the average number newly diagnosed and being managed in a PDU between 2013/14-2019/20 (2873). By comparison, the mean number of children and young people with all types of diabetes being managed within a PDU in 2020/21 was 185.

Figure 4a shows the incidence of Type 1 diabetes among boys and girls aged 0-15 years, from 2013/14 to 2020/21. It shows an increase in both girls and boys in 2020/21 (a 27.4% increase in boys and a 12.6% increase in girls) compared to 2019/20.

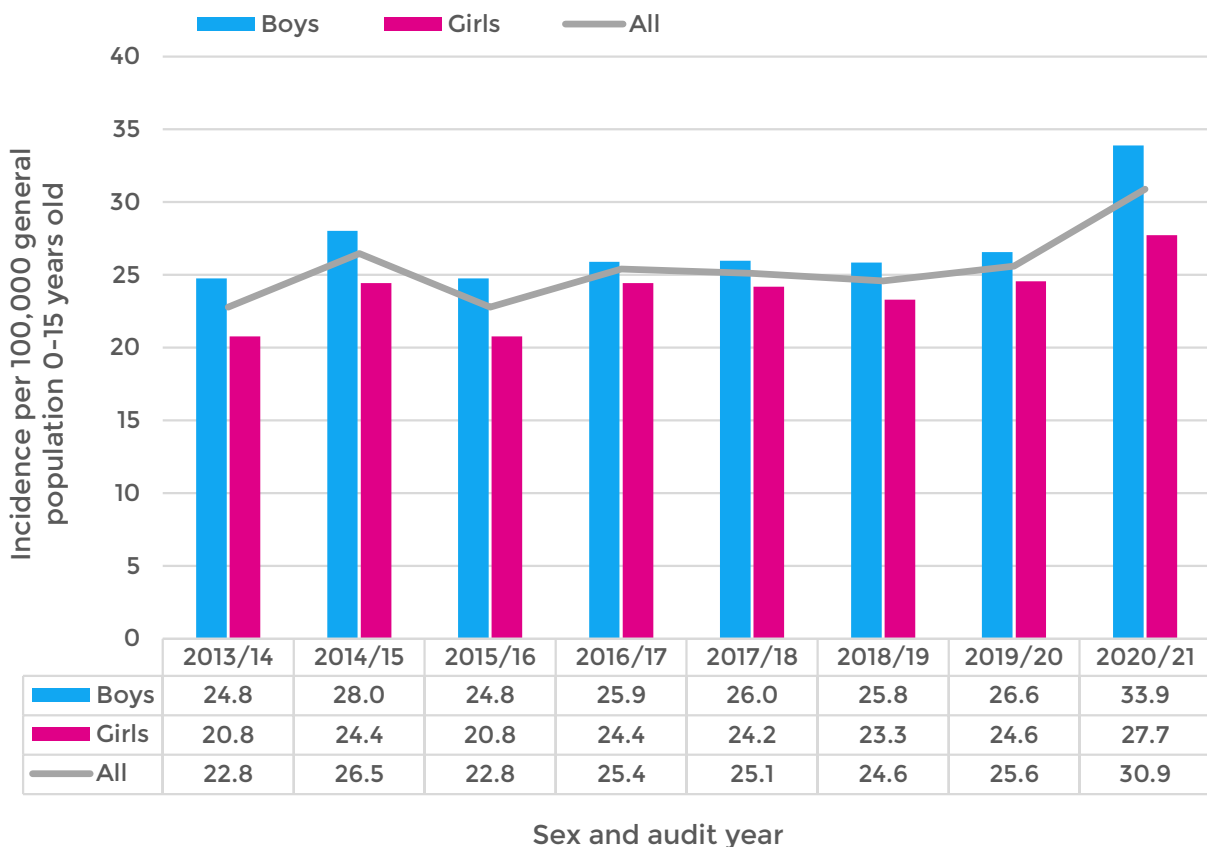


Figure 4a: Incidence of Type 1 diabetes per 100,000 general population among children aged 0-15 years by sex, 2013/14 to 2020/21

Figure 4b shows that the consistent seasonal pattern of new diagnoses of Type 1 diabetes amongst all children and young people receiving care from a PDU observed in previous audit years was disrupted in 2020/21. The reason for this is not known.

¹ The NPDA and the [National Diabetes Audit \(NDA\)](#) have undertaken a quality assurance exercise around case ascertainment of new cases of Type 1 diabetes. The NPDA collects data on children and young people with diabetes from PDUs where care is provided whereas the NDA collects data from the General Practice Extraction Service (GPES) covering whole populations. Although there are slight differences in the number of new cases from these two data sources, the increasing incidence is demonstrated in both, thus validating the data for audit and QI purposes.

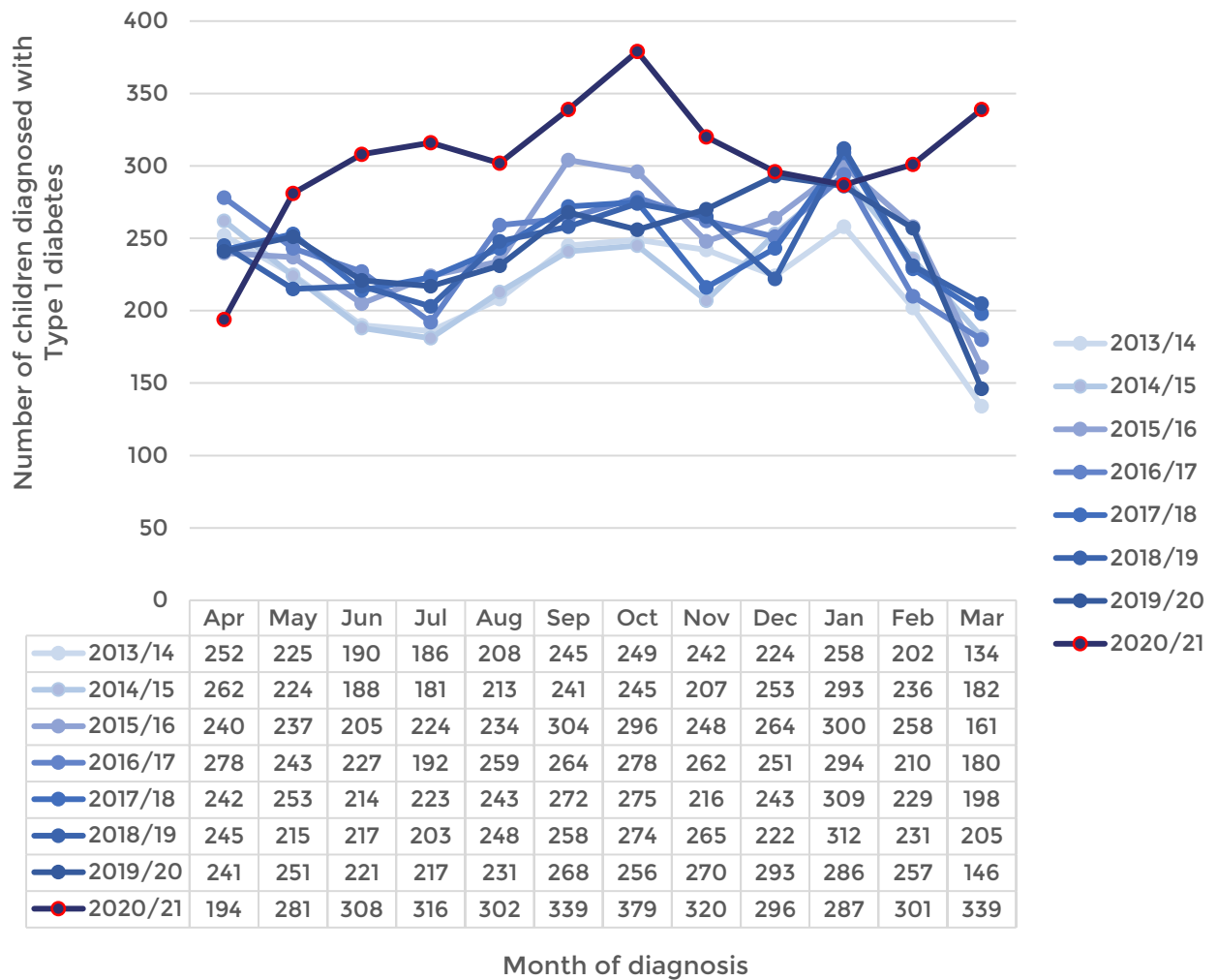


Figure 4b: Number of new cases of Type 1 diabetes amongst children and young people receiving care from a PDU by month, 2013/14-2020/21

Figure 5 shows the breakdown of the age at diagnosis for both boys and girls with Type 1 diabetes in 2020/21.

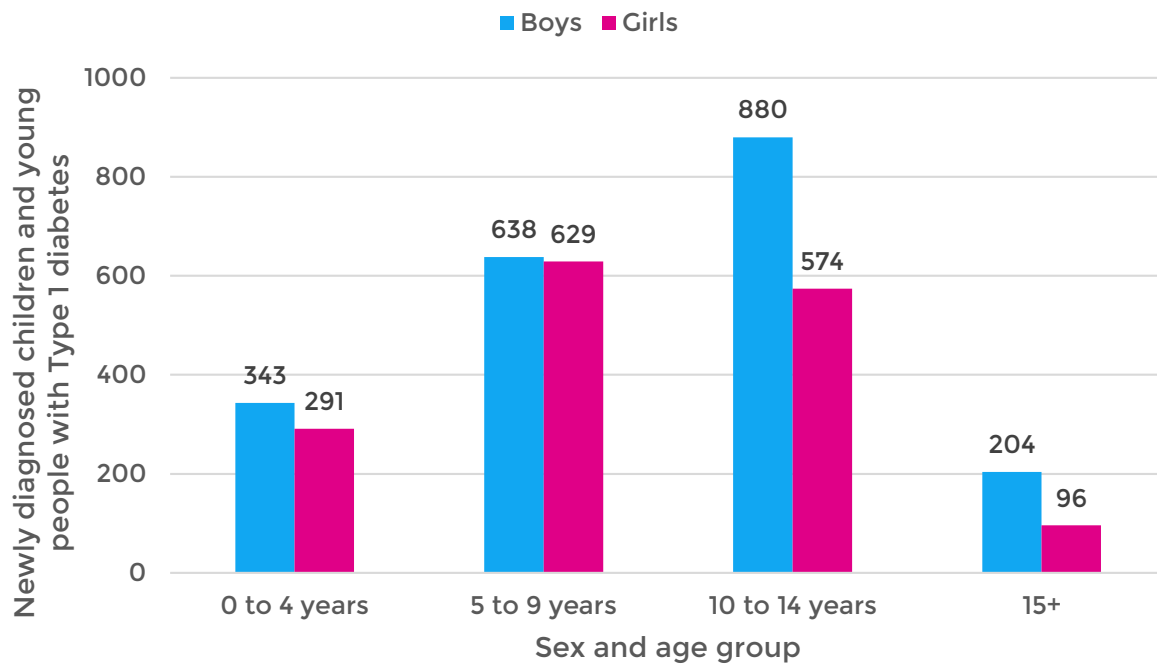


Figure 5: Newly diagnosed children and young people with Type 1 diabetes by age group and sex, 2020/21

Figure 6 shows an increase in incidence of Type 1 in 2020/21 compared to all previous audit years in each age group, and in both boys and girls, with the highest incidence amongst boys aged 10-14 years.

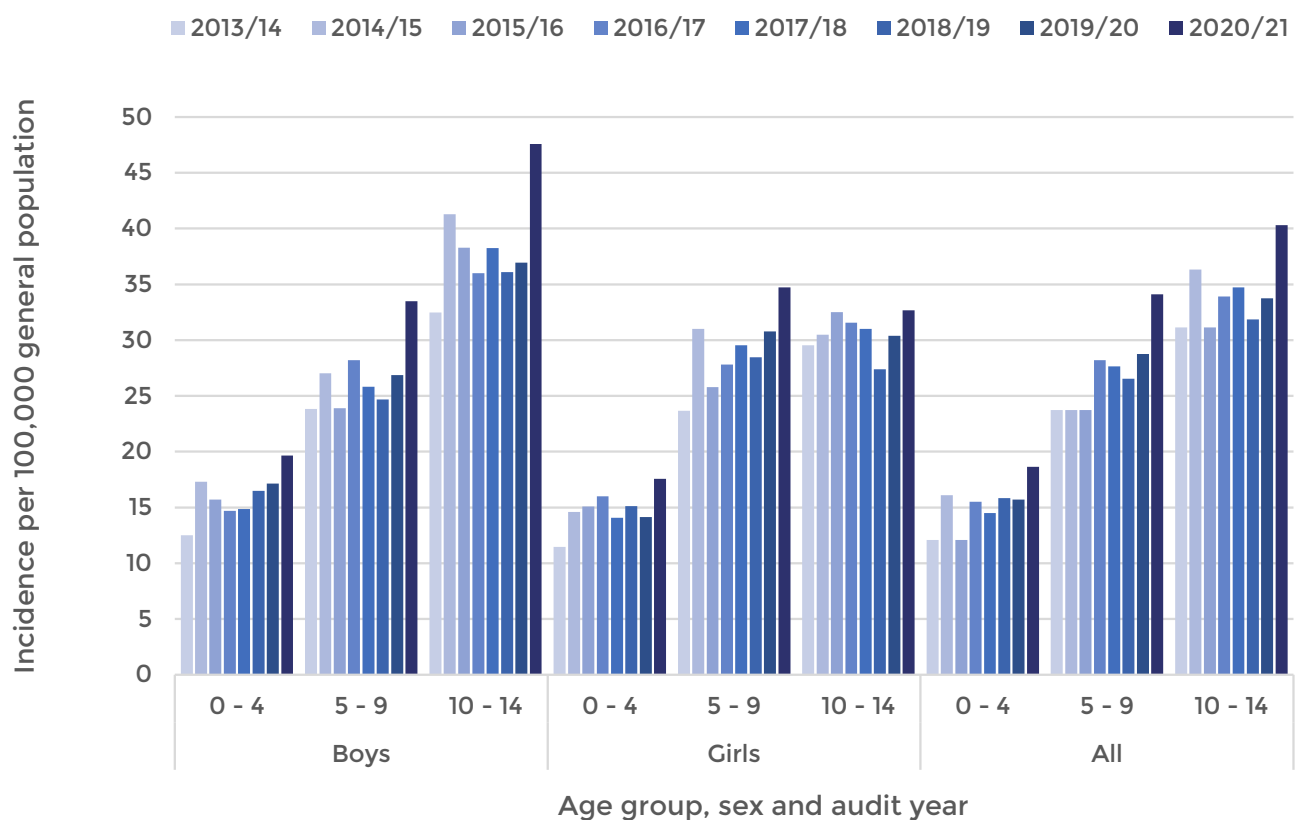


Figure 6: Incidence of Type 1 diabetes per 100,000 general population by age group and sex, 2013/14 to 2020/21

Despite the increased incidence, Figure 7 shows no difference in the age profile in new incidence of Type 1 diabetes between 2019/20 and 2020/21.

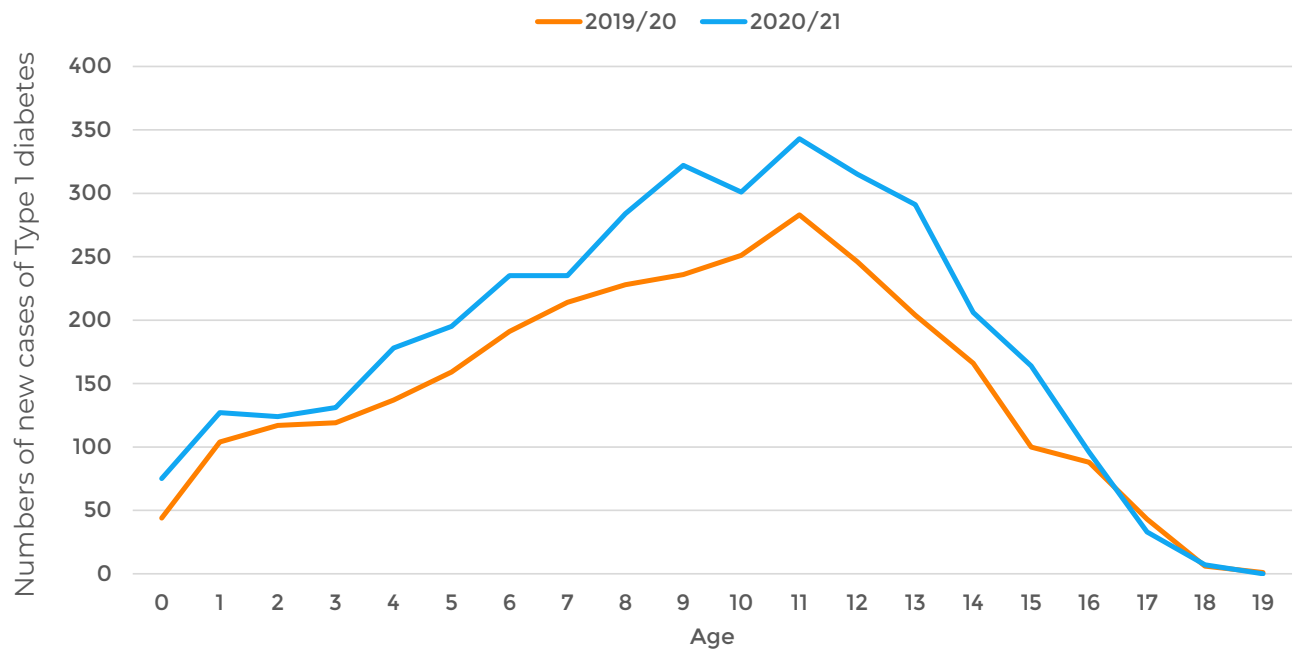


Figure 7: Numbers of new cases of Type 1 diabetes presenting in 2019/20 and 2020/21 by age at the beginning of the audit year

Figure 8 shows the incidence per 100,000 of Type 1 diabetes by CCG in England and LHB in Wales.

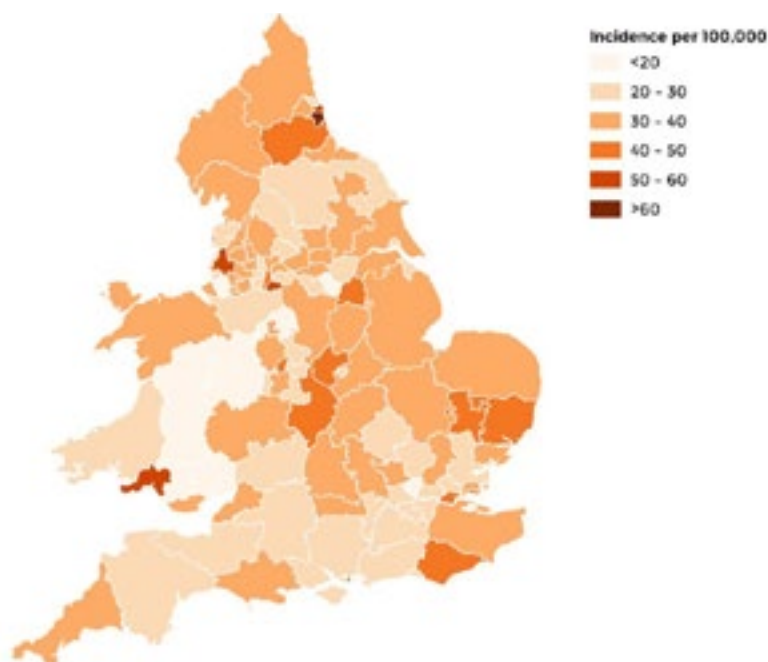


Figure 8: Incidence of Type 1 diabetes amongst children and young people aged 0-15 years per 100,000 by CCG (England) and LHB (Wales)

1.4 Characteristics of children and young people with Type 2 diabetes

In 2020/21, there were 973 children and young people with Type 2 diabetes being cared for in a PDU, of whom 230 (23.6%) were newly diagnosed within the audit year. Prevalence and/or incidence rates of Type 2 diabetes cannot be accurately calculated from NPDA data as an unknown number of children and young people are treated for Type 2 diabetes in primary care and will therefore not be included in the paediatric audit. However, there appears to be a year on year increase in the number of children and young people with Type 2 diabetes being managed within PDUs. For instance, in 2020/21 there was an increase of 107 (12.4%) compared to the total number reported in 2019/20. Figure 9 shows the numbers of children and young people with Type 2 diabetes being managed within a PDU since 2011/12.

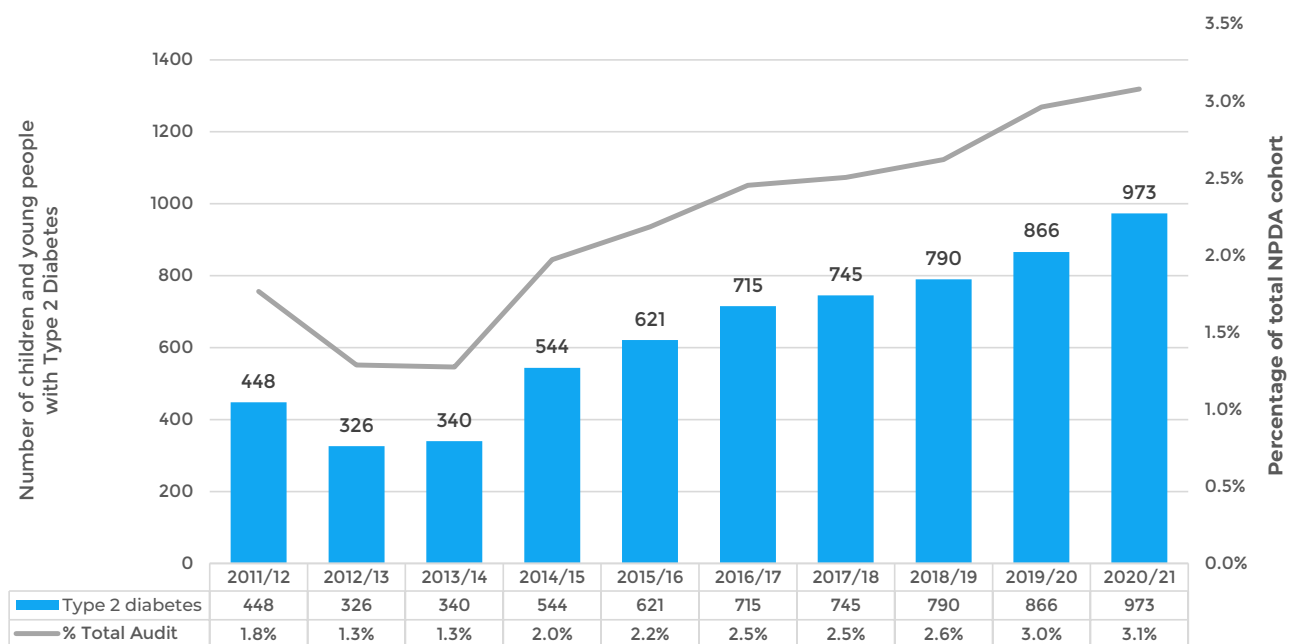


Figure 9: Numbers of children and young people with Type 2 diabetes included in the NPDA, 2011/12- 2020/21

1.4.1 Age and sex

Figure 10 shows the age and sex breakdown of children and young people with Type 2 diabetes. The numbers start to fall from ages 15-16 years due to transitioning to adult services. In every age there is a higher proportion of girls with Type 2 diabetes. It shows there were higher numbers of young people with Type 2 diabetes aged 15-17 receiving care from PDUs in 2020/21 compared to 2019/20.

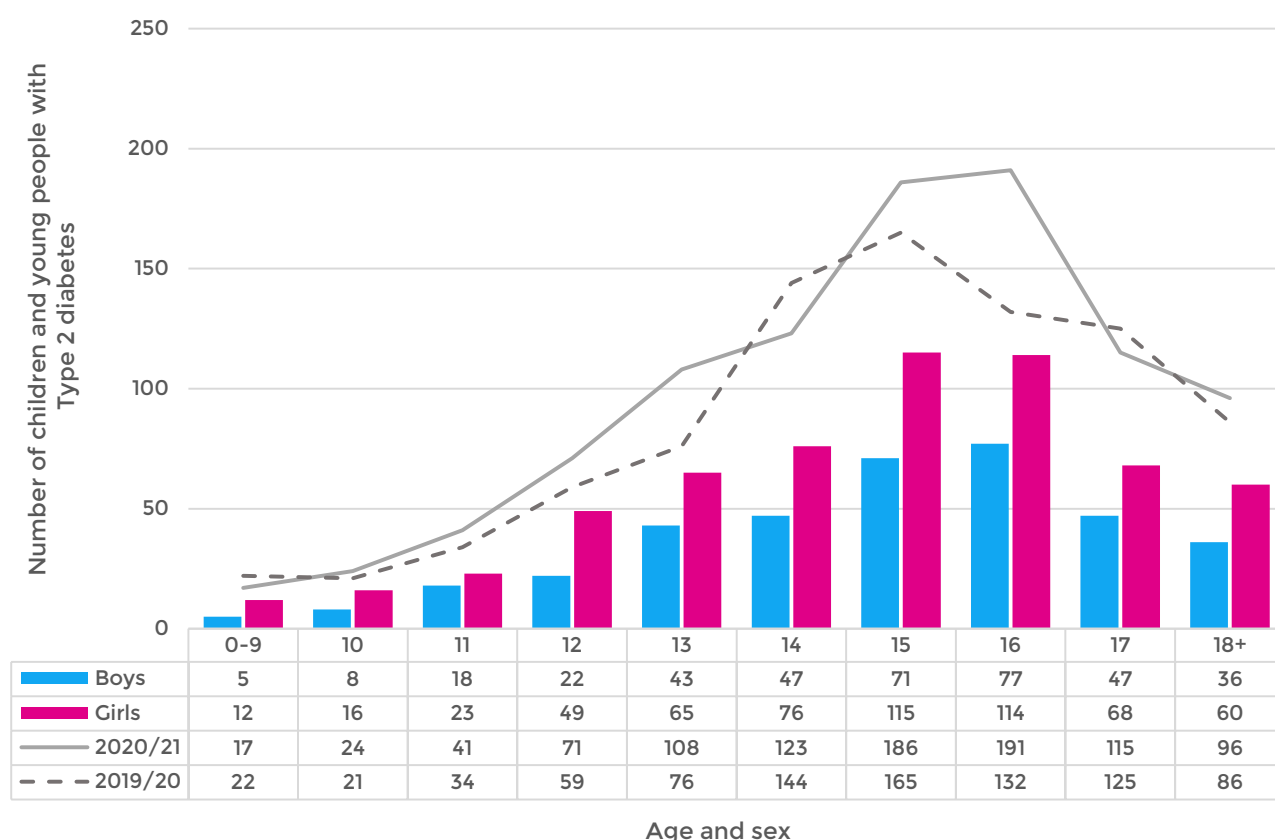


Figure 10: Numbers of children and young people with Type 2 diabetes by age and sex, 2019/20 and changes in numbers between 2019/20 and 2020/21

1.4.2 Regional distribution

Table 5 shows the number of children and young people with Type 2 diabetes by country and region, based on PDU location.

Table 5: Number of children and young people with Type 2 diabetes by country and region, 2020/21

| Region/Country | 5-9 years | 10-14 years | 15-19 years | Total | (% of cohort) |
|------------------------------|-----------|-------------|-------------|------------|---------------|
| England and Wales | 17 | 367 | 589 | 973 | 3.3% |
| England | 17 | 354 | 574 | 945 | 3.2% |
| Wales | 0 | 13 | 15 | 28 | 0.1% |
| East Midlands | 27+ | | 39 | 66 | 0.2% |
| East of England | 22+ | | 39 | 61 | 0.2% |
| London and South East | 5 | 127 | 194 | 326 | 1.1% |
| North East and North Cumbria | 0 | 16 | 22 | 38 | 0.1% |
| North West | 55+ | | 63 | 118 | 0.4% |
| South Central | 0 | 30 | 34 | 64 | 0.2% |
| South West | 12+ | | 29 | 41 | 0.1% |
| West Midlands | 48+ | | 94 | 142 | 0.5% |
| Yorkshire and Humber | 29+ | | 60 | 89 | 0.3% |

+Results merged to mask numbers <5

1.4.3 Ethnicity

Table 6 shows the breakdown of children and young people with Type 2 diabetes by ethnic category. The percentage of the general population in each ethnic category according to the most recent census is presented to enable comparison of prevalence of Type 2 diabetes within each category. Most children and young people with Type 2 diabetes were of non-White ethnicity, and the prevalence of Type 2 diabetes in children of non-White ethnicity was disproportionately higher than the prevalence of non-White ethnicity in the general population. The breakdown in 2020/21 was similar compared to 2019/20.

Table 6: Children and young people with Type 2 diabetes England and Wales by ethnic group, 2020/21

| Ethnicity | Total | % of cohort | % of total with stated ethnicity | % of total population* |
|------------|-------|-------------|----------------------------------|------------------------|
| White | 324 | 33.3% | 36.2% | 86.0% |
| Asian | 343 | 35.3% | 38.4% | 7.5% |
| Black | 129 | 13.3% | 14.4% | 3.3% |
| Mixed | 49 | 5.0% | 5.5% | 2.2% |
| Other | 39 | 4.0% | 4.4% | 1.0% |
| Not stated | 29 | 3.0% | - | - |
| Not known | 60 | 6.2% | - | - |

*Percentage of total population in 2011 England and Wales Census

1.4.4 Deprivation

Table 7 shows that there were a disproportionate number of children and young people with Type 2 diabetes living in the most deprived areas compared to the least deprived. This trend was observed in previous audit years.

Table 7: Numbers and percentages of children and young people with Type 2 diabetes by deprivation quintile, 2020/21

| Deprivation quintile | Total | % of cohort | % of total with known deprivation* | % of children and young people aged 0-19 years old (England and Wales)** |
|-----------------------|-------|-------------|------------------------------------|--|
| Most deprived | 406 | 41.7% | 41.9% | 23.7% |
| Second most deprived | 273 | 28.1% | 28.1% | 20.7% |
| Third least deprived | 157 | 16.1% | 16.2% | 19.0% |
| Second least deprived | 81 | 8.3% | 8.4% | 18.1% |
| Least deprived | 52 | 5.3% | 5.4% | 18.5% |
| Missing | 4 | 0.4% | - | - |

* Percentages within deprivation quintiles have been calculated excluding those without an allocated quintile due to missing data, to allow comparison to the age group 0-19 years old in England and Wales, 2020.

**Percentage of general population aged 0 to 19 years old in England and Wales. Calculations made using the "Lower layer Super Output Area population estimates" from the Office for National Statistics, mid-year 2020.

2. Completion of annual health checks

2.1 Completion of health checks for children and young people with Type 1 diabetes

2.1.1 Completion of key health checks

Health checks recommended by NICE for children and young people with Type 1 diabetes (NG18, NICE 2015; NG19, 2015) should be performed at least once annually.

Prior to 2020/21 the NPDA reported on the following seven to be the 'key' annual checks:

1. Glycated Haemoglobin A1c (HbA1c) (blood test for diabetes control)
2. Body Mass Index (BMI) (measure of cardiovascular risk)
3. Blood pressure (measure of cardiovascular risk)
4. Urinary albumin (urine test for kidney function)
5. Thyroid screen (blood test for hyper/hypothyroidism)
6. Eye screening (photographic test for eye risk)
7. Foot examination (foot examination for ulcer risk)

However, disruptions to the diabetic retinopathy screening schedule due to the COVID-19 pandemic meant that fewer children and young people underwent retinopathy screening. Furthermore, there was a recommendation to reduce screening from annually to biennially unless retinopathy was observed at a previous screen, for many services in England. In view of this change, the NPDA has changed its reporting and now describes six 'key annual checks', excluding retinopathy screening. Guidelines specify a starting age of 12 years for commencing all checks except for HbA1c and measurement of height and weight, which should be recorded in all ages of children and young people with Type 1 diabetes, and thyroid screening, which should be performed at diagnosis and annually thereafter.

In 2020/21, there were 24,138 children and young people with Type 1 diabetes who completed a full year of care (i.e. who did not transition to adult services, did not die, and were not diagnosed within the audit year), of whom 14,449 (59.9%) were aged 12 and above. Table 8 shows the percentage of children and young people recorded as receiving essential healthcare checks in the audit year, from 2015/16 to 2020/21.

Table 8: Percentage of children and young people with Type 1 who completed a full year of care recorded as receiving health checks, 2015/16 to 2020/21

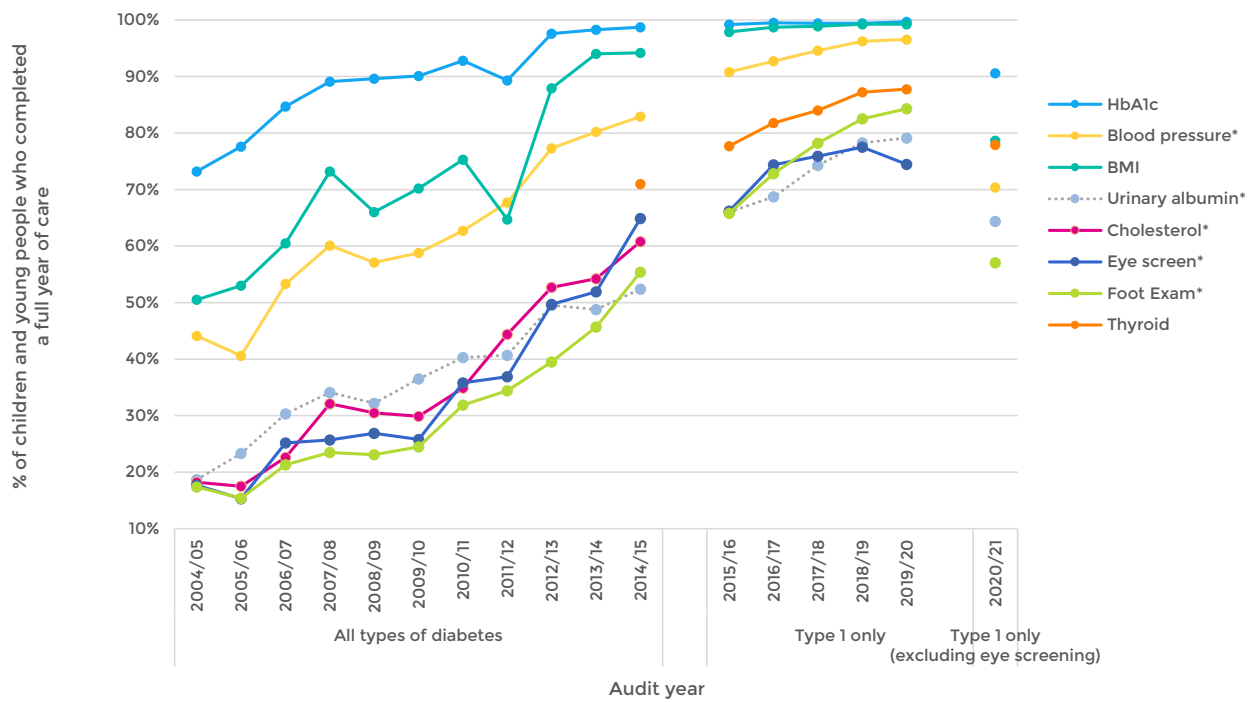
| Age | Health check completion | Audit year | | | | | |
|-------------------|---|------------|---------|---------|---------|---------|---------|
| | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 |
| All ages | No. of children and young people with T1 diabetes (n) | 22,567 | 22,933 | 23,130 | 23,223 | 22,638 | 24,138 |
| | HbA1c (%) | 99.2 | 99.5 | 99.4 | 99.4 | 99.7 | 90.6 |
| | BMI (%) | 97.9 | 98.7 | 98.9 | 99.2 | 99.3 | 78.6 |
| | Thyroid (%) | 77.7 | 81.8 | 84 | 87.2 | 87.8 | 77.9 |
| Aged 12 and above | No. of young people with T1 diabetes (n) | 13,313 | 13,437 | 13,363 | 13,391 | 13,266 | 14,449 |
| | Blood pressure (%) | 90.8 | 92.7 | 94.6 | 96.2 | 96.5 | 70.4 |
| | Urinary albumin (%) | 66.0 | 68.7 | 74.3 | 78.3 | 79.1 | 64.4 |
| | Foot Exam (%) | 65.8 | 72.8 | 78.2 | 82.5 | 84.3 | 57.1 |
| | All seven health checks* (%) | 35.5 | 43.5 | 49.8 | 55.2 | 54.4 | N/a |
| | All six health checks (%)* | | | | | | 40.2 |

* Includes retinal screening- one of the key annual checks until 2020/21

**Excludes retinal screening due to change in screening interval for 2020/21.

Given the suspension of 'face to face' clinic visits across England and Wales for much of 2020/21, and reluctance amongst some families to come to the hospital setting following cessation of restrictions, it is not surprising that completion rates for 2020/21 have decreased from previous years. Figure 11 shows completion rates from 2004/05 up until 2020/21. Comparisons of completion rates prior to 2015/16 should be reviewed with caution as they included both Type 1 and Type 2 diabetes.

Figure 11 shows that the improvement trend from previous audit years reversed in 2020/21, with smaller percentages receiving each key health check compared to the previous audit year.



* health checks completed on children and young people aged 12 or older

Figure 11: Percentage of children and young people who completed a full year of care recorded as receiving individual health checks, 2004/05 to 2020/21

Figure 12 shows that only two fifths (40.2%) of all children with Type 1 diabetes who completed a year of care in 2020/21 received all six key annual healthcare checks, which is lower than the percentage receiving all seven in 2020/21 (when retinopathy screening was included),

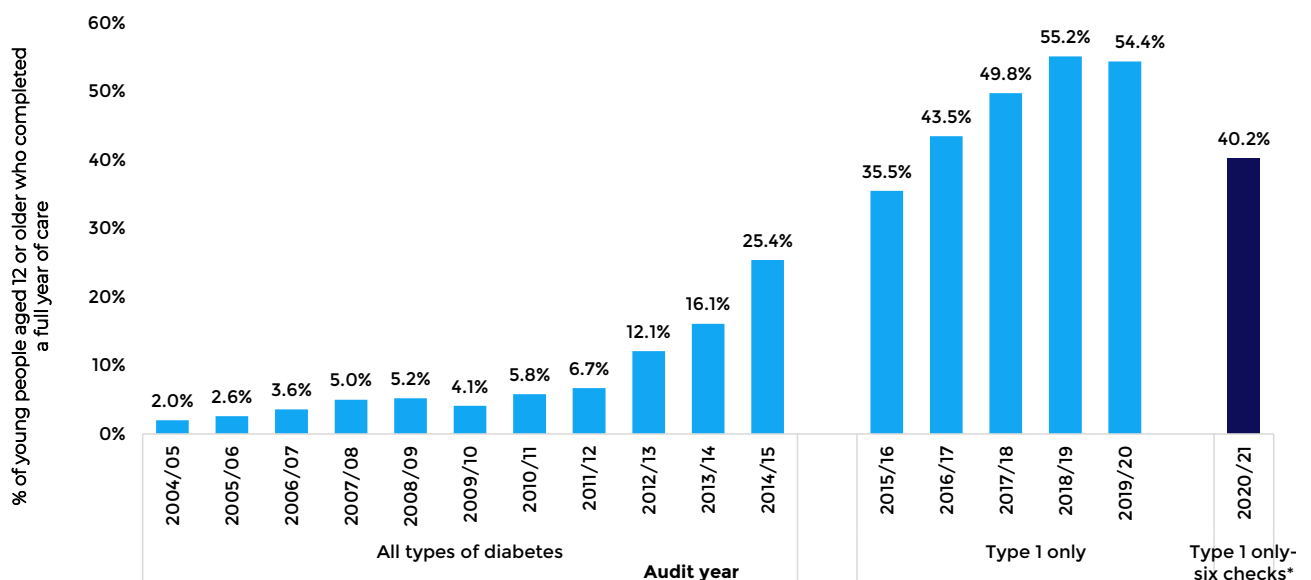


Figure 12: Percentage of young people aged 12 or above who completed a full year of care recorded as receiving all seven/six key health checks, 2004/05 to 2020/21.

* Retinopathy screening was removed from the 'seven key health checks' analysis in 2020/21 due to changes in frequency of screening during this audit year. The percentage receiving all of the remaining six key annual checks is presented instead for this audit year.

2.1.1.1 Retinopathy screening

Retinopathy screening intervals changed for many services in England in 2020/21. Rather than screening all those with diabetes aged 12 and above annually, many were advised to screen biennially unless an abnormal result was observed at previous annual screen. In 2020/21, 24.3% of children and young people with Type 1 diabetes age 12 and above received a screen, a decrease from 74.5% in 2019/20.

In 2019/20, 1,302 young people with Type 1 diabetes had an abnormal eye screen recorded, of whom 1,056 were also captured in the 2020/21 audit dataset. Figure 13 shows that of those with results in both years, only half (49.1%) who had an abnormal eye screen result in 2019/20 had an eye screen in 2020/21.

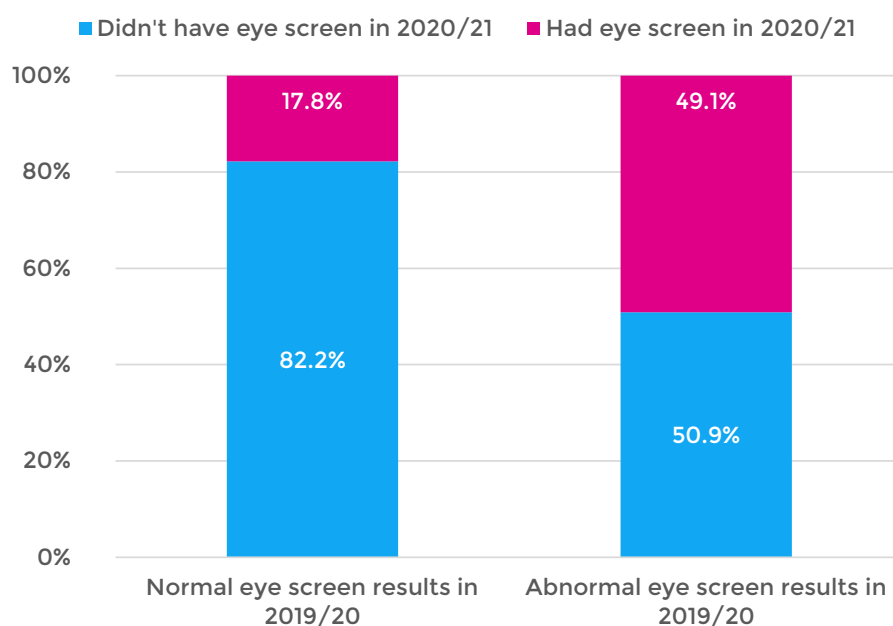


Figure 13: Percentage of children and young people aged 12 and above in 2019/20 receiving retinopathy screening in 2020/21, by screening result in 2019/20

2.1.2 Variation in key health check completion

2.1.2.1 Variation in completion rates nationally and regionally

Tables 9 and 10 provide a breakdown of the health checks recorded for children and young people with Type 1 diabetes with a complete year of care in 2020/21 by regional network, country and overall, in England and Wales. Table 9 contains data on the health checks received by all children and young people with Type 1 diabetes and Table 10 contains data on the health checks received by those aged 12 and above.

Table 9: Percentage of children and young people of all ages with Type 1 diabetes who completed a full year of care recorded as having received key health checks by country and region, 2020/21

| Country/Region | No. of children and young people with Type 1 diabetes | Percentage completing health checks | | |
|------------------------------|---|-------------------------------------|---------|-------------|
| | | HbA1c (%) | BMI (%) | Thyroid (%) |
| England and Wales | 24,138 | 90.6 | 78.6 | 77.9 |
| England | 22,965 | 90.3 | 78.8 | 77.9 |
| Wales | 1,173 | 95.2 | 74.8 | 78.9 |
| | | | | |
| East Midlands | 1,660 | 97.3 | 82.3 | 78.5 |
| East of England | 2,645 | 89.9 | 68.4 | 57.7 |
| London and South East | 5,395 | 80.4 | 75.7 | 79.2 |
| North East and North Cumbria | 1,322 | 97.8 | 92.5 | 87.2 |
| North West | 3,011 | 90.5 | 79.9 | 78.2 |
| South Central | 2,213 | 97.4 | 94.3 | 83.5 |
| South West | 1,893 | 95.4 | 77.4 | 83.9 |
| West Midlands | 2,512 | 89.0 | 66.5 | 75.6 |
| Yorkshire and Humber | 2,314 | 94.9 | 86.2 | 83.5 |

Table 10: Percentage of young people aged 12 and above with Type 1 diabetes who completed a full year of care recorded as having received key health checks by country and region, 2020/21

| Country/Region | No. of young people aged 12 and above with Type 1 diabetes | Percentage completing health checks | | | |
|------------------------------|--|-------------------------------------|--------------------|---------------------|-------------|
| | | Foot exam (%) | Blood pressure (%) | Urinary albumin (%) | All six (%) |
| England and Wales | 14,449 | 57.1 | 70.4 | 64.4 | 40.2 |
| England | 13,765 | 57.7 | 70.6 | 64.1 | 40.4 |
| Wales | 684 | 43.9 | 65.2 | 69.9 | 35.8 |
| | | | | | |
| East Midlands | 1,000 | 48.2 | 76.3 | 63.0 | 32.8 |
| East of England | 1,542 | 39.8 | 58.2 | 50.9 | 23.2 |
| London and South East | 3,276 | 55.6 | 63.7 | 59.4 | 38.7 |
| North East and North Cumbria | 777 | 61.0 | 89.1 | 77.7 | 46.6 |
| North West | 1,836 | 62.6 | 74.9 | 64.1 | 43.8 |
| South Central | 1,292 | 59.4 | 81.7 | 73.1 | 46.4 |
| South West | 1,120 | 60.2 | 70.1 | 67.0 | 40.9 |
| West Midlands | 1,518 | 60.6 | 60.6 | 61.5 | 37.7 |
| Yorkshire and Humber | 1,404 | 74.4 | 81.6 | 74.9 | 58.0 |

2.1.2.5 Variation in completion rates across PDUs

The 2020/21 audit year has clearly been a difficult year to complete health checks in children and young people with diabetes. However, there has been large variation in rates across all the PDUs submitting data. Figure 14 shows the percentage of eligible children and young people with Type 1 diabetes receiving each specific key annual health check within each PDU from lowest to highest in 2020/21. It shows huge variation in the percentages receiving each check within different PDUs, with some services achieving rates of 100% on some, and others achieving rates lower than 10% of their caseload.

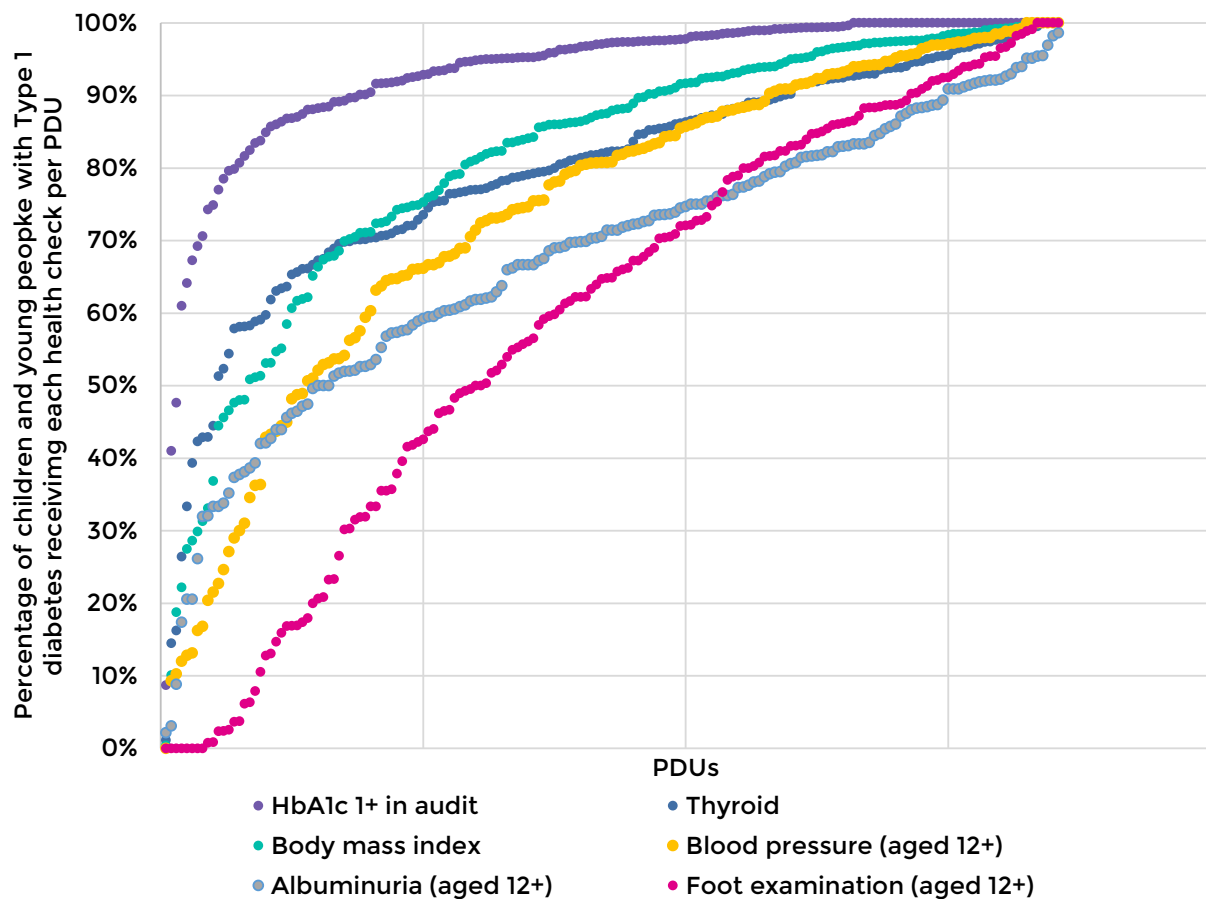


Figure 14: Percentage of children and young people with Type 1 diabetes receiving each key health check by PDU, 2020/21

Figure 15 shows the variation by PDU in the percentage of young people aged 12 years and older who were recorded to have received all six key health checks in 2020/21. The horizontal navy line shows the mean completion rate for England and Wales, and the dotted lines indicate PDUs whose results are within two standard deviations (dashes) or three standard deviations (dots) of the mean. There remains considerable variation in percentage of young people receiving all six health checks across PDUs.

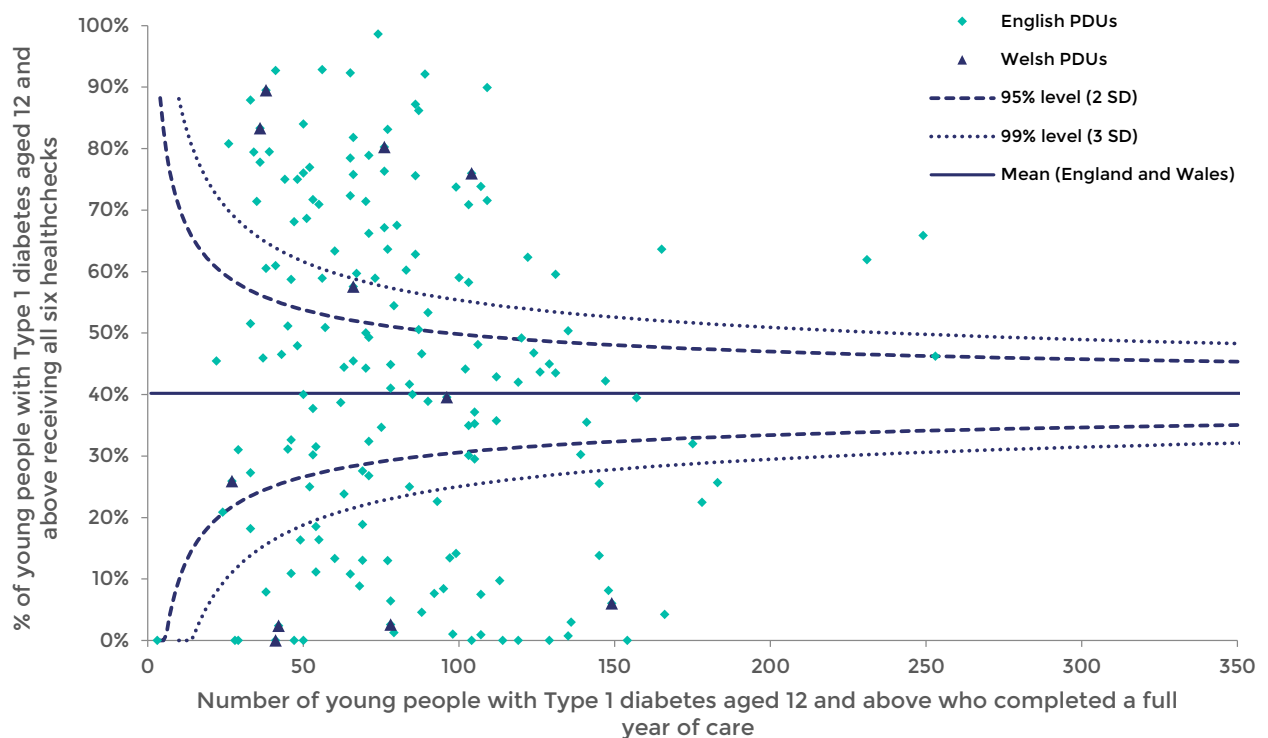


Figure 15: Percentage of young people aged 12 years and above with Type 1 diabetes who completed a full year of care recorded as receiving all six health checks by unit, 2020/21

Figure 16 plots overall PDU health check completion rates against the total number of young people with Type 1 diabetes aged 12 and above who completed a full year of care within each PDU. The health check completion rate is calculated by dividing the sum of the number of health checks received by young people with Type 1 diabetes aged 12 and above who completed a full year of care by the sum of the total expected number of health checks. The total expected number of health checks is equal to the number of young people, with Type 1 diabetes aged 12 and above who completed a full year of care, multiplied by six (i.e. the number of health checks that they should have received within the audit year). This metric is used in the NPDA to determine outlier status, with PDUs below the bottom dotted line ($>3SD$) considered 'alarm' outliers, as they were recording significantly fewer key health checks than other PDUs in England and Wales. In 2020/21 outlier status is for information only as NICE recommendations were difficult to fulfil during the pandemic year.

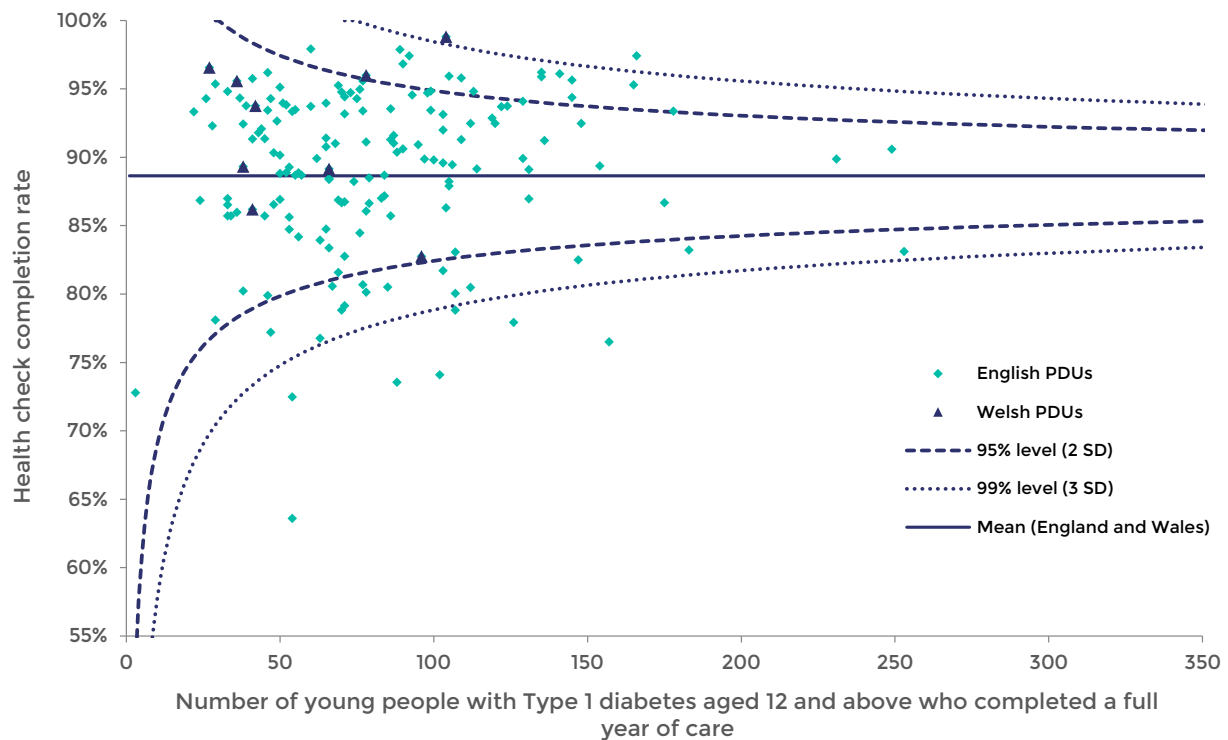


Figure 16: Funnel plot of key health check completion rates for young people aged 12 years and above with Type 1 diabetes who completed a full year of care 2020/21, by PDU

Given the overdispersal of results against these compound health check metrics within the 2020/21 audit year, and the fact that provision of health checks was so severely disrupted during this first year of the COVID-19 pandemic, the NPDA suspended the outlier management process for this audit year.

2.1.3 Number of HbA1c measurements received

NICE (NG18) recommends that a minimum of four HbA1c measurements are offered to children and young people with Type 1 diabetes per annum. Figure 17 shows the percentage of children and young people with Type 1 diabetes receiving a full year of care by number of HbA1c measurements received in the audit year. It shows that less than a fifth (14.9%) had four or more measurements recorded in 2020/21, which is 38.2 percentage points lower than in 2019/20, and a quarter (26.0%) only had one HbA1c recorded in the audit year.

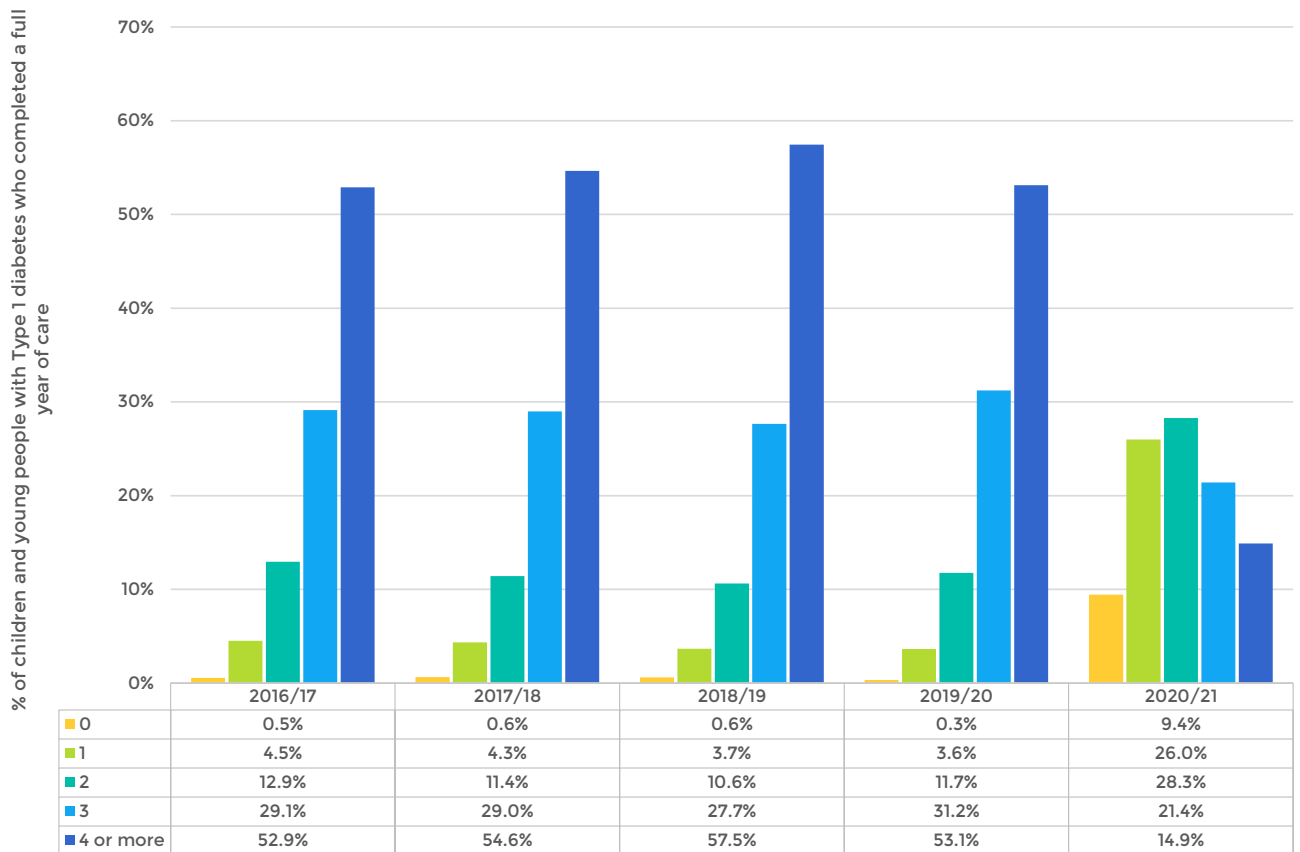


Figure 17: Percentage of children and young people with Type 1 diabetes who completed a full year of care by number of HbA1c measurements recorded per child or young person, 2016/17 to 2020/21

Table 11 shows the percentage of children and young people with Type 1 diabetes receiving a full year of care by number of HbA1c measurements in each country and region.

Table 11: Percentage of children and young people with Type 1 diabetes who completed a year of care receiving 1-4+ HbA1c measurements by country and region, 2020/21.

| Country/Region | Total | None (%) | One (%) | Two (%) | Three (%) | Four (%) |
|------------------------------|--------|----------|---------|---------|-----------|----------|
| England and Wales | 24,138 | 9.4 | 26.0 | 28.3 | 21.4 | 14.9 |
| England | 22,965 | 9.7 | 26.3 | 28.0 | 21.0 | 14.9 |
| Wales | 1,173 | 4.8 | 18.8 | 32.9 | 28.2 | 15.3 |
| East Midlands | 1,660 | 2.7 | 15.2 | 28.3 | 29.7 | 24.1 |
| East of England | 2,645 | 10.1 | 28.8 | 27.3 | 22.2 | 11.6 |
| London and South East | 5,395 | 19.6 | 29.7 | 25.6 | 15.4 | 9.7 |
| North East and North Cumbria | 1,322 | 2.2 | 19.3 | 31.9 | 30.3 | 16.3 |
| North West | 3,011 | 9.5 | 32.7 | 28.8 | 18.1 | 10.9 |
| South Central | 2,213 | 2.6 | 14.8 | 25.3 | 27.2 | 30.0 |
| South West | 1,893 | 4.6 | 23.7 | 35.1 | 25.8 | 10.8 |
| West Midlands | 2,512 | 11.0 | 33.5 | 32.1 | 16.2 | 7.2 |
| Yorkshire and Humber | 2,314 | 5.1 | 24.8 | 23.7 | 20.7 | 25.7 |

2.1.4 Nutrition and lifestyle education and support

NICE (NG18) recommends offering children and young people with diabetes dietetic support to help optimise body weight and blood glucose control, and NHS England's Best Practice Tariff criteria for paediatric diabetes care (NHS Improvement, 2019) include the offering of an additional dietetic appointment outside of multidisciplinary (MDT) clinic meetings. A lower take up rate of dietetic appointments outside of appointments with the rest of the MDT should be interpreted with caution, as it could reflect satisfaction with the advice shared during routine MDT appointments rather than a lack of engagement with the service.

Of those children and young people with Type 1 diabetes who completed a full year of care 82.6% were offered an additional dietetic appointment, compared to 89.0% in 2019/20. Table 12 shows the percentages who were offered an additional appointment and attended the offered appointment within the audit year.

Table 12: Percentage of children and young people with Type 1 diabetes who completed a full year of care who were offered and/or attended an additional dietetic appointment by country, 2020/21

| Country/Region | Total | Appointment offered | Appointment attended |
|------------------------------|--------|---------------------|----------------------|
| England and Wales | 24,138 | 82.5% | 49.1% |
| England | 22,965 | 83.8% | 49.6% |
| Wales | 1,173 | 57.9% | 39.6% |
| East Midlands | 1,660 | 59.8% | 45.7% |
| East of England | 2,645 | 84.5% | 48.5% |
| London and South East | 5,395 | 83.0% | 52.0% |
| North East and North Cumbria | 1,322 | 83.3% | 56.4% |
| North West | 3,011 | 87.0% | 42.1% |
| South Central | 2,213 | 84.2% | 53.3% |
| South West | 1,893 | 83.1% | 34.1% |
| West Midlands | 2,512 | 87.7% | 58.4% |
| Yorkshire and Humber | 2,314 | 94.4% | 53.8% |

There was no difference in the percentages of appointments offered across different age groups, ethnic categories, deprivation quintiles or between girls and boys. The percentage of appointments attended decreased with age and duration of diabetes, from 56.3% of those four years old or younger to 44.5% in the group aged 15 years old or older (Figure 18).

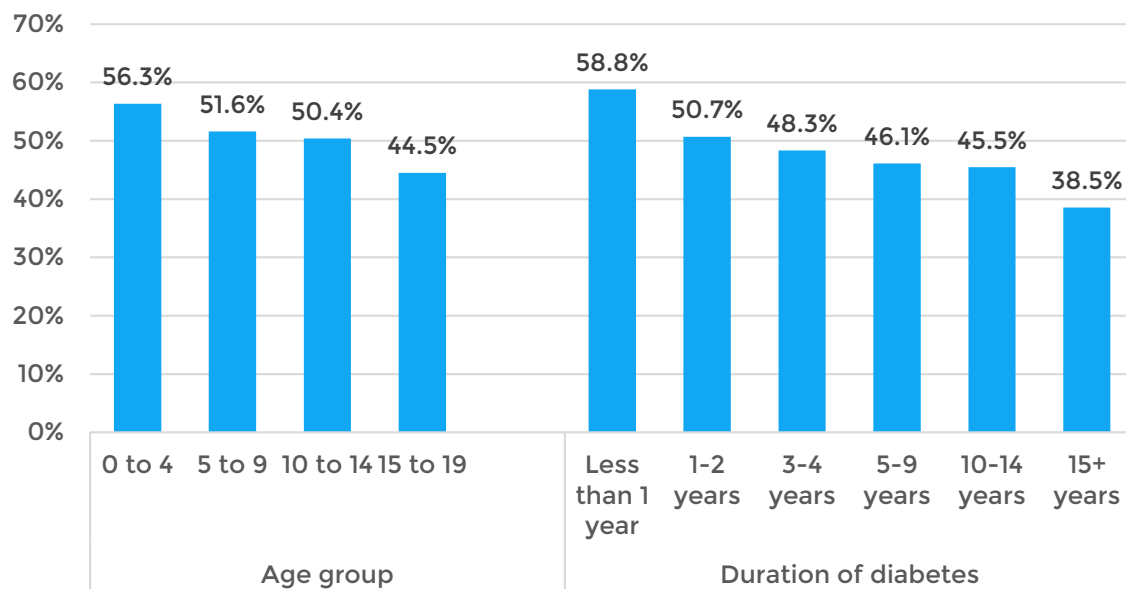


Figure 18: Percentage of offered dietetic appointments attended by age group and duration of diabetes, 2020/21

2.1.5 Completion of all other annual health checks

The NPDA also collects data on five additional health checks for children and young people with Type 1 diabetes as recommended by NICE 2015 (NG18):

1. Psychological assessment (assessment for need of psychological support)
2. Offering of immunisation against influenza
3. Advice about managing diabetes ('sick-day rules')
4. Using (or trained to use) blood ketone testing strips and a meter
5. Smoking status check

Results are shown in Table 13.

Table 13: Percentage of children and young people with Type 1 diabetes who completed a full year of care recorded as receiving health checks by region and country, 2020/21.

| Country/ Region | No. of young people aged 12 and above with T1 diabetes and a complete year of care | Flu vaccine (%) | Sick day rules (%) | Blood ketone testing (%) | Psychological assessment (%) | Smoking health check (%)* |
|------------------------------|--|-----------------------|-----------------------|-----------------------------------|------------------------------------|---------------------------------|
| England and Wales | 24,138 | 80.3 | 82.1 | 86.9 | 71.6 | 88.2 |
| England | 22,965 | 80.7 | 82.5 | 86.6 | 72.1 | 87.7 |
| Wales | 1,173 | 72.8 | 72.6 | 92.8 | 60.6 | 99.1 |
| | | | | | | |
| East Midlands | 1,660 | 71.6 | 91.7 | 96.0 | 65.9 | 86.8 |
| East of England | 2,645 | 69.1 | 82.8 | 83.0 | 62.0 | 85.0 |
| London and South East | 5,395 | 77.4 | 78.1 | 84.0 | 74.8 | 86.2 |
| North East and North Cumbria | 1,322 | 95.5 | 94.3 | 86.2 | 80.0 | 78.4 |
| North West | 3,011 | 86.4 | 82.1 | 89.3 | 63.5 | 97.5 |
| South Central | 2,213 | 77.7 | 71.4 | 84.3 | 81.7 | 85.1 |
| South West | 1,893 | 81.7 | 85.6 | 88.9 | 64.1 | 86.5 |
| Wales | 1,173 | 72.8 | 72.6 | 92.8 | 60.6 | 99.1 |
| West Midlands | 2,512 | 83.0 | 82.0 | 82.3 | 78.1 | 88.5 |
| Yorkshire and Humber | 2,314 | 92.1 | 88.4 | 91.9 | 79.7 | 89.5 |

*percentage of young people age 12 and above with Type 1 diabetes

Approximately 2.1% young people were recorded as smoking within the audit year and of those, 39.3% were offered a referral to smoking cessation services, compared to 46.0% in 2019/20. The proportion of current smokers was higher in boys (2.4%) than girls (1.7%), and higher among those living in the most deprived areas (2.8%) than in the least deprived areas (1.4%).

Figure 19 shows a consistent increase over the previous three audits in the percentage of children and young people with Type 1 diabetes being offered flu vaccination, "Sick day rules" advice and blood ketone testing, and a small decrease in the percentage of children receiving psychological assessment. In 2020/21 there is a marked decrease.

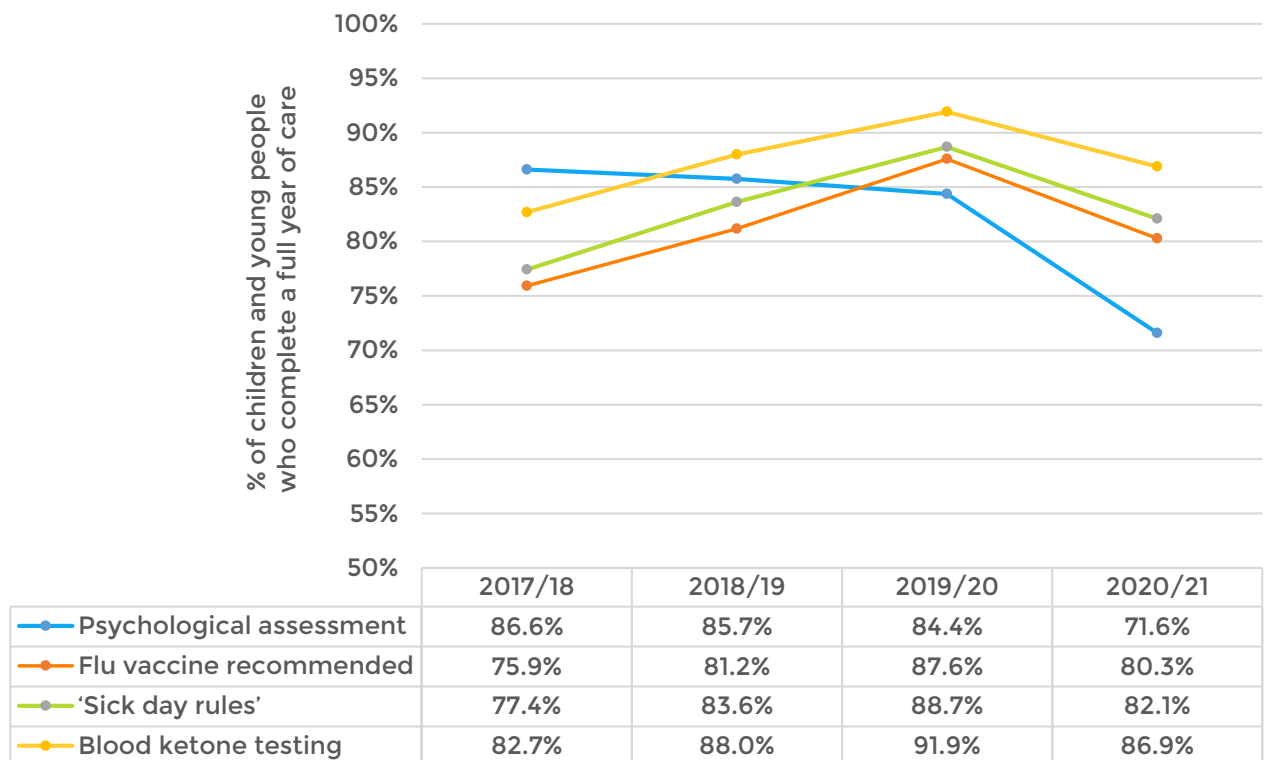


Figure 19: Completion rates for psychological assessment, flu vaccine recommendation, “Sick day rules” advice and blood ketone testing, for children and young people with Type 1 diabetes who completed a full year of care, 2017/18 to 2020/21

2.1.6 Care at diagnosis

2.1.6.1 Screening for autoimmune conditions

Children and young people with Type 1 diabetes are at greater risk of having other autoimmune conditions. NG18 (NICE, 2015) and NG20 (NICE, 2015) recommend screening for thyroid and coeliac disease at diagnosis.

Figure 20 shows the percentage of children and young people diagnosed more than 90 days before the end of the audit year (n=2,720), who received screening for coeliac and thyroid disease within 90 days of diagnosis. In 2020/21 the rates of completion of both health checks at diagnosis saw a small increase with respect to 2019/20.

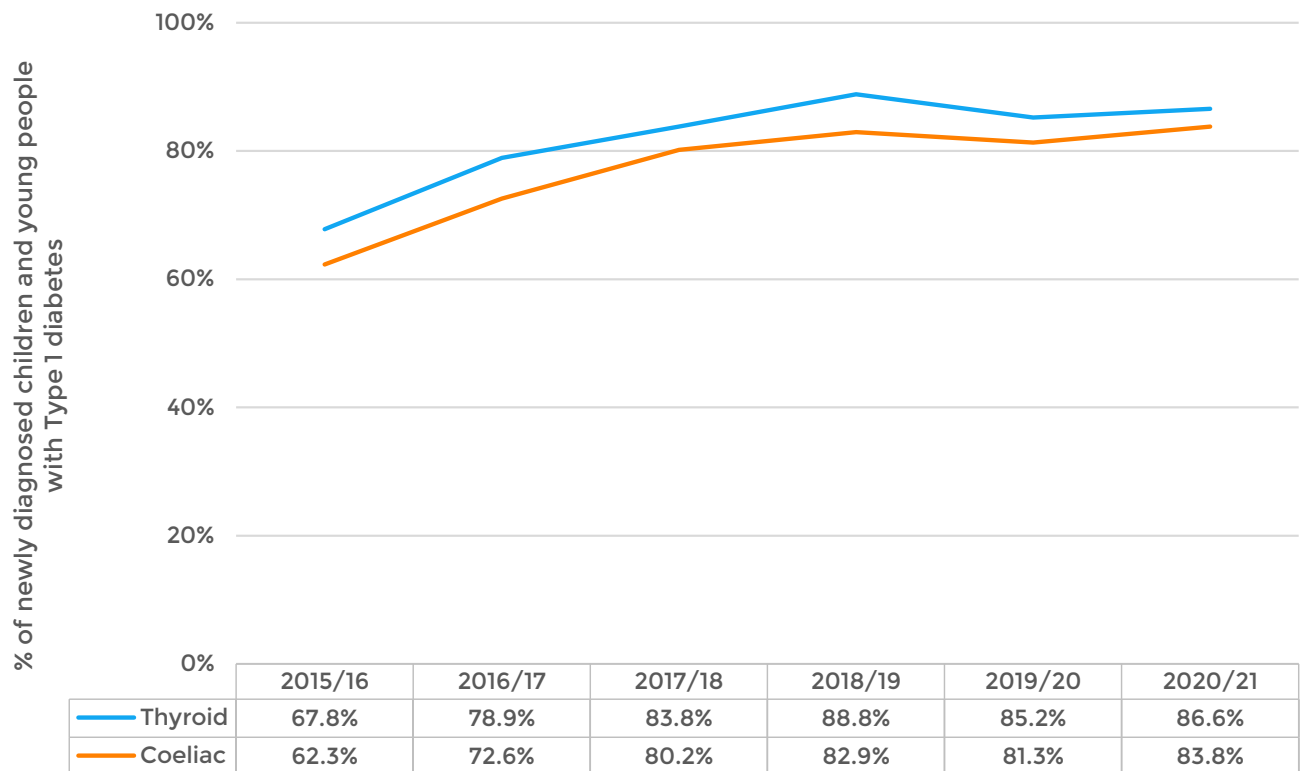


Figure 20: Percentage of newly diagnosed children and young people with Type 1 diabetes who received screening for thyroid and coeliac disease within 90 days of diagnosis, 2015/16 to 2020/21

2.1.7.2 Level 3 carbohydrate counting

NICE guidance (NG18, NICE 2015) recommends offering level 3 carbohydrate-counting education to children and young people with Type 1 diabetes from diagnosis.

Figure 21 shows the percentage of children and young people diagnosed more than 14 days before the end of the audit year (n=3,526) who received level 3 carbohydrate-counting education within 14 days of diagnosis from 2017/18 to 2020/21.

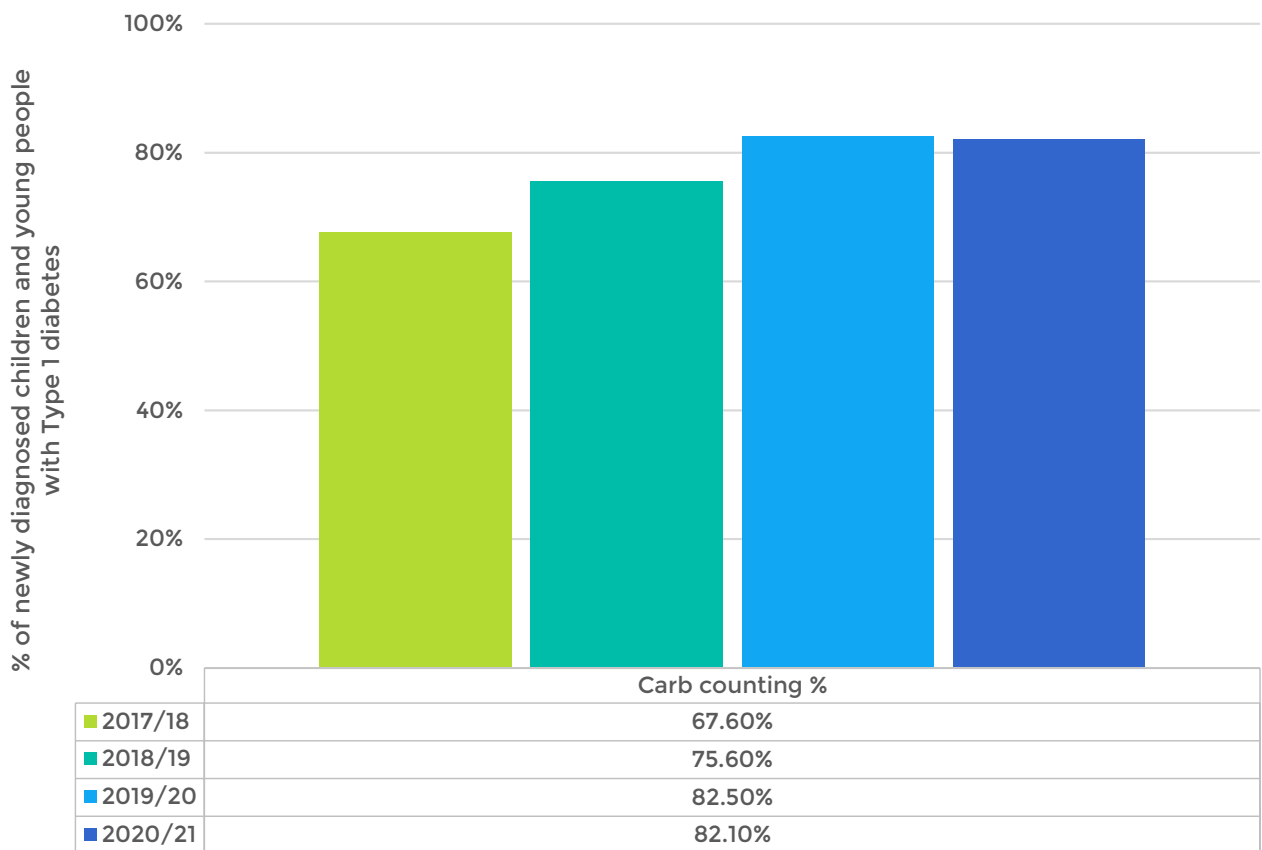


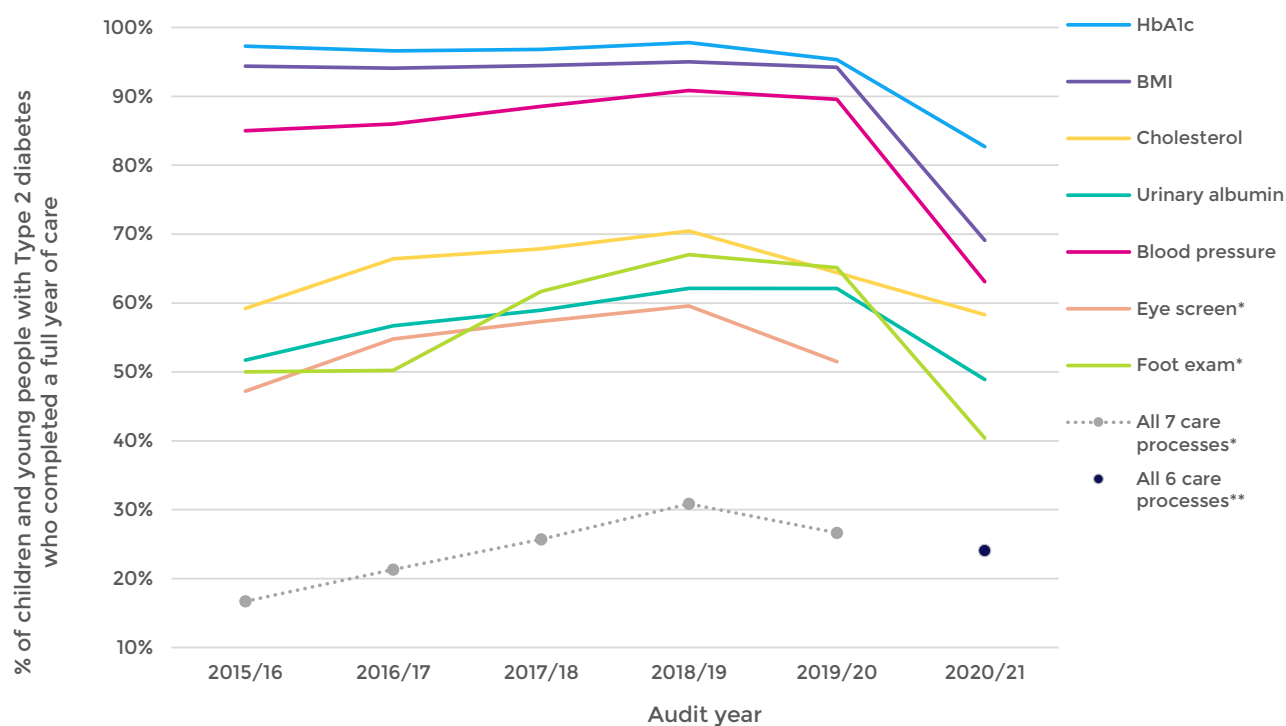
Figure 21: Percentage of newly diagnosed children and young people with Type 1 diabetes who received level 3 carbohydrate counting education within 14 days of diagnosis, 2017/18 to 2020/21

2.2 Health checks for children and young people with Type 2 diabetes

The health checks for children and young people with Type 2 diabetes recommended in NG18 and NG19 (NICE, 2015) differ slightly from those for Type 1 diabetes. The NPDA includes cholesterol screening as one of the six essential annual checks for those with Type 2 rather than thyroid screening. All should be performed annually from diagnosis, except for foot examination, which is indicated from age 12, and eye screening, which is also indicated from 12, and indicated biennially from 2020 onwards (previously annually). In 2020/21, there were 618 children and young people who completed a full year of care (i.e. were not diagnosed, did not die and did not transition to adult services within the audit year) recorded as having Type 2 diabetes, of whom 577 (93.4%) were aged 12 years and above.

2.2.1 Completion of key health checks

Figure 22 shows the percentage of children and young people with Type 2 diabetes who completed a full year of care recorded as receiving each of the six recommended health checks from 2015/16 to 2020/21.



* % refers to young people aged 12 or older with a complete year of care

*Health check for those aged 12 and above

** Excludes retinal screening for 2020/21 due to change in screening frequency from this year

Figure 22: Percentage of children and young people with Type 2 diabetes who completed a full year of care recorded as receiving key health checks, 2015/16 to 2020/21.

Table 14 shows the percentage of children and young people with Type 2 diabetes recorded as receiving recommended health checks in the audit year, from 2015/16 to 2020/21.

Table 14: Percentage of children and young people with Type 2 diabetes who completed a full year of care recorded as receiving recommended health checks, 2015/16 to 2020/21

| Age | Health check completion | Audit year | | | | | |
|-------------------|--------------------------------------|------------|---------|---------|---------|---------|---------|
| | | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 |
| All ages | No. of children and young people (n) | 412 | 473 | 470 | 501 | 534 | 618 |
| | HbA1c (%) | 97.3 | 96.6 | 96.8 | 97.8 | 95.3 | 82.7 |
| | BMI (%) | 94.4 | 94.1 | 94.5 | 95 | 94.2 | 69.1 |
| | Cholesterol (%) | 59.2 | 66.4 | 67.9 | 70.5 | 64.4 | 58.3 |
| Aged 12 and above | No. of young people (n) | 390 | 436 | 436 | 470 | 499 | 577 |
| | Urinary albumin (%) | 51.7 | 56.7 | 58.9 | 62.1 | 62.1 | 48.9 |
| | Blood pressure (%) | 85 | 86 | 88.5 | 90.9 | 89.6 | 63.1 |
| | Foot Exam (%) | 50 | 50.2 | 61.7 | 67 | 65.1 | 40.4 |
| | All six health checks (%) | 16.7 | 21.3 | 25.7 | 30.9 | 26.7 | 24.1 |

2.2.2 Number of HbA1c measurements

Figure 23 shows that 10.7% of children and young people with Type 2 diabetes recorded as completing a full year of care received the recommended four or more HbA1c measurements in the year, with nearly a fifth not receiving any at all.

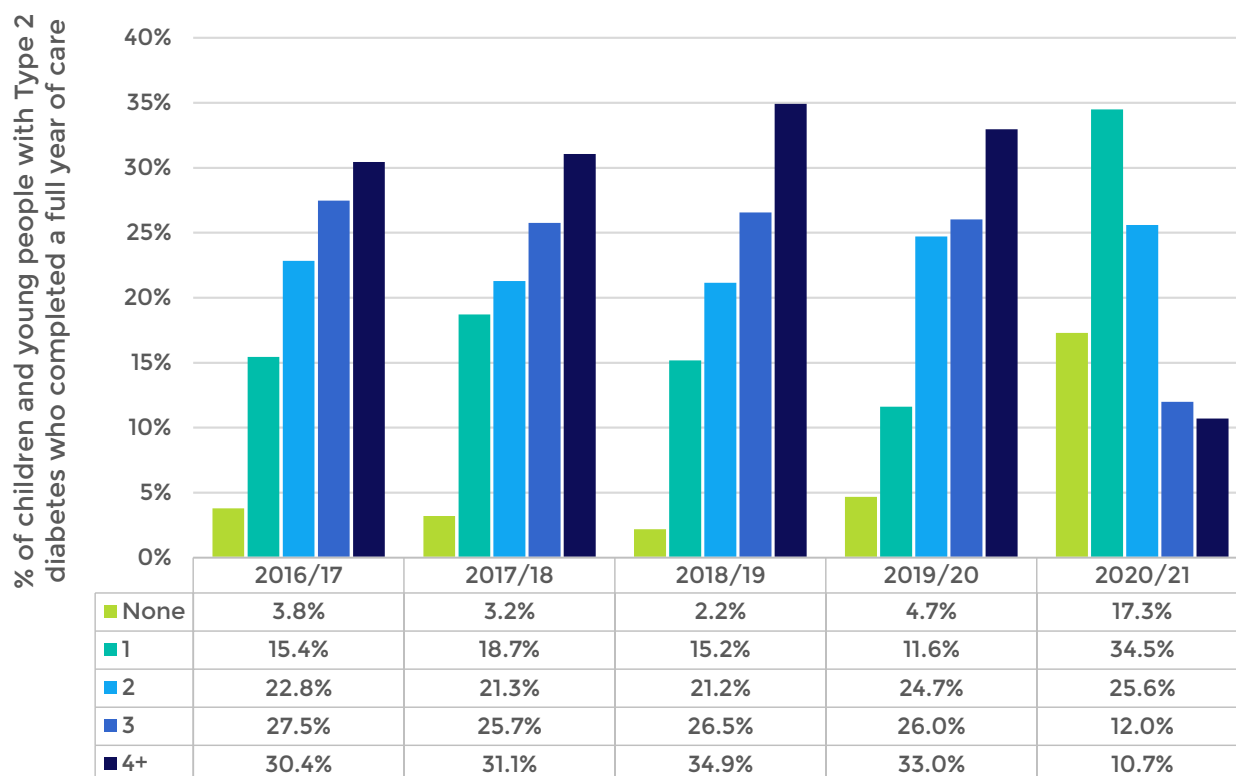


Figure 23: Number of HbA1c measurements recorded for children and young people with Type 2 diabetes receiving a full year of care, 2016/17 – 2020/21

2.2.3 Completion of all other health checks

Table 15 shows the percentage of children and young people with Type 2 diabetes completing a full year of care (n=618) recorded as being offered and attending an additional dietetic appointment outside of routine MDT clinics with the rest of the MDT present. Lower uptake may be indicative of satisfaction with advice provided in routine clinics rather than lack of engagement with dietetic services.

Table 15: Percentage of children and young people with Type 2 diabetes who completed a full year of care recorded as being offered and attending an additional dietetic appointment, 2017/18 to 2020/21

| | England and Wales | | | |
|--------------------------|-------------------|---------|---------|---------|
| | 2017/18 | 2018/19 | 2019/20 | 2020/21 |
| Appointment offered (%) | 70.0 | 80.0 | 80.0 | 78.3 |
| Appointment attended (%) | 48.7 | 48.5 | 56.0 | 56.3 |

The NPDA also collects data on four additional health checks for children and young people with Type 2 diabetes:

- Psychological assessment (assessment for need of psychological support)
- Offering of immunisation against influenza
- Advice about managing diabetes during sickness ('sick day rules')
- Smoking status

Results are shown in Table 16 for all children and young people with Type 2 diabetes and a complete year of care (n= 618).

Table 16: Percentage of young people with Type 2 diabetes who completed a full year of care recorded as receiving additional health checks by region and country, 2017/18 to 2020/21

| Health checks | England and Wales | | | |
|--|-------------------|---------|---------|---------|
| | 2017/18 | 2018/19 | 2019/20 | 2020/21 |
| Assessment for need of psychological support (%) | 77.9 | 75 | 70.8 | 60.5 |
| Flu vaccine recommendation (%) | 49.4 | 69.3 | 67.8 | 63.3 |
| 'Sick day rules' advice (%) | 41.7 | 51.5 | 53 | 48.5 |
| Smoking status check (%)* | 83.3 | 84.3 | 85.0 | 83.7 |

*percentage of children and young people age 12 and above

3. Outcomes

3.1 HbA1c

HbA1c is a marker of overall diabetes blood glucose levels over the preceding six to eight weeks and is associated with lifetime risk of microvascular complications. There is clear evidence from the DCCT trial (The Diabetes Control and Complications Trial Research Group, 1994) and the follow up EDIC trial (Nathan et al., 2005) that good diabetes management in childhood tracks into adulthood with a lower risk of developing vascular complications and early mortality in the future.

In 2015, NICE (NG18, 2015) introduced a stricter HbA1c target of 48mmol/mol or less to indicate excellent diabetes management for both Type 1 and 2 diabetes and requested that providers also report those achieving a level of 53 mmol/mol or below. To allow historical benchmarking, the NPDA also reports the numbers achieving the previous NICE (2004) target of 58 mmol/mol or below and an HbA1c level above 80mmol/mol representing considerable increased risk of both microvascular diabetic complications (eye disease and kidney disease) and cardiovascular disease.

Average HbA1c and the proportion of children and young people meeting specific HbA1c targets vary depending on the type of diabetes. Children and young people with non-Type 1 diabetes tend to have a lower HbA1c than those with Type 1 diabetes. Some of the data presented below refer to children and young people with all types of diabetes whilst other sections detail the results of those with Type 1 or Type 2 diabetes separately. Numbers of children and young people with other types of diabetes were too low to enable meaningful analysis.

This section of the report seeks to answer the following audit questions:

1. What are the average HbA1c levels and percentage of children and young people with diabetes hitting targets in England and Wales for 2020/21, and
2. What are the longitudinal changes?

3.2 HbA1c outcomes of children and young people with all types of diabetes

Table 17 provides a breakdown of the unadjusted mean and median HbA1c results achieved by each country, and regional network. The mean HbA1c of children and young people with all types of diabetes in England and Wales receiving care in a PDU in 2020/21 was 64.0 mmol/mol; this is a decrease of 0.5 mmol/mol compared to that recorded in 2019/20 (64.5 mmol/mol). The median HbA1c was 61 mmol/mol, which is a decrease of 0.5 mmol/mol compared to that recorded in 2019/20 (61.5 mmol/mol).

Table 17: HbA1c for all children and young people with all types of diabetes and one or more valid HbA1c measurements by region, county and overall, 2020/21

| Country/Region | No. of children and young people with all types of diabetes | Mean | Standard deviation | Median | Interquartile range |
|------------------------------|---|------|--------------------|--------|---------------------|
| England and Wales | 26,139 | 64.0 | 16.8 | 61.0 | 18.0 |
| England | 24,806 | 63.9 | 16.8 | 61.0 | 18.0 |
| Wales | 1,333 | 64.7 | 17.3 | 62.0 | 18.0 |
| | | | | | |
| East Midlands | 1,944 | 61.4 | 15.0 | 59.0 | 16.0 |
| East of England | 2,769 | 64.3 | 17.2 | 61.0 | 18.0 |
| London and South East | 5,266 | 65.1 | 17.9 | 62.0 | 18.5 |
| North East and North Cumbria | 1,576 | 62.2 | 15.8 | 60.0 | 17.0 |
| North West | 3,240 | 65.3 | 16.9 | 62.0 | 19.0 |
| South Central | 2,602 | 62.1 | 15.4 | 60.0 | 16.8 |
| South West | 2,108 | 63.0 | 15.9 | 60.0 | 16.0 |
| West Midlands | 2,662 | 64.1 | 16.3 | 62.0 | 17.0 |
| Yorkshire and Humber | 2,639 | 64.6 | 18.0 | 61.0 | 18.5 |

Figure 24 shows the median HbA1c for children and young people with all types of diabetes, in England and Wales, from 2009/10 to 2020/21. The timeline below the graph highlights key quality improvement initiatives implemented in England and Wales over the same period.

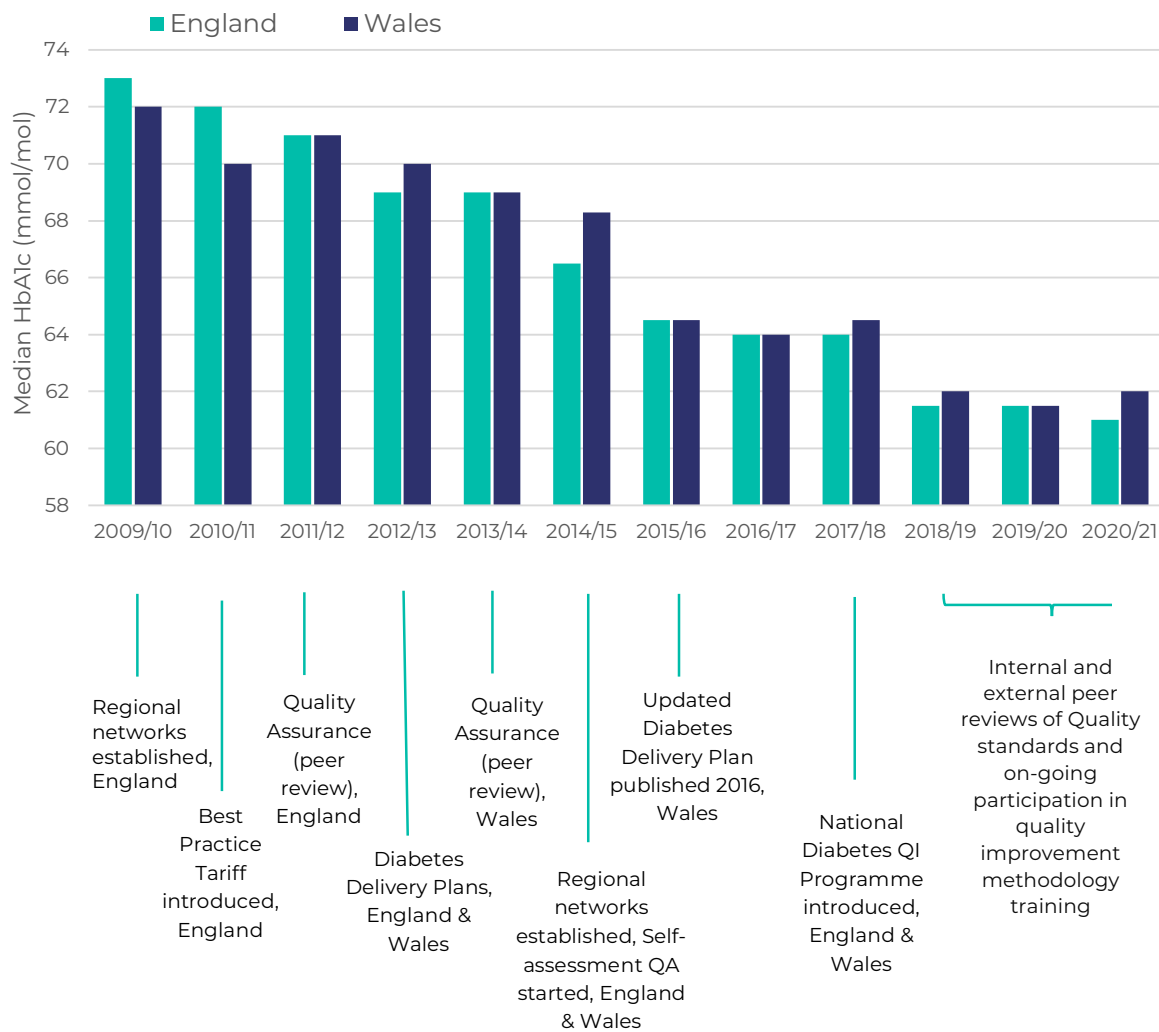


Figure 24: Median HbA1c for children and young people with all types of diabetes in England and Wales 2009/10 to 2020/21, with associated NHS policy and/or paediatric diabetes delivery structural changes

3.3 HbA1c outcomes of children and young people with Type 1 diabetes

The results presented in this section pertain to children and young people with Type 1 diabetes and show the variation in HbA1c outcomes nationally and regionally as well as by patient characteristics.

3.3.1 National and regional unadjusted HbA1c results

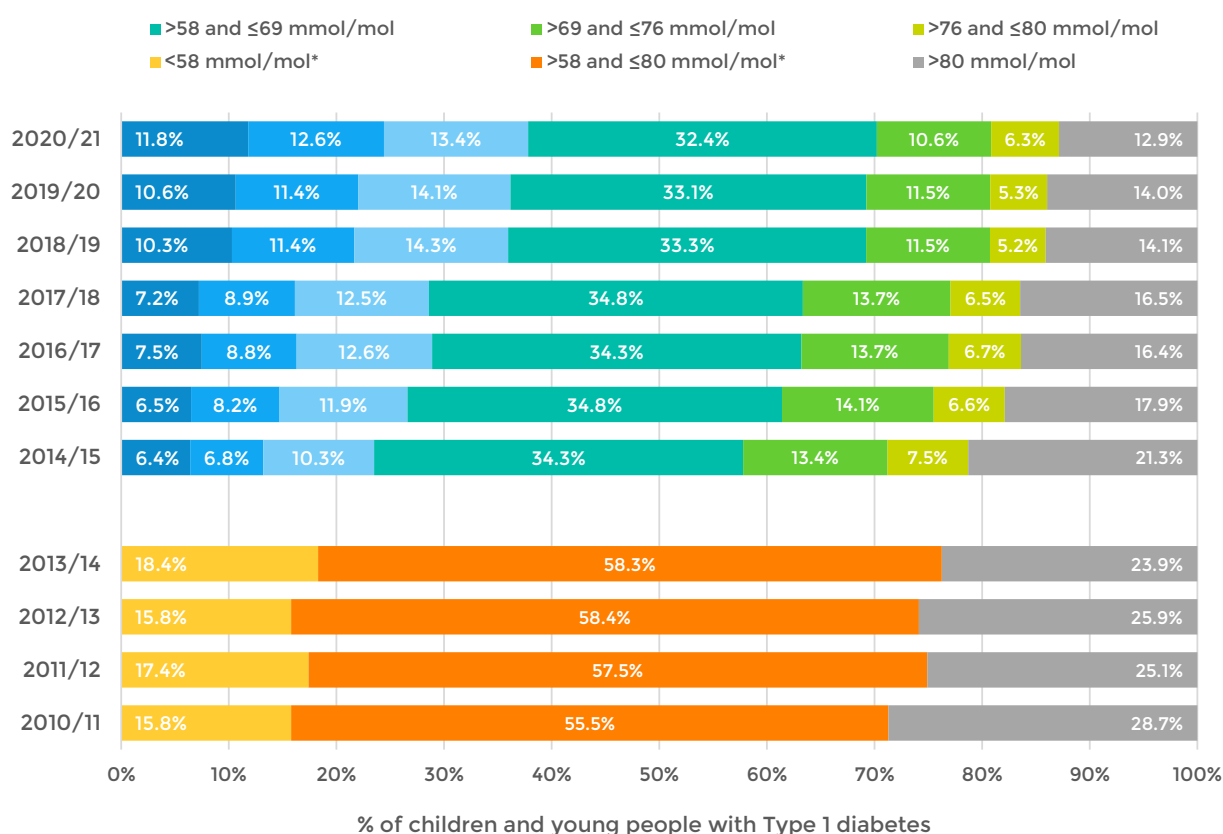
Table 18 shows the unadjusted mean and median HbA1c results for children and young people with Type 1 diabetes achieved by region and country. The unadjusted mean HbA1c was 64.2 mmol/mol, which is a decrease of 0.8 mmol/mol from 2019/20. The median HbA1c was 61.0 mmol/mol, a decrease of 1 mmol/mol from 2019/20.

Table 18: HbA1c for all children and young people with Type 1 diabetes with one or more valid HbA1c measurement, by regional network, country, and overall, 2020/21

| Country/ Region | No. of children and young people with Type 1 diabetes | Mean mmol/mol | Standard deviation mmol/mol | Median mmol/mol | Interquartile range mmol/ mol |
|---------------------------------|---|------------------|-----------------------------------|--------------------|-------------------------------------|
| England and Wales | 24,986 | 64.2 | 16.4 | 61.0 | 17.0 |
| England | 23,693 | 64.2 | 16.4 | 61.0 | 17.0 |
| Wales | 1,293 | 65.0 | 17.1 | 62.0 | 18.0 |
| | | | | | |
| East Midlands | 1,877 | 61.7 | 14.8 | 59.5 | 15.5 |
| East of England | 2,694 | 64.6 | 17.0 | 61.0 | 17.6 |
| London and South East | 4,939 | 65.5 | 17.2 | 62.0 | 18.4 |
| North East and North Cumbria | 1,513 | 62.5 | 15.7 | 60.0 | 16.5 |
| North West | 3,077 | 65.6 | 16.5 | 62.5 | 18.0 |
| South Central | 2,518 | 62.3 | 15.1 | 60.0 | 15.0 |
| South West | 2,040 | 63.3 | 15.6 | 60.5 | 15.0 |
| Wales | 1,293 | 65.0 | 17.1 | 62.0 | 18.0 |
| West Midlands | 2,509 | 64.4 | 15.8 | 62.0 | 17.0 |
| Yorkshire and Humber | 2,526 | 64.6 | 17.4 | 61.0 | 17.5 |

Figure 25 and Table 19 show the percentages of children and young people with Type 1 diabetes achieving each of the NICE (2015) treatment targets from 2014/15 to 2020/21.

Figure 25 also includes the percentages of children and young people with Type 1 diabetes who achieved the NICE (2004) treatment targets of below 58 mmol/mol, between 58 mmol/mol and 80 mmol/mol, and above 80 mmol/mol from 2010/11 to 2013/14.



* NICE (2004) treatment targets from 2010/11 to 2013/14

Figure 25: Percentage of children and young people with Type 1 diabetes with an HbA1c result within current and previous target ranges, 2010/11 – 2020/21

Table 19 shows the percentages of children and young people who achieved HbA1c targets by country and by region.

Table 19: Percentage of children and young people with Type 1 diabetes achieving HbA1c targets by country and regional network, 2020/21

| Country/regional network | ≤48 mmol/mol (%) | ≤53 mmol/mol (%) | ≤58 mmol/mol (%) | 58-80 mmol/mol (%) | ≥69 mmol/mol (%) | >75 mmol/mol (%) | >80 mmol/mol (%) |
|------------------------------|------------------|------------------|------------------|--------------------|------------------|------------------|------------------|
| England and Wales | 11.8 | 23.7 | 37.9 | 49.2 | 29.7 | 18.1 | 12.9 |
| England | 11.9 | 23.8 | 38.0 | 49.1 | 29.6 | 18.1 | 12.8 |
| Wales | 11.4 | 22.4 | 35.5 | 50.8 | 32.3 | 19.6 | 13.7 |
| East Midlands | 14.4 | 27.8 | 43.2 | 47.7 | 24.0 | 13.4 | 9.1 |
| East of England | 12.1 | 23.3 | 37.9 | 47.8 | 30.7 | 19.6 | 14.3 |
| London and South East | 11.2 | 22.1 | 35.3 | 49.9 | 32.8 | 20.7 | 14.8 |
| North East and North Cumbria | 15.1 | 28.0 | 42.7 | 47.1 | 27.0 | 15.7 | 10.2 |
| North West | 9.8 | 20.5 | 33.8 | 51.2 | 33.1 | 20.9 | 15.0 |
| South Central | 12.9 | 27.4 | 42.1 | 47.6 | 24.7 | 14.5 | 10.3 |
| South West | 12.1 | 24.3 | 39.5 | 49.4 | 26.7 | 15.9 | 11.1 |
| West Midlands | 10.9 | 22.6 | 35.8 | 52.2 | 29.5 | 17.0 | 12.0 |
| Yorkshire and Humber | 11.4 | 23.5 | 39.2 | 47.3 | 30.4 | 19.0 | 13.5 |

3.3.2 HbA1c outcomes by sex

Figure 26 shows that the mean HbA1c has decreased at a similar rate for both boys and girls with Type 1 diabetes over the last 18 years. It also shows a consistently higher mean HbA1c in girls compared to boys.

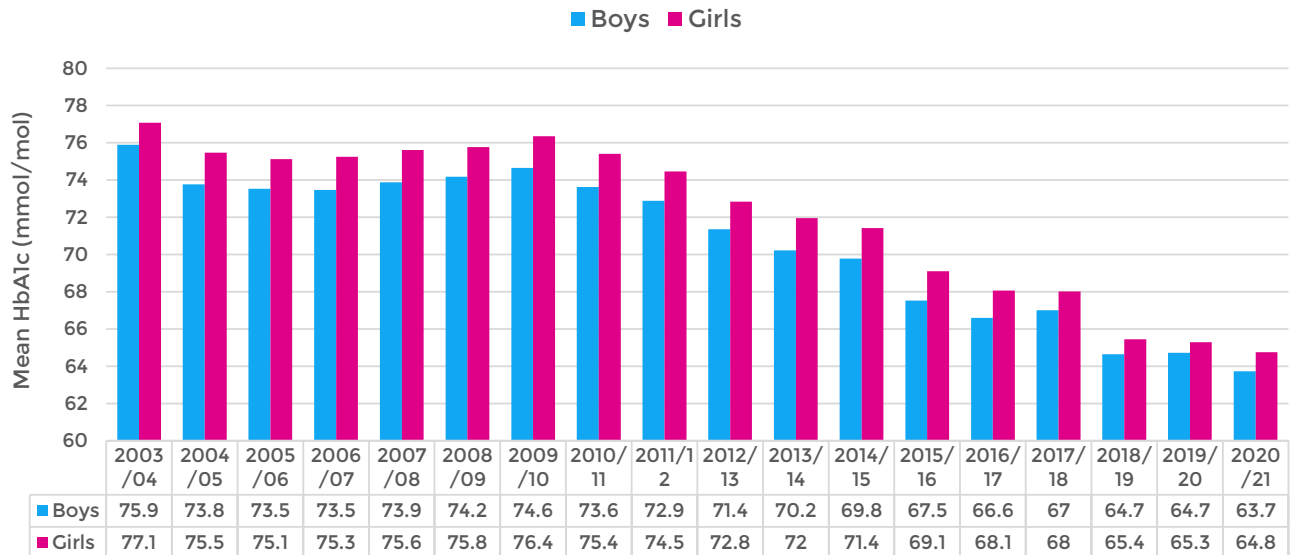


Figure 26: Mean HbA1c for boys and girls with Type 1 diabetes, 2003/04 to 2020/21

3.3.3 HbA1c outcomes by age and duration of diabetes

Figure 27 shows mean unadjusted HbA1c by duration of diabetes in 2019/2020 and 2020/21. Children and young people of all age groups had higher HbA1c from two years following diagnosis, with the exception of those aged 0-4 years. After the first year following diagnosis, those aged 15-19 had consistently higher HbA1c than other age groups.

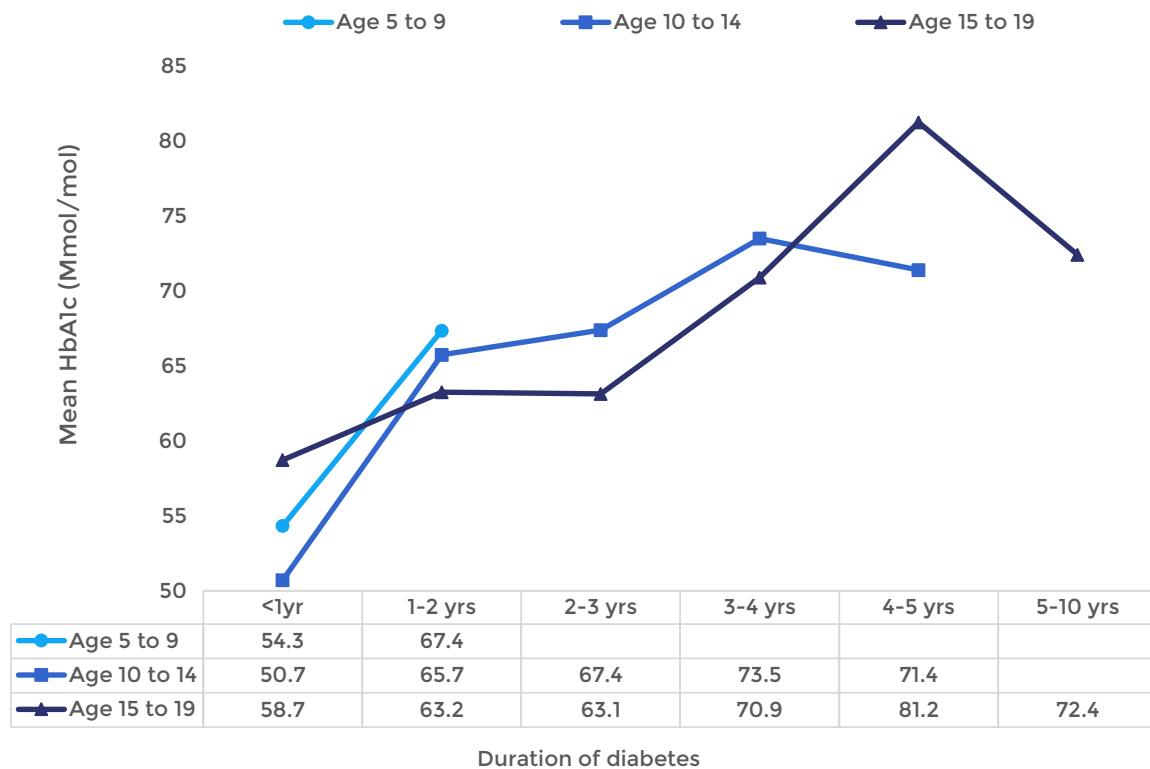


Figure 27: Mean HbA1c for children and young people with Type 1 diabetes in England and Wales by duration of diabetes and age group, 2020/21

3.3.4 HbA1c outcomes by ethnicity

Figure 28 shows that whilst there have been overall improvements in the average HbA1c amongst children and young people with Type 1 diabetes in all ethnic categories since 2011/12, there have been consistent differences in HbA1c outcomes between those in different ethnic categories, with those of White ethnicity having lower average HbA1c and those of Black ethnicity having the highest average HbA1c year on year.

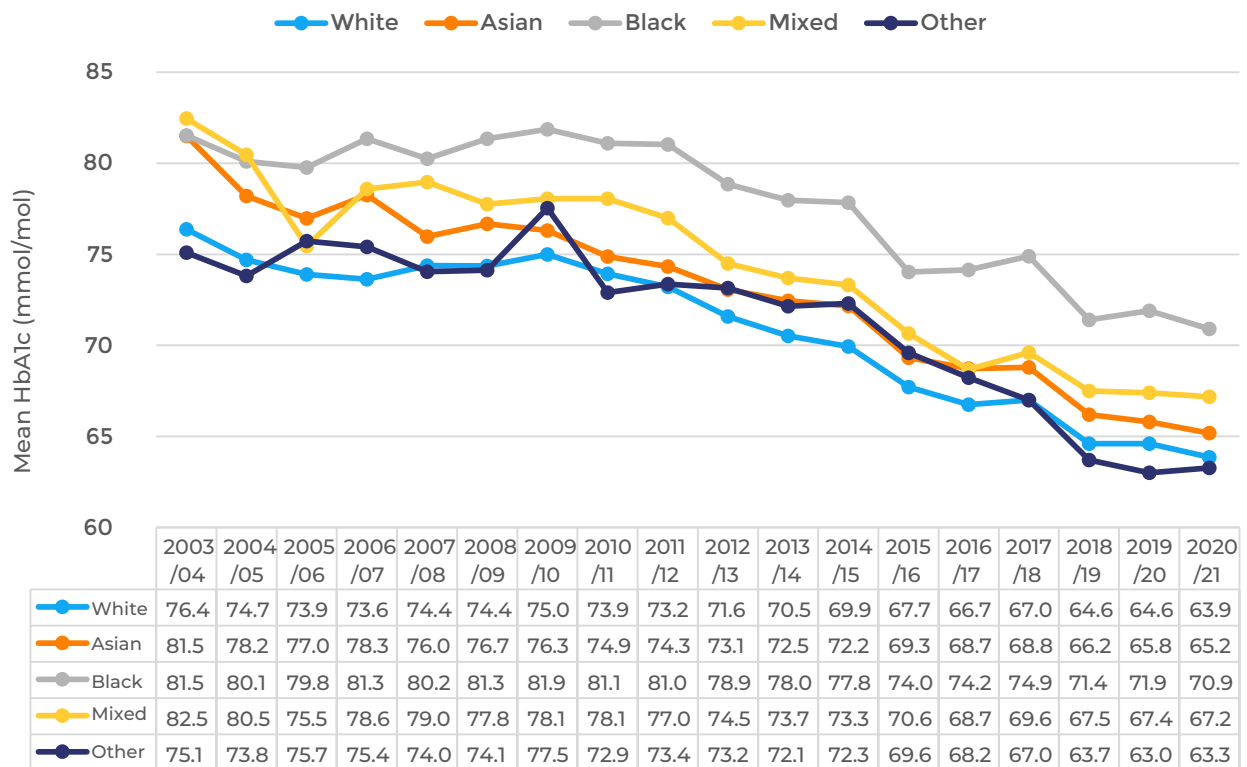


Figure 28: Mean HbA1c for children and young people with Type 1 diabetes in England and Wales by ethnic group, 2003/04 to 2020/21

Table 20 provides a breakdown of average HbA1c by ethnic group and deprivation. It shows that overall, living in a less deprived area was associated with lower HbA1c amongst those of all ethnicities, except for those of Black ethnicity. It also shows that the average HbA1c for children and young people of Black ethnicity living in the least deprived areas was similar to that of children of Asian and White ethnicity living in the most deprived areas.

Table 20: Mean HbA1c for children and young people with Type 1 diabetes by ethnic category and deprivation quintile, 2020/21*

| Ethnicity | most deprived | second most deprived | third least deprived | second least deprived | least deprived |
|-----------|---------------|----------------------|----------------------|-----------------------|----------------|
| White | 67.5 | 64.9 | 64.3 | 62.2 | 60.7 |
| Asian | 67.7 | 64.0 | 64.4 | 63.8 | 60.6 |
| Black | 71.9 | 71.0 | 69.2 | 66.9 | 71.4 |
| Mixed | 70.9 | 67.3 | 66.1 | 64.7 | 63.3 |
| Other | 65.2 | 63.6 | 63.7 | 60.2 | 58.9 |

*The (red–white–green) colour scale indicates (higher–mid–lower) mean HbA1c levels

Figure 29 shows the percentage of children and young people with Type 1 diabetes meeting HbA1c treatment targets. It shows that results of those of White or Other ethnicity skew towards the lower targets, whereas those of Black or Mixed ethnicity skew above these targets.

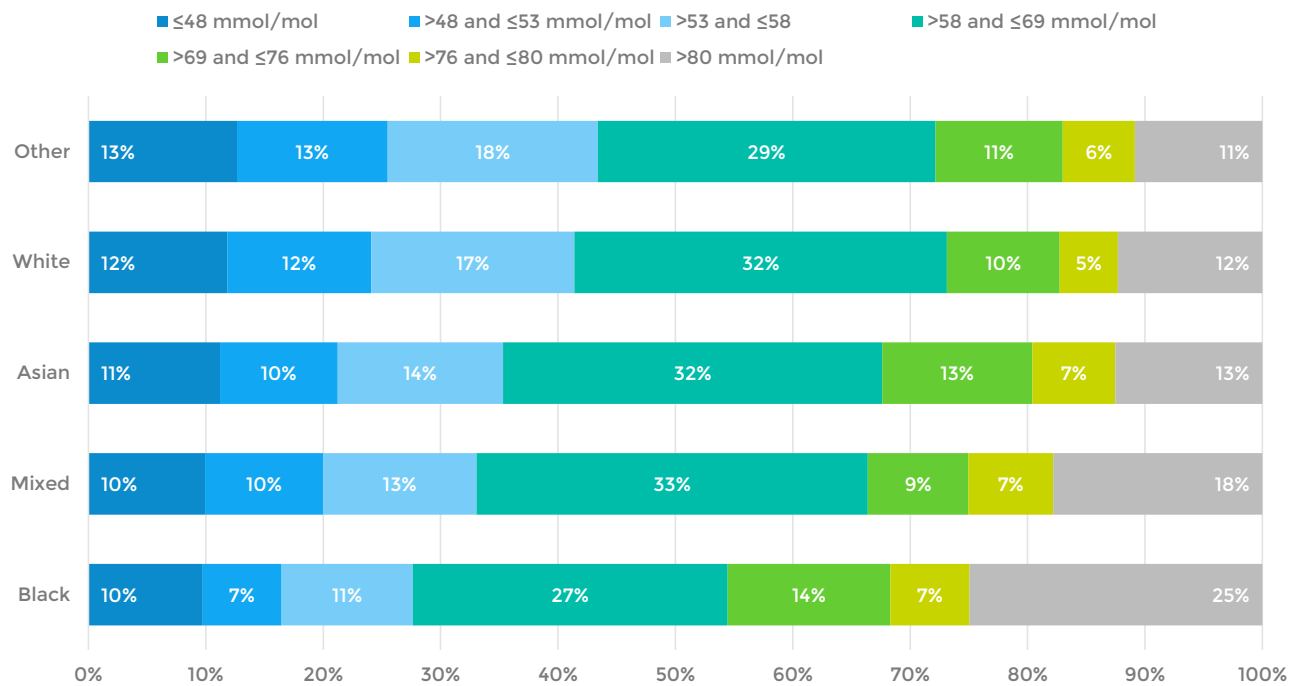


Figure 29: Percentage of children and young people with Type 1 diabetes in England and Wales achieving HbA1c targets by ethnic group, 2020/21

3.3.5 HbA1c outcomes by deprivation quintile

NPDA results have consistently shown an association between higher HbA1c and living in more deprived areas. Figure 30 shows that in 2020/21 there was a reduction in mean HbA1c within each deprivation quintile compared to 2019/20.

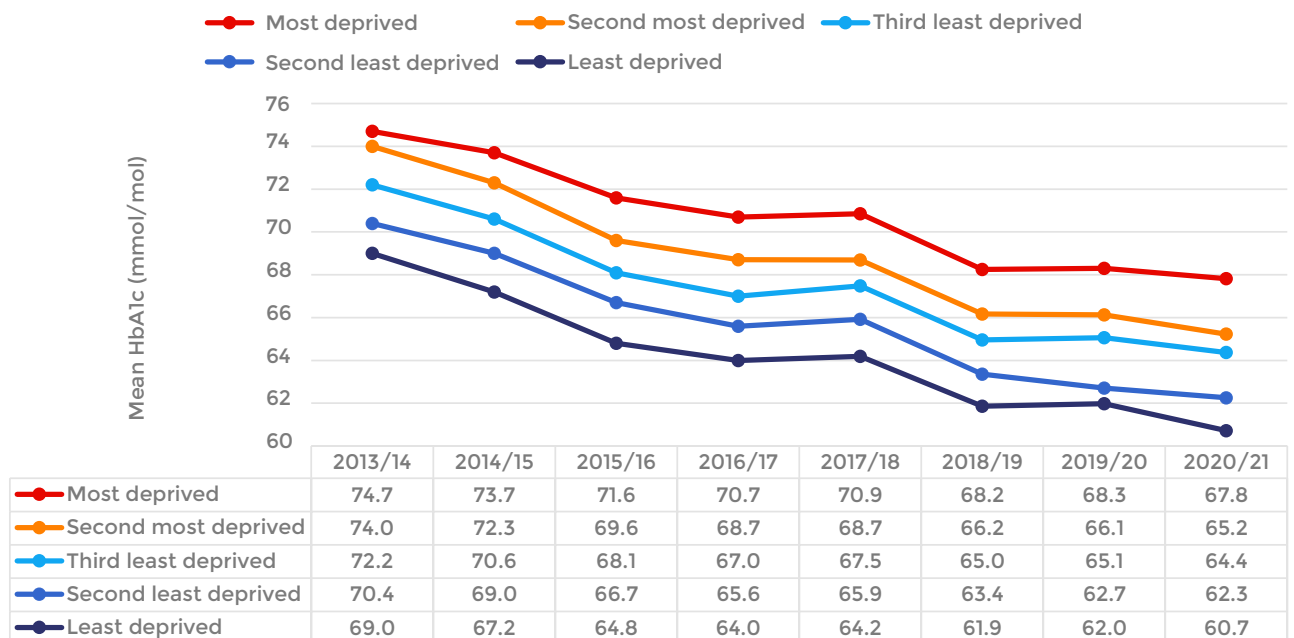


Figure 30: Mean HbA1c for children and young people with Type 1 diabetes by deprivation quintile, 2013/14 to 2020/21

Figure 31 shows the percentages of children and young people with Type 1 diabetes achieving treatment targets by deprivation quintile. Results of those in the least deprived areas skewed towards lower targets, whereas those of children and young people living in the most deprived areas skewed towards the higher cut offs.

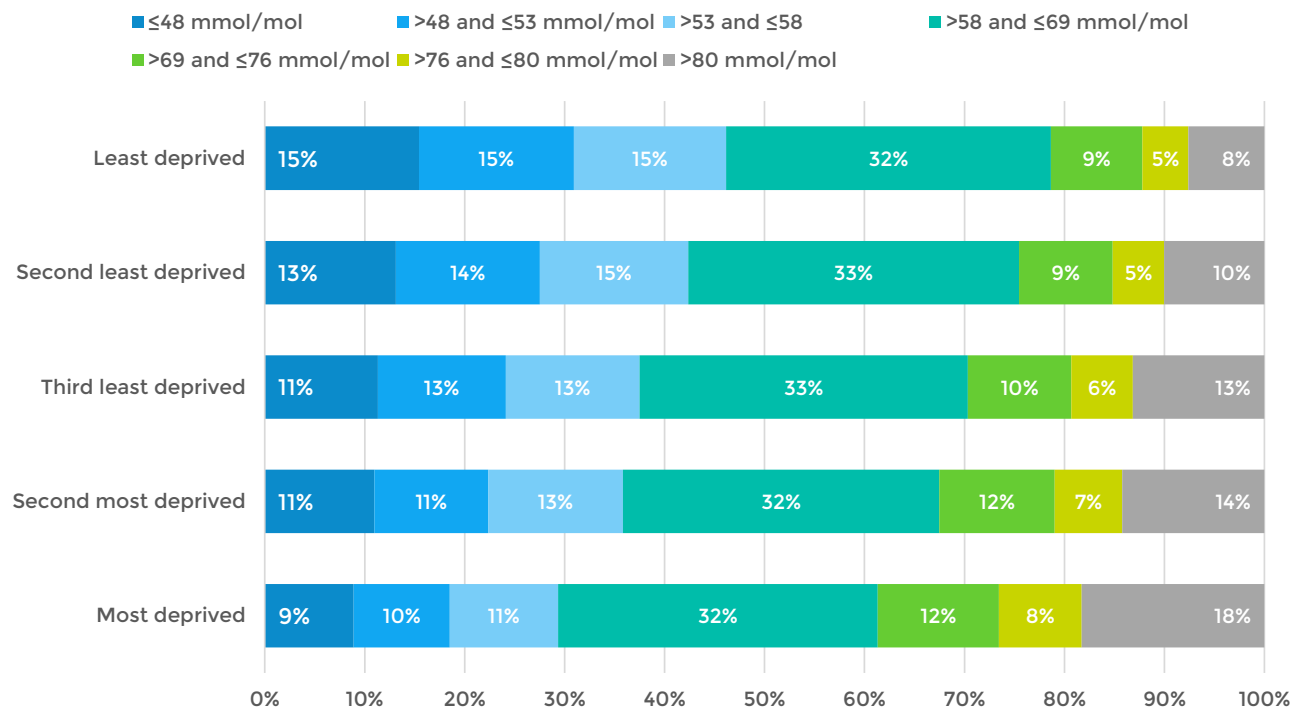


Figure 31: Percentage of children and young people with Type 1 diabetes in England and Wales achieving HbA1c targets by deprivation quintile, 2020/21

3.3.6 HbA1c outcomes across PDUs in England and Wales

Figure 32 shows the median HbA1c value for all PDUs in England and Wales. Median HbA1c values by PDU ranged from 54.5 mmol/mol to 69.0 mmol/mol.

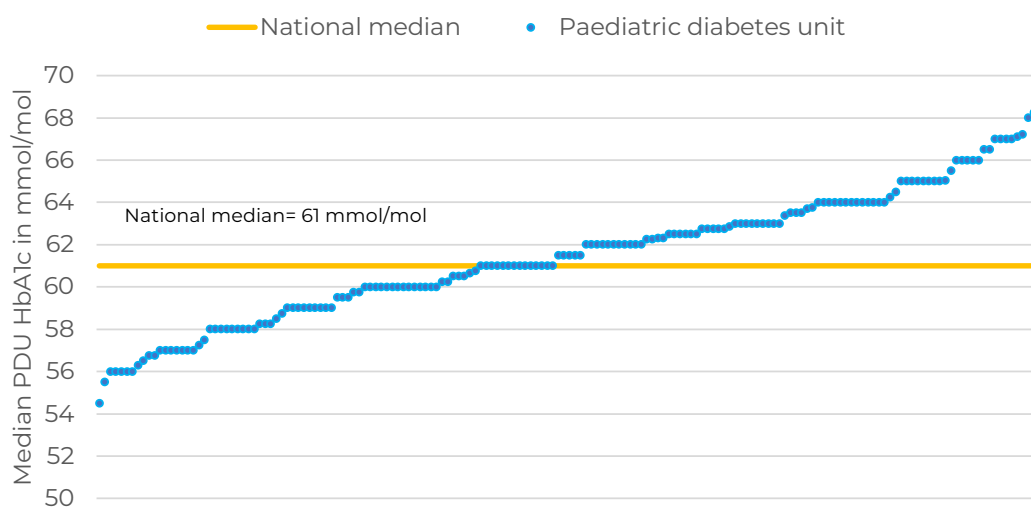


Figure 32: Median HbA1c per PDU 2020/21

Figure 33 shows the percentage of children and young people with Type 1 diabetes achieving the HbA1c target of <58 mmol/mol by PDU. The overall percentage achieving this target was 37.9%. The percentages achieving this target per PDU ranged from 17.8% to 67.7%.

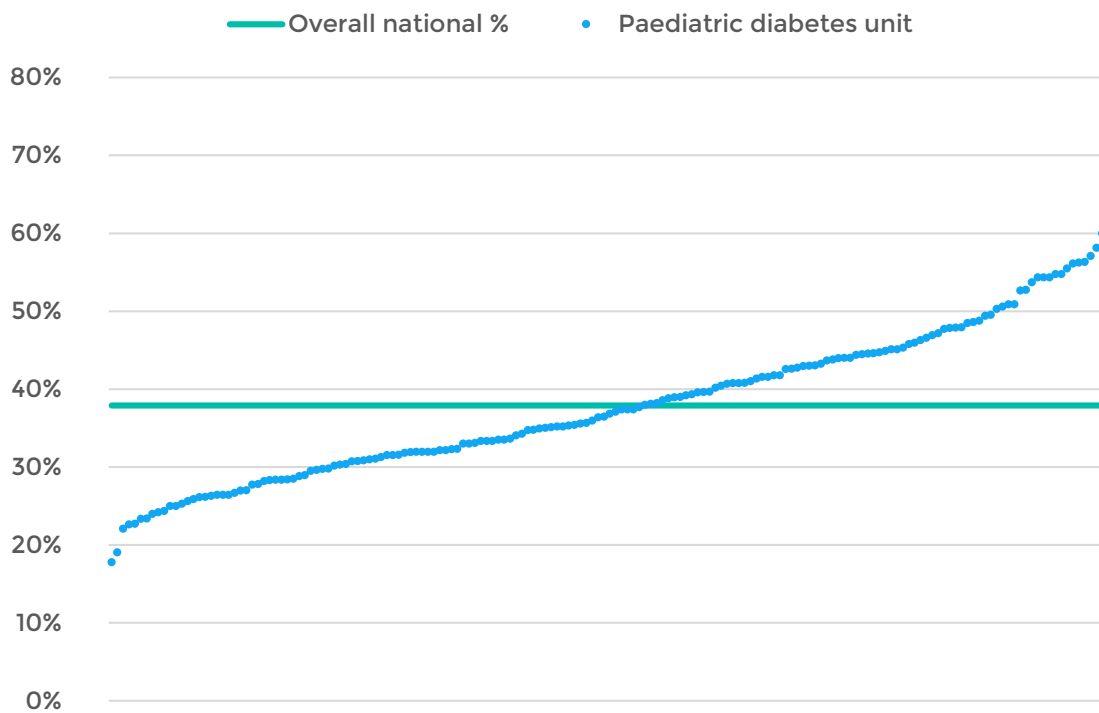


Figure 33: Percentage of children and young people with HbA1c <58mmol/mol per PDU 2020/21

3.4 HbA1c outcomes of children and young people with Type 2 diabetes

HbA1c outcomes are jointly reported for England and Wales given the smaller numbers of children and young people with Type 2 diabetes included within the audit. The mean and median HbA1c of children and young people with Type 2 diabetes in England and Wales receiving care in a PDU in 2020/21 were 61.0 and 53.0 mmol/mol, respectively; both higher than in 2019/20, with a wider interquartile range. This in contrast to Type 1 diabetes, where the national mean and medians fell in 2020/21.

Table 21: HbA1c for all children and young people with Type 2 diabetes and one or more valid HbA1c measurements in England and Wales, 2015/16 – 2020/21

| Audit year | No. of children and young people with Type 2 diabetes | HbA1c in mmol/mol | | | |
|------------|---|-------------------|--------------------|--------|---------------------|
| | | Mean | Standard deviation | Median | Interquartile range |
| 2015/16 | 539 | 59.7 | 25.4 | 51 | 30.5 |
| 2016/17 | 605 | 60.2 | 24.6 | 52 | 33.5 |
| 2017/18 | 650 | 61.3 | 25.3 | 53 | 28.5 |
| 2018/19 | 674 | 57.4 | 23.5 | 49.5 | 26 |
| 2019/20 | 731 | 58.6 | 23.6 | 51 | 28 |
| 2020/21 | 676 | 61 | 24.8 | 53 | 33.5 |

Figure 34 shows variation in the percentages of children and young people with Type 2 diabetes achieving HbA1c targets since 2017/18, with no improvement trend across this period. Two fifths (40.9%) were achieving the recommended target of lower or equal to 48 mmol/mol, a decrease from 44.3% in 2019/20.

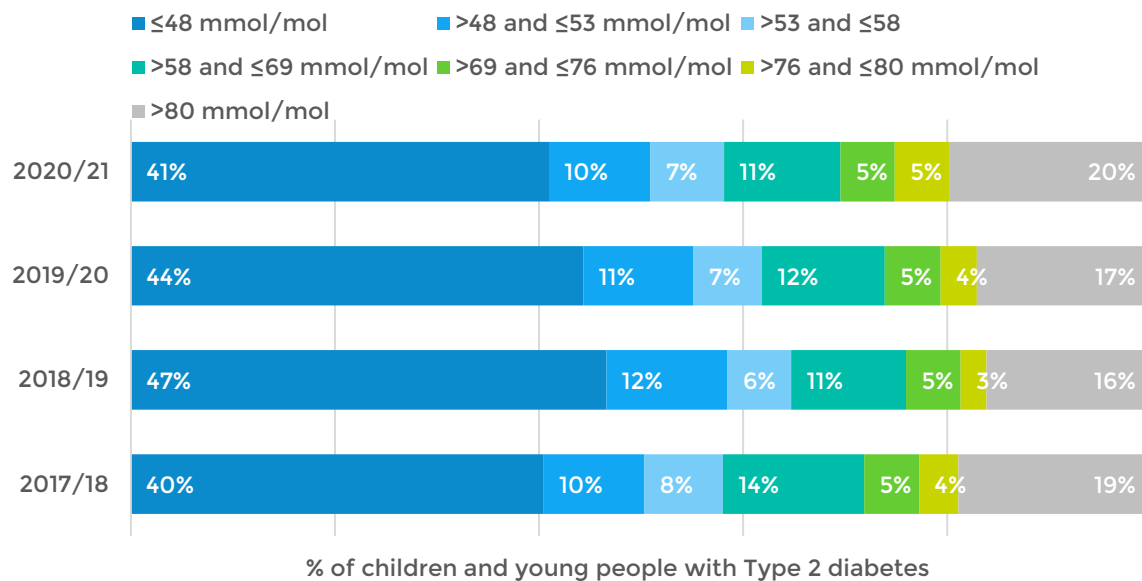


Figure 34: Percentage of children and young people with Type 2 diabetes with an HbA1c result within current and previous target ranges, 2017/18 – 2020/21

3.4.1 HbA1c outcomes by sex

Figure 35 provides a breakdown of mean HbA1c amongst children and young people with Type 2 diabetes broken down by sex in each audit year. It shows variation between the audit years, and a tendency for girls to have higher HbA1c.

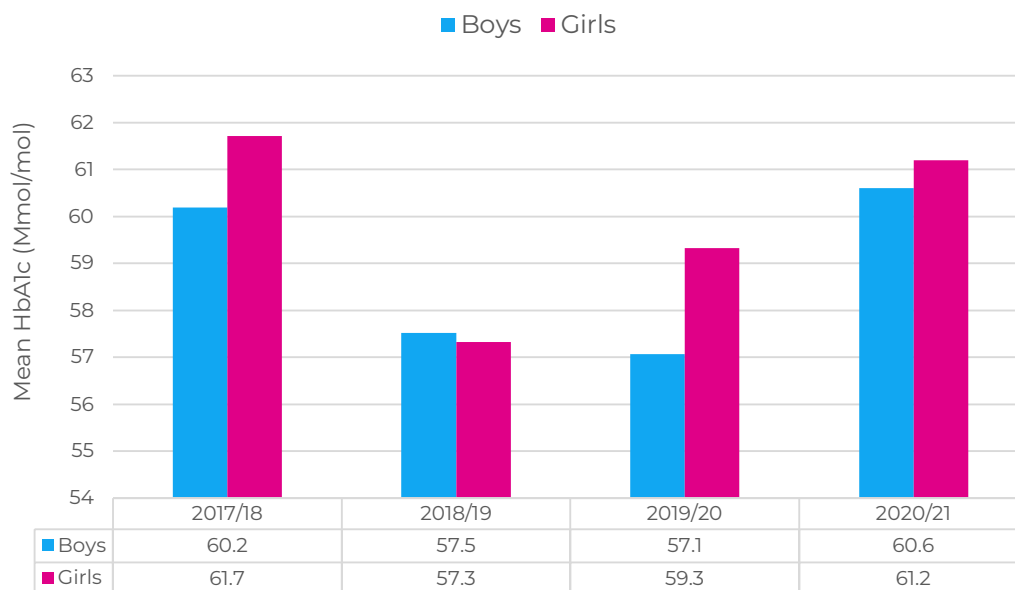


Figure 35: Mean HbA1c for boys and girls with Type 2 diabetes, 2017/18 to 2020/21

3.4.2 HbA1c outcomes by age group and duration of Type 2 diabetes

Figure 36 shows that mean HbA1c increases within each age group after the first year of diagnosis of Type 2 diabetes.

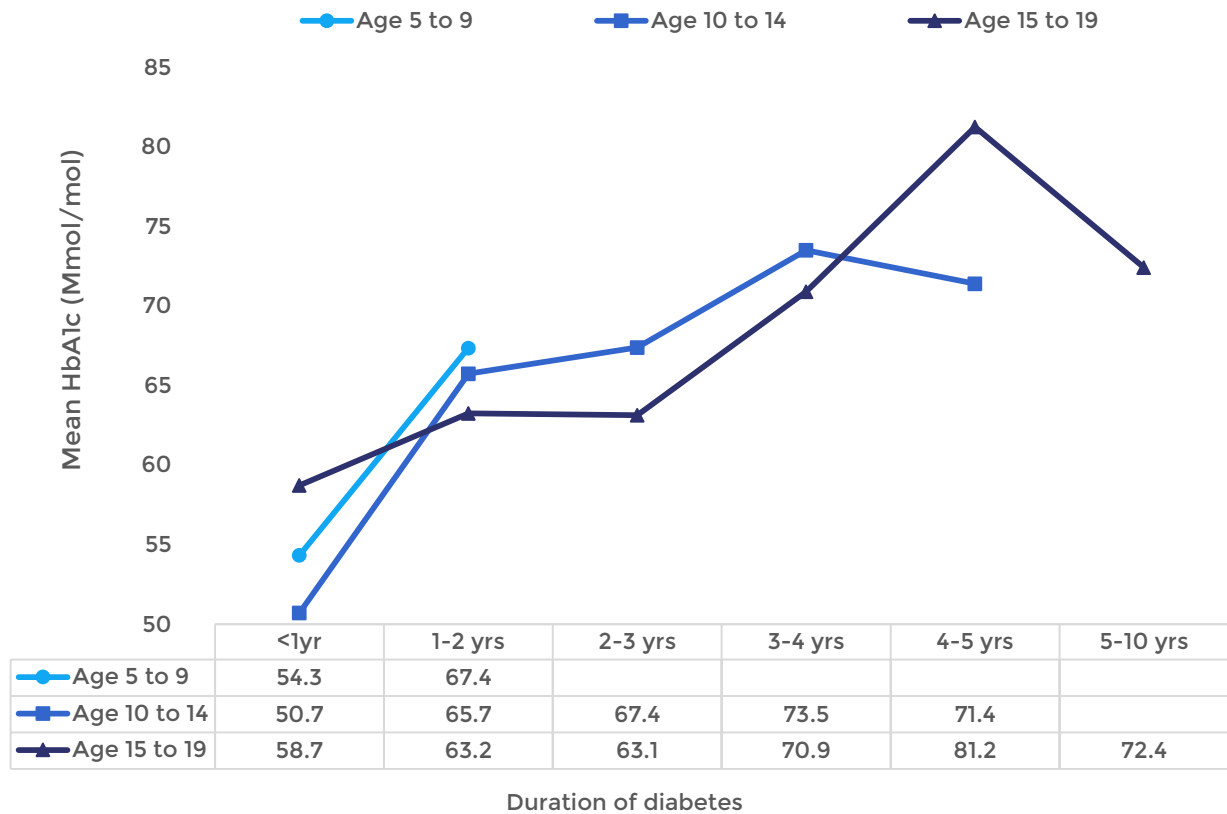


Figure 36: Mean HbA1c for children and young people with Type 2 diabetes, by age group and duration of diabetes, 2020/21

3.4.3 HbA1c outcomes by deprivation quintile

Figure 37 shows variation in mean HbA1c by deprivation quintile across audit years. There has been a weaker correlation between deprivation and mean HbA1c as has been observed amongst those with Type 1 diabetes.

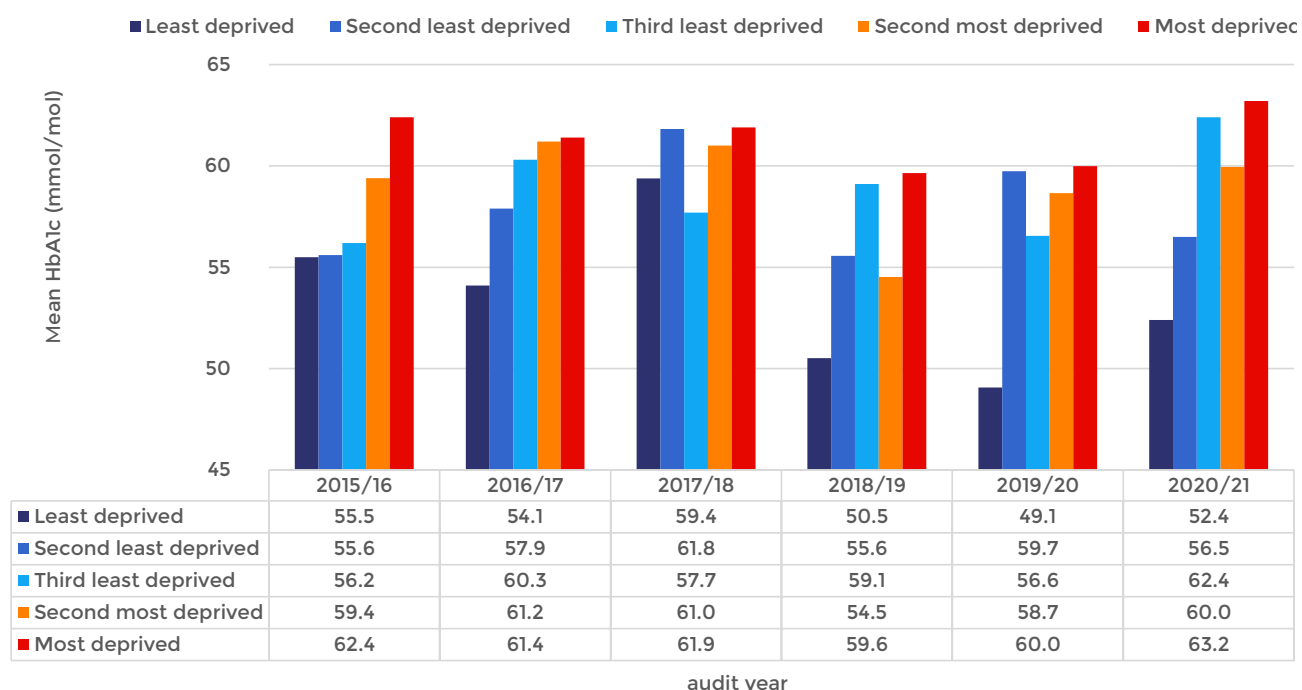


Figure 37: Mean HbA1c for children and young people with Type 2 diabetes in England and Wales by deprivation quintile, 2015/16 to 2020/21

3.4.4 HbA1c outcomes by ethnic category

Similarly to those with Type 1 diabetes, Figure 38 shows that White children and young people with Type 2 diabetes had lower mean HbA1c, and Black children with Type 2 diabetes had higher mean HbA1c than those in other ethnic categories between 2015/16 and 2020/21.

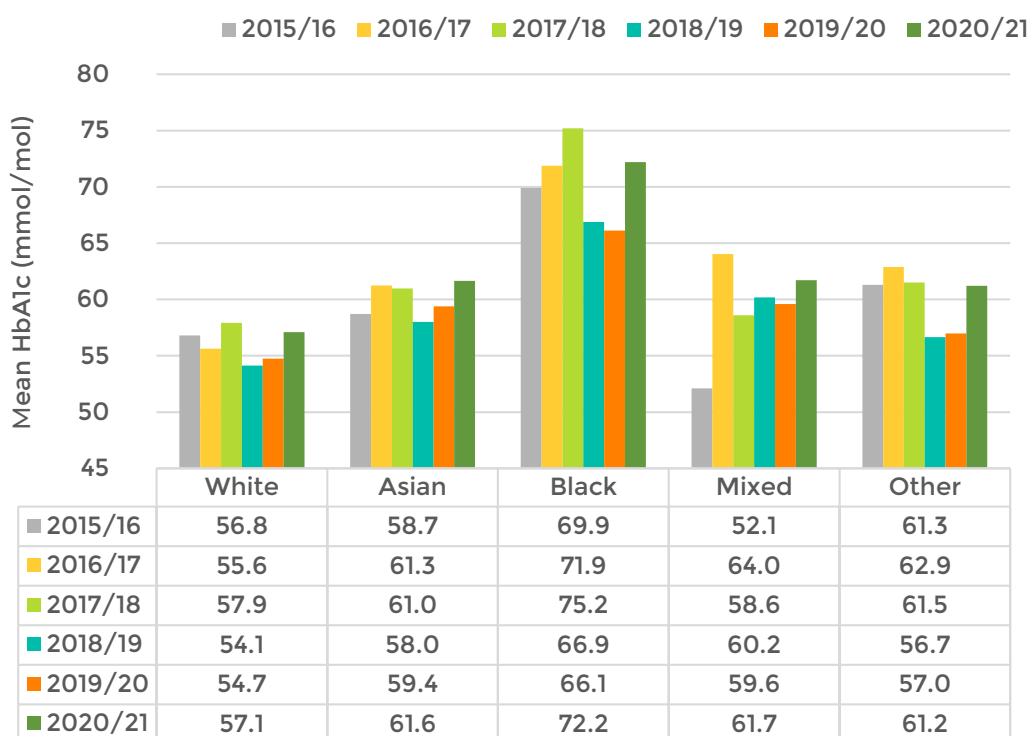


Figure 38: Mean HbA1c for children and young people with Type 2 diabetes by ethnic category, 2015/16- 2020/21

3.5 Small vessel (microvascular) disease

People with diabetes are at increased risk of microvascular disease including diabetic kidney disease (nephropathy) and diabetic eye disease (retinopathy). This chapter explores the incidence and demographics of early signs of microvascular disease in children with diabetes.

3.5.1 Diabetic kidney disease

Annual albuminuria screening is recommended by NICE (2015) in all children with Type 1 diabetes aged 12 and above, and for all those with Type 2 diabetes of any age. The presence of significant albuminuria may be indicative of progressive diabetic kidney disease.

3.5.1.1 Albuminuria in young people with Type 1 diabetes

Nearly two-thirds (n = 10,204) of young people with Type 1 diabetes aged 12 years and above were recorded as receiving an albuminuria screen during the audit period. Of those, 95.9% (n = 9,785) had a valid interpretation of their urinary albumin level. Increased risk of kidney disease is indicated by the presence of either micro- or macro-albuminuria. Figure 39 shows that 10.3% of young people in England and Wales were recorded as having micro- or macro-albuminuria.

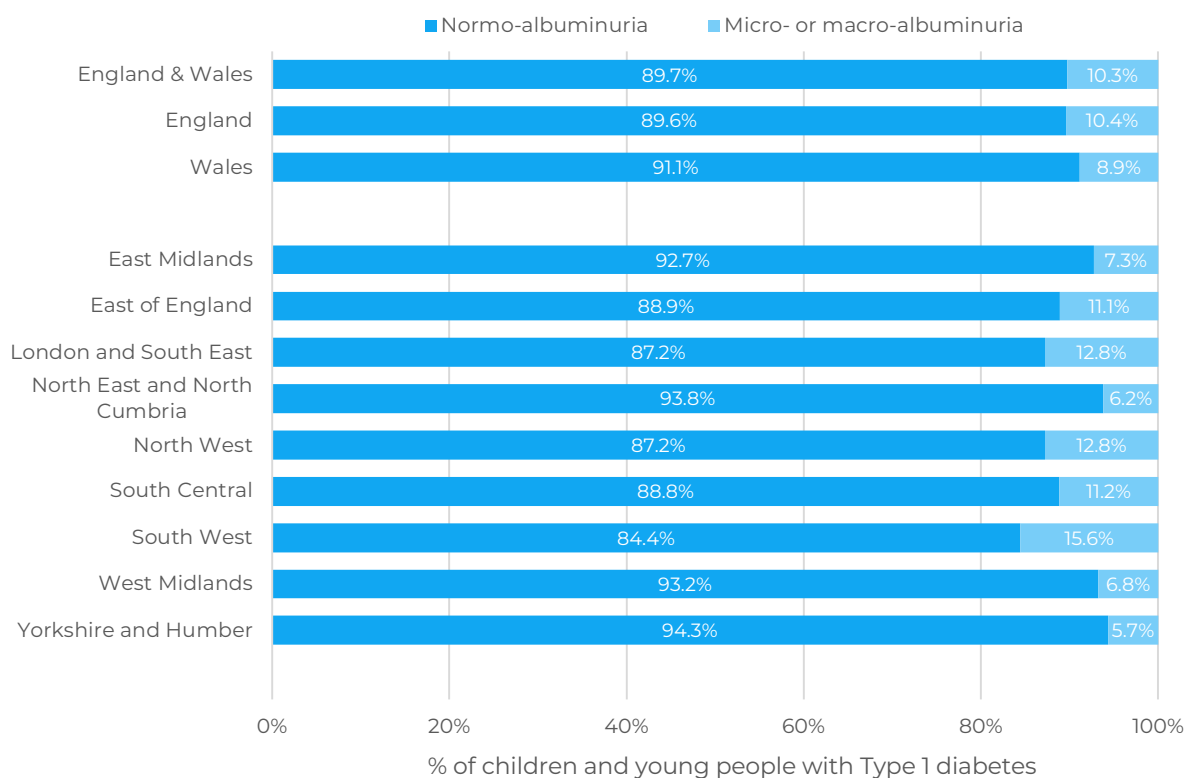


Figure 39: Percentage of young people with Type 1 diabetes aged 12 years and older with albuminuria by country and regional network 2020/21

Table 22 shows that the percentage of young people with Type 1 diabetes aged 12 years and above with albuminuria has remained stable since 2015/16.

Table 22: Percentage of young people with Type 1 diabetes aged 12 years and above with albuminuria, 2015/16 to 2020/21

| Audit Year | Total (n) | Normo-albuminuria (%) | Micro- or macro-albuminuria (%) |
|------------|-----------|-----------------------|---------------------------------|
| 2020/21 | 9,785 | 89.7 | 10.3 |
| 2019/20 | 11,270 | 88.9 | 11.1 |
| 2018/19 | 11,075 | 90.2 | 9.8 |
| 2017/18 | 10,631 | 89.8 | 10.2 |
| 2016/17 | 9,938 | 90.0 | 10.0 |
| 2015/16 | 9,364 | 90.1 | 9.9 |

Figure 40 shows little variation in the presence of albuminuria by duration of diabetes between the audit years.

**Figure 40:** Percentage of young people with Type 1 diabetes aged 12 years and above with albuminuria by duration of diabetes, 2016/17 – 2020/21

Figure 41 shows little difference in rates of albuminuria by age and sex, with boys having a marginally higher rate at every age, with the exception of age 18, however this finding should be interpreted with caution given the small numbers of young people receiving care from a PDU at this age.

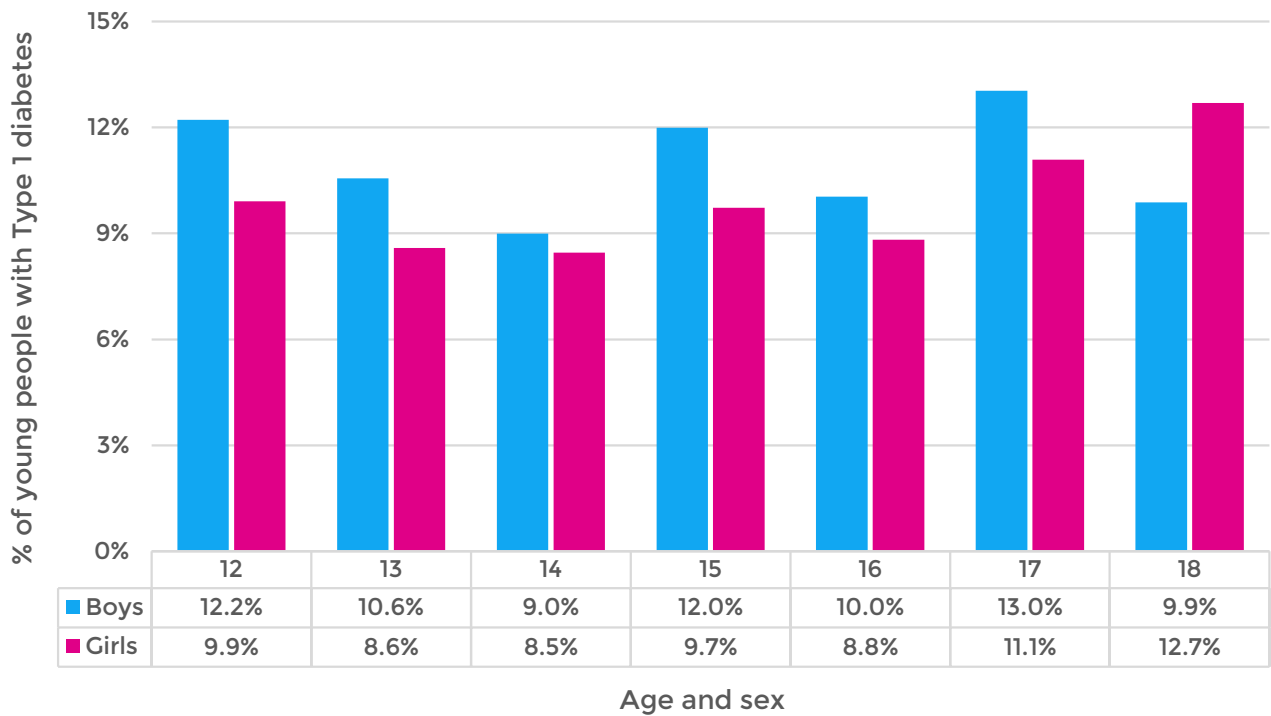


Figure 41: Percentage of young people with Type 1 diabetes aged 12 years and above with albuminuria by age and sex, 2016/17 – 2020/21

Figure 42 shows that prevalence of albuminuria decreased in nearly all deprivation quintiles in 2020/21, but no clear relationship between prevalence of albuminuria and deprivation.

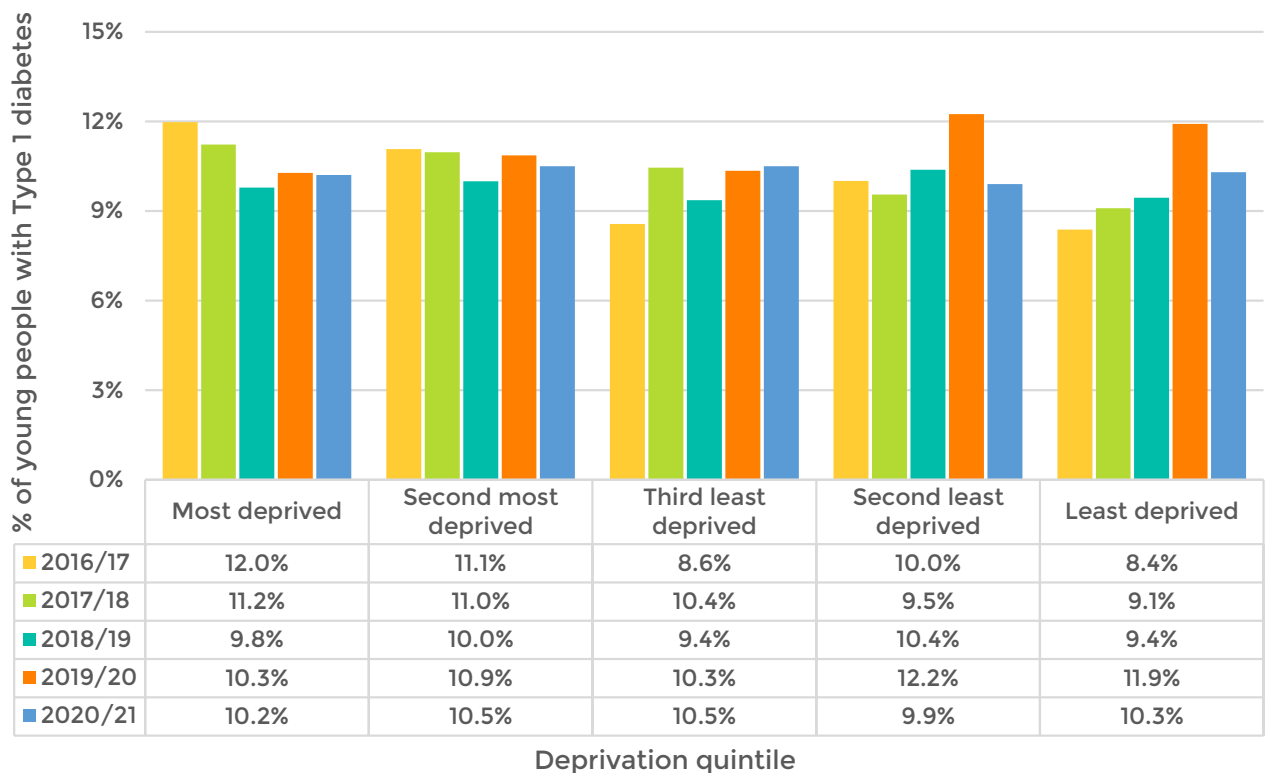


Figure 42: Percentage of young people with Type 1 diabetes aged 12 years and above with albuminuria by deprivation quintile, 2016/17 – 2020/21

Figure 43 shows that young people with Type 1 diabetes and higher HbA1c tend to be more at risk of albuminuria. It also shows that albuminuria can be present even amongst those meeting the lower HbA1c targets.

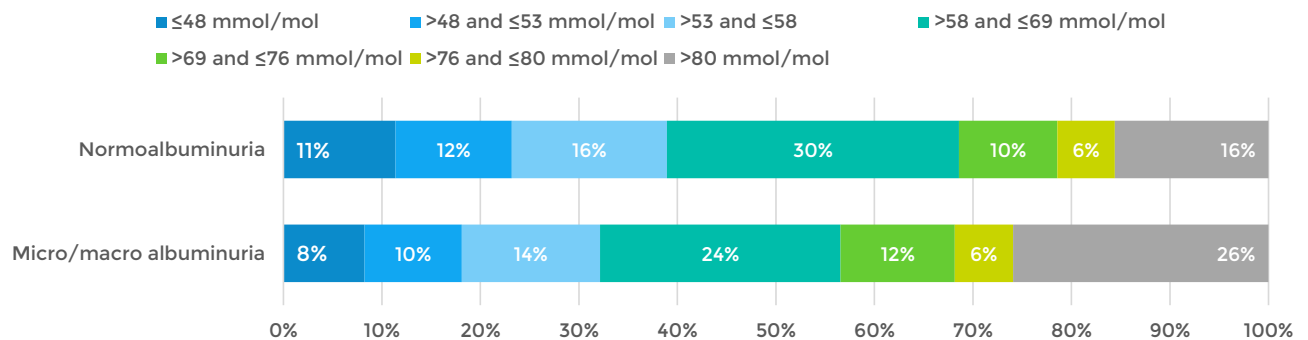


Figure 43: Percentage of young people with Type 1 diabetes achieving HbA1c targets by presence of albuminuria, 2020/21

3.5.1.2 Albuminuria in children and young people with Type 2 diabetes

Figure 44 shows that albuminuria was present in 23.4% of children and young people with Type 2 diabetes with a valid PDU interpretation of their urinary albumin level (n=346) in 2020/21. The percentage of children and young people with Type 2 diabetes with albuminuria is over twice that recorded for young people with Type 1 diabetes (10.3%) – indicating that children and young people with Type 2 diabetes are at greater risk of kidney disease.

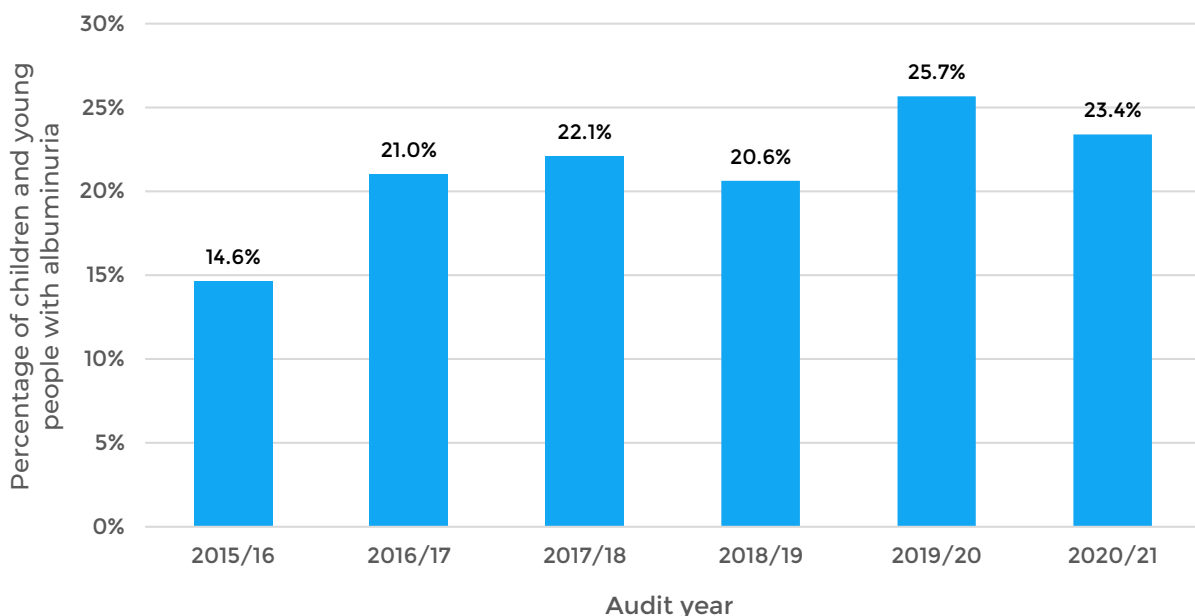


Figure 44: Percentage of children and young people with Type 2 diabetes with albuminuria in England and Wales, 2015/16 – 2020/21

3.5.2 Eye Disease

3.5.2.1 Retinopathy in young people with Type 1 diabetes

There were 4,247 young people with Type 1 diabetes aged 12 years and above recorded as receiving an eye screen during the audit period. Of those, 97.1% (n = 4,127) had a valid eye screen result recorded. Table 23 shows that 16.9% of young people with Type 1 diabetes aged 12 and above had an abnormal eye screen result recorded within the audit period. The NPDA only records an eye screen as being normal or abnormal. Most abnormal screens in this age group are likely to represent background retinopathy. The higher rate of retinopathy in 2020/21 could reflect that services were asked to prioritise screening patients with retinopathy identified at their previous annual screen.

Table 23: Percentage of young people with Type 1 diabetes aged 12 years and above with a normal/abnormal eye screening result, 2015/16 to 2020/21

| Audit Year | Total (n) | Normal % | Abnormal % |
|------------|-----------|----------|------------|
| 2020/21 | 4,247 | 83.1 | 16.9 |
| 2019/20 | 10,852 | 88.0 | 12.0 |
| 2018/19 | 11,431 | 86.9 | 13.1 |
| 2017/18 | 11,134 | 87.2 | 12.8 |
| 2016/17 | 9,938 | 85.2 | 14.8 |
| 2015/16 | 9,788 | 84.7 | 15.3 |

Figure 45 provides a breakdown of screening results in 2020/21 of all those who also had a recorded retinopathy screening result in 2019/20. It shows that of those with a normal result in 2019/20, a tenth (10.3%) were found to have retinopathy in 2020/21, whilst two fifths (42.4%) of those with retinopathy in 2019/20 had a normal result in 2020/21.

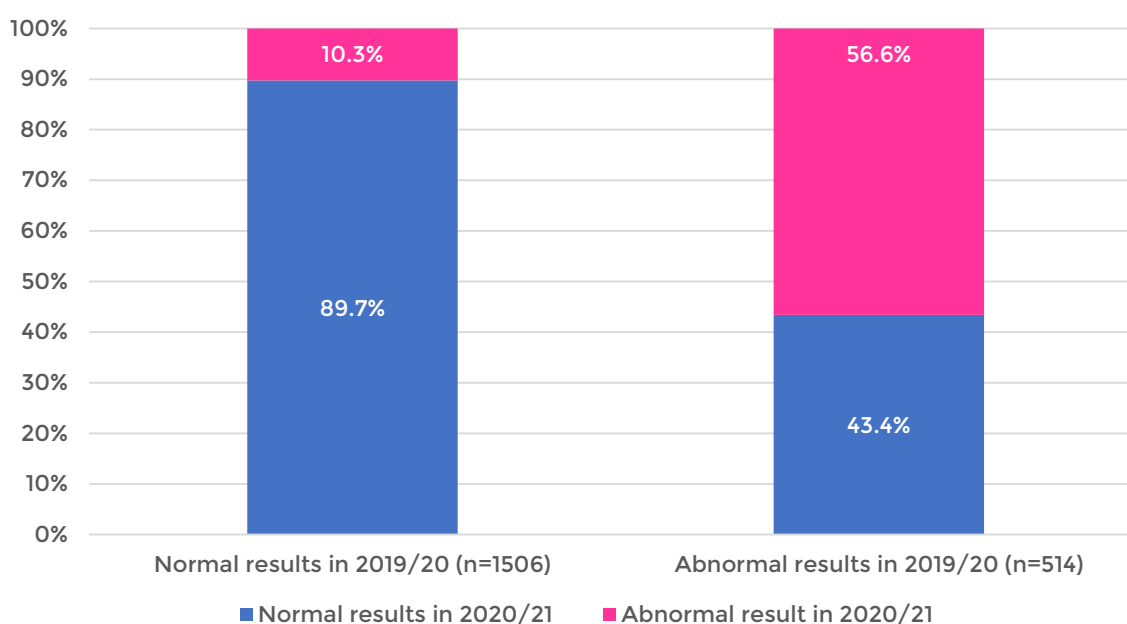


Figure 45: Retinopathy screening outcomes of children and young people with Type 1 diabetes on 2020/21 by result of screening in 2019/20

3.5.2.2 Retinopathy in young people with Type 2 diabetes

Figure 46 shows that 3.5% of young people with Type 2 diabetes aged 12 years and above with a valid eye screening result (n=171) had an abnormal result. The rate of retinopathy found amongst young people with Type 1 diabetes was 16.9% by comparison.

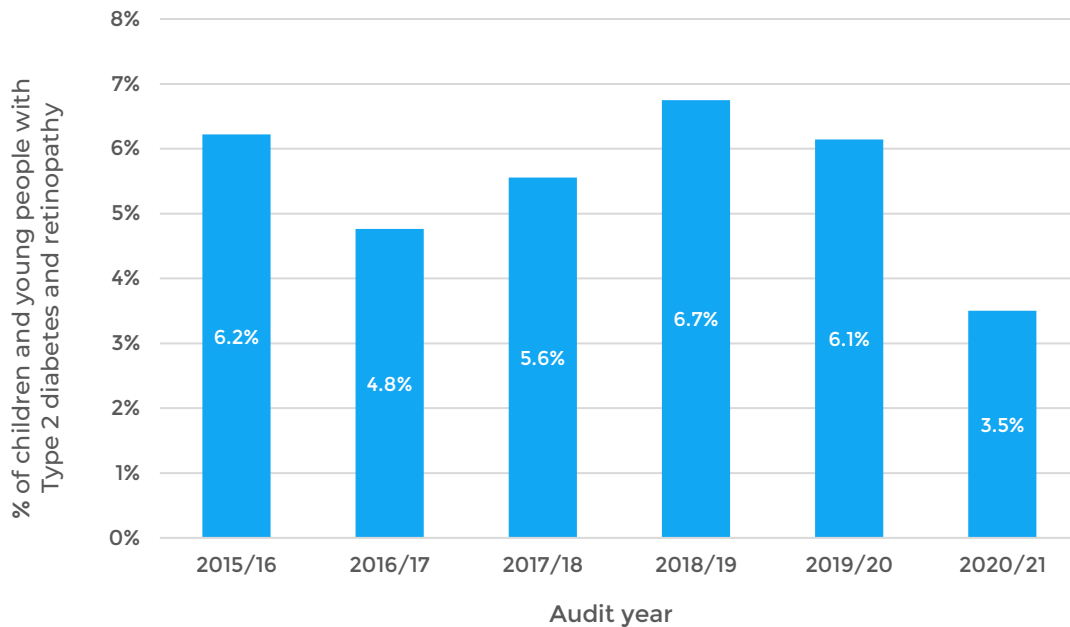


Figure 46: Eye screening results for young people aged 12 years and above with Type 2 diabetes, 2015/16 to 2020/21

3.6 Large vessel disease – Cardiovascular Disease (CVD) risk factors

People with diabetes are at an increased risk of cardiovascular disease secondary to macrovascular risk factors including high blood pressure, abnormal lipid levels and high body mass index. This chapter examines the prevalence of these risk factors, and patient characteristics associated with higher risk for them.

3.6.1 Blood pressure and cholesterol

High blood pressure and/or raised blood cholesterol increases lifetime risk of cardiovascular disease, including stroke and heart disease. In adults with Type 1 diabetes, maintaining normal blood pressure and cholesterol within target (less than 5 mmol/L) reduces this risk. Although screening of total cholesterol levels is no longer a mandatory requirement for children and young people with Type 1 diabetes following NICE guidance NG18 (2015), results are still presented where data have been submitted. Diastolic and systolic blood pressure measurements were converted to age- and sex- adjusted centiles using survey data between 1995 and 1998 from the general population aged between 4 and 24 years old (Jackson et al., 2007).

3.6.1.1 Blood pressure and cholesterol in young people with Type 1 diabetes

Table 24 shows the percentages of young people aged 12 and above with Type 1 diabetes with a recorded blood pressure in the audit period (n=11,702) classified as having 'high normal' (91st -98th centile) or 'high' blood pressure (>98th centile). Nearly one third of young people (31.0%) with Type 1 diabetes had high blood pressure (hypertension); this represents an increase compared to the figure reported in the 2019/20 audit (26.7%).

Table 24: Percentage of young people with Type 1 diabetes aged 12 years and above falling within blood pressure targets by country and region, 2020/21

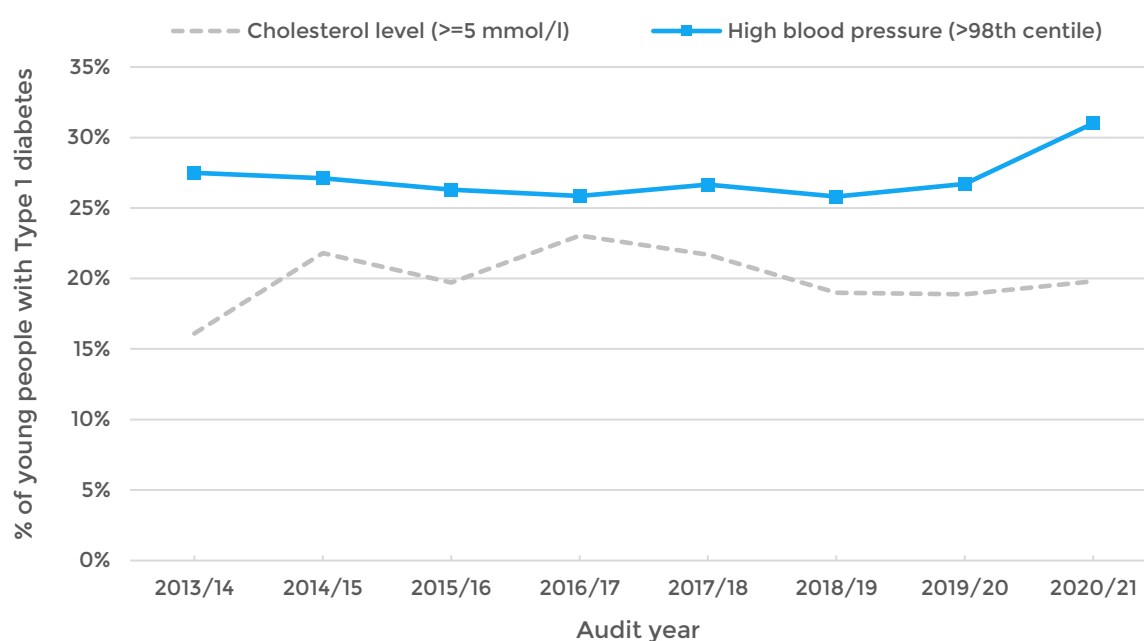
| Country/region | 'High normal' blood pressure (91st-98th centile) | | | High' blood pressure (>98th centile) | | |
|------------------------------|--|--------------|---------------------------|--------------------------------------|--------------|---------------------------|
| | Diastolic (%) | Systolic (%) | Diastolic and/or systolic | Diastolic (%) | Systolic (%) | Diastolic and/or systolic |
| England and Wales | 28.8 | 10.1 | 28.9 | 30.6 | 4.2 | 31.0 |
| England | 28.8 | 10.1 | 28.9 | 30.3 | 4.2 | 30.7 |
| Wales | 29.5 | 10.6 | 30.4 | 35.8 | 4.9 | 36.9 |
| East Midlands | 30.0 | 11.1 | 30.0 | 35.8 | 4.8 | 36.9 |
| East of England | 28.5 | 11.3 | 29.1 | 30.3 | 3.5 | 30.3 |
| London and South East | 30.2 | 9.1 | 30.5 | 29.4 | 3.4 | 29.7 |
| North East and North Cumbria | 25.6 | 5.7 | 25.9 | 28.0 | 1.7 | 28.5 |
| North West | 27.4 | 9.5 | 26.0 | 30.8 | 3.7 | 29.2 |
| South Central | 27.1 | 9.3 | 28.2 | 28.3 | 3.3 | 29.5 |
| South West | 28.7 | 12.5 | 25.7 | 33.4 | 8.6 | 33.9 |
| Wales | 29.5 | 10.6 | 30.4 | 35.8 | 4.9 | 36.9 |
| West Midlands | 32.2 | 10.0 | 33.6 | 28.7 | 5.2 | 30.1 |
| Yorkshire and Humber | 27.7 | 12.8 | 29.0 | 30.1 | 4.7 | 31.6 |

Table 25 shows the percentages of young people aged 12 and above with Type 1 diabetes with a recorded cholesterol screen (n=10,030) within the target for total blood cholesterol. It shows that 19.8% exceeded the higher (≥ 5 mmol/l) target for total blood cholesterol. This figure is 0.9% higher than the one reported in the 2019/20 audit (18.9%).

Table 25: Percentage of young people with Type 1 diabetes aged 12 years and above falling within cholesterol targets by country and region, 2020/21

| Country/region | 4 mmol/l or more (%) | 5 mmol/l or more (%) |
|------------------------------|----------------------|----------------------|
| England and Wales | 61.9 | 19.8 |
| England | 61.6 | 19.9 |
| Wales | 66.1 | 18.1 |
| East Midlands | 60.2 | 19.2 |
| East of England | 61.9 | 20.4 |
| London and South East | 62.7 | 20.2 |
| North East and North Cumbria | 61.1 | 22.2 |
| North West | 64.3 | 22.0 |
| South Central | 61.4 | 20.7 |
| South West | 60.7 | 18.4 |
| Wales | 66.1 | 18.1 |
| West Midlands | 58.4 | 15.6 |
| Yorkshire and Humber | 60.8 | 20.5 |

Figure 47 shows the percentages of young people aged 12 years and older with Type 1 diabetes with 'high' blood pressure (>98th centile) and the percentage above the target for total blood cholesterol (>=5 mmol/l) reported to the audit since 2013/14.

**Figure 47:** Percentage of young people aged 12 years and older with Type 1 diabetes with high blood pressure and total blood cholesterol above the target in England and Wales, 2013/14 to 2020/21

3.6.1.2 Blood Pressure and cholesterol in patients with Type 2 diabetes

Table 26 shows the percentage of children and young people with Type 2 diabetes with a recorded blood pressure in the audit period (n=519) classified as 'high normal' (91st -98th centile) or 'high' blood pressure (>98th centile). Half (49.3%) of children and young people with Type 2 diabetes had high blood pressure.

Table 26: Percentage of children and young people with Type 2 diabetes with 'high' or 'high-normal' blood pressure, 2016/17 – 2020/21

| Country/region | 'High normal' blood pressure (91st-98th centile) | | | High' blood pressure (>98th centile) | | |
|----------------|--|--------------|---------------------------|--------------------------------------|--------------|---------------------------|
| | Diastolic (%) | Systolic (%) | Diastolic and/or systolic | Diastolic (%) | Systolic (%) | Diastolic and/or systolic |
| 2020/21 | 21.4 | 14.6 | 22.0 | 46.8 | 13.5 | 49.3 |
| 2019/20 | 28.3 | 16.1 | 26.8 | 42.8 | 10.4 | 44.3 |
| 2018/19 | 25.4 | 17.6 | 39.6 | 42.5 | 10.1 | 44.6 |
| 2017/18 | 22.2 | 16.9 | 34.1 | 42.7 | 13.1 | 44.9 |
| 2016/17 | 24.5 | 15.8 | 36.2 | 42.2 | 13.6 | 45.6 |

Table 27 shows the percentage of children and young people with Type 2 diabetes with a recorded cholesterol screen (n=466) above the target for total blood cholesterol. It shows that 28.0% met or exceeded the higher target for total blood cholesterol (≥ 5 mmol/l) in 2020/21, a similar percentage with respect to 2019/20 (28.8%).

Table 27: Percentage of children and young people with Type 2 diabetes above cholesterol targets, 2016/17 – 2020/21

| | 4 mmol/l or more | 5 mmol/l or more |
|---------|------------------|------------------|
| 2020/21 | 71.4 | 28.0 |
| 2019/20 | 69.1 | 28.8 |
| 2018/19 | 69.1 | 28.3 |
| 2017/18 | 74.9 | 33.8 |
| 2016/17 | 75.9 | 36.2 |

3.6.2 Body Mass Index

Higher Body Mass Index (BMI, weight/height²) is associated with increased cardiovascular risk. BMI has been standardised using appropriate UK 1990 centile charts to allow direct comparisons across different ages and between sexes. The following categories of BMI are shown based on the UK 1990 standards (Pan & Cole, 2012):

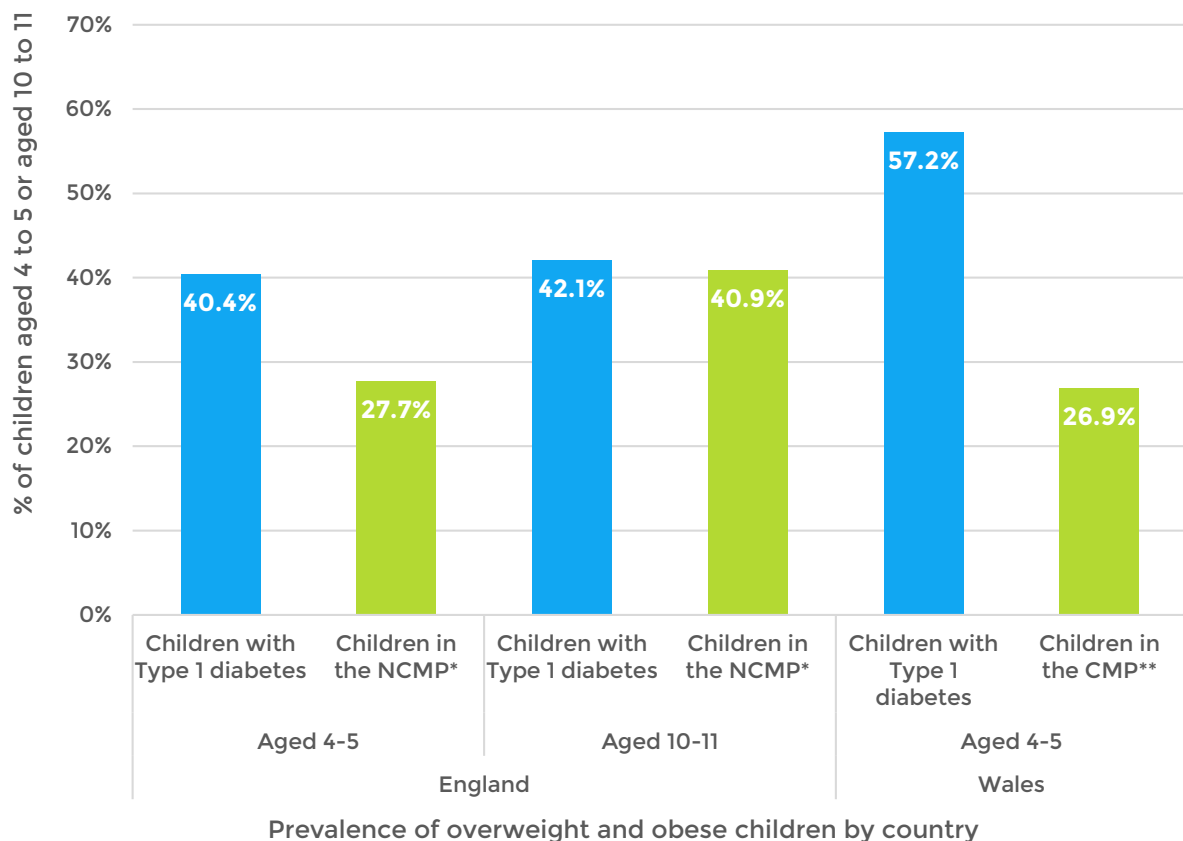
- Underweight: below the 2nd centile
- Healthy weight: between the 2nd and 85th centile
- Overweight: between the 85th and 95th centile
- Obese: above the 95th centile

Comparisons can be made with the National Child Measurement Programme in England (NHS Digital, 2021) and the Child Measurement Programme in Wales (Public Health Wales, 2019). These programmes measure the height and weight of all children in Reception class (aged 4 to 5 years old) in both countries and Year 6 (aged 10 to 11 years old) in England.

3.6.2.1 Body Mass Index and Type 1 diabetes

Figure 48 shows the prevalence of obese and overweight children with Type 1 diabetes compared against the prevalence within wider population in England and Wales. For 2020/21, in England 40.4% of children aged 4 to 5 years old with Type 1 diabetes were overweight or obese (an increase from 32.5% in 2019/20) – higher than the 27.7% in the National Child Measurement Programme (NCMP) for England 2020/21. In Wales, 57.2% of children with Type 1 diabetes aged 4 to 5 years were overweight or obese (an increase from 47.2% in 2019/20) – more than double the 26.9% recorded in the Child Measurement Programme (CMP) for Wales in 2018/19 (the latest data available). However, given the small numbers of children with Type 1 diabetes at these ages in Wales, this increase could be artefactual. The prevalence of overweight and obesity in children aged 10 to 11 years old with Type 1 diabetes in England 2020/21 was 42.1% (an increase from 38.7% in 2019/20) compared to 40.9% of the wider cohort within the National Child Measurement Programme for England 2020/21.

These findings indicate that there is a higher prevalence of obesity and overweight among younger children with Type 1 diabetes compared to children of similar ages in the wider population.



* National Child Measurement Programme (England)

** Child Measurement Programme (Wales)

Figure 48: Percentage children with Type 1 diabetes with obesity and overweight, aged 4 to 5 and age 10 to 11 years old, compared to the wider population by country, 2020/21

Figure 49 shows the percentage of children and young people with Type 1 diabetes included in the audit within each BMI category for 2019/20 and 2020/21. In 2020/21, a higher percentage of those aged 0-11 years had a healthy weight (63.2%) compared to those aged 12 years and above (56.2%), and that a higher percentage of children and young people with Type 1 diabetes were overweight or obese than were underweight. It also shows that in those aged 0-11, a higher percentage were obese in 2020/21 compared to 2019/20.

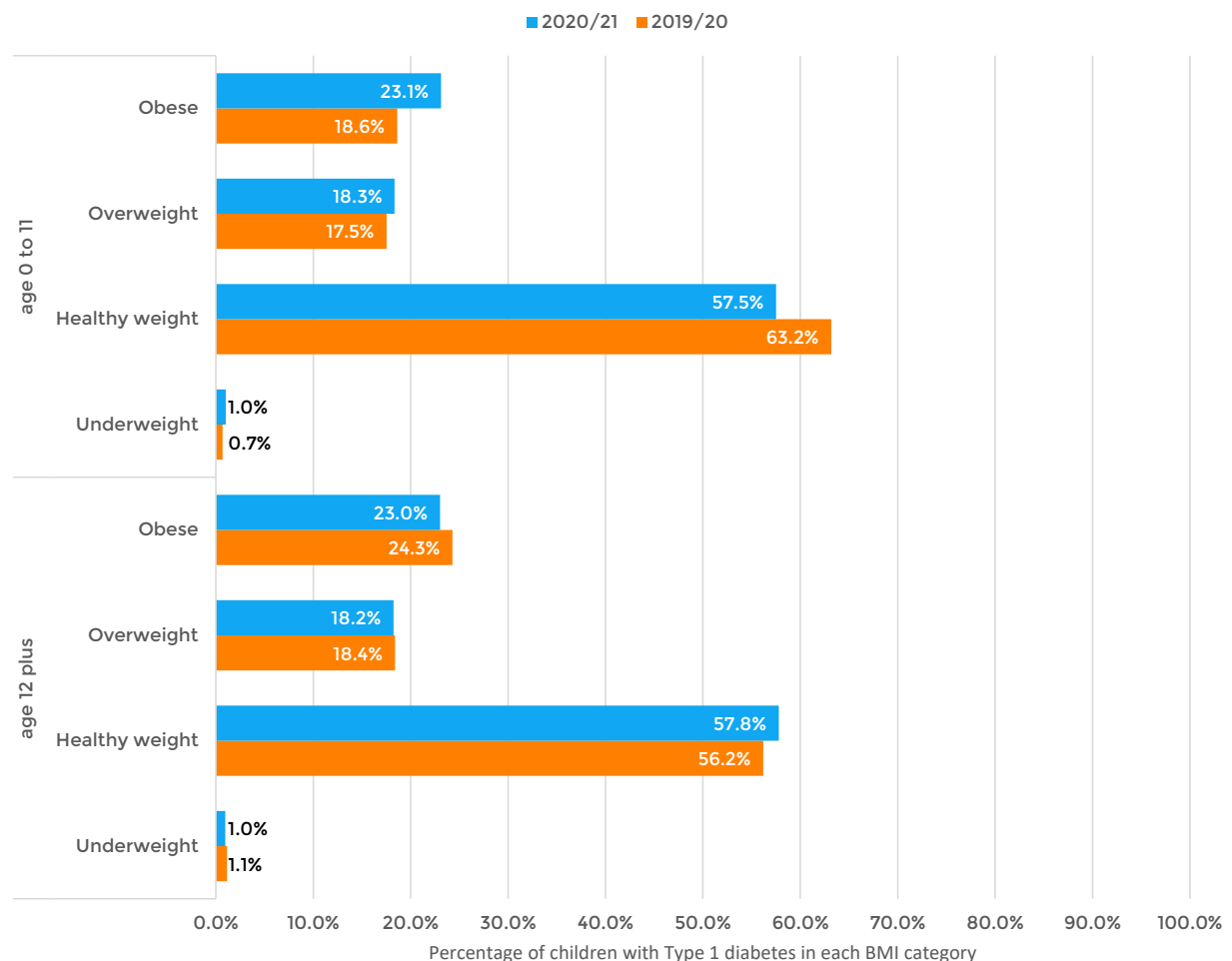


Figure 49: Percentage of children and young people with Type 1 diabetes within BMI categories by age group, 2019/20- 2020/21

Figure 50 shows the distribution of BMI of children and young people with Type 1 diabetes for 2019/20 and 2020/21 compared to the 1990 reference population. It shows that overall, children and young people with Type 1 diabetes have a higher BMI than the general population, and an overall trend towards higher BMI between 2019/20 and 2020/21.

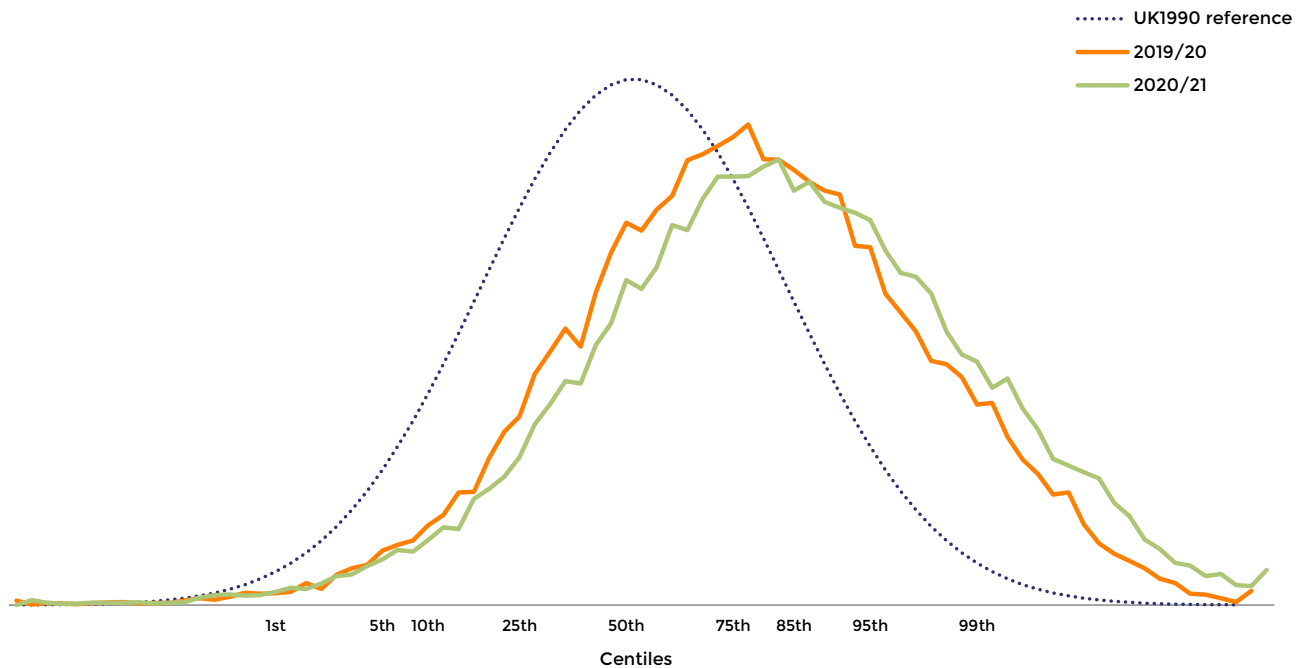


Figure 50: Distribution of body mass index of children and young people with Type 1 diabetes in 2019/20 and 2020/21 compared to the 1990 reference population

Figure 51 shows that the percentage of boys and girls with overweight or obesity increases with deprivation, and that girls aged under 12 were less likely to be overweight or obese compared to boys, whereas this trend was reversed in girls and boys aged 12 and above.

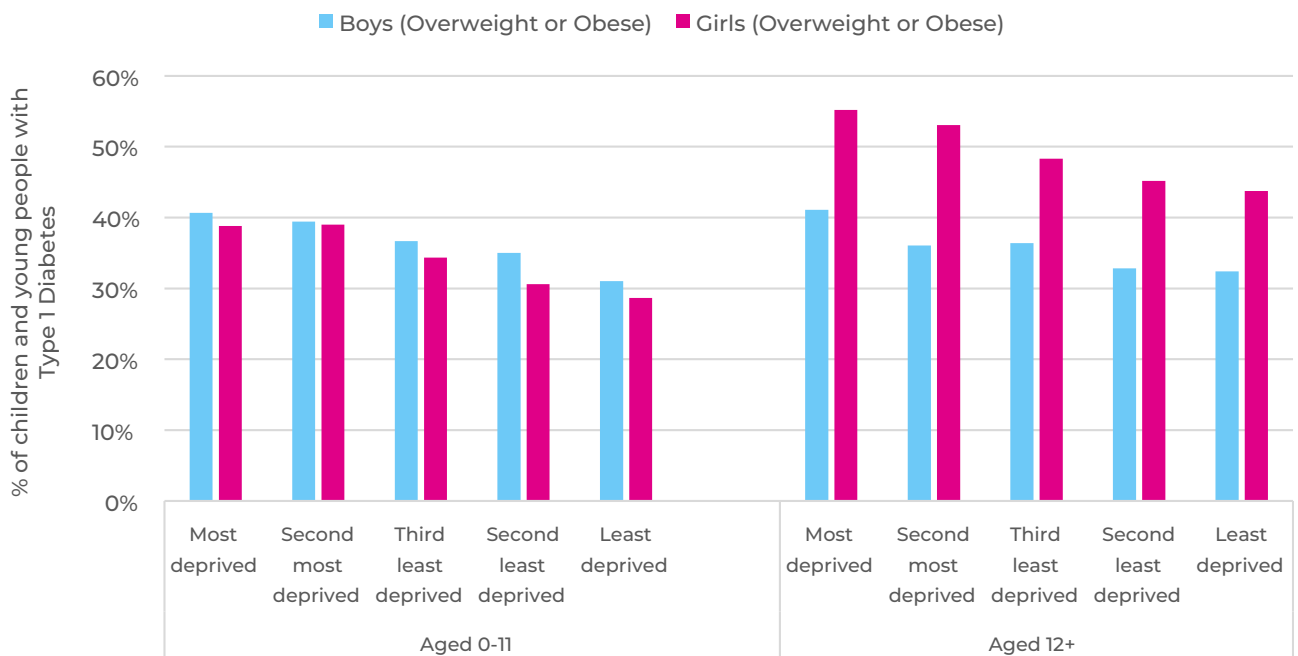


Figure 51: Percentage of children and young people with Type 1 diabetes within the overweight or obese BMI category, by deprivation quintile, age group and sex, 2020/21

Figure 52 shows that a higher percentages of children and young people with Type 1 diabetes and a healthy weight are meeting lower HbA1c targets compared to children and young people with overweight or obesity, however the proportions of those in each BMI category with an HbA1c exceeding 80mmol/mol were very similar.

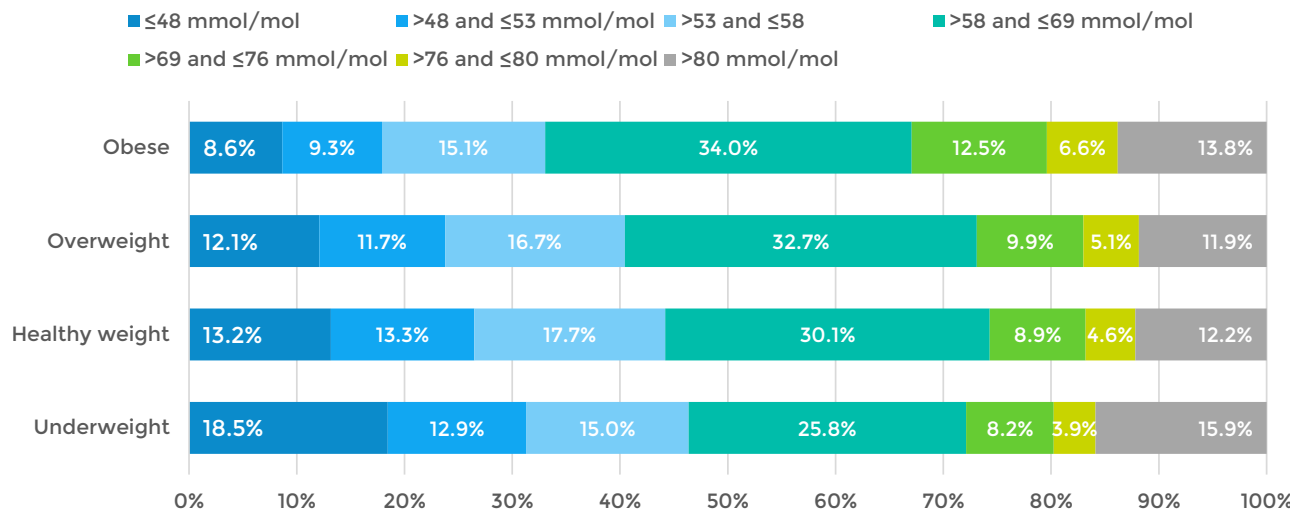


Figure 52: Percentage of children and young people with Type 1 diabetes achieving HbA1c targets by BMI category, 2020/21

3.6.2.2 Body Mass Index and Type 2 diabetes

Table 28 shows the percentage of children and young people with Type 2 diabetes in each BMI category for England and Wales from 2016/17 to 2020/21. It shows that in each audit year, most children and young people with Type 2 diabetes were obese.

Table 28: Body mass index categories for children and young people with Type 2 diabetes, 2016/17 to 2020/21

| | Total (n) | Underweight (%) | Healthy weight (%) | Overweight (%) | Obese (%) |
|---------|-----------|-----------------|--------------------|----------------|-----------|
| 2020/21 | 648 | 8.1* | | 7.4 | 84.6 |
| 2019/20 | 796 | 7.2* | | 8.7 | 84.2 |
| 2018/19 | 737 | 7.6* | | 7.7 | 84.7 |
| 2017/18 | 677 | 0.0 | 5.9 | 9.5 | 84.6 |
| 2016/17 | 658 | 6.5* | | 8.1 | 85.4 |

*results merged to mask number <5

Figure 53 shows similar percentages of children and young people with Type 2 diabetes within each weight category when broken down by sex.

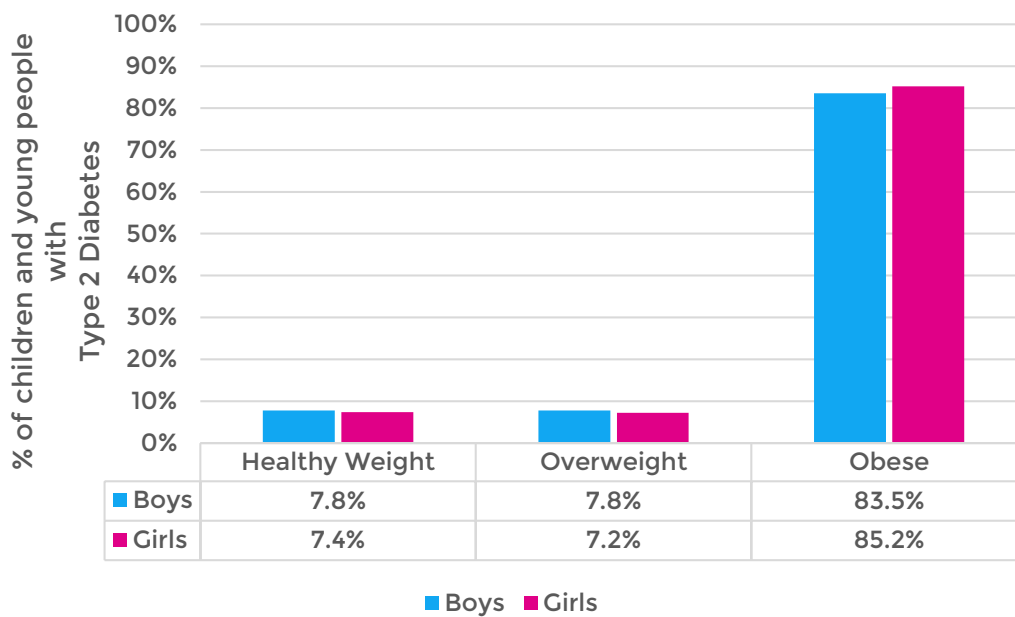


Figure 53: Percentage of children and young people with Type 2 diabetes who were in healthy weight, overweight or obese category by sex, 2020/21

3.7 Psychological assessment

Psychological assessment and access to psychology services should be available to all children and young people and their families with diabetes as children and young people with diabetes have a greater risk of emotional and behavioural difficulties. All children and young people with diabetes and their family members or carers (as appropriate) should be offered emotional support after diagnosis, which should be tailored to their emotional, social, cultural and age-dependent needs.

3.7.1 Psychological outcomes of children and young people with Type 1 diabetes

There were 20,204 (67.6%) children and young people with Type 1 diabetes recorded as having a psychological screening assessment within the audit period, 96.2% (n=19,434) of whom had a known outcome of the assessment recorded. Of these, 46.5% (n=9,031) were assessed as requiring additional psychological or CAMHS support outside of multidisciplinary team (MDT) clinics (hereafter 'additional psychological support'). Table 29 shows an increase in the number of children and young people recorded as requiring additional support compared to 2019/20.

Table 29: Outcome of assessment of the need for psychological support and/or child and adolescent mental health services (CAMHS) support, for children and young people with Type 1 diabetes, 2017/18 – 2020/21

| Audit year | No. of children and young people with a known outcome of psychological assessment | Required additional support (n) | Required additional support (%) |
|------------|---|---------------------------------|---------------------------------|
| 2020/21 | 19,434 | 9,031 | 46.5 |
| 2019/20 | 21,137 | 9,283 | 43.9 |
| 2018/19 | 20,852 | 8,153 | 39.1 |
| 2017/18 | 20,114 | 5,672 | 28.2 |

Figure 54 shows that the percentages of younger boys and girls assessed as requiring additional psychological support were similar up to age 12. Rates diverged thereafter as more adolescent girls were recorded as requiring additional support compared to adolescent boys.

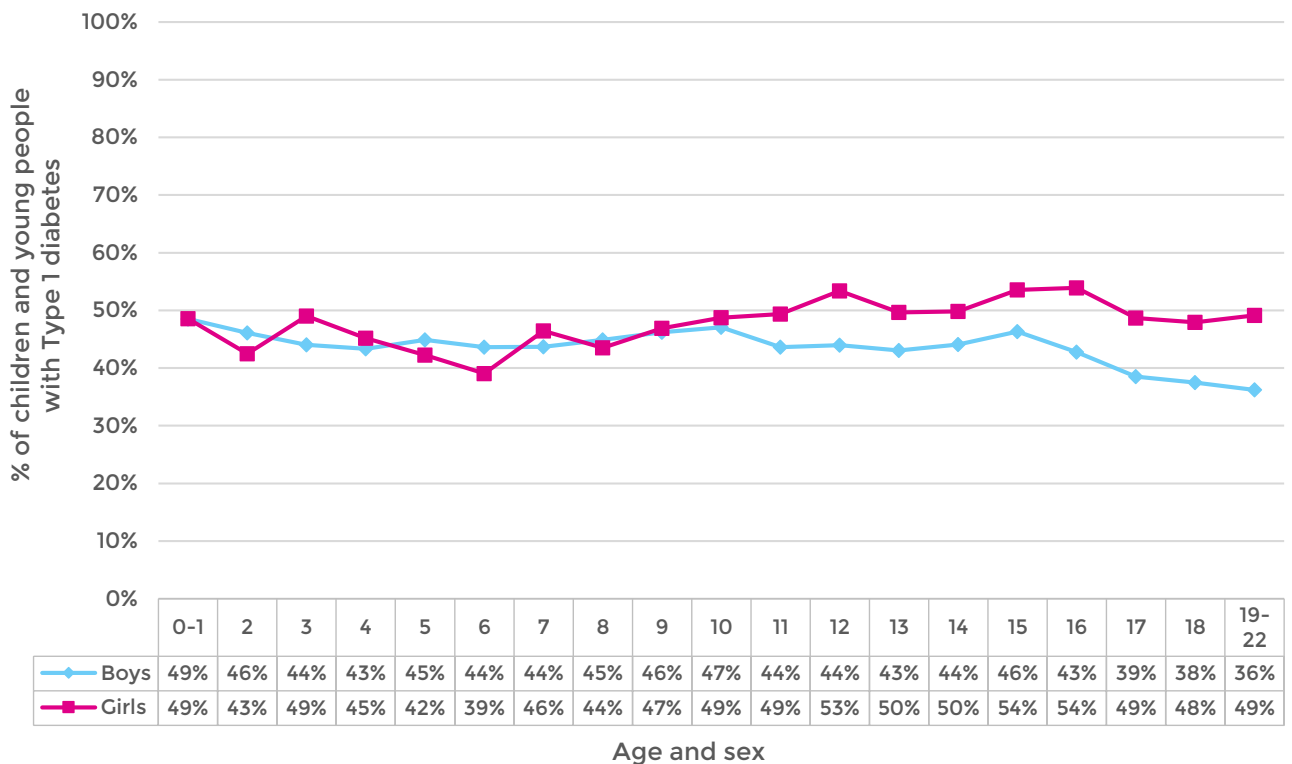


Figure 54: Percentage of children and young people with Type 1 diabetes who were assessed as requiring additional psychological support by age and sex, 2020/21

Figure 55 shows that children and young people with Type 1 diabetes who required additional psychological support were more likely to have an HbA1c in the higher target range compared to those who did not require additional psychological support.

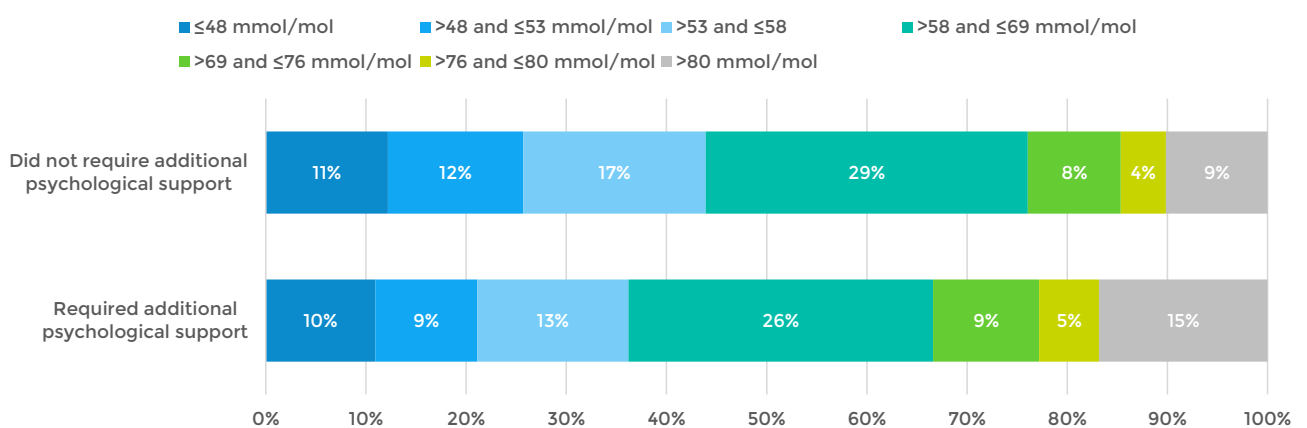


Figure 55: Percentage of children and young people with Type 1 diabetes achieving HbA1c targets by outcome of psychological assessment, 2020/21

3.7.2 Psychological outcomes of children and young people with Type 2 diabetes

There were 559 (64.5%) children and young people with Type 2 diabetes recorded as receiving a psychological assessment within the audit period, 506 (90.5%) of whom had a known outcome of the assessment recorded.

Of the children and young people with Type 2 diabetes with a known result, more than half (59.5%) were assessed as requiring additional psychological or CAMHS support outside of MDT clinics (Table 30).

Table 30: Outcome of assessment for need of child and adolescent mental health services/ psychological support of children and young people with Type 2 diabetes by country, 2017/18 to 2020/21

| England and Wales | No. of children and young people with a known outcome of psychological assessment | Required additional support (n) | Required additional support (%) |
|-------------------|---|---------------------------------|---------------------------------|
| 2020/21 | 506 | 301 | 59.5 |
| 2019/20 | 534 | 286 | 53.6 |
| 2018/19 | 457 | 208 | 45.5 |
| 2017/18 | 417 | 126 | 30.2 |

3.8 Hospital Admissions

Diabetes-related hospital admission rates in this section have been calculated from data submitted by PDUs. Previous hospital admission reports from the NPDA have utilised linked admission data taken from Hospital Episode Statistics (HES) in England, and the Patient Episode Database for Wales (PEDW) (RCPCH, 2014 and 2017), hence rates are not directly comparable. NPDA reported admissions data submitted by PDUs for the first time in the 2016/17 core report to encourage submission of higher quality admissions data, which permits regional network and unit level comparisons.

Results in this section are presented for children and young people with Type 1 diabetes only due to small numbers with other types of diabetes. In 2020/21, 165 out of 171 PDUs submitted admission data for children and young people with Type 1 diabetes. There were 5,379 diabetes-related admissions within the 2020/21 audit year reported for 4,370 children and young people with Type 1 diabetes.

3.8.1 Type 1 diabetes-related admissions

Table 31 shows the percentage of children and young people with Type 1 diabetes being managed within PDUs who submitted admissions data, who were admitted at least once with a diabetes-related admission, not associated with diagnosis, within the audit year.

Table 31: Percentage of children and young people with Type 1 diabetes admitted at least once for a diabetes-related reason that was not associated with diagnosis, 2020/21

| Country/region | No. of children and young people with T1 diabetes* | Diabetic Ketoacidosis (%) | Hypoglycaemia (%) | Ketosis without Acidosis (%) | Stabilisation (%) | Other (incl. surgery) (%) |
|------------------------------|--|---------------------------|-------------------|------------------------------|-------------------|---------------------------|
| England and Wales | 28,976 | 1.8% | 0.6% | 0.8% | 1.7% | 2.8% |
| England | 27,513 | 1.8% | 0.6% | 0.8% | 1.8% | 2.8% |
| Wales | 1,463 | 2.6% | 0.9% | 1.4% | 1.1% | 2.9% |
| East Midlands | 2,104 | 1.4% | 0.5% | 0.2% | 1.3% | 1.7% |
| East of England | 3,252 | 1.7% | 0.6% | 0.6% | 1.3% | 2.6% |
| London and South East | 6,579 | 1.8% | 0.6% | 0.5% | 3.2% | 2.4% |
| North East and North Cumbria | 1,685 | 1.4% | 0.2% | 0.6% | 0.7% | 1.9% |
| North West | 3,455 | 2.3% | 0.6% | 1.0% | 1.0% | 2.9% |
| South Central | 2,790 | 1.6% | 0.8% | 1.2% | 1.2% | 5.2% |
| South West | 2,087 | 1.5% | 0.6% | 1.2% | 1.8% | 3.6% |
| West Midlands | 2,668 | 1.6% | 0.5% | 0.4% | 1.8% | 2.6% |
| Yorkshire and Humber | 2,893 | 2.3% | 0.6% | 1.6% | 1.3% | 2.6% |

* Totals shown include only children and young people with Type 1 diabetes being managed by PDUs submitting admissions data.

3.8.2 DKA at diagnosis

Figure 56 shows that for England and Wales combined, 25.8% of the newly diagnosed patients being managed by PDUs submitting admissions data in 2020/21 (n = 2,737), had DKA at diagnosis of Type 1 diabetes. This finding is higher than the 23.9% incidence rate reported in the previous NPDA Hospital Admissions Report (RCPCH, 2017), and the rate (22.9%) reported for 2019/20. There was significant variation in rates of DKA at diagnosis between regions, which suggests data completeness and quality issues with incomplete submission of admission data by certain participating PDUs in the 2020/21 audit.

The 2022 NPDA admissions report will combine HES and PEDW data with admissions data submitted by PDUs and will include assessment of whether PDU-submitted admission data can be considered representative of admission trends in England and Wales.

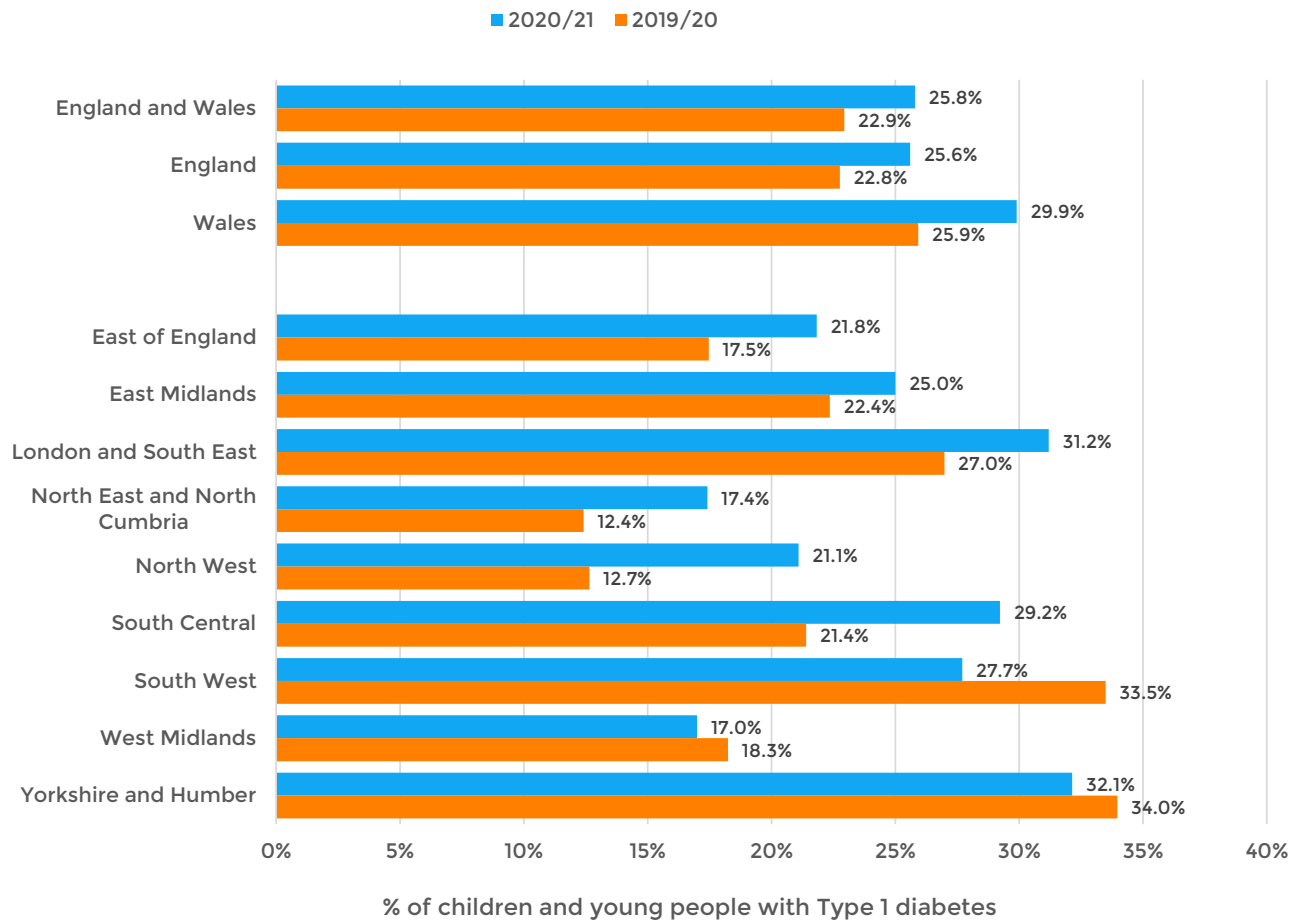


Figure 56: Percentage of children and young people with Type 1 diabetes who had DKA at diagnosis in 2020/21, by region and country

4. Treatment regimen and diabetes monitoring

The NPDA collects treatment regimen data and data on usage of real-time continuous glucose monitors (rtCGM) with alarms amongst children and young people with diabetes. Where a treatment regimen changes throughout the audit year, the latest regimen recorded is used for the analysis.

4.1 Treatment regimens

4.1.1 Treatment regimens of children and young people with Type 1 diabetes

There were 27,053 children and young people with Type 1 diabetes with a valid treatment regimen recorded within the audit period. Table 32 provides a breakdown of the treatment regimens recorded by nation and region for children and young people with Type 1 diabetes.

Table 32: Percentage of children and young people with Type 1 diabetes, on each treatment regimen, by country and region, 2020/21

| Country/region | No. of children and young people with T1 diabetes | One – three injections/day | Four or more injections/day | Insulin pump |
|------------------------------|---|----------------------------|-----------------------------|--------------|
| England and Wales | 27,053 | 2.4% | 59.1% | 38.5% |
| England | 25,674 | 2.5% | 59.1% | 38.4% |
| Wales | 1,379 | 0.9% | 59.2% | 39.8% |
| | | | | |
| East Midlands | 1,919 | 1.3% | 54.9% | 43.8% |
| East of England | 2,813 | 1.2% | 65.0% | 33.7% |
| London and South East | 5,800 | 3.7% | 54.7% | 41.6% |
| North East and North Cumbria | 1,603 | 2.4% | 51.8% | 45.7% |
| North West | 3,217 | 3.8% | 59.3% | 36.9% |
| South Central | 2,586 | 3.2% | 57.7% | 39.1% |
| South West | 2,227 | 2.6% | 69.8% | 27.7% |
| West Midlands | 2,754 | 1.6% | 61.5% | 36.9% |
| Yorkshire and Humber | 2,755 | 0.9% | 59.3% | 39.7% |

In England and Wales, 1% of children and young people with Type 1 diabetes using insulin injections were also using other blood glucose lowering medication (BGLM), whereas 0.4% of children and young people using insulin pump therapy were using other BGLM.

Figure 57 shows the breakdown of insulin regimens amongst those with a recorded sex and age (n=27,021). Younger children (< 4 years) were more likely to be using insulin pump therapy than older children, in keeping with the trend seen in other European and transatlantic cohorts (Sherr et al., 2016), and pump usage was more prevalent in girls.

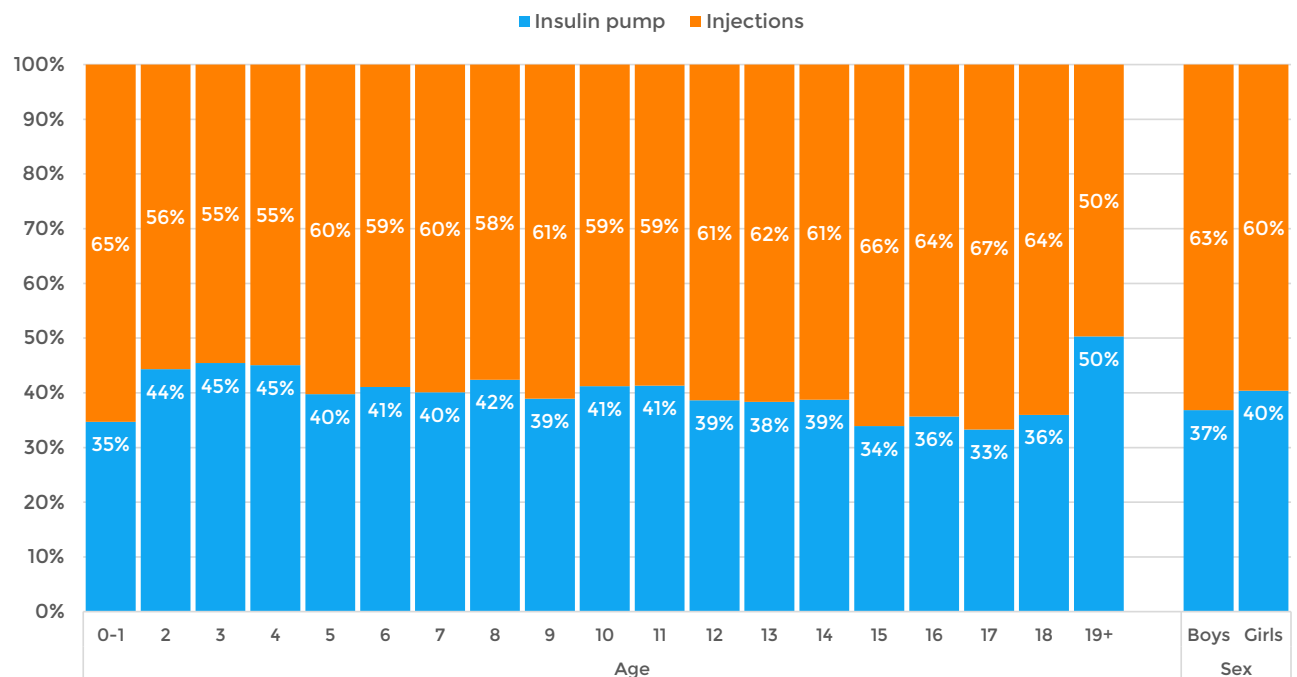


Figure 57: Percentage of children and young people with Type 1 diabetes recorded as using insulin injections or insulin pump therapy by age and sex, 2020/21

Since 2014/15, there has been an increase in insulin pump usage for all age groups with a corresponding reduction in use of insulin injections (Figure 58), however the trend for increasing pump use amongst those aged 0-9 has reversed since 2018/19.

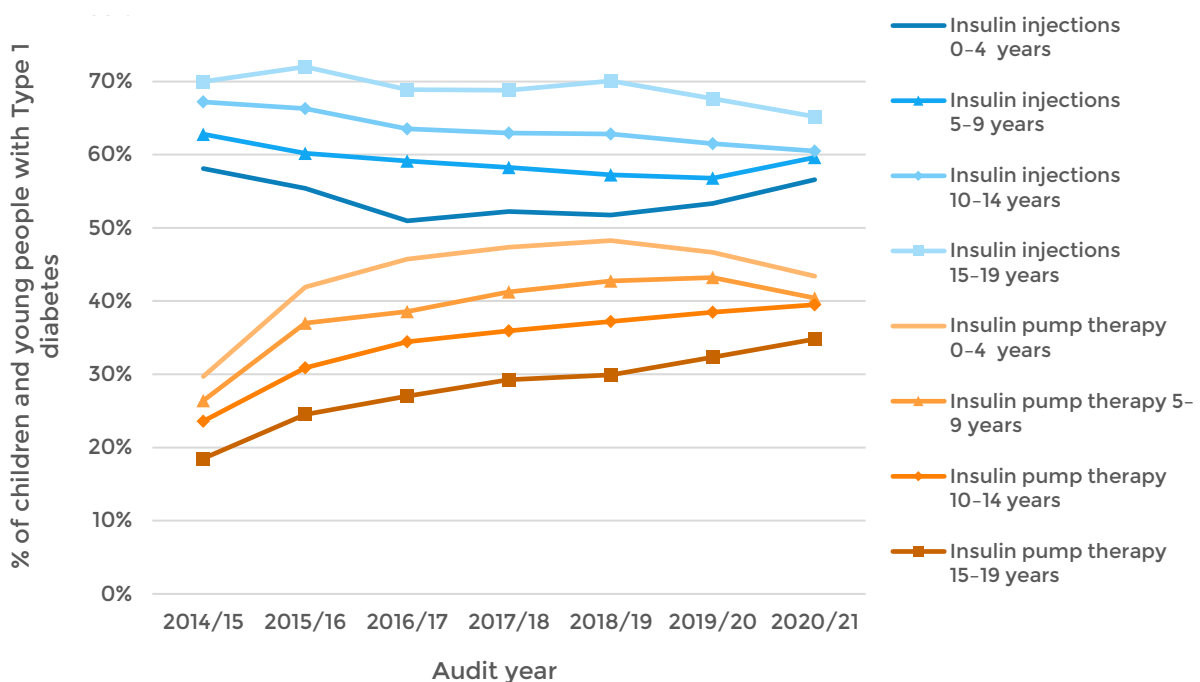


Figure 58: Percentage of children and young people either on daily insulin injections or pump therapy by age group, 2014/15 to 2020/21

Insulin pump usage increased with duration of diabetes (Figure 59) with 86.1% of those in their first year of diagnosis of Type 1 diabetes using insulin injections, compared to less than half (48.9%) of those after 5 to 9 years post diagnosis. The percentage of those using insulin pumps in the first year of Type 1 diabetes reduced by almost a half, from 24.8% in 2019/20 to 13.9% in 2020/21.

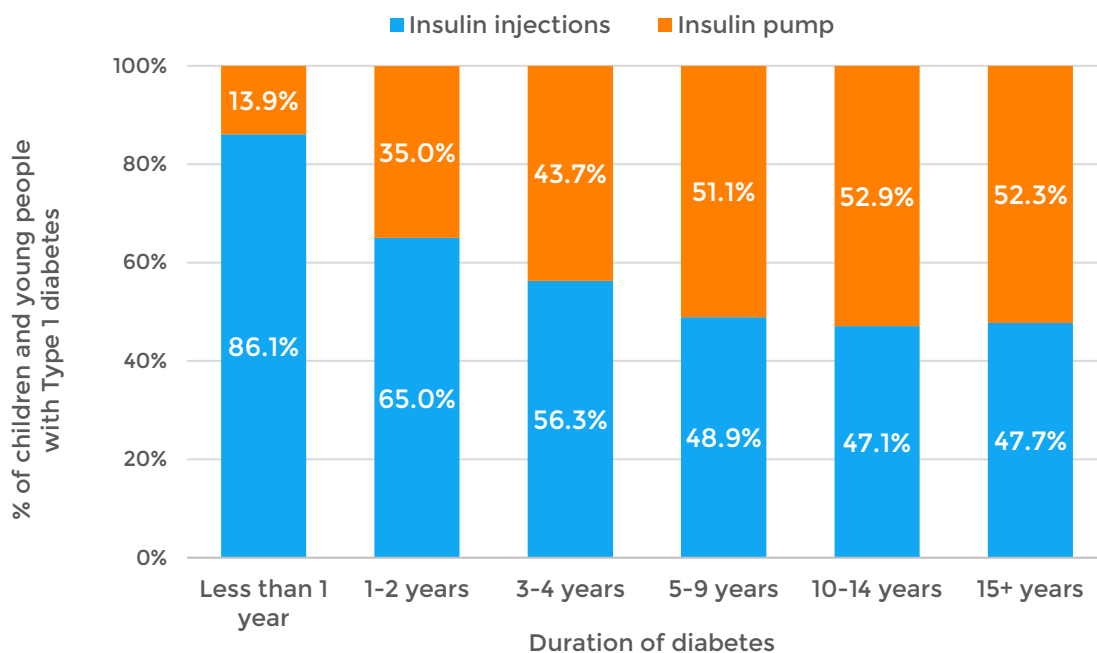


Figure 59: Percentage of children and young people either on daily insulin injections or pump therapy by duration of diabetes for England and Wales, 2020/21

Figure 60 shows that White children and young people were more likely to be using a pump compared to those within Asian and Black ethnic groups. Insulin pump therapy usage was also more prevalent in those living in the least deprived compared to the most deprived areas of the country.

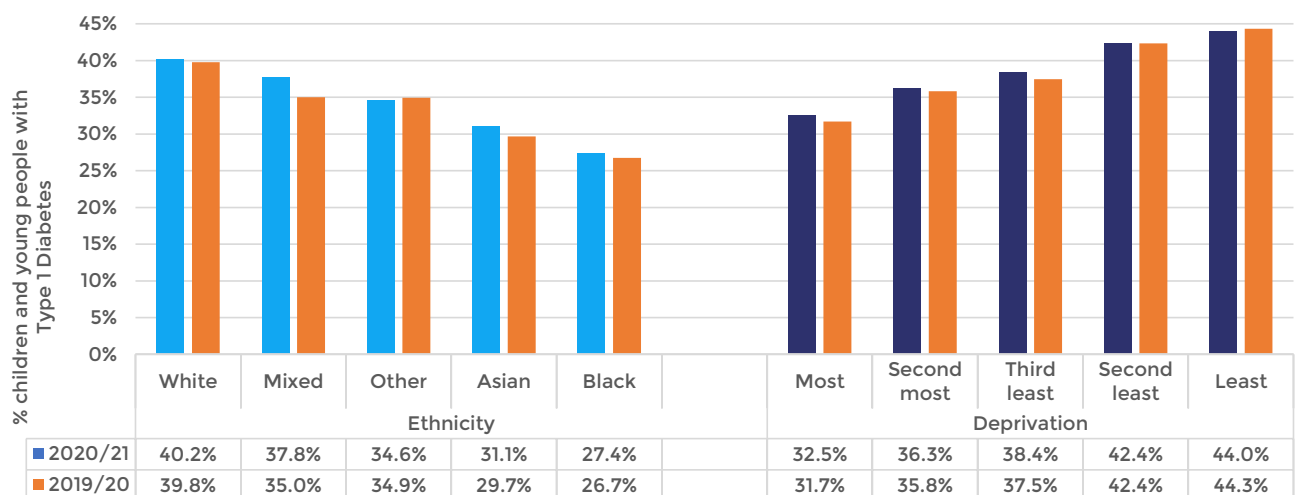


Figure 60: Percentage of children and young people with Type 1 diabetes using insulin pump therapy by ethnic group and deprivation, 2020/21

Figure 61 shows that despite increases in insulin pump usage compared to insulin injections in all quintiles of deprivation, the gap between the most and least deprived areas has widened with time. In 2014/15 the percentage on insulin pump therapy for the most and least deprived areas was 18.4% versus 26.3% (a difference of 7.9 percentage points), whereas in 2020/21 the gap had widened to 32.5% versus 44.0%, respectively (a difference of 11.5 percentage points). However, the discrepancy has decreased from 2019/20, when there was a 12.6% difference.

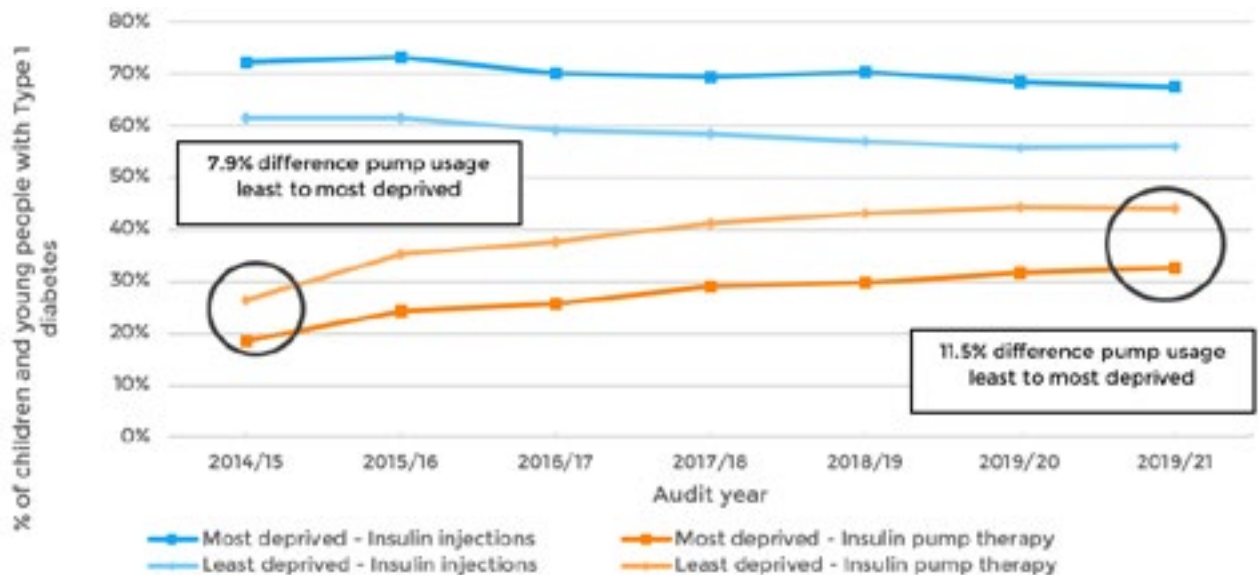


Figure 61: Percentage of children and young people with Type 1 diabetes using insulin injections or insulin pump therapy by 'least' and 'most' deprived quintile, 2014/15 to 2020/21

Figure 62 shows a general trend for children and young people with Type 1 diabetes using insulin pump therapy to achieve lower HbA1c targets compared to those on insulin injections. These data do not account for the influence of deprivation, age, duration of diabetes or other factors which may influence the choice of insulin regimen, which have also been shown to impact upon target achievement.

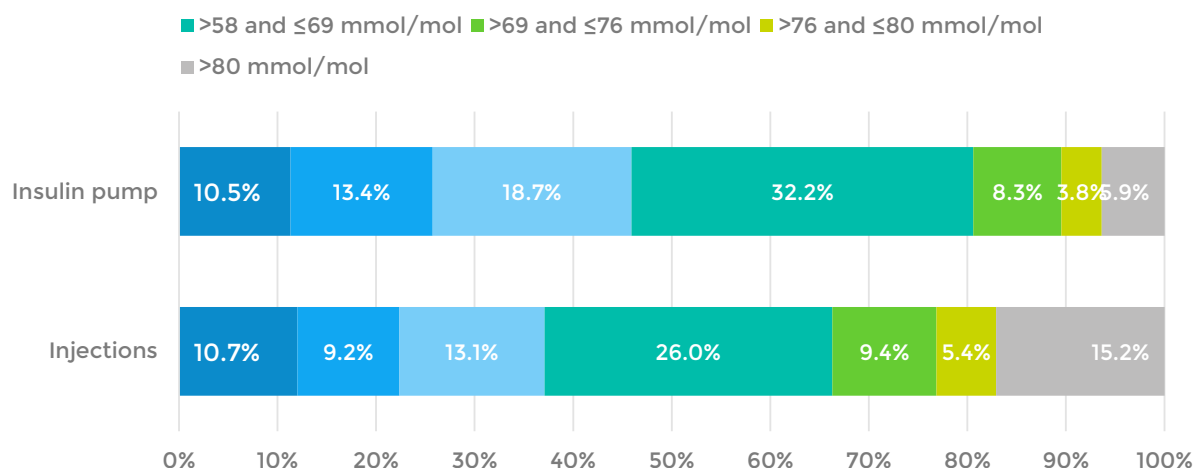


Figure 62: Percentage of children and young people with Type 1 diabetes achieving HbA1c targets by treatment regimen, 2020/21

4.1.2 Treatment regimens of children and young people with Type 2 diabetes

Table 33 shows the breakdown of diabetes treatment regimen for children and young people with Type 2 diabetes. Data was either missing or reported as 'unknown' for 33.4% of children and young people with Type 2 diabetes.

The majority of those with Type 2 diabetes were either managing their diabetes with diet alone (11.4%) or in combination with another blood glucose lowering agent (48.1%). However, given that there was a cohort on insulin alone, and missing data, caution should be taken when interpreting these results.

Table 33: Percentage of children and young people with Type 2 diabetes using each treatment regimen, England and Wales, 2019/20 and 2020/21

| Treatment regimen | | 2019/20 | 2020/21 |
|---|---------------------|---------|---------|
| No. of children and young people with Type 2 diabetes with a recorded treatment regimen (n) | | 660 | 648 |
| Dietary management | Only (%) | 11.8 | 11.4 |
| | And other BGLM† (%) | 45.9 | 48.1 |
| 1 to 3 insulin injections | Only (%) | 4.2 | 2.6 |
| | And other BGLM† (%) | 13.2 | 11.6 |
| 4 or more insulin injections | Only (%) | 14.1 | 12.5 |
| | And other BGLM† (%) | 9.7 | 11.6 |
| Insulin pump | Only (%) | 1.1* | 2.2* |
| | And other BGLM† (%) | | |

*Results merged to mask number <5

† And other blood glucose lowering medication

4.2 Real time continuous glucose monitoring (rtCGM)

NICE guidance applicable at the time of the 2020/21 audit (NG18) stated that ongoing rtCGM monitoring with alarms to children and young people with Type 1 diabetes who:

- had frequent severe hypoglycaemia or
- had impaired hypoglycaemia awareness that is associated with adverse consequences (for example, seizures or anxiety) or
- couldn't recognise or communicate about symptoms of hypoglycaemia (for example, because of cognitive or neurological disabilities).

However, new guidance published in 2022 (NG18- 2022) now recommends that it should be offered to all children and young people with type 1 diabetes, as long as it is provided alongside education to support children and young people and their families and carers to use it.

4.2.1 rtCGM use among children and young people with Type 1 diabetes

There were 24,184 children and young people with Type 1 diabetes with a negative or positive indication of use of rtCGM with alarms reported within the audit period. Overall, 27.9% were using rtCGM in England and Wales (Figure 64)- an increase from 19.4% in 2019/20. These results should be interpreted with caution given that 19.0% (n = 5,708) of children and young people with Type 1 diabetes had an unknown or missing entry; percentages of missing data also varied by region.

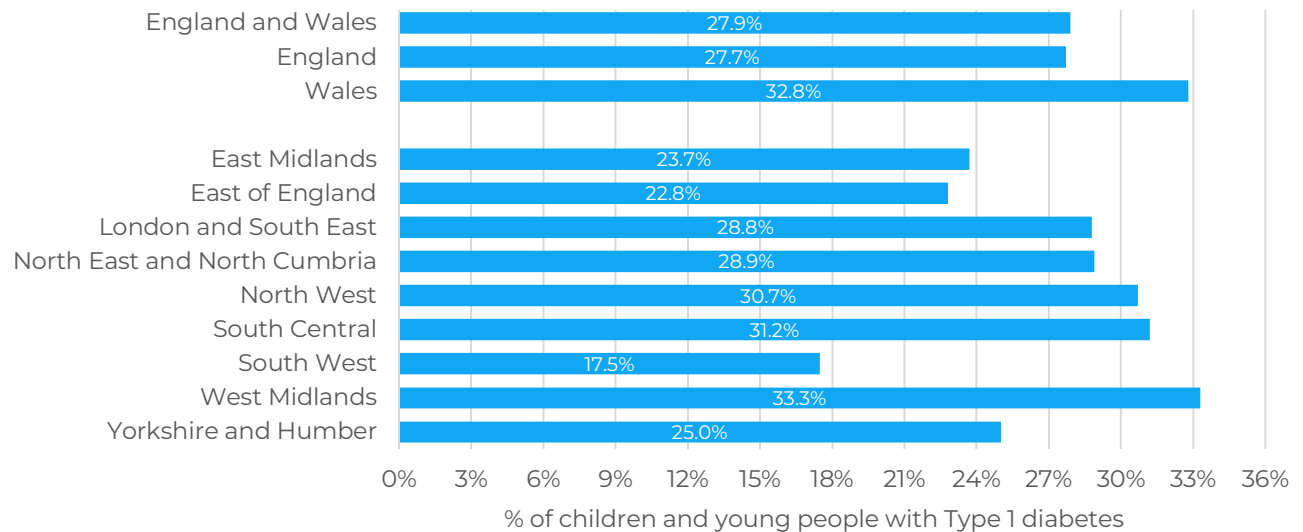


Figure 63: Percentage of children and young people with Type 1 diabetes using rtCGM with alarms by country and regional network, 2020/21

Figure 64 shows that younger children with Type 1 diabetes were more likely to be using rtCGM than those who were older.

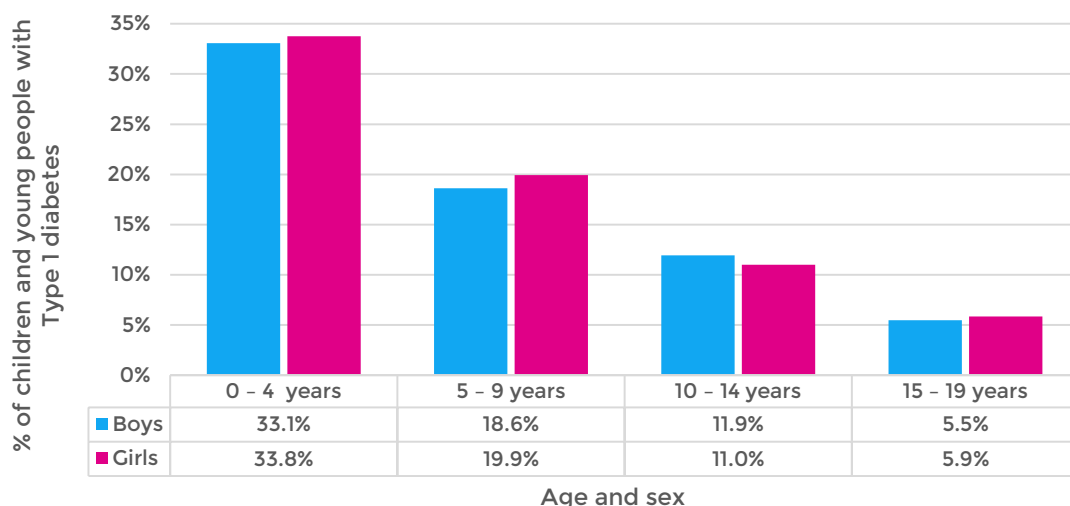


Figure 64: Percentage of children and young people with Type 1 diabetes using a real-time continuous glucose monitor (CGM) with alarms by age and sex, 2020/21

Figure 65 shows that rtCGM was more likely to be used in the first two years following diagnosis of Type 1 diabetes.

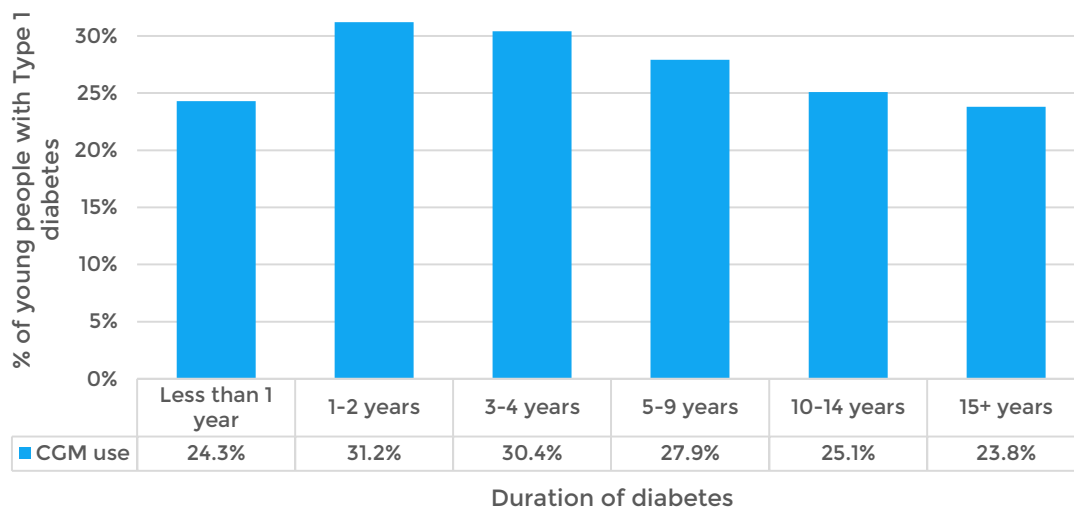


Figure 65: Percentage of children and young people with Type 1 diabetes using a rtCGM by duration of Type 1 diabetes, 2020/21

Figure 64 shows variation in use of rtCGM by ethnic group and deprivation quintile. Increased use was found across all deprivation quintiles and ethnic groups, with the highest percentage increase between the audit years being amongst Black children and young people with Type 1 diabetes, from 11.7% in 2019/20 to 21.9% in 2020/21- an increase of 87.2%. However, this was the lowest percentage out of all ethnic groups, with those of Mixed ethnicity having the highest rate of usage, at 29.3%.

Figure 66 also shows that children and young people with Type 1 diabetes living in the least deprived areas were more likely to be using rtCGM compared to those living in the most deprived areas, although the percentage increase between the audit years was highest amongst those living in the most deprived areas, with a 70.0% increase in use between 2019/20 and 2020/21.

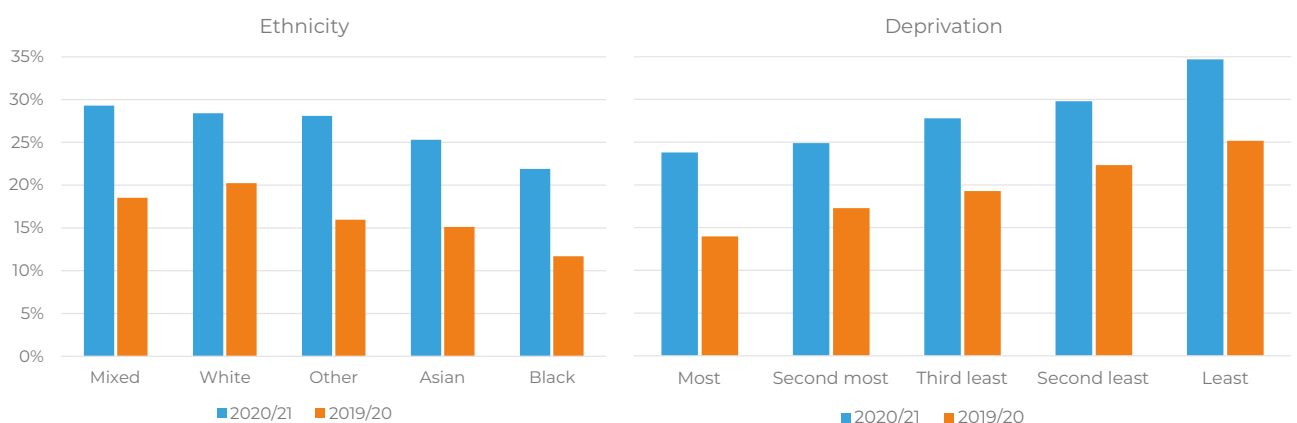


Figure 66: Percentage of children and young people with Type 1 Diabetes using a rtCGM by ethnic group and deprivation quintile, 2019/20 - 2020/21

Figure 67 shows the usage of rtCGM by ethnic group and deprivation quintile. It shows that rtCGM use was more prevalent amongst those living in the least and second least quintile within most ethnic groups, and that Black children and young people typically had lower use than other ethnic groups irrespective of deprivation status.

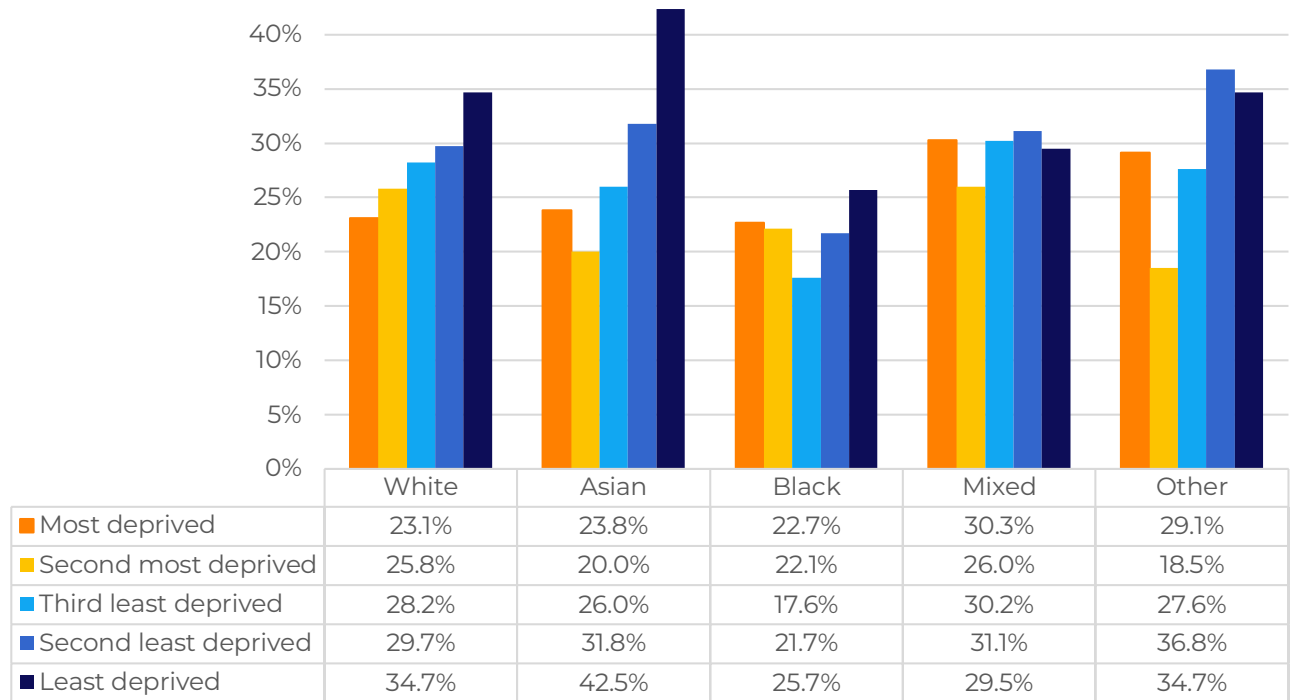


Figure 67: Percentage of children and young people with Type 1 Diabetes using a rtCGM by ethnic group and deprivation quintile, 2020/21

Figure 68 shows that despite increases in rtCGM usage in all quintiles of deprivation, the gap between the most and least deprived areas has widened with time. However, this trend reversed between the last two audit years, with the gap decreasing from 11.2% to 10.9% between 2019/20 and 2020/21.

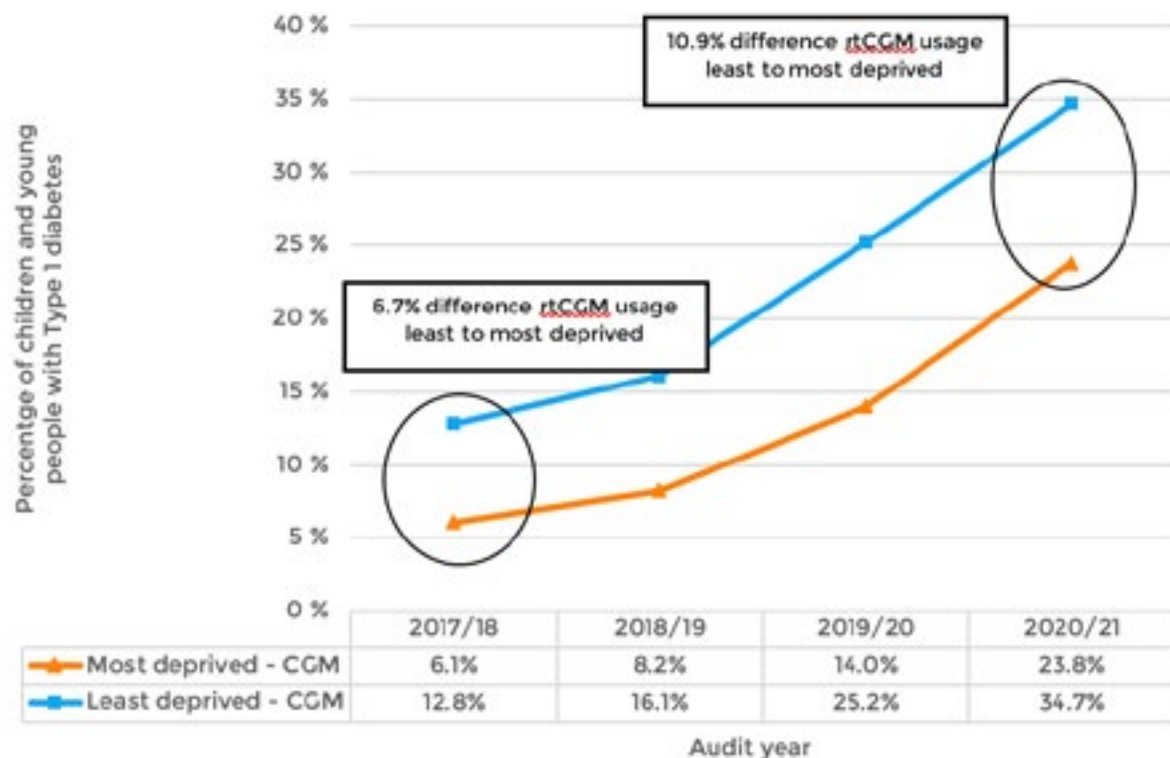


Figure 68: Percentage of children and young people with Type 1 diabetes using a real-time continuous glucose monitor (CGM) by 'least' and 'most' deprived quintile, 2017/18 to 2020/21

Figure 69 shows that children and young people with Type 1 diabetes using rtCGM were more likely to achieve lower HbA1c targets compared to those who were not using rtCGM.

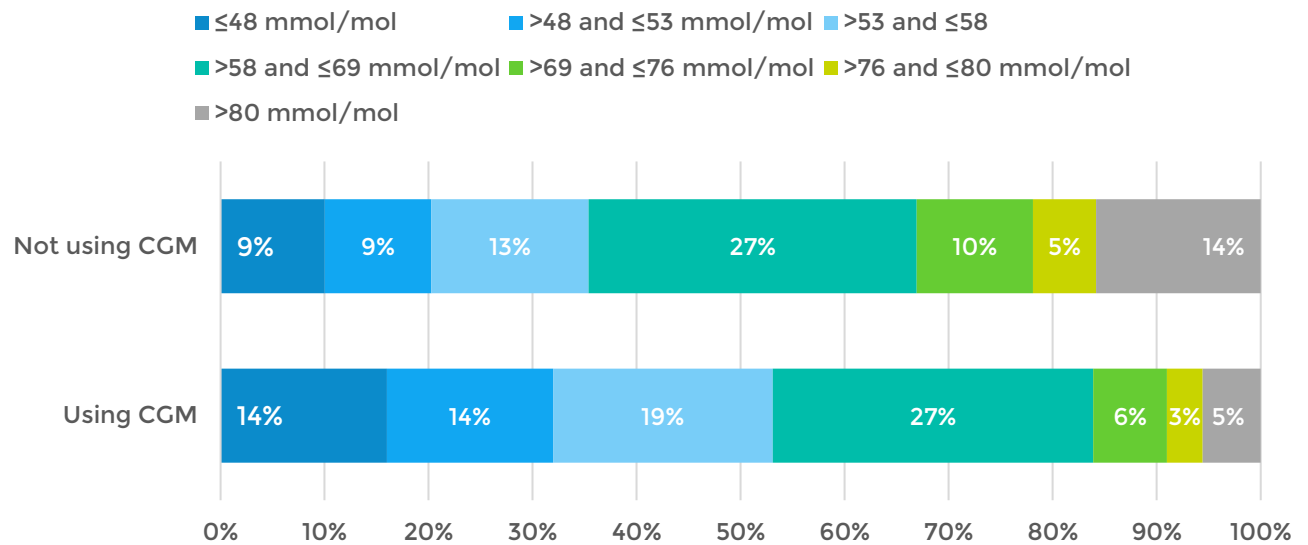


Figure 69: Percentage of children and young people with Type 1 diabetes achieving HbA1c targets by rtCGM usage, 2020/21

Figure 70 shows that rtCGM was more prevalent amongst pump users than those using insulin injections.

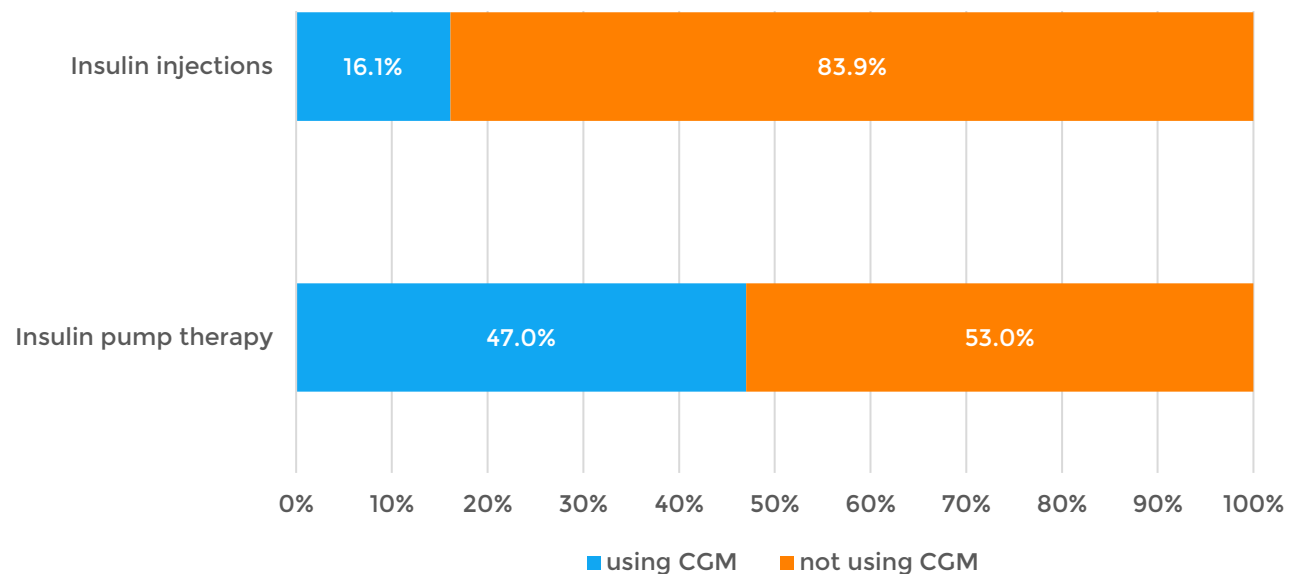


Figure 70: Percentage of children and young people with Type 1 diabetes using insulin injections or insulin pump therapy by rtCGM usage, 2020/21

Figure 71 shows year on year increase in the use of rtCGM in combination with insulin pump and insulin injections, for both England and Wales since 2015/16.

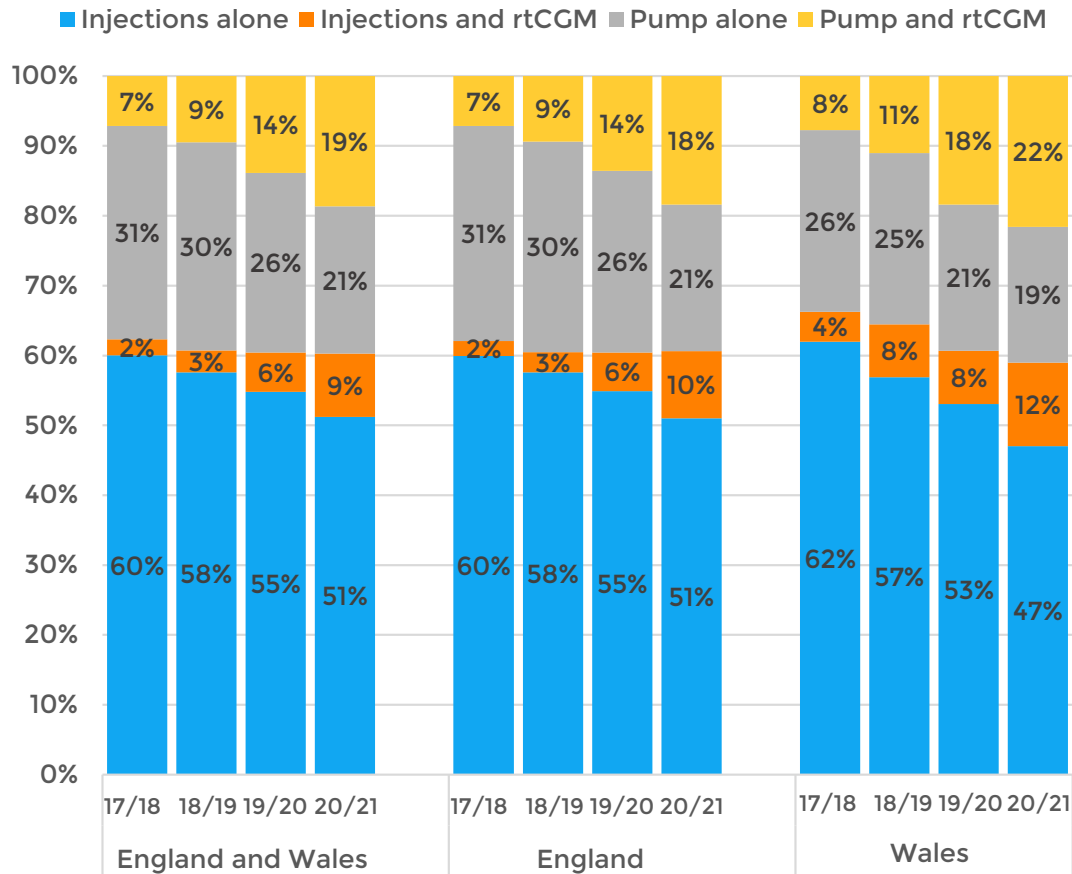


Figure 71: Percentage of children and young people with Type 1 diabetes using insulin injections alone, insulin injections and rtCGM, insulin pump alone, insulin pump and rtCGM, by country, 2017/18 to 2020/21

5. Thyroid and coeliac disease

5.1 Thyroid and coeliac disease amongst children and young people with Type 1 diabetes

Children and young people with Type 1 diabetes are at an increased risk of other autoimmune conditions. This chapter describes the prevalence of such associations in England and Wales.

Table 34 shows that the prevalence of Thyroid disease in 2020/21 for children and young people with Type 1 diabetes was 2.7%, and 5.2% of children and young people with Type 1 diabetes had coeliac disease. The figure for coeliac disease is similar compared to 2019/20 (5.8%), but higher compared to an international collaborative study that found a prevalence rate of 3.5% across three continents (Craig et al., 2017).

Table 34: Percentage of children and young people with Type 1 diabetes with thyroid or coeliac disease by country and region in England and Wales, 2020/21

| Country | No. of children and young people with Type 1 diabetes | Coeliac disease | Thyroid disease |
|------------------------------|---|-----------------|-----------------|
| England and Wales | 29,892 | 5.2% | 2.7% |
| England | 28,492 | 5.2% | 2.7% |
| Wales | 1,463 | 4.3% | 2.3% |
| East Midlands | 2,104 | 5.4% | 3.0% |
| East of England | 3,252 | 4.7% | 3.1% |
| London and South East | 6,579 | 4.9% | 2.9% |
| North East and North Cumbria | 1,685 | 4.0% | 3.3% |
| North West | 3,685 | 5.6% | 2.1% |
| South Central | 2,790 | 6.7% | 2.3% |
| South West | 2,309 | 4.3% | 2.9% |
| West Midlands | 3,132 | 5.1% | 2.3% |
| Yorkshire and Humber | 2,893 | 6.2% | 2.7% |

Figure 72 shows year on year variation in prevalence of thyroid and coeliac disease amongst those with Type 1 diabetes. Prevalence of both coeliac and thyroid disease decreased since 2019/20.

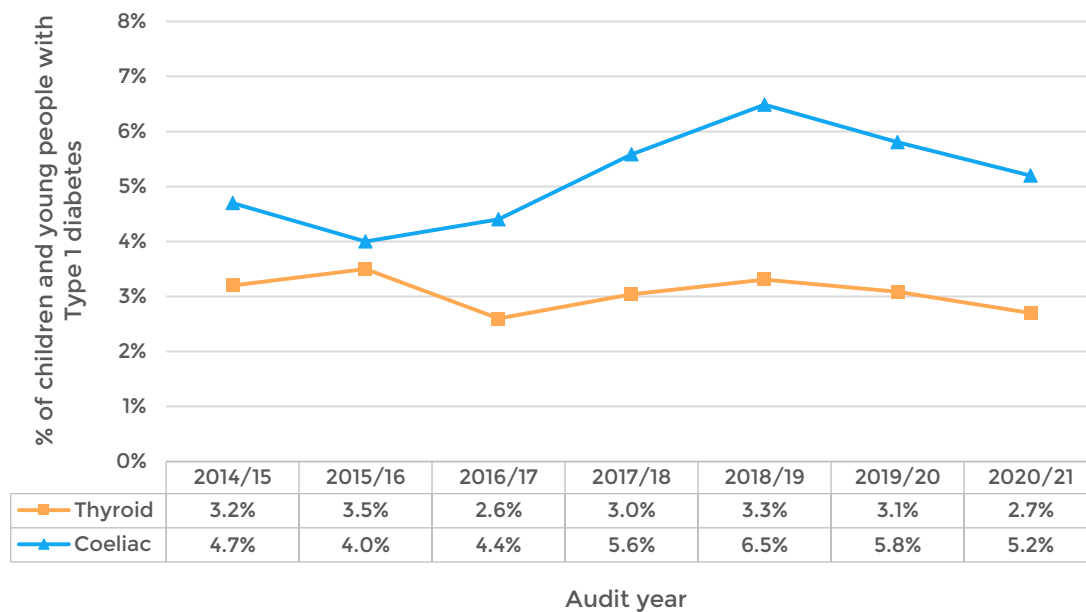


Figure 72: Percentage of children and young people with Type 1 diabetes with thyroid or coeliac disease in England and Wales, 2014/15 to 2020/21

Figure 73 shows that there was a higher prevalence of both autoimmune conditions amongst girls compared to boys.

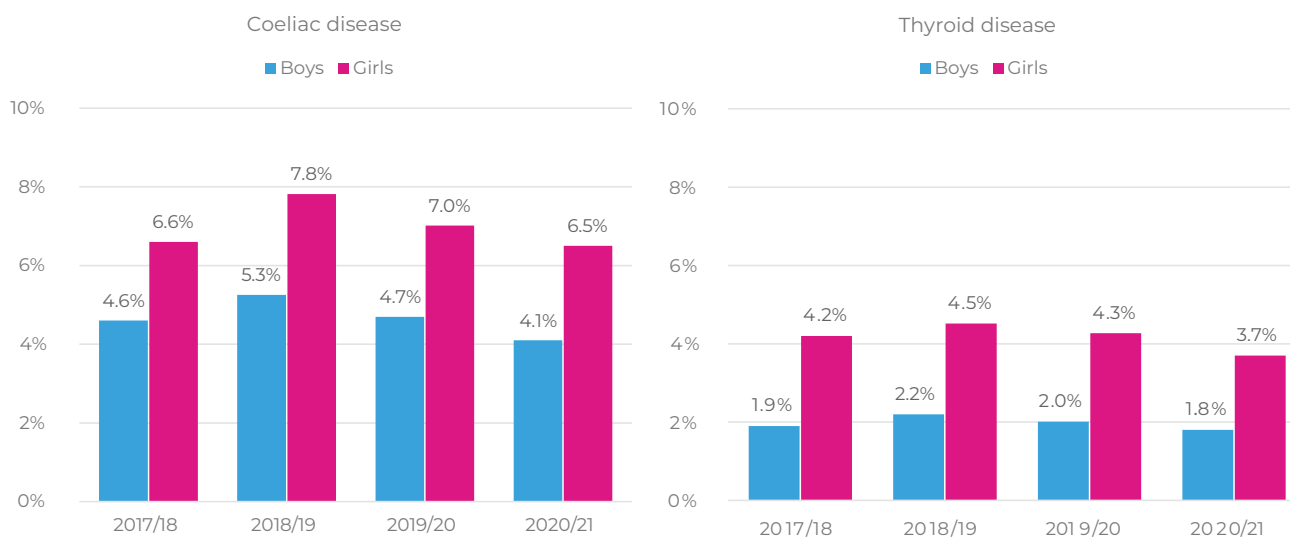


Figure 73: Percentage of children and young people with Type 1 diabetes and comorbid coeliac or thyroid disease by sex, 2017/18 to 2020/21

Coeliac disease prevalence was higher amongst children and young people with Type 1 diabetes living in the least deprived areas compared to the most deprived areas, but there was no clear association between prevalence of Thyroid disease and areas of deprivation (Figure 74).

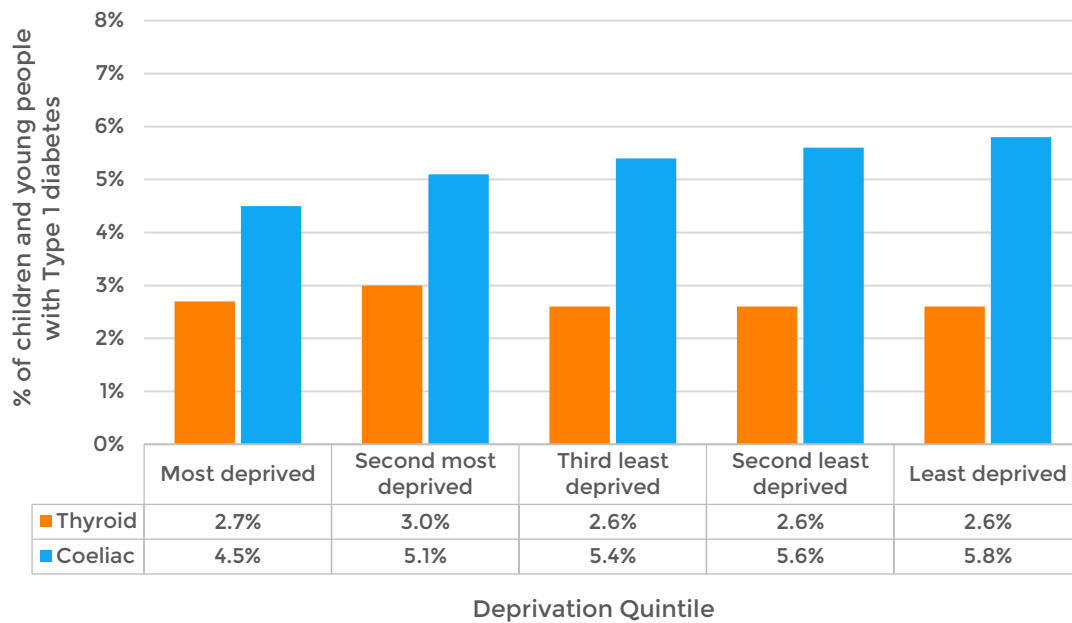


Figure 74: Percentage of children and young people with Type 1 diabetes and coeliac or thyroid disease by deprivation quintile, 2020/21

Figure 75 shows that the prevalence of coeliac disease was highest amongst White children and young people with Type 1 diabetes, while the prevalence of thyroid disease was highest amongst Asian children and young people with Type 1 diabetes. Those of Black ethnicity had the lowest rates of both coeliac and thyroid disease out of all ethnic groups.

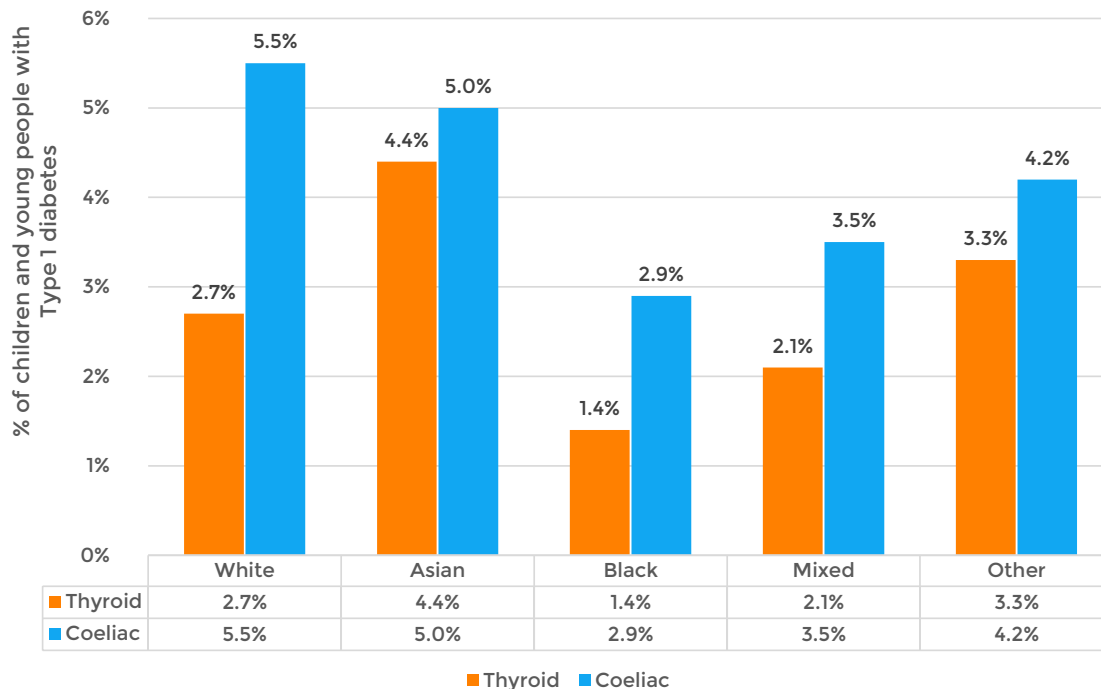


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