


BMJ Open Cardiovascular-related conditions and risk factors in primary care for deprived communities before and during the COVID-19 pandemic: an observational study in Northern England

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ABSTRACT

Objectives The North East of England, ranked as having the highest poverty levels and the lowest health outcomes, has the highest cardiovascular disease (CVD) premature mortality. This study aimed to compare CVD-related conditions and risk factors for deprived practice populations with other general practice (GP) populations in Northern England to England overall, before and during COVID-19 to identify changes in recorded CVD-related risk factors and conditions and evidence-based lipid prescribing behaviour.

Design A population-based observational study of aggregated practice-level data obtained from publicly accessible data sets.

Setting 34 practices that fall into the 15% most deprived practice populations in England were identified as the most deprived communities in the North East and North Cumbria (Deep End).

Participants Patients aged ≥16 registered with GP and diagnosed with any form of CVD.

Primary and secondary outcome measures CVD-related conditions and risk factors, statin prescribing.

Results Deep End (n=263 830) had a smaller, younger and more deprived population with lower levels of employment and full-time education and higher smoking prevalence. They had some higher recorded CVD-related conditions than England but lower than the non-Deep End. Atrial fibrillation (−0.9, −0.5), hypertension (−3.7, −1.3) and stroke and transient ischaemic attack rates (−0.5, −0.1) appeared to be lower in the Deep End than in the non-Deep End but the optimal statin prescribing rate was higher (3.1, 8.2) than in England.

Conclusion Recorded CVD-related risk factors and conditions remained comparable before and during COVID-19. These are higher in the Deep End than in England and similar or lower than the non-Deep End, with a higher optimal statin prescribing rate. However, it was not possible to control for age and sex. More work is needed to estimate the consequences of the pandemic on disadvantaged communities and to compare whether the findings are replicated in other areas of deprivation.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study focused on the practices that serve the most deprived populations in Northern England.
- ⇒ This study analysed multiple observational publicly accessible data sets which recorded data aggregated at the general practice (GP) level.
- ⇒ It compared practice profile and cardiovascular disease risk management between the deprived population practices and the rest of the GPs in the region and England overall.
- ⇒ Data analysis undertaken was based on limited data available at the practice level only, without controlling for age, gender, deprivation or ethnicity.

INTRODUCTION

More than 7 million people are living with cardiovascular disease (CVD)¹ in the UK. CVD accounts for a quarter of premature mortality and leads to the largest gap in healthy life expectancy.^{2,3} CVD morbidity is also a major challenge for health and social care. More than 100 000 admissions per year are caused by heart attacks and more than 100 000 strokes occur in the UK each year. This places a substantial financial burden on the National Health Service (NHS) and wider society, with healthcare costs being estimated at £9 billion and costs to the UK economy at £19 billion per year.¹

Identification and assessment of CVD risk in primary care remain central to clinical guidelines in many countries.⁴⁻⁶ The overall aim of treatment is to prevent CVD occurrence by reducing risk factors through optimising lifestyle and drug management. Common modifiable risk factors and comorbidities that can increase the risk of developing CVD include smoking, high cholesterol, coronary heart disease (CHD), stroke and transient

ischaemic attack (STIA) and peripheral arterial disease (PAD).⁷ However, CVD has shown significant health inequalities for people with low socioeconomic status. People in the most deprived areas in England were four times more likely to die prematurely due to CVD than those in the least deprived areas from 2017 to 2019.⁸ As a result, CVD has been identified as a clinical priority by Core20PLUS5 (a national NHS England and NHS Improvement approach to support the reduction of health inequalities)⁹ and the latest NHS Long Term Plan, which included a major ambition to prevent 150 000 heart attacks, strokes and dementia cases over the next decade.¹⁰ The plan has also defined new actions to address health inequalities in which all national programmes and local areas are required to set out specific measurable goals and mechanisms contributing to reducing health inequalities. The NHS has also set up the national CVD prevention programme² which aims to develop targeted interventions to minimise risk factors by maximising diagnosis and treatment, accompanied by the general practice (GP) contract to commission a new national CVD prevention audit for primary care,¹¹ in collaboration with the British Heart Foundation, the Stroke Association, the Academic Health Science Networks and (the former) Public Health England.

CVD and its risk factors are common comorbidities in patients with COVID-19^{12–15} and associated with poorer COVID-19 outcomes and higher mortality.¹⁶ There are early indications that COVID-19 restrictions may have led to a significant, unintended reduction in detection and treatment reviews of CVD risk factors. A study in the UK suggested a 43% reduction in new diagnoses of CVD and a 30%–52% decrease in prescribing cardiovascular medications between March and May 2020.¹⁷ Evidence is accumulating that the COVID-19 pandemic has also led to worsening of health inequalities.¹⁸ Research before COVID-19 had already suggested that attendance at CVD screening assessments was lower in individuals with high deprivation scores who are also more likely to have a higher CVD risk,¹⁹ indicating potential unmet needs and underdiagnosis of CVD in disadvantaged communities. CVD has also shown a disproportionate impact on people living in different geographic locations. The North East of England, consistently ranked as having the highest poverty levels and the lowest health outcomes,²⁰ has the highest CVD premature mortality, a close second to the North West compounded by the pandemic.²¹ With this background, it is important to explore whether existing inequalities have been exacerbated during COVID-19 in the region, and therefore whether individuals in areas of higher deprivation face widening disadvantages and worse CVD outcomes going forward.

Using publicly available data, this study aimed to compare CVD-related risk factors and conditions, evidence-based lipid prescribing behaviour and other practice characteristics in the most deprived GP populations in the North East and North Cumbria (NENC)

region with other practices in the region and England, before and during the COVID-19 pandemic.

METHODS

This is a population-based observational study comparing retrospective data from practices in deprived communities, practices in non-deprived communities and national practice-level data from the year before the COVID-19 pandemic started (April 2019 to March 2020) and the first year of the COVID-19 pandemic (April 2020 to March 2021). These data were obtained from publicly accessible data sets only.

Setting

There are 283 practices with approximately 2.4 million registered patients in the region. A total of 34 practices (with 263 830 registered patients) that fall into the 15% most deprived practice populations ranked in the lowest Indices of Multiple Deprivation (IMD) decile in England have previously been identified as the Deep End practices in the NENC (<https://deependnenc.org/>), according to the definition used in the Scottish Deep End project.²² These practices form the Deep End network in the NENC, and the network aims to improve and change the way primary care is delivered to the most deprived populations, to meet patients' needs and to reduce health inequalities. The practices described as 'Non-Deep End' practices (with 2 118 633 registered patients) are the rest of the GPs located in the NENC region.

Data sources

Practice characteristics

A summary of practice characteristics for Deep End, non-Deep End and practices across England was obtained from the GP practice profiles in the Office for Health Improvement and Disparities' Fingertips tool—a large publicly available public health data collection where data are organised into themed profiles (<https://fingertips.phe.org.uk>).²³ Profiles that update annually are generated for all practices in Quality and Outcomes Framework (QOF) that contains indicators calculated for GP practices in key areas of clinical care and public health (accessed via NHS Digital) to support GPs, primary care networks, clinical commissioning groups and local authorities to ensure appropriate healthcare services are provided for their local population. Variables included practice list size, IMD, age breakdown of registered population, Income Deprivation Affecting Children Index, Income Deprivation Affecting Older People Index, patient satisfaction (from the GP patient survey), total QOF points, sex breakdown of life expectancy and percentage of patients with caring responsibilities.

CVD-related risk factors and CVD conditions: CVD registers and prevalence

Practice-level data were downloaded from publicly available QOF²⁴ 2019/2020 cardiovascular group data,

covering recorded CVD-related risk factors (estimated smoking prevalence, hypertension (HYP)) and CVD conditions (CHD, atrial fibrillation (AF), heart failure (HF), left ventricular systolic dysfunction (LVSD), PAD and STIA). Each condition was analysed separately. Raw prevalence percentages for the seven conditions were calculated as the number of patients on the practice disease register divided by practice list size.

Statin prescription

Data on statin therapy (low intensity, medium intensity and total statins) were downloaded from publicly available OpenPrescribing²⁵ which gives free and open access to monthly prescription data at every GP practice in England.

High-intensity statins are recognised as the most appropriate evidence-based treatment for those with hypercholesterolaemia who have not responded to lifestyle modification,²⁶ with the proportion of high-intensity statin prescribing of overall statin used as a surrogate marker for evidence-based approaches to lipid management. High-intensity statins were calculated by subtracting low and medium-intensity statins from the total statins, which were then divided by the total statins.

Population

The study population was patients aged 16 and above who have registered with the 34 Deep End practices in the NENC as recorded on the QOF from 2019 to 2020. The study comparators were the patients registered in non-Deep End practices in the region and all registered patients in England where data were available for the same time period.

Data analysis

Primary outcomes were (a) the comparison of prevalence of CVD-related risk factors and conditions between Deep End practices, non-Deep End practices and all-England practices; (b) comparison of statin prescribing rates; and (c) the change in the prevalence of CVD-related risk factors and conditions in these groups of practices before and during COVID-19. GP practice code was used to link data across all data sets. Due to the nature of the aggregated data available from the public sources used (Fingertips²³ and QOF), it was not possible to control any of the comparisons for age, gender, deprivation or ethnicity. Descriptive statistics using means, SDs and range were used to compare the practice profile of the 34 Deep End practices with non-Deep End in the region and the England average level. The prevalence of risk factors, conditions and statin prescribing was analysed with an appropriate statistical test (ie, two-sample t-test, single sample t-test and paired t-test), which yielded p values that indicated the statistical significance of any differences between Deep End, non-Deep End and England levels, and over time (before and during COVID-19). There were no missing values in the practice-level data

obtained from the publicly available data sets for analyses in this study.

Patient and public involvement

Due to the nature of this study being a fully data-based analysis based on the existing data sets, there was no specific involvement of patients or the public in the design or conduct of the study. However, results will be widely shared via the public involvement and community engagement network for the National Institute of Health Research Applied Research Collaboration NENC that brings together six regional universities, the NHS, health and social care providers, local authorities, the voluntary sector, community groups, members of the public and others.

RESULTS

Characteristics of the Deep End practices compared with non-Deep End and England practices

As shown in [table 1](#), on average the 34 Deep End practices had a list size of 7760 which is smaller than the average seen in non-Deep End practices and England average.²⁷ The Deep End practices had significantly higher levels of deprivation compared with the non-Deep End (46.4 vs 26.7) and England practices (46.4 vs 21.7), with deprivation scores around twice as high as the England average in the NENC Deep End practices. This highlighted that NENC practices in general were more deprived. The age profile of those registered in the Deep End was different compared with both the non-Deep End NENC practices and England overall, with a significantly lower proportion of those aged over 85 in the Deep End and an apparent shift towards younger age groups. Deprivation was also significantly higher for those younger and older groups in the Deep End practices in NENC when assessed using the income deprivation for children and older people. As explained earlier, despite these very clear differences in the demographic make-up of Deep End versus non-Deep End and all-England practices, it was not possible to control any of the comparisons in this paper for these factors.

Also as expected, life expectancy for those living in the Deep End was significantly lower in both males and females, with males living on average 3.2 and 4.5 years and females 2.8 and 3.8 years less in the Deep End compared with the non-Deep End and England practices, respectively.

There were comparable proportions of those in the Deep End practices with caring responsibilities compared with the non-Deep End practices (18.0% vs 18.6%) and England practices (18.0% vs 17.0%). Lower proportions of people registered in the Deep End practices (6.7% and 12% less than the non-Deep End and England practices, respectively) were in paid work or full-time education and more were unemployed (6.7% and 7.3% more than the non-Deep End and England practices, respectively).

Table 1 NENC Deep End practice (n=34) characteristics compared with NENC non-Deep End and England-level practices

Characteristics	Deep End practices		Non-Deep End practices		95% CI mean difference (DE vs non-DE)	England Mean	P value† (DE vs England)
	Mean (SD)	Range	Mean (SD)	Range			
Practice list size (October 2020)	7760 (5238)	(1337, 26 551)	8509 (4730)	(1668, 39 075)	(-2474 to 976)	8757‡	
IMD scores 2019	46.4 (7.8)	(34.2, 67.4)	26.7 (8.7)	(8.5, 42.7)	(16.6 to 22.8)**	21.7	**
% patients, 0–4 years, 2021	5.7 (1.0)	(3.6, 8.2)	4.7 (1.0)	(0.9, 8.8)	(0.7 to 1.4)**	5.1	**
% patients, 5–14 years, 2021	12.7 (2.5)	(8.7, 21.1)	11.0 (1.9)	(1.2, 17.3)	(0.9 to 2.3)**	11.8	*
% patients, under 18 years, 2021	21.7 (3.5)	(14.9, 33.4)	18.9 (3.2)	(2.4, 32.2)	(1.7 to 4.0)**	20.2	*
% patients, 65+ years, 2020	14.8 (5.1)	(0.4, 22.9)	20.4 (5.2)	(1.1, 34.5)	(-7.5 to -3.8)**	17.4	*
% patients, 85+ years, 2020	1.5 (0.6)	(0.0, 2.7)	2.4 (0.7)	(0.1, 4.3)	(-1.1 to -0.5)**	2.1	**
IDACI, under 16 years, 2019	0.3 (0.1)	(0.2, 0.5)	0.2 (0.1)	(0.0, 0.3)	(0.1 to 0.2)**	0.2	**
IDAOP1, 60+ years, 2019	0.3 (0.1)	(0.2, 0.4)	0.2 (0.1)	(0.1, 0.4)	(0.1 to 0.1)**	0.1	**
Female life expectancy 2013–2017	79.3 (1.4)	(76.0, 82.1)	82.1 (1.6)	(78.8, 88.3)	(-3.4 to -2.2)**	83.1	**
Male life expectancy 2013–2017	75.0 (1.4)	(71.9, 77.6)	78.2 (1.9)	(74.7, 83.6)	(-3.8 to -2.5)**	79.5	**
% patients with caring responsibility, 2020	18.0 (5.7)	(3.2, 29.3)	18.6 (4.5)	(2.8, 33.7)	(-2.2 to 1.1)	17.0	
% paid work or full-time education, 2020	51.7 (8.9)	(15.6, 64.1)	58.4 (7.4)	(33.9, 79.1)	(-9.4 to -3.9)**	63.7	**
% unemployed, 2020	11.2 (10.4)	(2.2, 57.4)	4.5 (3.7)	(0.0, 17.5)	(4.9 to 8.5)**	3.9	**
% patients' positive experiences, 2020	83.8 (7.0)	(70.7, 95.0)	84.6 (9.3)	(55.1, 100.0)	(-4.0 to 2.5)	81.8	
% patients satisfied with phone access, 2020	72.1 (19.6)	(33.4, 98.4)	74.3 (19.2)	(21.3, 100.0)	(-9.1 to 4.7)	65.2	*
% patients satisfied with appointment times, 2020	69.4 (9.6)	(53.6, 88.9)	67.1 (14.0)	(26.2, 96.8)	(-2.5 to 7.2)	63.0	**
% patients' good overall experience of appointment, 2020	71.8 (10.8)	(53.9, 95.1)	70.1 (14.1)	(33.7, 98.5)	(-3.3 to 6.6)	65.5	*
% patients with a long-standing condition, 2020	59.7 (9.9)	(31.4, 78.1)	57.1 (7.4)	(26.3, 73.7)	(-0.2 to 5.4)	52.4	**
Total QOF points	95.4 (9.3)	(47.8, 100.0)	97.4 (2.7)	(84.9, 100.0)	(-3.5 to -0.6)*	95.6	

IMD score: the larger the score, the more deprived the area. Total QOF points: defined as a proportion of all achievable QOF points across all domains.^{23,24}

*P<0.05; **p<0.001.

†Practice-level data for England are not publicly accessible, one sample t-test was conducted to compare the sample against the population mean.

‡Published by NHS Digital for October 2019.²⁷

DE, Deep End; IDACI, Income Deprivation Affecting Children Index; IDAOP1, Income Deprivation Affecting Older People Index; IMD, Index of Multiple Deprivation; NENC, North East and North Cumbria; QOF, Quality and Outcomes Framework.

In the GP patient survey data, patients in the NENC region were found to be more satisfied with their GP practices compared with England practices, specifically with phone access, appointment times and overall experience of appointment. This was the case across the board for both patients from Deep End and non-Deep End practices.

Over 2.5% and 7% more of those registered with a Deep End practice had a long-term condition compared with the non-Deep End (59.7% vs 57.1%) and England levels (59.7% vs 52.4%), respectively, and the total QOF points achieved were lower than non-Deep End practices (95.4 vs 97.4) but comparable with the England average (95.4 vs 95.6).

CVD and CVD-related risk factor prevalence in the Deep End practices compared with non-Deep End and England practices

As shown in [table 2](#), when considering individual CVD risk factors, recording of smoking prevalence was significantly higher in Deep End practices compared with the rest of the region and England. However, the recorded HYP prevalence was lower in the Deep End practices than that in the non-Deep End but comparable with the England average.

Looking at CVD-related conditions, interestingly, there was lower recorded CHD prevalence in the Deep End compared with the non-Deep End practices but higher prevalence compared with England practices. The prevalence of AF was also lower in the Deep End practices compared with regional non-Deep End practices but was similar to England practices. Prevalences for HF were comparable across the Deep End, regional non-Deep End and England. Despite no difference in rates for LVSD and PAD between the Deep End and regional non-Deep End practices, Deep End practices had higher prevalence compared with England practices. However, the pattern of prevalence was different when it came to STIA with the Deep End having lower prevalence compared with non-Deep End but similar to England. As noted earlier, none of these comparisons of CVD-related conditions between the different groups of practices have been controlled for age, sex or deprivation.

There was no significant change in any of the identified CVD-related risk factors before and during COVID-19. However, it was noted that the range for each risk factor in regional non-Deep End practices was greater.

Prescribing of statin therapy in Deep End practices compared with the non-Deep End and England practices

As shown in [table 3](#), the percentage of high intensity was comparable between the Deep End and the non-Deep End, but significantly higher than England average.

The percentage of high-intensity statins had increased during COVID-19 compared with the year before COVID-19, with a significant increase for regional non-Deep End and England practices but not for Deep End practices.

DISCUSSION

This observational study examined practice profiles and recorded CVD-related risk factors and conditions for Deep End practices in the NENC and compared these with the regional non-Deep End and England practices before and during the COVID-19 period using publicly accessible data sets.

This study has found that Deep End practices had on average a smaller and younger population than other practices in the region and nationally.²⁷ As expected, the overall deprivation score is high in Deep End populations with those below age 16 and over age 60 also being scored higher on income deprivation. The Deep End populations also had lower levels of paid employment or full-time education and higher levels of unemployment. There was clear evidence of higher health needs in the Deep End practices, with higher levels of long-term conditions and poorer life expectancy than both non-Deep End and England practices. Despite that, patients in the region reported higher satisfaction with their practices compared with England across the board for both Deep End and non-Deep End practices. In addition, Deep End practitioners have achieved slightly lower results measured by total QOF points.

This study also found that, consistently across the region, for both the Deep End and non-Deep End practices, patients reported a better overall experience of making appointments than in England. This contradicts previous findings from the GP patient survey that the deprived populations were non-likely to report a positive experience of accessing GP or a good overall experience.^{28 29} It is worth noting that we did not have data on respondents to the survey nor response rate to these questions, therefore comparisons across practices were not possible. Also, patient satisfaction levels were not adjusted for age or gender in this study. Given poorer experience reported in the most deprived populations elsewhere, this finding requires further exploration, which may consider whether primary care staff working in some of the most disadvantaged communities in the region are achieving above-average service delivery despite these circumstances and the impact on staff health.

Despite disruptions to essential health services caused by the pandemic, this study did not observe any significant changes in CVD-related risk factors or conditions regionally and nationally. There may be some reasons for this. First, this study provided a descriptive analysis of practice-level data without controlling for demographic variables (particularly age, as Deep End practices have an average younger population). Second, evidence of the wider lifestyle, health and care consequences of the pandemic is still emerging especially for the most disadvantaged communities, hence it may still be too early to observe any significant impact. Third, given that it is known that CVD risk factors are usually more common in deprived areas,⁸ and if the lower recorded prevalences (and lack of change in prevalences) found in this study were not due only to the inability to control for age, one

Table 2 Cardiovascular diseases and CVD-related risk factor prevalence in NENC Deep End practices compared with NENC non-Deep End and England practices

Risk factors	Deep End practices			Non-Deep End practices			England		
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	95% CI mean difference (DE vs England)
Smoking prevalence (%)									
Register 2019/2020	24.5 (4.9)	(17.8, 39.3)	16.3 (4.5)	(4.7, 27.5)	16.5 (-)	(6.5 to 9.8)**	16.5 (-)	(6.3 to 9.7)**	(6.3 to 9.7)**
Register 2020/2021	23.8 (4.5)	(17.6, 37.5)	15.8 (4.4)	(4.5, 26.4)	15.9 (-)	(6.4 to 9.6)**	15.9 (-)	(6.3 to 9.5)**	(6.3 to 9.5)**
95% CI mean difference	(-2.9 to 1.6)		(-1.3 to 0.3)						
HYP									
Register (n) 2019/2020	1131 (856)	(11, 4504)	1373 (717)	(164, 3530)	1279 (868)	(-506 to 22)	1279 (868)	(0, 11 720)	(-440 to 145)
Register (n) 2020/2021	1136 (876)	(14, 4500)	1392 (861)	(176, 8858)	1287 (889)	(-567 to 54)	1287 (889)	(0, 11 886)	(-450 to 149)
95% CI mean difference	(-414 to 424)		(-120 to 159)		(-22 to 38)		(-22 to 38)		
Prevalence (%)	14.2 (4.3)	(0.9, 21.2)	16.6 (3.2)	(1.0, 29.3)	14.4 (4.1)	(-3.6 to -1.2)**	14.4 (4.1)	(0, 87.9)	(-1.5 to 1.2)
Prevalence (%)	13.9 (4.1)	(1.0, 20.7)	16.5 (3.2)	(1.0, 28.8)	14.2 (4.0)	(-3.7 to -1.3)**	14.2 (4.0)	(0, 61.3)	(-1.6 to 1.1)
95% CI mean difference	(-2.3 to 1.7)		(-0.7 to 0.4)		(-0.3 to 0.0)		(-0.3 to 0.0)		
AF									
Register (n) 2019/2020	143 (112)	(0, 539)	202 (112)	(12, 634)	186 (150)	(-99 to -18)*	186 (150)	(0, 1445)	(-94 to 7)
Register (n) 2020/2021	146 (122)	(0, 517)	206 (113)	(14, 1346)	189 (155)	(-107 to -12)*	189 (155)	(0, 1424)	(-95 to 9)
95% CI mean difference	(-53 to 60)		(-17 to 26)		(-2 to 8)		(-2 to 8)		
Prevalence (%)	1.7 (0.6)	(0, 2.7)	2.4 (0.6)	(0.1, 4.2)	2.0 (1.0)	(-0.9 to -0.5)**	2.0 (1.0)	(0, 28.7)	(-0.6 to 0.1)
Prevalence (%)	1.7 (0.6)	(0, 2.7)	2.4 (0.6)	(0.1, 4.3)	2.0 (1.1)	(-0.9 to -0.5)**	2.0 (1.1)	(0, 28.2)	(-0.7 to 0.1)
95% CI mean difference	(-0.3 to 0.3)		(-0.1 to 0.1)		(0.0 to 0.0)		(0.0 to 0.0)		
CHD									
Register (n) 2019/2020	302 (221)	(3, 1078)	348 (192)	(25, 977)	281 (204)	(-117 to 24)	281 (204)	(0, 2392)	(-48 to 90)
Register (n) 2020/2021	301 (230)	(3, 1067)	349 (231)	(24, 2447)	282 (209)	(-131 to 35)	282 (209)	(0, 2447)	(-51 to 90)
95% CI mean difference	(-110 to 109)		(-36 to 39)		(-6 to 8)		(-6 to 8)		
Prevalence (%)	3.8 (1.3)	(0.3, 6.4)	4.2 (0.9)	(0.2, 6.2)	3.2 (1.2)	(-0.7 to 0.0)*	3.2 (1.2)	(0, 31.1)	(0.2 to 1.1)*
Prevalence (%)	3.7 (1.2)	(0.2, 5.9)	4.1 (0.9)	(0.1, 6.2)	3.1 (1.2)	(-0.7 to -0.1)*	3.1 (1.2)	(0, 30.0)	(0.2 to 1.0)*
95% CI mean difference	(-0.7 to 0.5)		(-0.2 to 0.1)		(-0.1 to 0.0)		(-0.1 to 0.0)		
HF									

Continued

Table 2 Continued

Risk factors	Deep End practices			Non-Deep End practices			England		
	Mean (SD)	Range	95% CI mean difference (DE vs non-DE)	Mean (SD)	Range	95% CI mean difference (DE vs non-DE)	Mean (SD)	Range	95% CI mean difference (DE vs England)
Register (n) 2019/2020	86 (82)	(1, 405)	(-45 to 8)	104 (73)	(4, 471)	(-45 to 8)	81 (70)	(0, 1124)	(-19 to 29)
Register (n) 2020/2021	91 (92)	(1, 410)	(-48 to 18)	106 (92)	(5, 1047)	(-48 to 18)	84 (74)	(0, 1047)	(-18 to 32)
95% CI mean difference	(-37 to 47)			(-13 to 16)			(0 to 5)		
Prevalence (%) 2019/2020	1.0 (0.5)	(0.1, 2.2)	(-0.4 to 0)	1.2 (0.5)	(0, 3.1)	(-0.4 to 0)	0.9 (0.5)	(0, 13.4)	(0 to 0.3)
Prevalence (%) 2020/2021	1.1 (0.6)	(0.1, 2.8)	(-0.3 to 0)	1.2 (0.5)	(0, 2.9)	(-0.3 to 0)	0.9 (0.5)	(0, 12.1)	(0 to 0.3)
95% CI mean difference	(-0.2 to 0.3)			(-0.1 to 0.1)			(0.0 to 0.0)		
LVSD									
Register (n) 2019/2020	45 (51)	(0, 259)	(-31 to 5)	59 (50)	(3, 309)	(-31 to 5)	33 (39)	(0, 532)	(0 to 26)
Register (n) 2020/2021	51 (62)	(0, 265)	(-31 to 12)	60 (60)	(3, 625)	(-31 to 12)	36 (43)	(0, 670)	(0 to 29)*
95% CI mean difference	(-22 to 33)			(-8 to 11)			(2 to 4)		
Prevalence (%) 2019/2020	0.6 (0.4)	(0, 1.6)	(-0.3 to 0)	0.7 (0.4)	(0, 2.3)	(-0.3 to 0)	0.4 (0.3)	(0, 3.4)	(0.1 to 0.3)**
Prevalence (%) 2020/2021	0.6 (0.5)	(0, 2.2)	(-0.2 to 0.1)	0.7 (0.4)	(0, 2.1)	(-0.2 to 0.1)	0.4 (0.3)	(0, 5.6)	(0.1 to 0.3)**
95% CI mean difference	(-0.2 to 0.2)			(-0.1 to 0.1)			(0.0 to 0.0)		
PAD									
Register (n) 2019/2020	76 (55)	(0, 251)	(-17 to 16)	77 (45)	(3, 228)	(-17 to 16)	54 (45)	(0, 747)	(7 to 37)*
Register (n) 2020/2021	76 (56)	(0, 243)	(-19 to 19)	76 (51)	(4, 487)	(-19 to 19)	54 (46)	(0, 720)	(6 to 37)*
95% CI mean difference	(-27 to 27)			(-10 to 7)			(-1 to 2)		
Prevalence (%) 2019/2020	0.9 (0.3)	(0.0, 1.8)	(-0.1 to 0.1)	0.9 (0.3)	(0.0, 2.4)	(-0.1 to 0.1)	0.6 (0.4)	(0.0, 12.8)	(0.2 to 0.5)**
Prevalence (%) 2020/2021	0.9 (0.3)	(0.0, 1.7)	(-0.1 to 0.1)	0.9 (0.3)	(0.0, 2.2)	(-0.1 to 0.1)	0.6 (0.4)	(0.0, 21.6)	(0.2 to 0.5)**
95% CI mean difference	(-0.2 to 0.1)			(-0.1 to 0.0)			(0.0 to 0.0)		
STIA									
Register (n) 2019/2020	162 (125)	(0, 617)	(-75 to 4)	197 (107)	(19, 529)	(-75 to 4)	163 (123)	(0, 1385)	(-43 to 40)
Register (n) 2020/2021	167 (135)	(0, 651)	(-79 to 13)	200 (127)	(20, 1240)	(-79 to 13)	166 (128)	(0, 1427)	(-42 to 44)
95% CI mean difference	(-57 to 68)			(-18 to 24)			(-1 to 8)		
Prevalence (%) 2019/2020	2.0 (0.6)	(0.0, 2.9)	(-0.6 to -0.2)**	2.4 (0.5)	(0.1, 3.5)	(-0.6 to -0.2)**	1.8 (0.8)	(0.0, 21.9)	(-0.1 to 0.5)

Continued



Table 2 Continued

Risk factors	Deep End practices		Non-Deep End practices		England		95% CI mean difference (DE vs England)
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range	
Prevalence (%) 2020/2021	2.0 (0.6)	(0.0, 2.9)	2.3 (0.5)	(0.1, 3.9)	1.8 (0.9)	(0.0, 26.7)	(-0.1 to 0.5)
95% CI mean difference	(-0.3 to 0.3)		(-0.1 to 0.1)		(0.0 to 0.0)		

*P<0.05; **p<0.001.
 AF, atrial fibrillation; CHD, coronary heart disease; CVD, cardiovascular disease; DE, Deep End; HF, heart failure; HYP, hypertension; LVSD, left ventricular systolic dysfunction; NENC, North East and North Cumbria; PAD, peripheral arterial disease; STIA, stroke and transient ischaemic attack.

alternative explanation could include under-recording or missed recording (eg, due to potential underdiagnosis); however, the finding needs further exploration including using individual-level data which can be adjusted for demographic variables.

The Deep End practices had a higher smoking prevalence. A multilevel, multicomponent, cross-party, evidence-based programme targeting the whole systems and local environments is needed to reduce inequalities in smoking prevalence.³⁰ Interventions focusing solely on individual behaviour change and providing information or education³¹ without taking into consideration the issues of differential access, use and outcome of preventive healthcare services across disadvantaged groups³⁰ are likely to exacerbate these inequalities.

The Deep End patients had lower recorded HYP and CVD-related conditions overall compared with the non-Deep End patients. However, when compared with the national level, the Deep End showed a similar recorded HYP and STIA prevalence and a higher level of many CVD-related conditions (CHD, LVSD and PAD). This has confirmed existing evidence that the North East of England is an area of high CVD risk.³² However, the inability to control for age makes this impossible to interpret and the finding may be attributed to differences between the Deep End and England average in the characteristics of the population, particularly age. Further research is needed to compare risk factors and CVD-related conditions in Deep End practices adjusted for the characteristics of the population. Given the positive association between deprivation and HYP, CHD and STIA prevalences,³³⁻³⁶ the lack of a difference in recorded prevalence between Deep End and non-Deep End needs to be explored further. As previously noted, none of the comparisons were adjusted by age, and therefore the finding of lower recorded CVD-related conditions in Deep End compared with non-Deep End practices could be largely attributed to the larger proportion of young people in the Deep End practices.

There appeared to be a lower recorded level of AF in those living in the Deep End. Although recent studies seemed to observe a rising trend of AF with a deprivation score after controlling for age and gender,³⁷ it is worth noting that there is a lack of association of AF with deprivation shown in an observational study examining the prevalence and treatment of AF in GP in the UK between 2000 and 2016. It found that a lower proportion of patients with AF were in the most materially deprived areas than the least deprived areas with a steady increase in the age-gender standardised AF prevalence.³⁸ In addition, when adjusting for age, patient-level socioeconomic status and comorbidities such as CHD, HYP, obesity, HF and diabetes, previous research has concluded that socioeconomic disparities and deprivation are not independently associated with AF.³⁹

The rate of high-intensity statin prescribing was recorded as lower than the non-Deep End but higher in the Deep End before and during COVID-19 than in

Table 3 Statin therapy in NENC Deep End practices compared with NENC non-Deep End and England practices

Statin	Deep End practices			Non-Deep End practices			England		
	Mean (SD)	Range	95% CI mean difference (DE vs non-DE)	Mean (SD)	Range	95% CI mean difference (DE vs non-DE)	Mean (SD)	Range	95% CI mean difference (DE vs England)
Total intensity (n)									
2019/2020	14 068 (9124)	(152, 41 312)	(-4819 to 1431)	15 763 (8623)	(1133, 46 517)	(-4819 to 1431)	-	-	-
2020/2021	14 872 (10 339)	(172, 44 602)	(-4662 to 1999)	16 204 (9101)	(1315, 54 288)	(-4662 to 1999)	-	-	-
95% CI mean difference	(-3918 to 5525)		(-1120 to 2002)						
High intensity (n)									
2019/2020	8922 (6659)	(100, 28 369)	(-3367 to 1001)	10 104 (5984)	(821, 36 007)	(-3367 to 1001)	-	-	-
2020/2021	10 024 (8047)	(127, 34 588)	(-3212 to 1636)	10 812 (6541)	(1011, 42 851)	(-3212 to 1636)	-	-	-
95% CI mean difference	(-2474 to 4679)		(-396 to 1812)						
High intensity (%)									
2019/2020	61.9 (10.4)	(46.8, 86.7)	(-5.5 to 1.8)	63.8 (10.2)	(35.4, 91.0)	(-5.5 to 1.8)	56.4 (5.0)	(44.8, 76.5)	(2.9 to 8.1)**
2020/2021	65.4 (10.4)	(47.3, 87.4)	(-4.5 to 2.4)	66.4 (9.5)	(36.1, 91.2)	(-4.5 to 2.4)	59.7 (4.9)	(48.2, 78.8)	(3.1 to 8.2)**
95% CI mean difference	(-1.6 to 8.5)		(0.9 to 4.4)*				(2.0, 4.6)**		

*P<0.05; **p<0.001.

DE, Deep End; NENC, North East and North Cumbria.



England. This indicates the high risk of CVD in the region and the likelihood of underdiagnosed CVD-related risk factors or CVD conditions in the Deep End practices. Higher high-intensity statin prescribing in the region may also reflect that practitioners are actively treating CVDs with greater compliance with the clinical guideline for the use of high-intensity statins,⁴⁰ which could be the consequence of the Accelerated Access Collaborative Lipid Management Rapid Uptake Product programme initiated and supported by Statin Intolerance Pathway endorsed by the National Institute for Health and Care Excellence.⁴¹

This study has several limitations that impact the applicability of the findings. It was a retrospective study conducted using multiple observational publicly accessible data sets which recorded data aggregated at the GP practice level. Limitations and factors influencing the quality of those data sets apply to this study, which could include sampling bias, recall bias, confounding by indication and changes in practice and/or disease biology. Despite that, the findings are considered hypothesis generating as this study provided valuable information on practice characteristics and CVD-related risk factors and conditions in a real-world setting which is essential to the evidence base required for CVD optimisation in deprived communities. Due to the inability to access patient-level data, it was not possible to control comparisons for age, gender, deprivation or ethnicity. Also, the analyses based on average values calculated at predefined time points can produce biased estimates due to potential missing data in patient-level data. In addition, QOF data are based on recorded data within practices to meet QOF requirements, and the QOF is a voluntary reward and incentive programme, which has been reported not to be effective in narrowing health inequality.⁴² Although this study focused on only one region in the UK, it did enable a high-level view of CVD-related characteristics of practices in the region with the poorest health outcomes.

CONCLUSION

This descriptive study finds that CVD-related risk factors and conditions remain comparable before and during COVID-19 across Deep End, non-Deep End and all-England practices. Deep End practices present higher CVD-related conditions compared with England but similar or lower compared with the regional non-Deep End practices, with a higher smoking prevalence and evidence-based lipid prescribing rate. However, these findings should be interpreted with caution due to the quality of data and limited analyses possible that may be largely confounded by the inability to control for demographic variables in the comparisons. An alternative explanation could include potential underdiagnosed and under-recorded CVD-related conditions, potentially leading to unmet needs. However, these findings require further exploration for wider implementation or evidence generation. Future work is needed using individual-level data

controlled for key demographic variables to estimate the health and care consequences of the pandemic on disadvantaged communities and to further compare whether findings are replicated in other areas of deprivation. In addition, research with qualitative methods would be helpful to explore how health professionals manage CVD-related risk factors and conditions in routine practice for deprived populations and in general how they manage to deliver higher satisfaction.

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