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Socioeconomic status and HRT prescribing:

a study of practice-level data in England

Abstract

Background
Concerns have been raised that women from deprived backgrounds are less likely to be receiving hormone replacement therapy (HRT) treatment and its benefits, although evidence in support of this is lacking.

Aim
To investigate general practice HRT prescription trends and their association with markers of socioeconomic deprivation.

Design and setting
Cross-sectional study of primary care prescribing data in England in 2018.

Method
Practice-level prescribing rate was defined as the number of items of HRT prescribed per 1000 registered female patients aged ≥40 years. The association between Index of Multiple Deprivation (IMD) score and HRT prescribing rate was tested using multivariate Poisson regression, adjusting for practice proportions of obesity, smoking, hypertension, diabetes, coronary heart disease and cerebrovascular disease, and practice list size.

Results
The overall prescribing rate of HRT was 29% lower in practices from the most deprived quintile compared with the most affluent (incidence rate ratio [IRR] = 0.71; 95% confidence interval [CI] = 0.68 to 0.73). After adjusting for all cardiovascular disease outcomes and risk factors, the prescribing rate in the most deprived quintile was still 18% lower than in the least deprived quintile (adjusted IRR = 0.82; 95% CI = 0.77 to 0.86). In more deprived practices, there was a significantly higher tendency to prescribe oral HRT than transdermal preparations (P<0.001).

Conclusion
This study highlights inequalities associated with HRT prescription. This may reflect a large unmet need in terms of menopause care in areas of deprivation. Further research is needed to identify the factors from patient and GP perspectives that may explain this.

Keywords
cross-sectional studies; female; general practice; hormone replacement therapy; menopause; prescribing.

INTRODUCTION

Socioeconomic deprivation may be associated with prescribing rates in primary care. Recent research has looked at opioid, benzodiazepine, and antibiotic prescribing, all of which have higher rates of prescribing in areas of greater socioeconomic deprivation.[1–3]

Hormone replacement therapy (HRT) is a medication that has been subject to wide fluctuations in prescribing rates over recent decades. Following its introduction in the 1960s, prescribing rates rose and, by the 1990s, 30% of UK women aged 50–64 years were current users and 50% were ever users.[4]

Evidence presented by the Women's Health Initiative (WHI) programme (between 1996–2000) showed that deprivation was associated with HRT prevalence. In the least deprived areas, 34% of women were receiving HRT compared with 30% in the most deprived. They also found, however, that HRT prescribing was influenced considerably more strongly by a woman's medical and surgical background than by deprivation.[5] Other studies in the 1990s showed a reduced prescribing rate in lower socioeconomic groups.[6,7]

Prescribing rates of HRT changed dramatically with the premature closure of the UK WHI study in 2002.[8] The findings, which showed an increased risk of breast cancer in HRT users, triggered a worldwide review of practice. The prevalence of menopause-related consultations fell, as did the incidence and prevalence of HRT prescribing.[4] Although more reassuring results were published, they received relatively little media attention, and so the number of women consulting for both menopause and prescribing of HRT continued to fall.[9] More recent primary care prescribing data suggest that the prescribing of drugs included in the *British National Formulary* (BNF) section 'Female Sex Hormones and Their Modulators',[10] which includes oestrogen-containing HRT as well as progesterone, sildenafil, and ulipristal, has gradually increased over the past 5 years from around 218 000 items in November 2014 to around 345 000 items in October 2019.

HRT is prescribed for the treatment of menopausal or perimenopausal symptoms, such as vasomotor instability or vaginal atrophy. HRT can also improve a plethora of symptoms as captured by the Greene climacteric score.[11] The menopause can have a negative effect on mood as well as physical symptoms. Many women find that their work and home life are negatively affected and consult their GP during this time.

Social deprivation is associated with a range of morbidities, many of which may affect a clinician's decision to prescribe HRT. Bone fractures and osteoporosis are more prevalent in areas of socioeconomic deprivation,[12] and deprivation is associated

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How this fits in

Little is known about the relationship between hormone replacement therapy (HRT) prescribing rates and socioeconomic deprivation. This analysis shows that there is an 18% lower HRT prescribing rate in primary care practices in the most deprived areas compared with the least deprived after adjusting for all cardiovascular disease outcomes and risk factors. In addition, women in more deprived areas who are prescribed HRT are relatively more likely to receive oral rather than transdermal therapy compared with women in the least deprived areas. More research is needed to confirm these findings, to establish the reasons for this difference, and to identify how inequalities in menopause support associated with socioeconomic deprivation can be addressed.

with a younger age of the menopause,[13] both of which are positive influences to prescribe. Cardiovascular disease and diabetes are more prevalent in more deprived areas. HRT does not increase cardiovascular risk when commenced in women aged younger than 60 years and is cardiovascular protective (when prescribed as oestrogen alone). However, cardiovascular risk factors and the presence of known cardiovascular comorbidity may dissuade a clinician from prescribing if the patient is aged ≥60 years.[14] A difference in prescribing levels may also not be attributed solely to the decision-making behaviour of the clinician, but to the consulting behaviour of the woman.

There is no recent evidence regarding whether the rates of HRT prescribing are linked to socioeconomic deprivation. In a climate where prescribing costs are a growing concern and there is still a reluctance from both women and clinicians to use HRT in the post-WHI era, the authors hypothesised that it is the women from the most deprived backgrounds who are least likely to receive HRT. In addition to exploring this hypothesis in relation to all oestrogen-containing HRT, this study also looked at the types of HRT prescribed (oral versus transdermal), the effect of cardiovascular risk factors, and the relationship of HRT prescribing to socioeconomic deprivation.

METHOD

Data sources

This is a cross-sectional study of monthly prescribing data for primary care practices in England in 2018, downloaded from NHS Digital.[15] The dataset gives information for each primary care practice and their clinical commissioning group (CCG), and the number of prescription items prescribed that month for each drug preparation. Private prescriptions are not recorded in this dataset. Information on GP practice list sizes (in January 2018), including stratification by sex and 5-year age bands, were also retrieved from NHS Digital,[16] as were BNF drug codes.[17]

Data on practice-level and CCG-level socioeconomic status (SES) were obtained from Public Health England's National General Practice Profiles.[18] SES was quantified using the Index of Multiple Deprivation (IMD) score from 2015. The IMD score combines information from seven domains to produce an overall relative measure of SES. The domains are combined using the following weights:[19]

- income deprivation (22.5%);
- employment deprivation (22.5%);
- education, skills, and training deprivation (13.5%);
- health deprivation and disability (13.5%);
- crime (9.3%);
- barriers to housing and services (9.3%); and
- living environment deprivation (9.3%).

Data processing

Primary care prescribing data for each month in 2018 were filtered for all oestrogen-containing HRT preparations and aggregated by BNF drug code to give the total number of items prescribed under each BNF code per practice over a year. All oral, transdermal, intranasal, and implant preparations were included, but progesterone-only preparations — such as Utrogestan and levonorgestrel-releasing intrauterine devices — were excluded so as not to 'double count' HRT prescriptions (for the BNF drug codes used in this analysis see Supplementary Table S1). The total number of prescribed items were then aggregated by practice, irrespective of the initial preparation. Practices with small numbers of patients (<500 women) or prescribing <50 HRT items in 2018 were then excluded, in order to help differentiate prescribing from units other than general practices (such as walk-in centres). Information on the following were added to the aggregated prescribing dataset:

- practice-level IMD score;
- the total number of women aged ≥40 years on the practice list (calculated

Table 1. Summary of regression analysis results for all oestrogen-containing HRT[a]

IMD score (quintile)	Unadjusted IRR (95% CI)		Adjusted IRR (95% CI)	
1 (least deprived)	ref		ref	
2	0.91	(0.89 to 0.94)	0.97	(0.94 to 1.00)
3	0.80	(0.77 to 0.82)	0.89	(0.85 to 0.92)
4	0.72	(0.70 to 0.74)	0.82	(0.79 to 0.86)
5 (most deprived)	0.71	(0.68 to 0.73)	0.82	(0.77 to 0.86)

[a]Results from unadjusted and adjusted Poisson regression analyses showing the association between HRT prescribing rate IMD score. The multivariable model adjusted for the practice list size of females aged ≥40 years, and the practice prevalence of smoking, obesity, hypertension, diabetes, coronary heart disease, and stroke/transient ischaemic attack. CI = confidence interval. HRT = hormone replacement therapy. IMD = Index of Multiple Deprivation. IRR = incidence rate ratio.

from the age/sex-stratified practice list size dataset); and

- the practice prevalence risk factors or clinical conditions that may influence the prescribing of HRT (smoking, obesity, diabetes, hypertension, coronary heart disease [CHD], and stroke or transient ischaemic attack [TIA]).

Disease and risk factor prevalence estimates were taken from Quality and Outcomes Framework returns from 2017/2018.[20]

Prescribing in each practice was calculated as number of HRT items per 1000 female patients aged ≥40 years. Practice-level prescribing was then categorised by IMD decile, showing the mean and 95% confidence interval (CI), where decile 10 represents the practices with the highest IMD score (lowest SES).

Statistical analysis

The association between practice-level IMD score quintiles and HRT prescribing rate was initially tested using simple (univariate) Poisson regression. Robust standard errors were calculated to control for any violations in the assumption of variability equalling the mean. To test whether practice-level IMD was independently associated with the rate of HRT prescribing, multivariable stepwise Poisson regression was conducted considering factors that may influence decision making when prescribing HRT; specifically these were practice prevalence of smoking, obesity, diabetes, hypertension, CHD, and stroke or TIA, as well as the practice list size of women aged ≥40 years. All independent variables were stratified by quintile, with the lowest values in magnitude assigned to quintile 1. Multicollinearity was tested using the variance inflation factor. The final model chosen was the most parsimonious, as judged using Akaike Information Criterion. In addition to exploring the association between deprivation and the prescribing rate of all HRT items, the analysis was repeated for oral preparations alone and transdermal preparations alone, in order to ascertain whether or not the pattern seen across all HRT prescribing was consistent among different HRT preparations. Implant or intranasal oestrogen were not analysed separately because there were far fewer prescriptions.

The results of Poisson regression analyses are presented as unadjusted or adjusted incident rate ratios (IRRs or aIRRs), with the lowest quintile for each variable used as the reference comparator. A *P*-value of <0.05 was considered statistically significant. All data were analysed and all plots generated using the software R version 3.5.3 (https://www.r-project.org).

RESULTS

Association between socioeconomic status and all HRT prescribing

Of 7099 practices in the dataset, with 14 637 950 women aged ≥40 years, 621 practices (8.7%) did not meet the eligibility thresholds, thereby excluding 345 961 women (2.4%). The final dataset included 6478 practices with 14 291 989 women aged ≥40 years, and 2 677 613 prescriptions for oestrogen-containing HRT at a cost of £38 583 509. Overall, 53% more items of oral HRT were prescribed than transdermal HRT.

The association between HRT prescribing rates and practice IMD score decile was examined (Figure 1). There was a stepwise decrease in prescribing rates from deciles 1 to 9 (see Supplementary Table S2).

On univariate analysis, there was a significant association between practice IMD score quintile and prescribing rate (IRR = 0.71; 95% CI = 0.68 to 0.73; quintile 5 versus quintile 1), with a significant reduction in prescribing rate with each quintile of practice IMD score (Table 1). Before running the multivariable analysis, it was confirmed that there was no evidence of multicollinearity.

The most parsimonious model on stepwise regression was found to be that which had all included variables. After adjusting for the practice prevalence of smoking, obesity, hypertension, diabetes, CHD, and stroke or TIA, practice IMD score quintile remained an independent predictor

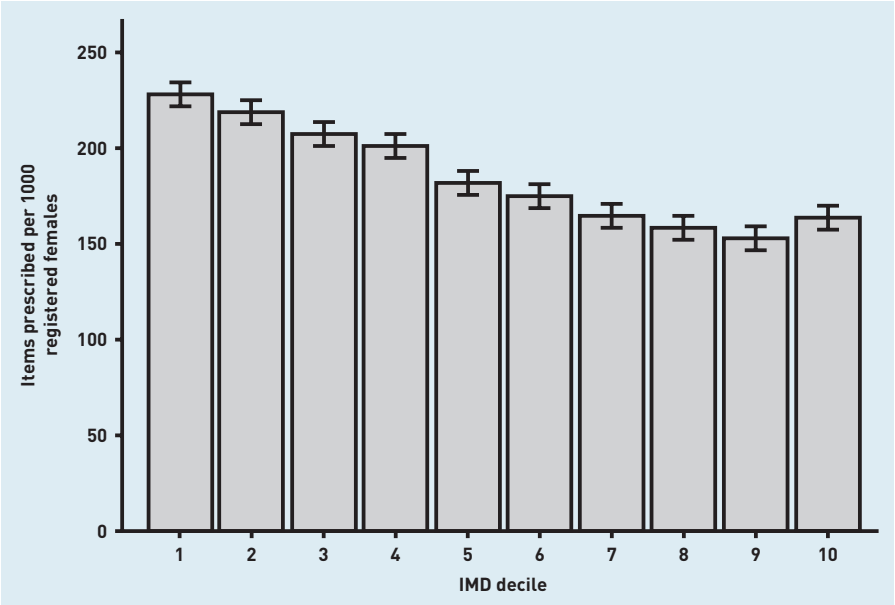

Figure 1. Oestrogen-containing HRT prescription rates per 1000 registered women aged ≥40 years, by practice IMD score deciles in England in 2018.[a]
[a]For IMD deciles, decile 1 includes practices with the lowest IMD scores (least deprived). Bars and whiskers show the mean and 95% CIs for each decile. CI = confidence interval. IMD = Index of Multiple Deprivation.

of prescribing rates, with an 18% lower prescribing rate of HRT in the most deprived practices compared with the least deprived practices (aIRR = 0.82; 95% CI = 0.77 to 0.86; quintile 5 versus quintile 1).

For summary of the regression results of all variables included in the multivariable model see Supplementary Table S3. Interestingly, of all the independent variables in the model, the practice prevalence of diabetes was most strongly associated with prescribing rates, with 34% less prescribing in practices with the highest prevalence of diabetes compared with those with the lowest prevalence (aIRR = 0.66; 95% CI = 0.63 to 0.69; quintile 5 versus quintile 1).

Association between socioeconomic status and oral or transdermal preparation prescribing

Similar relationships were found when examining only oral or only transdermal preparations alone, with both exhibiting a clear reduction in prescribing rate in practices with higher IMD scores on univariate analysis (oral IRR = 0.83; 95% CI = 0.81 to 0.86; transdermal IRR = 0.68; 95% CI = 0.65 to 0.71; both for quintile 5 versus quintile 1). The difference in prescribing rates, however, between the least and most deprived practices was more pronounced for transdermal preparations (45% higher in decile 1 versus decile 10) compared with oral preparations (15% higher in decile 1 versus decile 10). In the adjusted regression model, IMD score was an independent predictor of prescribing rates for oral preparations (aIRR = 0.81; 95% CI = 0.76 to 0.86; quintile 5 versus quintile 1) but not for transdermal preparations (aIRR = 0.97; 95% CI = 0.90 to 1.04; quintile 5 versus quintile 1) (see Supplementary Table S4 and S5 for details).

The ratio of oral-to-transdermal prescribing varied by deprivation quintile, with a trend towards more oral prescribing in more deprived practices (oral-to-transdermal prescribing ratios by IMD score quintile: 1.40 [quintile {Q}1], 1.55 [Q2], 1.67 [Q3], 1.69 [Q4], 1.62 [Q5]; $P<0.001$). Specifically, practices in IMD quintiles 2 to 5 prescribed a greater proportion of oral items than practices in IMD quintile 1 (the least deprived, adjusted $P<0.001$ for all) (data not shown).

DISCUSSION

Summary

This study has identified a stark association between prescribing rates for HRT at a practice level and socioeconomic deprivation. The overall rate of HRT prescriptions (per 1000 women aged ≥40 years) was 29% lower in practices from the most deprived quintile compared with the least deprived. After adjusting further for risk factors of cardiovascular health (obesity, smoking, practice prevalence of hypertension, diabetes, CHD, and stroke/TIA), there was still an 18% lower prescribing rate in the most deprived practices compared with the least deprived.

When preparation type was divided into transdermal and oral the trend persisted (more prescribing in affluent areas); however, proportionately more oral HRT was prescribed than transdermal in practices with higher levels of deprivation. This trend is interesting as cardiovascular risk (which is greater in areas of higher deprivation) is an indicator that might lead to a higher ratio of transdermal HRT prescriptions (which carries no increased risk of thromboembolism or stroke)[14] compared with oral HRT preparations. It may also reflect patient choice.

It appears that practices with a higher prevalence of diabetes prescribed less HRT, and it is possible that diabetes may influence clinical decision making in this setting. HRT should not be prescribed for the prevention of diabetes; however, it has been shown to improve glycaemic control, particularly when prescribed as oral oestrogen,[21] and can be prescribed after taking other cardiovascular risk factors into account.[22] This may go some way in explaining the higher oral HRT prescribing in deprived areas but as individual patient data were not analysed it cannot be said with certainty if diabetes directly affected

doctors' decisions to either prescribe HRT or give an oral preparation.

The prescription costs of HRT to women may also account for reduced prescribing in more deprived areas.

Strengths and limitations

This work provides an analysis of prescribing of HRT in England at the practice level compared with the overall level of socioeconomic deprivation of individuals registered at each practice. All NHS primary care prescribing is captured by NHS Digital, providing a robust and unbiased method for reviewing prescribing trends in England.

However, as prescription rates and deprivation were analysed at the aggregated practice level, the extent to which there may be intra-practice variation in prescribing HRT associated with the SES of the individual patient cannot be determined from these data. Research using individual patient-level data is needed to explore this further. Furthermore, IMD scores represent, but are not a direct measure of, socioeconomic deprivation.

Finally, the data used in this analysis precluded any meaningful health economic analysis beyond perhaps the extra cost required to abolish the inequality in prescribing rates across deciles of deprivation. Further work is required to estimate the health economic benefits of appropriate and equitable prescribing of HRT, to include consideration of savings on diagnostic tests and other medications (such as antidepressants or analgesics), and of benefits to the economy and wider society that may be associated with HRT prescribing (such as an increased ability to work).

Comparison with existing literature

Previous literature has shown decreased levels of HRT prescribing for women living in more deprived areas.[5,6] To the authors' knowledge there have not, however, been any recent studies (post-WHI publication) investigating the association between HRT prescription rates and socioeconomic deprivation.

Implications for research

Further research is needed to explore the facilitators and barriers to prescribing HRT from a patient, clinician, and health economic perspective, and these findings need to be confirmed using individual-level primary care data. Further research also needs to be done into the HRT preparation types prescribed, and the reasons for prescribing more or less transdermal HRT. The recent HRT shortages have added a further barrier to acquiring HRT to both the patient and prescriber, the impacts of which have yet to be established.[23]

It is likely that this analysis uncovers a larger unmet need in terms of the menopause care and support that is provided and utilised in areas of deprivation. The barriers to accessing support in and around the time of the menopause for women in areas of social deprivation need to be further explored before recommendations to change practice can be made.

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Ethical approval

This study used publicly available data only, so no ethical approval was required.

Provenance

Freely submitted; externally peer reviewed.

Competing interests

The authors have declared no competing interests.

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