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Statin prescribing patterns: variations by PCT: England, 2003/04

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Abstract

Several important clinical trials have demonstrated the benefits of lipid-lowering with statins for the primary and secondary prevention of coronary heart disease. In patients with coronary heart disease, other cardiovascular conditions, and diabetes, statins significantly reduce the risk of death, coronary events and stroke. The National Service Framework for Coronary Heart Disease launched in 2000 sets out national standards for the use of statins in treating patients after a heart attack and patients at high risk of developing one. However, recent studies based on small samples of general practices across England have indicated that there may be inequities in prescribing rates for coronary heart disease drugs, especially statins. This work supports earlier findings from a study based on Health Survey for England data.

In this study we look at the pattern of statin prescribing at PCT level using prescription data derived from the PACT database. Geographic variations by PCT will be examined while taking into account PCT profiles such as mortality, morbidity, demographic characteristics and the provision of general medical services by GP practices. Health policy implications of the findings will be discussed especially in the light of the recent decision by the Department of Health in England to make simvastatin available over the counter.

Introduction

In England, the 303 Primary Care Trusts (PCTs) are each responsible for planning and commissioning the majority of NHS services for their local communities as well as for developing primary care and providing community services. The average PCT's resident population is around 165,000. They receive funding directly from the Department of Health and since 2003/04 have controlled around 75 per cent of the NHS budget.

PCTs are responsible for the setting and management of prescribing budgets among their constituent practices. Like Hospital and Community Health Services (HCHS) commissioning, the prescribing budget in primary care is cash-limited and comes within the PCT unified budget allocation. It is cash-limited so that overspend on the prescribing budget will lead to a reduction in other parts of the PCT budget and vice versa. Thus although the formula used to derive PCTs' revenue allocations is calculated using a weight of about 15 per cent for prescribing, individual PCTs are free to determine how to allocate their total unified budget as they wish. The setting of prescribing budgets for practices is based on a mix of a weighted capitation methodology, historic prescribing patterns and local judgement.

An important contributor to increases in prescribing expenditure in recent years has been the use of statins, for which national guidance has been issued as part of the National Service Framework (NSF) for coronary heart disease (CHD). The NSF (Department of Health, 2000) recommends that statins and dietary advice be used to lower cholesterol concentrations either to less than 5 mmol/l (LDL-C to below 3 mmol) or by 30% (whichever is greater) in the following groups:

- People with diagnosed CHD or other occlusive arterial disease;

- People without diagnosed CHD or other occlusive arterial disease with a CHD risk greater than 30% over ten years.

Statins are also recommended as continuing care in patients with acute myocardial infarction (AMI) to achieve the same target cholesterol level.

This guidance follows on from guidance issued by the Standing Medical Advisory Committee on the use of lipid lowering drugs, based on presence or risk of CHD and low density lipoprotein levels, and guidance from the Faculty of Public Health Medicine, both issued in 1997 (Freemantle et al., 1997). Key studies on which various sets of guidance have drawn include the 4S trial (Scandinavia Simvastatin Survival Group, 1994) and the WOSCOPS trial (Shepherd et al., 1995).

Partly as a result of formal guidance and the accumulated evidence base, the prescribing of lipid lowering drugs increased from 1.6% of total net ingredient cost (NIC) of prescribing in the UK in 1995 to 8.4% in 2002. The issue we were interested in investigating was the extent of variations in the prescribing of stains between PCTs, in the context of previous work which had explored this issue. To give us a flavour of existing studies in the area, we searched PubMed for references on statin prescribing. We summarise the findings of the literature below before going on to present our own analysis of statin prescribing.

Literature review

Much of the literature we found was concerned with overall prescribing levels relative to the level indicated by guidelines or other measures of the appropriateness of prescribing such as the results of trials. Undertreatment is a common theme here. For example, Braunwald et al. (2001) refer to survey evidence from Europe that, of those discharged from hospital after an acute coronary syndrome, only one third are prescribed statins while, in the US, two thirds of those eligible for treatment according to national guidelines do not receive it. Durrington (2002) comments that, despite the existence of guidelines, only around one third of eligible patients receive lipid lowering therapy in clinical practice. Jackson (2000) noted that, although guidelines recommend the use of statin therapy after an acute coronary syndrome, “prescription rates seem to be static at around 40%”.

Individual studies concerned with the overall level of treatment are discussed below for the UK and internationally. Subsequent sections focus on studies which have explicitly addressed variations in treatment by patient and other characteristics, firstly those focusing on demographic characteristics such as age and sex and, secondly, those considering broader measures of ‘need’, such as morbidity, mortality and deprivation.

Overall prescribing – UK literature

A survey of GPs in south west London by Carroll et al. (2003) found that, while the majority of over 6,500 patients with coronary heart disease (CHD) were treated with aspirin, less than half were treated with statins or beta blockers. Similarly, in their survey of GP records in Manchester, Drummond et al. (2002) concluded that statins were probably underprescribed in those taking aspirin. In the north east of England, Holt et al. (200) reviewed a group of patients admitted to hospital with an acute myocardial infarction (AMI), or for elective percutaneous transluminal coronary angioplasty (PTCA) or coronary artery bypass grafting (CABG). They found that 99% had a total cholesterol check but only 30% with a cholesterol level above 6 mmol/L were on cholesterol-lowering drugs at discharge. Among diabetics, James et al. (2004) report a gap between those requiring lipid lowering and those receiving it in Tayside.

Broader geographical coverage has been provided by Primatesta and Poulter (2000) and Whincup et al. (2002). The former, in a study of over 13,000 adults in England, estimated that less than a third of patients with established cardiovascular disease received treatment with lipid lowering drugs. In the cohort of over 3500 men in 24 British towns reported by Whincup et al. (2002), 33% of those with definite MI were found to be taking a statin (36% a lipid lowering drug) and 21% of those with definite angina without MI (23% lipid lowering). The authors concluded that, among those with established CHD, statin use was suboptimal.

Two small studies of patients admitted to a clinic/hospital have produced contrasting results. Firstly, Fisher et al. (1999) reviewed the status of a group of patients in England six months after discharge from a specialist lipid clinic. Of the 86 with a current cholesterol measurement, 14 had been changed to/started on a statin, none of whom qualified for treatment under the 1997 guidelines. At the same time, only 14 of 25 patients discharged on drugs for secondary prevention and who qualified for statins received one. In comparison, Underwood and Beck (2002), in a review of 100 patients who had been admitted with AMI in south Wales, discovered that the CHD NSF's statement that 80-90% of patients should be prescribed appropriate secondary prevention "had nearly been achieved at hospital discharge in 1999".

Overall prescribing – international literature

In Ireland, Feely et al. (2000) found a four-fold increase in the use of lipid lowering drugs (92% being statins) in the community between 1994 and 1998 (after publication of 4S and WOSCOPS), yet they concluded that prescribing was below targets and not directed at those most likely to benefit. In Italy, Giorda et al. (2003) have commented on the mismatch between therapeutic guidelines and treatment in a group of around 1500 patients type 2 diabetics with a history of MI, CABG or PTCA who were attending Diabetic Care Units. An Austrian study by Lalouschek et al. (2003) has examined over 1700 patients admitted to one of eight neurological departments with acute ischaemic stroke or transient ischaemic attack. These authors found that nearly 40% of patients with manifest atherosclerosis and total cholesterol levels above 300 mg/dL (7.76 mmol/L) were discharged without a statin. Underuse was observed particularly in those for who statins were indicated on existing recommendations such as patients with additional coronary artery disease and hypercholesterolaemia.

In a review of nearly 3,000 patients recently hospitalized with AMI in Minnesota, Majumdar et al. (1999) found that only 37% of eligible patients received lipid lowering drugs (LLDs). Mantel-Teeuwisse et al. (2004), from their review of trends in the treatment of hypercholesterolaemia in the Netherlands, concluded that less over half of eligible patients remained untreated despite a steady increase over the previous ten years. A Swiss study of prescribing by office-based physicians for patients with coronary artery disease concluded that prescribing had improved but that "therapeutic goals for cholesterol levels and blood pressure are not being reached in a large proportion of patients". The Oslo Health Study reported by Tonstad et al. (2004) of over 13,000 men and women of four different birth cohorts found that, among those with a heart attack, stroke or diabetes, 45% of men and 35% of women were taking a statin. The authors concluded that people with cardiovascular disease or diabetes were undertreated with statins. Savoie et al. (2002) directly considered the relationship between presence of CHD and statin prescribing. Using a population-wide drug prescription database for one Canadian province, they found that 74.7% of those prescribed a statin had no reported history of CHD and that only 15.3% of men with CHD had been prescribed a statin. It was concluded that almost 90% of statins utilization in the province was not supported by a systematic review of randomized trials of statins.

One dissenting voice in the international literature is that of Larsen et al. (2001) who, noting that utilization of LLDs is suspected of being too low, reviewed purchases of LLDs (97% of which were reimbursed) in one Danish county between 1993 and 1998. They report that, over this period, "utilization of LLDs approached a level that may correspond to the current guideline recommendations".

Prescribing variation: demographic variables - UK

The study by Carroll et al. (2003) found that women were less likely than men to be treated with statins, despite being more likely to have cholesterol levels above 5 mmol/L. Similar findings emerge from a study of around 6000 men and women with recorded ischaemic heart disease (IHD) in one English region by Hippisley-Cox et al. (2001). While women were more likely to have a fasting serum cholesterol concentration over 5 mmol/L, men were more likely to receive lipid lowering therapy. This relationship remained in multivariate analysis taking account of practice where the patient is registered, age, diabetes, hypertension, obesity and smoking status. DeWilde et al. (2003), using data from 142 GP practices across England and Wales, also found that men were more likely to receive a statin than women. However, this difference was not significant after controlling for age and severity of disease. Geography had little effect and a weak socioeconomic gradient was observed. Gill et al. (2004), on the basis of 900 patients with data on prescription of lipid therapy from the Health Survey for England, estimated a logistic regression on ethnicity and a range of other characteristics. Only age, type of IHD and housing tenure were found to be significant in their final multivariate model.

Majeed et al. (2000) examined statin prescribing from 288 general practices using data from the General Practice Research Database (GPRD). They found that men below the age of 65 were more likely to be prescribed a statin than women in the same age group, but that neither men nor women aged 75 or over were likely to be prescribed a statin. Using the Health Survey for England (HSE), Reid et al. (2002) found that, of 760 adults with CHD, just under 20% were receiving lipid lowering drugs. Those in the 65-74 and 75 and over age groups were significantly less likely to receive statins than those aged under 65, while smokers were less likely to receive them than non-smokers and those with angina than those with a previous MI. They concluded that the observed inequalities in statin prescribing were inconsistent with evidence from large statin trials. The prescribing patterns for five major CHD drug groups in four English primary care trusts (PCTs) analysed by Ward et al. (2004) showed positive associations between prescribing rates (average daily quantities), the proportion of patients aged 55-74 and expected prevalence of CHD. In contrast, the proportion of patients aged over 75 was associated with prescribing rates in only one PCT.

Prescribing variation: demographic variables - International

A US study by Allen Maycock et al. (2002) of a cohort of over 7,000 patients with coronary artery disease (CAD) echoes the UK findings, with elderly patients (those aged 80 and over and those aged 65 to 79), significantly less likely to receive stains than those aged below 65. A telephone survey by Ayanian et al. (2002a) of around 700 patients aged 30 to 64 about one to two years after MI found that 62.5% reported taking a cholesterol-lowering drug. Adjusted analyses showed a reduced likelihood of receiving statins among African-Americans and those with congestive heart failure or peripheral vascular disease. Adjusted analyses of a second telephone survey (Ayanian et al., 2002b) found that, among 815 Medicare beneficiaries aged 65-74 who were hospitalized for AMI, drug treatment was significantly more common among women (against the trend of some other studies), and those aged 65-69. In older patients, the regression analysis used by Majumdar et al. (1999) showed a significantly reduced likelihood of receiving lipid-lowering drugs in those aged over 74.

Studies undertaken in Europe which have been referred to above looked at variations in prescribing between groups as well as the overall level. Feely et al. (2000), in their study of statin prescribing in Ireland, found, seemingly in contrast with some other studies, that more women than men in the over 65 age group were receiving statins. Williams et al. (2003) report no gender difference in statin prescribing among nearly 16,000 people with IHD (as given by a prescription for nitrate therapy) in Ireland, but found that those aged over 65 were less likely to receive a statin. Meanwhile, Giorda et al. (2003) found a negative association between statin use and age in Italy. This is in agreement with other findings already reported and, for Austria, with Lalouschek et al. (2003), although these authors found that most of their observed variability in prescribing was accounted for by differences between centres in a multivariate model. Contrary to most studies examining the age-prescribing relationship, Mantel-Teeuwisse et al. (2004) found, in their cross-sectional analysis of nearly 5000 patients in the Monitoring Project on Risk Factors for Chronic Diseases, that, in primary prevention, younger patients were less frequently treated. Males were less frequently treated in this study whereas, in Sweden, Nilsson et al. (2003) found no gender differences in cardiovascular drug treatment in a national sample of survivors of MI, or following CABG or PTCA for CHD.

Prescribing variation: 'need' factors

Most of the studies we identified on the use of deprivation, morbidity or mortality as indicators of need were undertaken in the UK. For example, the finding of Majeed et al. (2000) in general practice was that the recorded prevalence of ischaemic heart disease explained 12% of prescribing variation in men and 7% in women. These authors concluded that the variations in the use of statins between men and women and between practices were "poorly explained by measures of health need".

Two studies not hitherto discussed examined prescribing patterns in Nottingham during 1996 (Packham et al., 1999) and over the period 1996-1998 (Packham et al., 2000). These studies used deprivation, as measured by the Townsend index, as an indicator of cardiovascular morbidity and the need for statin treatment. In the first, the Townsend index accounted for 13% of the variability in statin prescribing between 118 general practices (19% adjusted) during 1996. Practices with higher deprivation indices prescribed fewer statins to their patients than less deprived practices. The second study, using data from 1996, 1997 and 1998, found that practices in the most deprived areas had lower rates of prescribing in each year but that increases in statin prescribing had been much greater in 1997 and 1998 in the deprived areas. No significant relationship was found between deprivation and prescribing rates in 1997 or 1998.

The most recent evidence for England (four PCTs) has been reported by Ward et al. (2004) who examined the relationship between prescribing and proxies of health care need such as patient age (over 75), ethnicity, levels of deprivation and standardized mortality ratios for CHD. In some PCTs, prescribing was found to be negatively associated with these proxies, suggesting that "prescribing rates in these PCTs may be inequitable as they are not positively associated with health care need".

One recent study conducted outside the UK showed, using Australian population data, a significant linear association between statin prescribing and CHD mortality by quintile of socioeconomic disadvantage in women but not in men (Stocks et al., 2004). The authors concluded that either statins are overprescribed in the highest socioeconomic quintile or underprescribed in the lowest. Relative to men, women were prescribed statins at higher rates at lower levels of risk, where CHD deaths were used as a proxy of risk.

Summary

A number of studies have reported underutilization of statins relative to existing prescribing guidelines or the available trial evidence. However, studies based on data from the mid to late 1990s are probably not a reliable guide to current practice given the more than doubling in NIC for statins between 1999 and 2002 (Yuen, 2004).

Studies of variations in prescribing have commonly focused on demographic variables such as age and sex. They suggest that the elderly are less likely to receive statins than younger age groups, despite some observers pointing out the potential benefits in older individuals (e.g. Levine and Kannel, 2003). Prescribing variations by gender appear to favour men over women with similarly elevated cholesterol levels (although this is not the only indicator of appropriateness of treatment). Fewer studies have considered the relationship between prescribing and deprivation or other indicators of need such as morbidity and mortality. Prescribing has been found in some cases to be unrelated or negatively related to need, although there are indications of greater increases over time in prescribing in areas of higher deprivation (greater need). Generally, studies in the UK have been undertaken across a limited number of PCTs and vary in the indicators of need considered and other aspects of methodology. Studies have not generally not exploited information on GP characteristics available by PCT which might be helpful in explaining prescribing variations.

Objectives

In light of the existing literature, our objective was to explain variations in statin prescribing across all PCTs in England using broad indicators of need and GP characteristics.

Material and methods

Prescription data

All prescription forms (FP10) for prescriptions written by a doctor, dentist or nurse and dispensed in England by pharmacies and dispensing doctors are submitted to the Prescription Pricing Authority (PPA) for processing. Prescription data fed into the PPA's information system include names and costs of the medicines and the number of items dispensed for individual GPs, their practice and their PCT and Strategic Health Authority. However, the prescription form contains no patient information such as name, age and gender. Medicines, drugs and appliances are classified into therapeutic groups according to the British National Formulary (BNF). The BNF lists over 4,000 drugs and appliances for prescribing in the UK.

We obtained from the Department of Health the Prescription Analysis and Cost (PACT) based statin prescription data for the financial year 2003/04. The PACT database derived from the PPA information system provides information about prescribing in general practice. It includes all prescription items prescribed in England by GPs and nurse prescribers for prescriptions dispensed in the community. It also includes items that have been personally administered such as vaccinations by GPs. Excluded from the PACT system are prescriptions written by dentists (FP10D) and hospitals doctors (FP10HP). The data used in this analysis consists of the total number of items and cost of statins prescribed and dispensed in the community for the 303 PCTs in England during the financial year.

The volume and cost of prescriptions within a geographic area such as a PCT is largely influenced by the size and demographic mix such as age and sex of the population it serves. However, as described earlier it is not possible to examine the effect of age and gender on the utilisation of prescriptions as such information is not available on the prescription form. As a weighting factor for comparing general practice prescribing figures locally and nationally, Prescribing units (PUs) were first introduced in 1983. By assuming a greater need for medication by patients aged over 65, each patient aged under 65 was counted as one prescribing unit while those over 65 counted as three. In the early 1990's a refined set of cost based demographic weightings was produced containing a set of weightings for 18 age-sex groups and for temporary residents (ASTRO-PUs) weights on the basis that demographic structure is one of the most influential factors in explaining prescribing patterns (Roberts et al. 199&). Later similar therapeutic specific prescribing units were also produced for the eight leading specific therapeutic groups (STAR-PUs). In recent years, therapeutic subgroups such as statins and antidepressants have also become available (Prescribing Support Unit 2002).

Population

GP relevant population estimates by age and gender for PCTs published by the Department of Health are based on the population registered with a GP constituent practice of a PCT and exclude within the boundary special populations such as the armed forces personnel and prisoners who are serving more than six months in jail. Data on patient registration are known to be inaccurate due to missing postcode information on addresses of usual residence or double counting. This results in a significant overestimate of the ONS population figure. To account for this deficiency, the GP relevant PCT population is adjusted to be consistent with

ONS estimates for Local Authority by rescaling back by age and gender using a set of adjustment factors.

GP practice characteristics

In England, services provided by the primary care sector including general medical services are managed by Primary Care Trusts (PCTs). Practically everyone in the UK is registered with a general medical practitioner (GP) or with a general practice. For most people seeking medical treatment, the GP is the first point of face to face contact with the NHS. A majority of GPs are independent contractors providing general medical services for the NHS and are remunerated and reimbursed for the services they provide based on nationally agreed contracts. The statistical return "General and Personal Medical Services (GPMS) Census" collected from PCTs by the Department of Health in England at 30 September every year contains details of each GP including name, age and sex, patient list size, partnership structure, country of qualification, practice supporting staff, services offered by doctors and target achievements. A summary of data relating to GPMS derived from this census is available which provides the number and whole-time-equivalent GP and practice staff, average practice list size and the number of practices at PCT level for this analysis.

The *NHS Plan* for England published in 2000 set the standard that patients be offered a routine appointment to see a GP within two working days. It was expected that 90% of GP practices would meet the target by March 2003 and100% from December 2004 onwards. The Plan also set the requirement that GP practices update practice based registers so that patients with coronary heart disease (CHD) and diabetes continue to receive appropriate advice and treatment in line with National Service Framework standards. Both standards were used as performance indicators in the NHS Performance Rating on PCT 2003/04. We included these two indicators in our analysis as explanatory variables to examine the variations in statin prescribing.

The prevalence of people in a population suffering from or at risk of coronary heart disease greatly affects the use of statins. In the absence of circulatory morbidity at PCT level, the mortality rate from all circulatory diseases in persons aged under 75 per 100,000 population (age and sex standardised) was used as a proxy. This is available as one of the key targets for the NHS Performance Rating on PCT as described above.

In allocating NHS funding to PCTs, one of the key elements that determines a PCT's actual allocation is the 'weighted capitation target'. This gives each PCT its relative target share of total resources that would enable them to commission similar levels of health services for populations in similar need (ref). The weighted capitation formula is based on population distribution as well as additional need. The need element for the prescribing component of the formula is based on a composite index formed by a combination of a set of need variables and a mortality index (Sutton M et al. 2002)).

1. Proportion of the population claiming attendance allowance and disability living allowance;

2. Proportion of the population claiming incapacity benefit and severe disability allowance;

3. Low income scheme index;

4. Circulatory morbidity index

Details of this index can be found in "*Allocation of Resources to English Areas Report"*

(Sutton M et al 2002)) and "*Resource Allocation: Weighted Capitation Formula*" (Department of Health 2003). This composite index was used in this analysis to examine the association between statin prescribing and need across the 303 PCTs.

Statistical Method

We applied the age/gender utilisation weights (STAR PU) for statins onto the corresponding GP relevant population distribution to generate the expected number of statin prescription items for each PCT.

Suppose P_{ijk} be the GP relevant population where i =1, 2, …, 303 PCTs, j = 1, 2, … age groups and k = 1, 2 gender. Now let w_{jk} be the statin utilisation weights and R_i be the number of statins prescription items dispensed in the i^{th} PCT. The expected number of statins prescriptions for the i^{th} PCT if it had the same utilisation as the standard would be

$$E_i = \sum_j \sum_k P_{ijk} * w_{jk}$$

We then scale back to E_i' so that

$$\sum_i E_i' = \sum_i R_i$$

i.e. total expected prescriptions are equal to the total actually dispensed.

This gives the ratio of actual to expected statins dispensed in the i^{th} PCT. By expressing the ratio as percentage, we term this the age and sex standardised prescription ratio (SPR).

$$SPR_i = \frac{R_i}{E_i'} x100$$

In particular, England = 100.

Simple scatter plots were used to study the association between individual factors described above with the age and sex standardised statin prescribing ratio (SPR). A stepwise multiple regression model was carried out to examine and identify factors that could explain the geographic variations in statin prescribing in England.

Results

The latest estimates on the utilisation of statins by age and sex published by the Prescribing Support Unit are illustrated in Figure 1.The use of statins increases with age for both men and women with a sharp increase around the age of 45 to 54 peaking at 65 to 74 and then drops to a low level for those aged 75 and over. Men consume significantly more statins than women in all age groups except for those aged 75 and over.

By applying these weights to the corresponding age/sex distribution of each PCT, we obtain the age and sex standardised prescription ratio (SPR). Figure 2 shows the distribution of the SPRs of the 303 PCTs in rank order revealing a huge variation among the PCTs across England with SPRs ranging from 173 to 54, more than a three-fold difference. The top 30 high and the low 30 ranked SPRs are listed in Table 1 alongside with the corresponding variables used in the analysis. Halton (SPR=173), Knowsly (169) and Salford (168) all in the north west of England had the highest SPR in the country. They shared with most of these 30 top PCTs relatively high level of claimants, low income and high circulatory mortality. On the other hand, St Albans and Harpenden (54) in the south east of England, Kensington and Chelsea (58) in London and Wyre Forest (62) in the north west had the lowest. Again they also had low level of need related measures and low circulatory mortality.

The average number of GPs per 10,000 population did not seem to be related to the level of statin prescribing. There is no obvious pattern as shown in Figure 3a. Neither the percentage of patients being offered a routine appointment to see a GP nor the percentage of GP practices with updated CHD registers for treatment bear any relationship with statin prescribing (Figures 3b and 3c). However, there was a strong association between the level of need as measured by the composite indicator and SPR (Figure 3d). There are a number of outliers with a high need index but low level of statin prescribing in the 2^{nd} quadrant of the figure. Further examination of these PCTs would be required. Similar pattern is also observed when the circulatory mortality ratio is plotted against the SPR.

A stepwise multiple regression model carried out regressing log SPR on the set of independent variables described earlier confirmed the weak association between statin prescribing and the provision of general medical services such as GP number and access to GP. The only significant factor is the composite need index (Table 2).

Conclusion/Discussion

Despite the lack of patient demographic information within our prescription data, we used the STAR PU age and gender utilisation rates on statins as a standard to derive a set of standardised prescribing ratios (SPRs) which reveal huge variations between PCTs in statins prescribing. The SPRs are not perfect for a number of reasons. One of the major problems is that the item based PACT data from which this analysis is based could significantly understate the actual use of statins in a population as an item in a prescription form can contain more than one month supply of the medicine.

With this caveat in mind, our statistical modelling identified need as the only significant factor in explaining the geographic variations in statins prescribing between PCTs in

England. This need factor, a composite indicator incorporating the proportion of population who are claimants, a low income indicator and the circulatory mortality index, is strongly positively associated with the level of utilisation of statins. However, there are pockets across the country where the level of need is high but the use of statins is low. Islington and Camden in London and Heart of Birmingham Teaching PCTs had a high level of need and high mortality in circulatory disease but the use of statins was well below average. Given such high level of need but low level of use of statins in these areas, the introduction of over-the-counter simvastatins should be monitored carefully.

Our overall finding contrasts with a number of studies which have suggested a relatively weak (or in some cases negative) association between statin prescribing and individual indicators of need. This suggests either that more recent prescribing patterns have shown greater consistency with need factors or that the measure of need we have used contains elements not included in other analyses.

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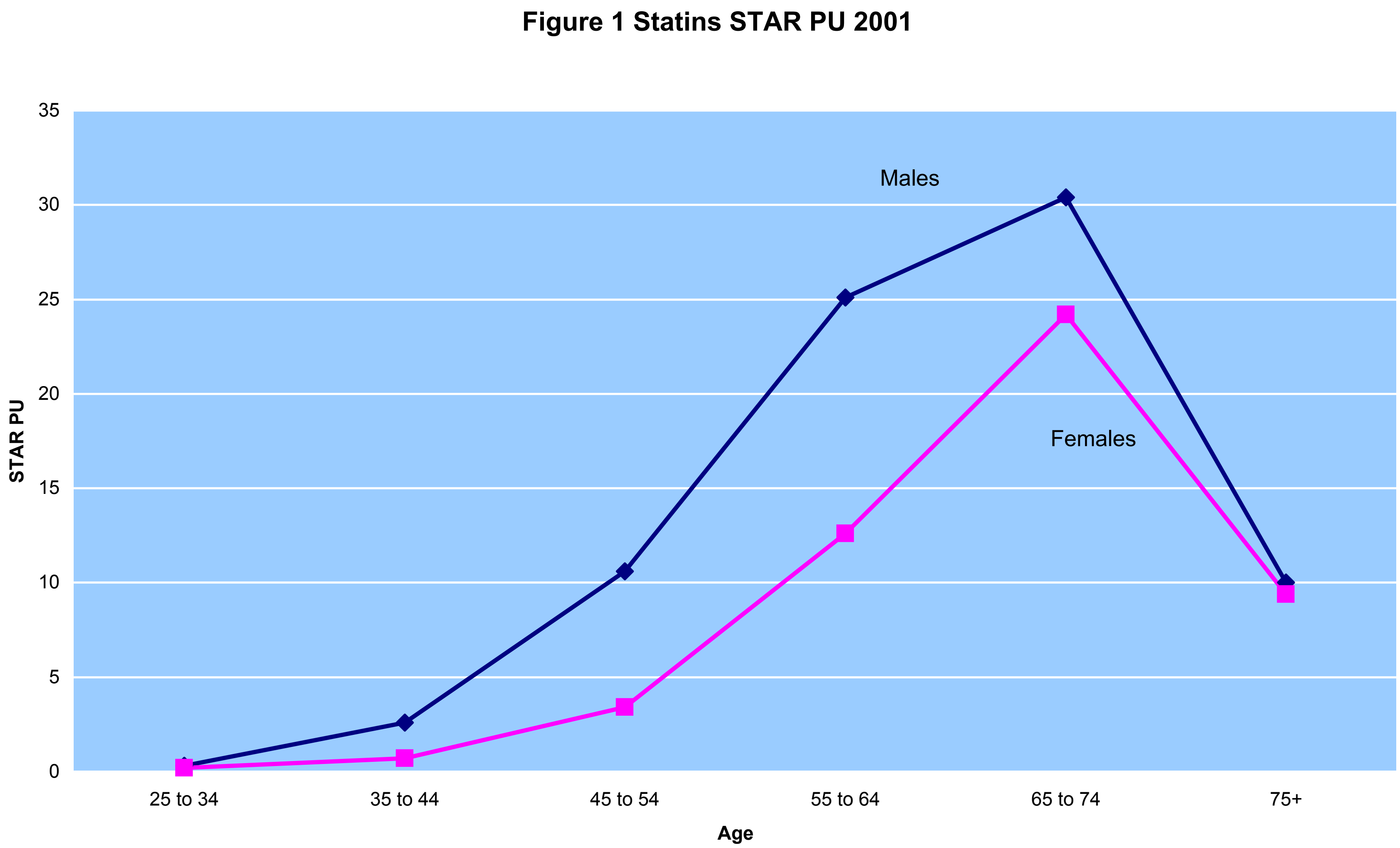

Figure 1 Statins STAR PU 2001
35
30
25
20
15
10
5
0
STAR PU
Males
Females
25 to 34
35 to 44
45 to 54
55 to 64
65 to 74
75+
Age

Figure 2. Age and sex standardised statins prescription ratio (SPR), England 2003/04

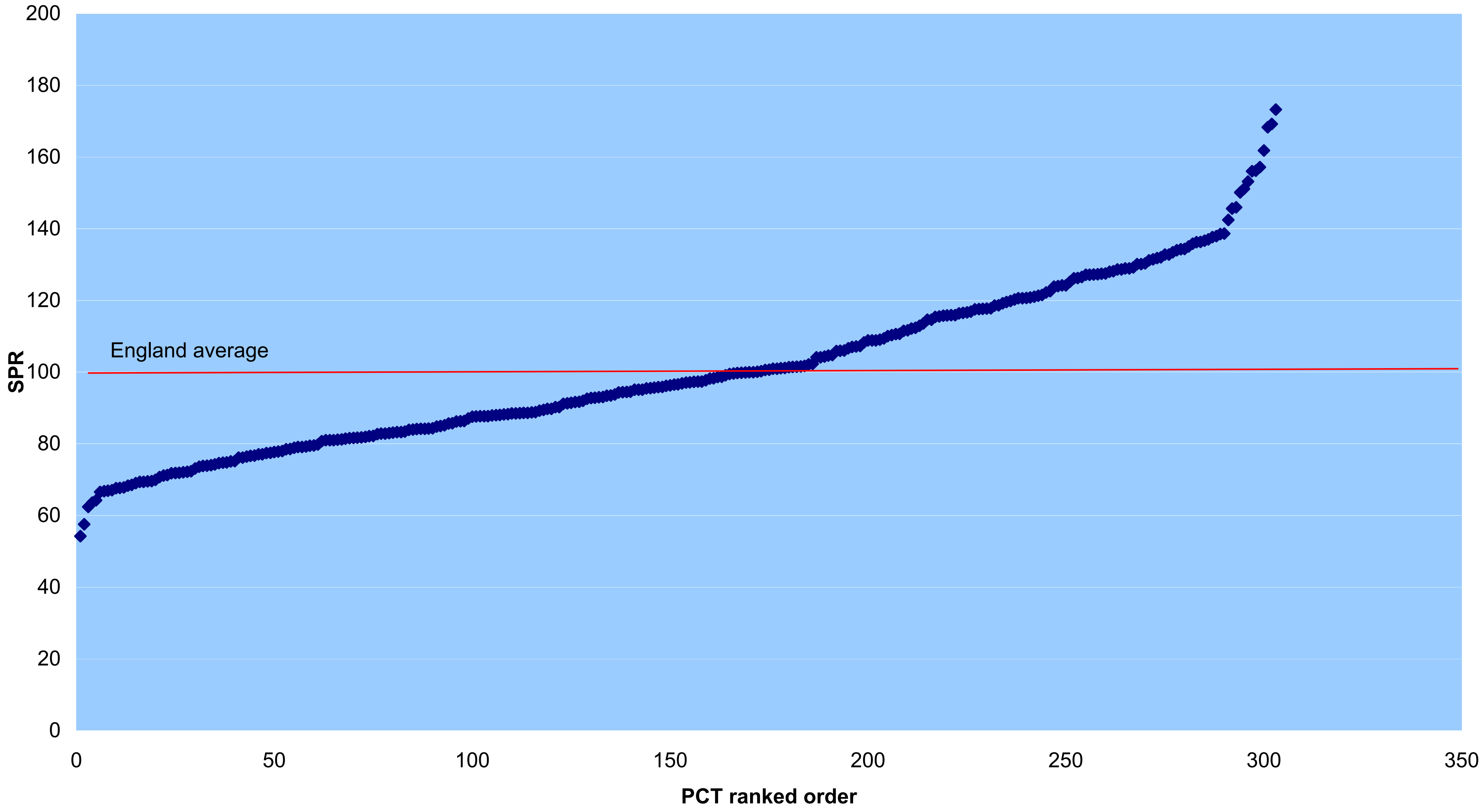

Figure 3a. GP per 10000 population and statins SPR

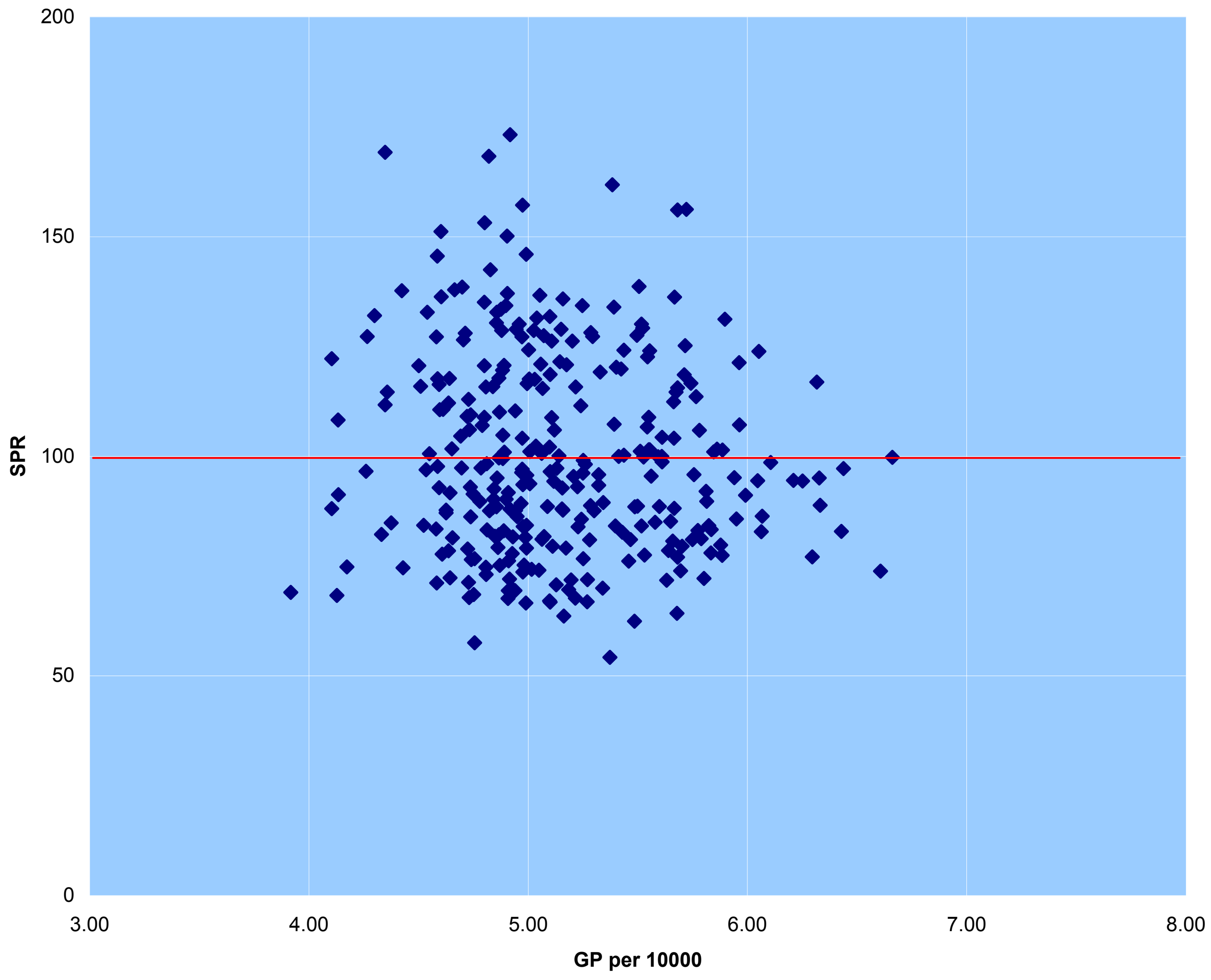

Figure 3b. Access to GP and statins SPR

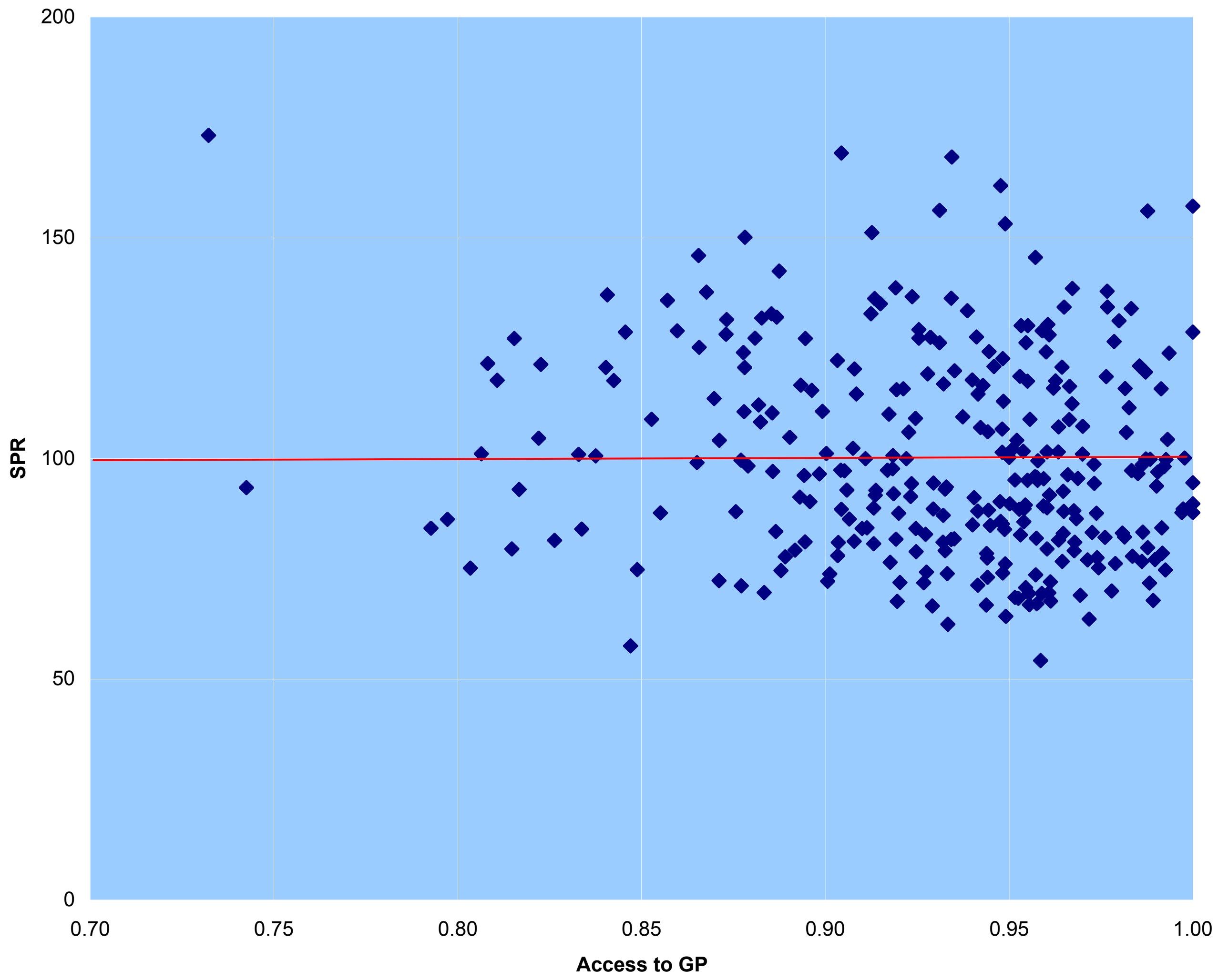

Figure 3c. Percent of CHD register and statins SPR

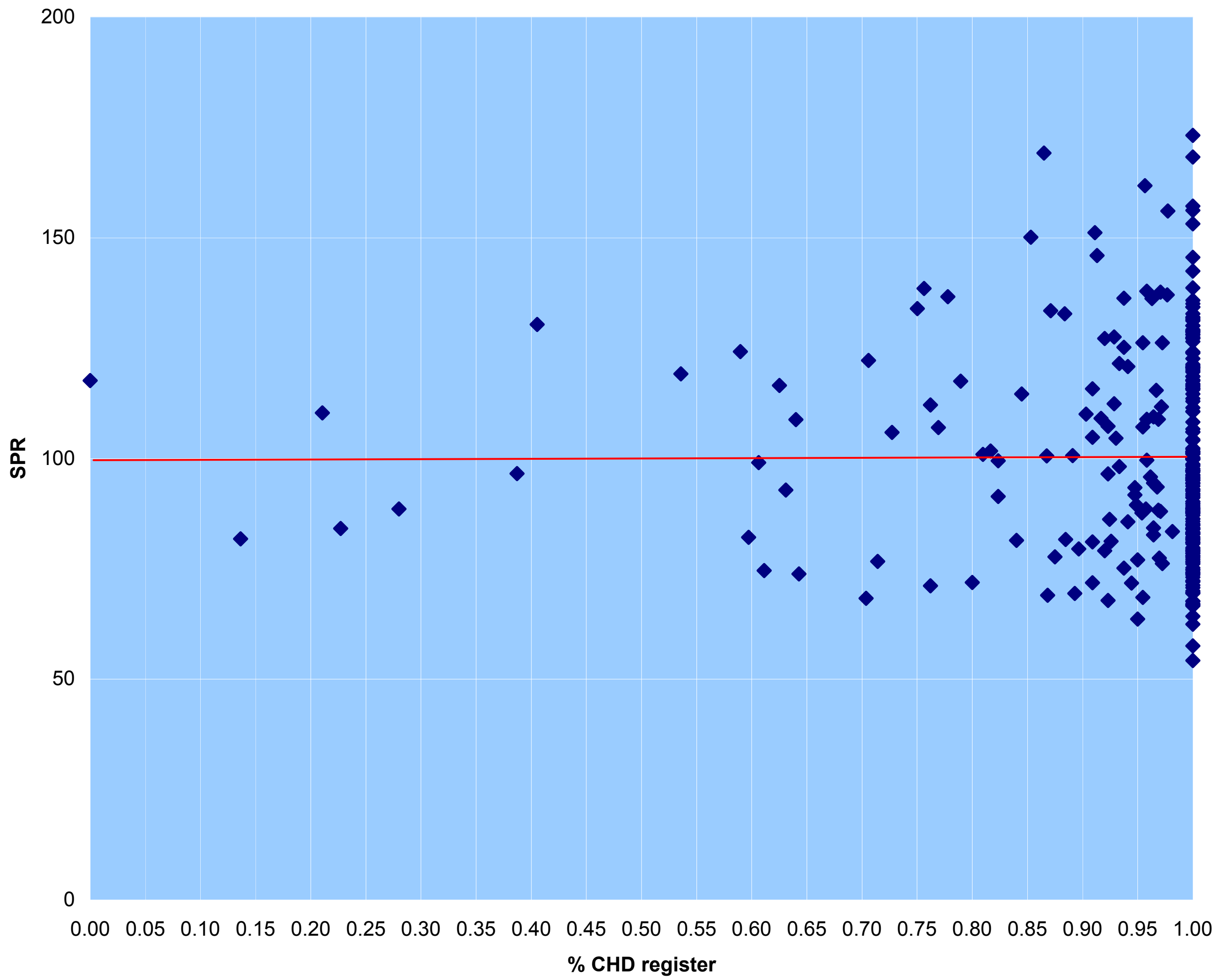

Figure 3d. Need index and statins SPR, England 2003/04

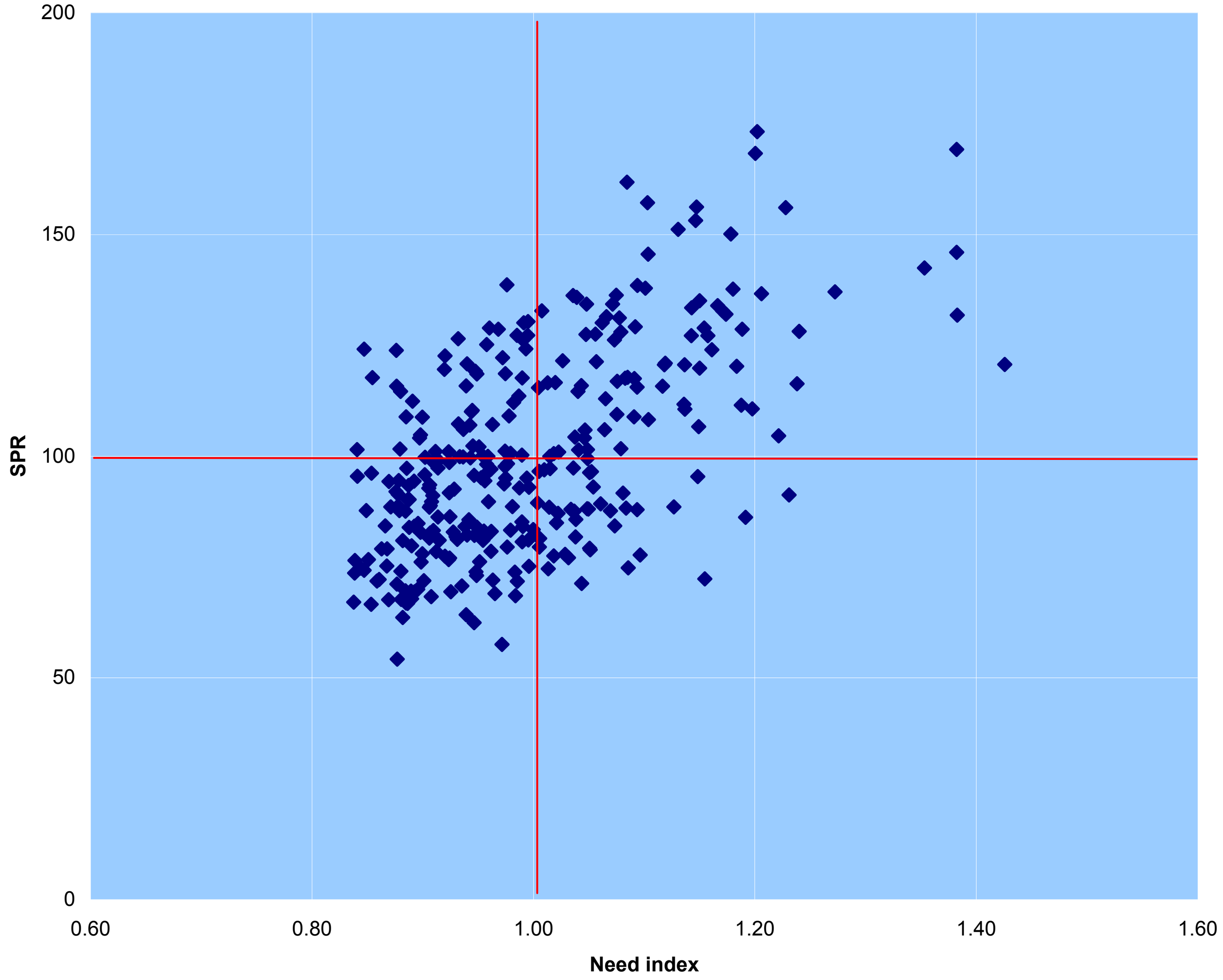

Figure 3e. Circulatory CMR and statins SPR

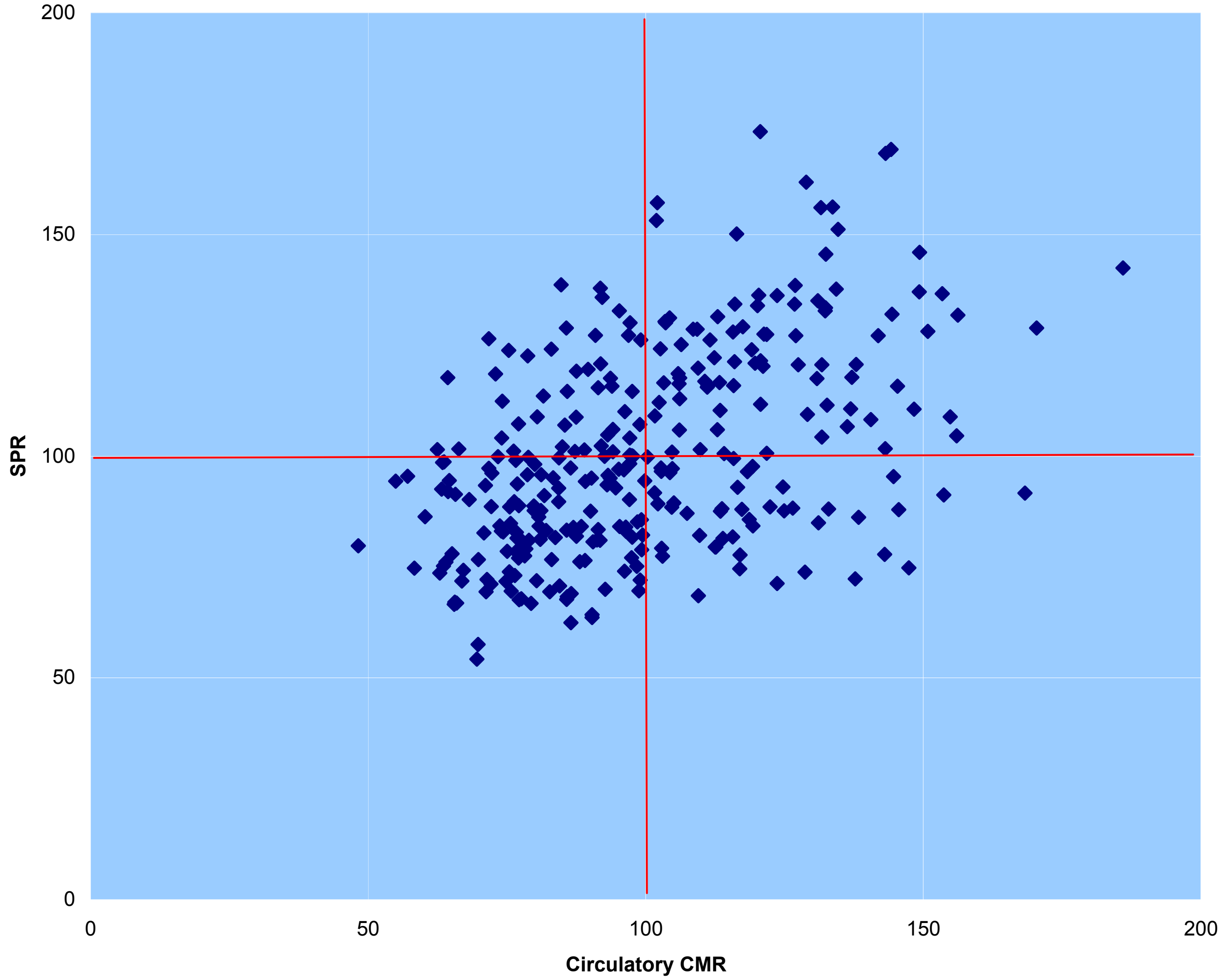

Table 1 The top 30 high ranked statins SPR and the related explanatory variables .

Primary Care Trust (PCT)	Items (000s)	SPR	Need index	AA/DLA claimants standardised	Incapacity benefit / severe disability standardised	Low income scheme index	Circulatory morbidity index	Cir CMR 2003	Acc GP	GP/100000	CHD reg
Halton PCT	93	173	1.20	0.96	0.86	0.53	1.16	121	0.73	4.92	1.00
Knowsley PCT	123	169	1.38	1.55	1.64	1.12	1.31	144	0.90	4.35	0.86
Salford PCT	177	168	1.20	0.70	0.91	0.52	1.17	143	0.93	4.82	1.00
Trafford North PCT	67	162	1.08	0.26	0.37	0.30	1.08	129	0.95	5.38	0.96
Doncaster East PCT	72	157	1.10	0.40	0.51	0.14	1.09	102	1.00	4.97	1.00
Newcastle PCT	182	156	1.15	0.31	0.72	0.47	1.13	134	0.93	5.72	1.00
Birkenhead and Wallasey PCT	165	156	1.23	0.82	1.02	0.76	1.17	132	0.99	5.68	0.98
Doncaster West PCT	80	153	1.15	0.67	0.63	0.34	1.12	102	0.95	4.80	1.00
Burnley, Pendle and Rossendale PCT	178	151	1.13	0.28	0.67	0.26	1.13	135	0.91	4.60	0.91
St Helens PCT	144	150	1.18	0.80	0.87	0.28	1.13	116	0.88	4.90	0.85
North Liverpool PCT	73	146	1.38	1.34	1.70	1.11	1.32	149	0.87	4.99	0.91
Eastern Hull PCT	79	146	1.10	0.36	0.34	0.66	1.08	132	0.96	4.59	1.00
North Manchester PCT	95	142	1.35	0.77	1.62	1.16	1.32	186	0.89	4.83	1.00
Bebington and West Wirral PCT	86	139	0.98	0.08	0.00	-0.32	0.96	85	0.92	5.51	1.00
Tameside and Glossop PCT	147	139	1.09	0.31	0.46	0.16	1.09	127	0.97	4.70	0.76
Hyndburn and Ribble Valley PCT	75	138	1.10	0.37	0.53	0.08	1.09	92	0.98	4.66	0.96
Blackburn with Darwen PCT	88	138	1.18	0.52	0.76	0.67	1.16	134	0.87	4.42	0.97
Central Manchester PCT	79	137	1.27	0.62	1.08	1.28	1.25	149	0.84	4.91	0.98
South Manchester PCT	77	137	1.21	0.51	0.91	0.78	1.18	153	0.92	5.05	0.78
Ashfield PCT	55	136	1.07	0.22	0.39	0.05	1.08	120	0.93	4.60	0.94
South Leeds PCT	90	136	1.04	0.17	0.12	0.10	1.04	124	0.91	5.67	0.96
Ellesmere Port and Neston PCT	60	136	1.04	0.27	0.20	0.05	1.02	92	0.86	5.16	1.00
Blackpool PCT	107	135	1.15	0.50	0.69	0.43	1.12	131	0.91	4.80	1.00
Doncaster Central PCT	69	134	1.07	0.23	0.36	0.11	1.07	127	0.98	4.90	1.00
Bury PCT	116	134	1.05	0.19	0.30	-0.07	1.04	116	0.96	5.25	1.00
Eastern Wakefield PCT	120	134	1.17	0.80	0.78	0.17	1.14	120	0.98	5.39	0.75
South Tyneside PCT	107	133	1.14	0.33	0.73	0.32	1.13	132	0.94	4.88	0.87
Barnsley PCT	153	133	1.17	0.58	0.86	0.20	1.16	132	0.91	4.54	0.88
Wyre PCT	98	133	1.01	0.16	0.13	-0.27	1.01	95	0.89	4.86	1.00
Newham PCT	103	132	1.17	0.45	0.55	0.96	1.18	144	0.89	4.30	1.00

Table 1 The bottom 30 low ranked statins SPR and the related explanatory variables .

Primary Care Trust (PCT)	Items (000s)	SPR	Need index	AA/DLA claimants standardised	Incapacity benefit / severe disability standardised	Low income scheme index	Circulatory morbidity index	Cir CMR 2003	Acc GP	GP/100000	CHD reg
Colchester PCT	57	73	0.95	-0.13	-0.23	-0.11	0.95	76	0.94	4.81	1.00
Islington PCT	45	72	1.15	0.21	0.52	1.19	1.13	138	0.87	4.64	1.00
Mid-Hampshire PCT	62	72	0.86	-0.47	-0.54	-0.53	0.88	71	0.90	5.80	1.00
Milton Keynes PCT	60	72	0.96	-0.05	-0.24	0.03	0.97	99	0.96	4.91	1.00
South Gloucestershire PCT	80	72	0.90	-0.26	-0.44	-0.42	0.94	80	0.92	5.27	0.80
South West Oxfordshire PCT	65	72	0.86	-0.40	-0.60	-0.57	0.89	67	0.93	5.20	0.91
Ipswich PCT	50	72	0.99	0.11	-0.08	-0.12	0.99	75	0.99	5.63	0.94
Hammersmith and Fulham PCT	41	71	1.04	-0.08	0.06	0.76	1.03	124	0.94	4.73	1.00
Billericay, Brentwood and Wickford PCT	53	71	0.88	-0.34	-0.49	-0.58	0.91	72	0.88	4.58	0.76
Redditch and Bromsgrove PCT	54	71	0.94	-0.03	-0.29	-0.29	0.95	84	0.95	5.13	1.00
Watford and Three Rivers PCT	55	70	0.90	-0.35	-0.45	-0.35	0.92	93	0.98	5.34	1.00
North Hampshire PCT	58	70	0.88	-0.38	-0.49	-0.44	0.92	99	0.88	5.19	1.00
South Leicestershire PCT	55	70	0.89	-0.27	-0.47	-0.50	0.92	76	0.96	4.93	1.00
Oxford City PCT	44	69	0.93	-0.29	-0.35	-0.09	0.94	83	0.96	4.94	0.89
Bromley PCT	105	69	0.89	-0.37	-0.43	-0.41	0.92	71	0.96	4.91	1.00
Southend-on-Sea PCT	58	69	0.97	-0.22	-0.16	0.02	0.98	87	0.97	3.92	0.87
Greater Derby PCT	50	69	0.98	0.06	-0.05	-0.19	0.99	109	0.95	4.75	0.95
Castle Point and Rochford PCT	63	68	0.91	-0.26	-0.39	-0.46	0.95	86	0.95	4.13	0.70
Hertsmere PCT	29	68	0.89	-0.32	-0.48	-0.37	0.91	78	0.99	4.73	0.92
Eastleigh and Test Valley South PCT	50	68	0.88	-0.37	-0.52	-0.40	0.91	86	0.96	5.21	1.00
North Surrey PCT	69	68	0.87	-0.44	-0.53	-0.54	0.91	77	0.92	4.91	1.00
Chiltern and South Bucks PCT	56	67	0.84	-0.46	-0.65	-0.64	0.86	66	0.96	5.10	1.00
Dacorum PCT	47	67	0.89	-0.32	-0.49	-0.45	0.91	66	0.96	5.27	1.00
Wycombe PCT	42	67	0.89	-0.36	-0.53	-0.32	0.92	79	0.94	5.10	1.00
Woking Area PCT	61	67	0.85	-0.48	-0.62	-0.49	0.88	65	0.93	4.99	1.00
Herefordshire PCT	64	64	0.94	-0.15	-0.25	-0.24	0.95	90	0.95	5.68	1.00
East Surrey PCT	48	64	0.88	-0.36	-0.46	-0.49	0.90	90	0.97	5.16	0.95
Wyre Forest PCT	37	62	0.95	-0.04	-0.24	-0.18	0.95	87	0.93	5.49	1.00
Kensington and Chelsea PCT	42	58	0.97	-0.35	-0.21	0.65	0.94	70	0.85	4.76	1.00
St Albans and Harpenden PCT	32	54	0.88	-0.36	-0.50	-0.38	0.88	70	0.96	5.37	1.00

Table 2. Regression analysis

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	NEED	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: lspr

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.574[a]	.330	.328	.18541

a. Predictors: (Constant), NEED

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.026	1	5.026	146.198	.000[a]
	Residual	10.210	297	.034		
	Total	15.236	298			

a. Predictors: (Constant), NEED

b. Dependent Variable: lspr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.401	.098		34.563	.000
	NEED	1.186	.098	.574	12.091	.000

a. Dependent Variable: lspr

Excluded Variables[b]

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics
						Tolerance
1	ACCGP	.015[a]	.299	.765	.017	.933
	GPNUM	.050[a]	1.037	.300	.060	.954
	CHDRG	-.026[a]	-.547	.585	-.032	1.000

a. Predictors in the Model: (Constant), NEED

b. Dependent Variable: lspr