UNIVERSITY OF LONDON

GENERIC PRESCRIBING IN GENERAL PRACTICE

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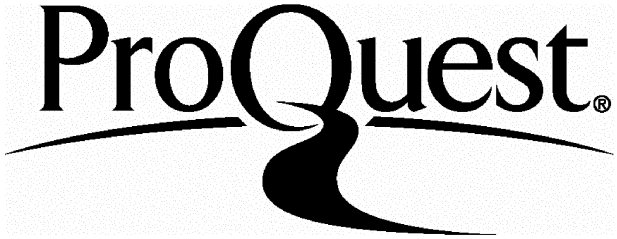

ABSTRACT

The study highlights the need to design new prescribing initiatives to realise remaining savings from generics. This presents a particular challenge: In the absence of demonstrable economic benefits e.g. money released to pay for other treatments, or clinical benefits (for which the evidence is sparse) the advantages of generic prescribing are less easy to promote to GPs already overloaded with information and demands on their time.

The generic prescribing rate in General Practice in the UK increased from 41% in 1991 to 47% in 1993. Despite this large variation remains in the generic rate at Regional, Family Health Service Authority (FHSA) and practice levels. In marked contrast to the detailed information on generic prescribing rate, information on actual and potential savings are not routinely available.

In this thesis a new measure of generic prescribing performance was developed to identify practices where substantial generic savings could be achieved. In addition the relationship between practice characteristics and generic savings potential was examined in order to identify practice characteristics associated with both high and low generic savings profiles. The generic rate was found to be significantly but only weakly correlated with generic savings potential and six practice characteristics were found to explain 65% of the variation in generic savings at practice level. Practices with a larger number of partners, a lower generic rate, a higher patient per doctor ratio, a higher proportion of patients over 65, higher prescribing costs and no computer were associated with higher generic savings potential. Total quarterly generic savings potential for 21 products in the FHSA studied were £146,000, suggesting annual savings of £584,000.

The ability to measure and monitor generic savings for individual practices on a regular basis and compare with information on practice profiles could enable prescribing advisers to design and target generic prescribing initiatives more accurately, and to reject initiatives that are not cost effective.

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LIST OF ABBREVIATIONS

ACTAP	Audit Commission Thematic Analysis of Prescribing
ASTRO-PU	Age, Sex, and Temporary Resident Originated Prescribing Units
BMA	British Medical Association
BNF	British National Formulary
DoH	Department of Health
FHSA	Family Health Services Authority
FPC	Family Practitioner Committee
GSP	Generic Savings Potential
GP	General Practitioner
MAAG	Medical Audit Advisory Group
MCA	Medicines Control Agency
NHS	National Health Service
NIC	Net Ingredient Cost
PACT	Prescribing and Costs Analysis
PACTLINE	Prescribing and Costs Analysis on Line
PPA	Prescription Pricing Authority
PU	Prescribing Unit
RMO	Regional Medical officer
SPA	Scottish Prescribing Analysis
SPSS	Statistical Package for the Social Sciences
SPSSPC	SPSS computer software for use on personal computers
UK	United Kingdom

DECLARATION

The work conducted in this thesis was carried out whilst I was employed as a Pharmaceutical Adviser to City and East London Family Health Services Authority. The work was funded by the Health Authority. Data access, computer programming support, and advice was provided by the Leeds Prescribing Research Unit. I am responsible for writing all parts of this thesis and for the conception, design, and analysis described within the body of this thesis. At all stages in the development of this work I have consulted with Dr Felicity Smith, Professor Bosanquet and David Roberts. David Clucas was responsible for developing the computer programme used to calculate generic savings. At several stages I have also consulted with Professor Conrad Harris and other members of the Leeds Prescribing Research Unit, the Prescription Pricing Authority, Ms Mary Tompkins and Brian Baker.

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City and East London Family Health Services Authority for sponsoring me, and enabling me to use their data and Mr Alan Bennett for supporting the research element of my work for the authority.

Special thanks are also due to my partner Steven Glautier for his encouragement, support and criticisms! A mention should also go to my son Ivan who appeared in the middle of it and also to the son/daughter that is due in March - thereby adding to the urgency of completion!

Thanks are also due to all my friends and family that have continued to take an interest in my work.

Finally I hope that this thesis will have something to offer to Pharmaceutical and Medical Advisers, GPs and Pharmacists who struggle with prescribing issues more complex than this one on a daily basis.

OVERVIEW

This thesis is presented as five chapters. The introduction is divided into two parts. Chapter One provides an historical background to prescribing since the inception of the National Health Service in 1948. Government sponsored reviews of prescribing provide an insight into the pressures for and against generic prescribing. The substantial NHS reforms introduced in the 1990s are considered in some detail, since these have had the most dramatic impact on generic prescribing. The introduction of performance indicators in the field of prescribing is also reviewed. Chapter Two focuses on generic prescribing, the way in which performance is currently measured, shortfalls in the generic rate as an indicator of prescribing economy, and recent prescribing trends. The literature relating to prescribing behaviour is then reviewed, and sources of influence on prescribing decisions discussed. The aims and objectives of this thesis are then presented.

Chapter Three describes the method used to develop a new measure of generic savings potential derived from prescribing data. Characteristics of the study area, sampling method and data collection are then described. Using prescribing data from City & East London Family Health Services Authority generic savings potentials for each practice are calculated. The relationship between these savings, the generic prescribing rate, and other practice characteristics identified in the literature review is then assessed by constructing a multiple regression model.

The results are presented in Chapter Four and discussed in Chapter Five in light of the literature review presented in the introduction. They are also considered in relation to recent efforts to influence generic prescribing behaviour, particularly in the study area. The use of a prescribing model as an exploratory tool is evaluated. Finally, the implications for future generic prescribing strategy is considered and some suggestions are made to match the performance indicator for generics more closely to the Government's economic prescribing objectives.

CHAPTER 1

GENERIC PRESCRIBING - AN HISTORICAL PERSPECTIVE

Summary

Since the National Health Service (NHS) was founded in 1948, the clinical freedom of General Practitioners (GPs) to prescribe any licensed drug has been the subject of many recommendations but relatively few constraints. This chapter presents a review of the history of generic prescribing in general practice spanning over four decades. Although quality and cost of prescribed drugs have been considered in successive government reviews over this period of time, with all making recommendations in favour of generic prescribing, the only notable attempt to curb clinical freedom and generate savings through greater use of generic drugs was a scheme specifically rejected by one of the government's own reviews in 1983. This long standing lack of government intervention may be in part due to a strong and successful lobby from the UK drug industry whose interests are served by brand name prescribing.

In 1989 the Government indicated in a White Paper its intentions to introduce the most wide ranging reforms of the NHS since its inception. It was not until these reforms that the concept of financial accountability for prescribing at practice level was introduced. In keeping with other activities, progress was to be measured using performance indicators. The new prescribing information, designed to provide GPs with feedback, was also perceived to provide a ready source of prescribing measures and was therefore seen as a relatively accessible tool with which to undertake performance management.

In a prescribing review in 1983 concerns were raised regarding the temptation to introduce of arbitrary measures to curb prescribing behaviour. In this chapter prescribing measures relating to generic prescribing introduced as a result of the 1989 reforms are considered within the context of this earlier prescribing review.

1.1 NHS foundation and reforms

The NHS was set up in 1948 under the auspices of the Secretary of State for Labour, Aneurin Bevan. The intention was to provide comprehensive health services to all, free at the point of delivery. The proposal to introduce a national service was not without its critics, both from within the health professions and from within the Government (Webster, 1991). Within months of the launch concerns over the cost of the service were raised (Webster, 1991). In pharmaceutical services alone the predicted spending for the first six months of £11.5 million was exceeded by £5 million leading Bevan to conclude that the costs of these services may pose a considerably greater threat to the NHS than many other areas of high growth such as dental fees (Webster, 1988).

In the first year alone, there were calls from some members of the Cabinet to introduce direct charging for selected services to avoid increasing the burden on the treasury. Suggestions for charging included dental and ophthalmic services and medicines. Bevan rejected these and instead favoured reduction or containment of expenditure through the recommendation of non-proprietary (generic) drugs where these were available (Webster, 1991). This suggestion was subsequently rejected by the British Medical Association (BMA), setting a precedent that remains to this day. Bevan also tried, unsuccessfully, to gain backing from the BMA to discipline doctors whose prescribing was considered extravagant (Webster, 1991). These two themes set the scene for others to follow over the next 40 years. Bevan resigned in 1951 over the Cabinet decision to introduce prescription charges although in the event they were not introduced within the Government's term of office which lasted for a further 6 months and were subsequently introduced by the incoming Conservative Government.

A number of organisational changes were made to the NHS over the next three decades, however the basic structure and ideals remained until the 1990's. The first major legislative change in 1974 introduced management tiers into the NHS. Regions and Area Health Authorities were created to undertake planning and

management of integrated hospital and community services. Local management was devolved to smaller district boundaries. Executive Councils, who contracted GPs, dentists, pharmacists and opticians to provide services, became Family Practitioner Committees (FPCs) (Leathard, 1990).

1.1.1 Small changes

In the early 1980's a series of small bills were introduced which were instrumental in producing a profound change in NHS philosophy (Butler, 1994). Despite the limited introduction of general management in 1974, professional independence had prevailed. However, the Griffiths report (House of Commons, 1983) supported the introduction of general management at all levels of the NHS. Welcomed and acted upon by the Secretary of State, a broad management ethos was introduced throughout the NHS, thereby threatening the traditional clinical power base (Butler, 1994).

The 'new managers' working within the service became aware of the finite resources available for the NHS and, despite having some of the lowest costs for health care expenditure per person in Europe (Office of Health Economics, 1989) it became evident that the Government's emphasis on securing a sound economic policy above all else, would encompass health care (Butler, 1994).

During the early 1980's the Government introduced the concept of competitive tendering in the circular *Contracting Out* (Department of Health and Social Security, 1983). By the end of the decade the range of support services had been extended so that clinical services eg. pathology could be provided by private contractors. In 1989 the Department of Health (DoH) produced guidelines on the introduction of income generation schemes which led to the development of considerable commercial enterprise within NHS premises. Some hospital pharmacies took advantage of this initiative to sell non-prescription medicines to the public. These relatively small legislative changes encouraged enterprise and

competition above collaboration and tradition and the resulting shift in values amounted to a significant cultural change within the NHS.

1.1.2 Larger changes

In 1987 renewed concerns with the cost of the NHS prompted the Conservative Prime Minister, Margaret Thatcher, to instigate a working party to review the operation of the whole service. At this time the White Paper *Promoting Better Health* (Department of Health, 1987) was published, introducing the Government's plans to improve primary health care. Negotiations with the professions to secure their support were also announced.

Whilst the review concentrated primarily on plans to extend the GP contract and identified prescribing as the single largest element of Family Practitioner Services expenditure, plans for managing prescribing were confined to the section on pharmaceutical services. The review stated that the introduction of the selected[1] list in 1985 had saved £75 million in the first year. Whilst the Government declared that it had no plans to introduce compulsory generic prescribing or substitution, it was seeking evidence that voluntary activities would 'yield positive results' through more economic and effective prescribing (Department of Health, 1987). The paper included the unsupported statement that 'voluntary generic prescribing is good professional practice' and the government expressed its view that rises in the proportion of generic prescribing were expected to continue.

Promoting Better Health therefore provided clear signals of the changes envisaged in the management of prescribing. Historically GP prescribing had been scrutinised by Regional Medical Officers answering directly to the Chief Medical Officer, but the paper described a pilot project using specially trained medical advisers to work within two health regions. As well as meeting GPs in their practices and at post

[1] The use of this term in the White Paper appears to have been used in error - Although a selected list does exist it is the limited (or restricted) list, introduced in 1985, that generated these savings.

graduate centres, the officers were required to make more visits to GPs whose prescribing costs were significantly above the average. FPCs were to be given new responsibilities for encouraging cost effective prescribing with the support of the new 'independent' medical advice.

The working party set up by Thatcher in 1987, but not announced until 1988, had started out with a brief to contain the government's burden of the rising costs of health care provision through alternative sources of external funding. However by the end of 1988 the brief had changed considerably to encompass an NHS re-organisation of unprecedented proportions but with little change to the funding base (Butler, 1994). The final recommendations emerged at the beginning of 1989 as a White Paper *Working for Patients* (Department of Health, 1989). This provided an introduction to the concept of an internal market for the NHS encompassing the purchaser/provider split, first explored by Enthoven in 1985 (Butler, 1994), but taking the concept much further. *Working for Patients* represented a consolidation of NHS philosophies encouraged and developed in the 1980s.

Following a period of consultation on the White Paper a series of eight working papers followed covering specific aspects of the service in varying amounts of detail. The main titles covered were: *Self Governing Hospitals (Trusts); Funding and Contracts for Hospital Services; Practice Budgets for Gps (Fund Holders); Indicative Prescribing Budgets for GPs; Capital Charges; Medical Audit; NHS Consultants: Appointments, Contracts & Distinction Awards; and Implications for Family Practitioner Committees.*

Paper four gave details of the new Indicative Prescribing Scheme (IPS) of which budgets were a feature, and Paper three put this into context for GP fund holding practices. Paper eight provided the organisational reform to the FPCs thereby shifting the balance of power away from the professional committees, and the appointment of 'independent' medical advisers to replace Regional Medical Officers. Paper six introduced the concept of Medical Audit Advisory Groups (MAAG), a title broad enough to encompass prescribing if desired. These

prescribing themes and ways in which they may relate to generic prescribing were subsequently developed in another Government Working Paper *Improving Prescribing* (Department of Health, 1990). This is considered further in section 1.3.

Paper eight, *Implications for Family Practitioner Committees*, laid out the organisational changes and additional responsibilities that FPCs would need to encompass in their new role as Family Health Service Authorities (FHSAs). FHSAs were to be accountable to the Regions instead of directly to the Department of Health. The additional responsibility regarding prescribing was accorded a special mention in the introduction. Until this time the task of monitoring prescribing and calling GPs to account rested with Regional Medical Officers answering directly to the Chief Medical Officer.

The major reforms recommended in *Working for Patients* were encompassed in the National Health Service and Community Care Act (1990), which came into force in April 1991.

1.2 Government prescribing reviews until 1983

Three prescribing reviews, commissioned by different governments over three decades, all recommended the promotion or adoption of generic prescribing. Commonly referred to by the name of their Chairmen, Hinchliffe (1959), Sainsbury (1967) and Greenfield (1983), the reports were all commissioned and published at a time when financial accountability for prescribing within general practice was not actively pursued, and this, together with the powerful 'brand-driven' drug industry lobby did not create an environment receptive to their suggestions on generic prescribing.

1.2.1 Hinchliffe (1959)

In 1957 the Government commissioned a report on the cost of prescribing. At the request of the Minister for Health, the committee, lead by Sir Henry Hinchliffe, produced an interim report concentrating on general information and advice that could be provided to GPs to encourage more economical prescribing (Ministry of Health, 1958). By the time the final report was published (Ministry of Health, 1959), the majority of these interim recommendations were already being pursued and put into practice. An exception to this was the section on approved names which concerned the speed with which the names were allocated, and the ease with which they could be memorised. The committee suggested that manufacturers should request an approved name for a new product prior to its launch, so that the approved name could appear on all marketing material and drug information.

In the final report, the committee expanded on their earlier findings and recommended that GPs should use approved names, even where they were more difficult to remember. Where GPs maintained a preference for branded products the committee recommended that they should be able to support their decision by reference to past experience or published evidence. They also recommended that the government or an alternative body should be charged with informing GPs as

soon as savings could be made by switching to the generic product i.e. when a patent has expired, and a competitor product is significantly cheaper.

The report recognised that there were misconceptions regarding the economies that could be generated from a total change to generic prescribing and that it was only prescribing of selected products (whose patent had expired) that would deliver this objective. This was perhaps the first recognition that on economic grounds alone a targeted campaign may be more appropriate. The authors also noted that although approved names were used increasingly for teaching purposes in medical schools, it did not appear that this activity was established to incur economic advantages.

The committee did not support the introduction of generic substitution by the dispenser considering it 'not a practical or desirable method of securing economies in the drugs bill'. It was thought that substitution by pharmacists would obviate the need for GPs to know and use the generic name and conflict with securing an effective long term solution by training doctors to be critical and discerning of their prescribing decisions.

The committee had access to a study undertaken by Dr J P Martin in 1951 into the prescribing behaviour of general practitioners and their environment, and also the trend analysis he provided up to 1957. In further work Martin and Williams (1959) concluded that frequency of issuing prescriptions had an important effect on total costs.

The Hinchliffe report recommended that significant improvements were required in the prescription pricing and information system so that much greater analysis of prescribing behaviour would be possible. The information system was to become of paramount importance two decades later when a GP feedback system was devised (see section 1.3.2).

1.2.2 Sainsbury (1967)

The report of the Committee of Enquiry into the Relationship of the Pharmaceutical Industry with the National Health Service was published in 1967 (Ministry of Health, 1967). Known as the Sainsbury Report, it contained two recommendations concerning patents and brand names: The issues surrounding patents was referred to a specialist committee on the subject, the Committee's considerations on brand names is now summarised.

Evidence presented by the medical profession supported the use of approved (generic) names. On the other hand, evidence presented by the industry supported their desire to associate the product and company. On balance, the findings of a large survey of GPs' views on drugs and the drug industry, commissioned by the Committee, led them to conclude that the greater importance given to advertising the brand name only served to increase the industry's defence of higher prices even when competitively priced generic equivalents were available.

The Committee therefore recommended that new products entering the market should only be licensed and marketed under their approved (generic) name. They recommended that brand name licensing should cease but that manufacturers name or trade mark could be included in subsequent marketing and in this way they envisaged that brand names would gradually disappear. In 1967 this latter concept may not have been as unrealistic as it may seem today since the promotion and marketing of brand names for medicines had only really begun in earnest in the late 1950's following the introduction of large scale production of the sulphonamide antibiotics. Given the established drug industry in the 1990's such a proposal would now be considered extremely radical and possibly unrealistic and in the event they were not implemented in 1967. Many of the recommendations contained within the report in a section entitled *Future Pricing Arrangements and the Medicines Commission* were implemented (Ministry of Health, 1967).

1.2.3 Greenfield (1983)

The Greenfield report was the result of an informal working group reporting to the Secretary of State (Department of Health and Social Security, 1983). The terms of reference were broad; to identify ways of encouraging effective prescribing. The group looked at the prescribing information available to doctors, the support from the Regional Medical Officers, publications, hospital prescribing, limitations on prescribing (including generics, limited lists and formularies), quantities prescribed and education of doctors and patients. It was accepted that savings should be achieved where they could be justified, and that cost effectiveness was also within the remit. However, the group were concerned that there was a strong temptation in some quarters to take arbitrary measures that had no positive impact on patient outcome, and warned against taking this approach.

The Committee noted that although generic prescribing had been recommended by Hinchliffe (1960) in 1980 only 20% of prescriptions were written using the generic name. This was despite the following advantages: Indication of therapeutic category; range of different drugs (versus different products of same drug); reduced range of stock for pharmacies; and greater economy. However, all this was subject to the resolution of GP reservations which included concerns of bio-availability, quality assurance, legal liability and product identification, and physical appearance. The financial position of the industry was considered outside of their remit.

Overall they concluded that many GPs would not oppose the provision of generic products, particularly if this did not involve them engaging in changes in *their* practice i.e. they could continue to prescribe by the branded name where this was most familiar to them. The committee suggested that a box was added to the prescription form that would enable GPs to express a positive preference for the branded version by ticking the box. In the absence of a tick, the pharmacist would be expected to dispense a generic product where this was available and would be reimbursed accordingly.

The Committee considered the introduction of a national limited list but felt that it could not be justified, giving the following reservations a) that it would represent an unacceptable challenge to clinical freedom on the part of the prescriber and b) that the cost of administration might out-weigh savings.

In summary, all three reports supported a move to generic prescribing. The Hinchliffe report favoured facilitative steps that would encourage GPs to be more critical of their prescribing behaviour, the Committee also set in motion developments that would build the foundations for detailed prescribing feedback to each GP decades later. The Sainsbury report took a more centralised approach, with radical proposals to ban the patenting of brand names which were not implemented, whilst the Greenfield proposals favoured an administrative approach that encouraged generics whilst maintaining the prescriber's ultimate clinical freedom.

One factor that may offer some explanation for the failure to implement the more radical proposals that were put forward over the decades relates to the 'special relationship' that exists in the United Kingdom the Government and the Drug Industry (Greenwood, 1991, personal correspondence). The large contribution of this industry to the country's Balance of Payments and the powerful lobby representing these commercial interests are very likely to have conspired against any serious attempts to make generic prescribing mandatory.

1.3 Government prescribing schemes

Following over three decades of 'steady-state' on GPs clinical freedom to prescribe without constraint, the period between 1985 and 1990 saw the introduction of two pieces of legislation aimed at curbing this freedom. The first of these was the introduction of a limited list in 1985, and the second, the introduction of the Indicative Prescribing Scheme in 1990. The later would not however been possible if computerisation of prescription pricing recommended in the Tricker Report (DHSS, 1977) had not already been implemented and utilised to produce PACT data.

1.3.1 The Tricker Report

The Secretary of State for Social Services, commissioned Tricker to produce the *Report of the Inquiry into the Prescription Pricing Authority* (PPA) (DHSS, 1977). The brief was to undertake a 'fundamental inquiry into the functions, organisation and constitution of the PPA' and it was the identification of three substantial benefits for those outside of the PPA that tipped the balance in favour of immediate computerisation of PPA functions; the benefits highlighted by Tricker related to the provision of information on dispensing activities, prescribing practice and drug usage. Tricker took evidence from many interested parties and as a result made some additional general observations on issues outside of his remit. Observations relating to the introduction of a limited list, the need for greater budgetary control, the provision of more timely feedback to GPs, and continuing education on drug use reflect gathering support for measures introduced many years later via the Limited List and Indicative Prescribing Scheme.

1.3.2 Limited List

The introduction of a National Limited List in 1985 was made against the recommendation made in the Greenfield report (1983) and is the only absolute restriction to GPs clinical freedom to prescribe to make the statute books. The list

of drugs was drawn up in 1985[2] without formal consultation but a committee was subsequently set up to review additions and deletions and this continues to this day. This autocratic and non-voluntary control mechanism is estimated[3] to have produced savings of £100 million (Drugs and Therapeutics Bulletin, 1987a) however, the cost of list circumvention through the supplementation of more expensive non-restricted drugs, and prescribing of listed drugs by the component ingredients have never been quantified. A survey undertaken a year after the List's introduction found that the most difficult task faced by GPs was persuading patients to accept alternative drugs in therapeutic areas where they themselves found it difficult to make a selection, and overall considerable patient resistance was noted (Drugs and Therapeutics Bulletin, 1987a).

1.3.3 The development of PACT data

Computerisation of the PPA following the recommendations of the Tricker Report presented opportunities for utilising prescribing data for information, educational and audit purposes. From August 1988, information on prescribing was available for every prescriber at three, increasingly detailed, levels. The data was given the acronym PACT to denote Prescribing Analysis and Costs. Each quarter every prescriber was presented with details of their prescribing costs and volume in comparison with the FPC and the national averages (Level one). Level two provided individual product details drawn from six therapeutic groups. This was the first time that all GPs were equipped to undertake self or peer audit of their prescribing behaviour on a regular basis, although a study undertaken by Harris et al. (1984) had already shown that presentation of similar data to GPs to stimulate discussion could result in changes in prescribing frequency and cost. In 1990 a book was published and circulated to all GPs to provide ideas on, and stimulate

[2] NHS (General medical and Pharmaceutical Services), Amendment to Regulations, Statutory Instrument 1985 (290).

[3] Based on cost of prescriptions in previous year for products included in limited list

interest in, prescribing audit using PACT data (Harris, Heywood and Clayden, 1990).

Although individual GPs received PACT data from 1988, aggregated data for FHSAs and Regions was not available until a year later, and details aggregated at practice level, the unit of greatest interest to prescribing advisers, was initially only made available to six FHSAs as a pilot. The pilot proved to be useful as it highlighted the enormous volume of paperwork that advisers might expect to receive, and indicated the need to maintain some of the more traditional reporting formats (Department of Health, 1990, *Improving Prescribing).*

1.3.4 The Indicative Prescribing Scheme

Four Government publications between 1987 and 1990 provided the setting and details on the Indicative Prescribing Scheme (IPS). Promoting Better Health (Department of Health, 1987) and Working for Patients (Department of Health, 1989) were discussed in Section 1.2. *Indicative Prescribing Budgets for GPs* (Department of Health, 1990) and *Improving Prescribing* (Department of Health, 1990) developed the prescribing themes in more detail and are now considered.

The IPS grew from the acceptance in 1987 of the need to improve prescribing practice, provide greater feedback to GPs on their prescribing patterns and encourage self-audit. However, by 1990, Working for Patients concentrated on managing the drug expenditure which was growing at about 4% above the national rate of inflation, and the budget which was the single largest element of the Family Practitioner Services Allocation. Formularies were proposed as a means of establishing rational prescribing policies and economical prescribing was discussed in general terms, although generic prescribing was not specifically mentioned. A more detailed working paper followed.

Working Paper number four, entitled *Indicative Prescribing Budgets for GPs* (Department of Health, 1990), promoted the concept of financial accountability for

prescribing at practice level with the stated objective 'to place downward pressure on expenditure on drugs'. A pilot scheme was undertaken in 1990/91 prior to their introduction in 1991/92.

Supportive measures such as medical advice, better information and incentives were also introduced. Better prescribing information for GPs had been called for by Hinchliffe back in 1963. In 1989, a new information system assuming the anachronism PACT - Prescribing Analysis and CosTs was introduced representing a major improvement in this respect. At the time of it's introduction PACT was described as a tool for family doctors to use within self-audit; increasing the proportion of prescriptions written by the generic name was used as an example of such an audit (Harris, Heywood, and Clayden, 1990). PACT data is described further in Chapter Two.

Due to the wording of Working Paper four, the reader can be forgiven for concluding, erroneously, that the suggestion that GPs could increase self-audit of prescribing using new information systems, and in particular increase the proportion of prescriptions written generically had previously been described in *Promoting Better Health.* The representation therefore leads the reader to assume that these suggestions are familiar and well accepted ideas, and by inference uncontentious.

One of the major weaknesses of the proposals was the explicit expectation that, with downward pressure, practice prescribing costs would gradually move towards the 'average'. This emphasis gave little consideration to the practice whose average costs concealed prescribing extremes that cancelled one another out. The proposed means of budget setting were crude, did not encompass quality issues and was poorly received by GPs and their representative bodies (Department of Health, 1990).

Improving Prescribing was published in 1990 after wide consultation on Working Paper four and emphasised a quality as well as a cost effective approach to

prescribing. It described the Government's philosophy for prescribing and operational details of the IPS. The term 'prescribing amounts' replaced 'prescribing budgets' at practice level and GPs were given assurances that they would maintain their right to clinical and prescribing independence. The early emphasis on cost containment and sanctions, was balanced by much greater weight being given to quality and effectiveness, education and support. However, it was indicated that GPs would be expected to 'show proper regard' for cost where medicines were equally effective, suggesting by default that GPs who did not prescribe generics when available might be considered wasteful. Reassurance was given of the quality standards applied by the Medicines Control Agency to generics, although a different interpretation of their position may be formed from other summaries of their quality assurance procedures. The need to maintain branded prescribing for exceptional products was also recognised.

Generic prescribing was promoted as good professional practice and something to be promoted through educational initiatives. It was discussed within the remit of self-audit and research and the advantages recommended for promotion to GPs. It was acknowledged that the average generic prescribing rate at the national level concealed wide differences in the average between health regions, which in turn concealed even wider differences between averages measured at FHSA and practice level.

There were also suggestions that FHSAs might allocate reduced prescribing budgets to practices with a low generic prescribing rate, although it was emphasised that practices would be at liberty to decide what steps they took to remain within the amount and clinical freedom would not be infringed. In practice this guidance gave the go-ahead for medical advisers to set lower prescribing amounts for practices with low generic prescribing rates while allowing the GPs to choose alternative strategies to remain within their indicative amount if they did not want to increase their rate. The weakness of this situation was that with some forethought practices could, and some did, increase their generic prescribing rate by selecting brands that had no generic equivalent and therefore produced no financial savings. The use of

the generic rate in this way to set budgets or amounts was the first indication that it may become a prescribing performance indicator.

The provision of medical and pharmaceutical advice were dealt with separately. Amongst other things pharmaceutical advice was to be obtained and it was suggested that this might be usefully employed to reinforce confidence in generic products.

1.3.5 Performance indicators

Improving Prescribing (Department of Health, 1990) announced the formation of the Leeds Prescribing Research Unit, whose remit would in part be to develop indicators showing the prescribing distribution that may be expected for a given therapeutic group in a defined population. In the absence of a definitive description of 'good prescribing', medical advisers began to develop their own indicators of good practice, which they described as quality markers. Areas commonly targeted included ranges of commonly used antibiotics, musculoskeletal drugs and generics.

The Greenfield report on effective prescribing (Department of Health and Social Security, 1983) stated in it's introduction that 'arbitrary measures' (performance indicators) should be rejected if they were unrelated to patients needs. The generic prescribing rate reported within Prescribing Analysis and Costs data (PACT) was adopted as a performance measure within the essentially financial concept of the Indicative Prescribing Scheme. Unfortunately a weakness, inherent in the indicator, meant that the method of measuring the generic rate did not directly reflect cost savings at practice level, but prescribing behaviour. Consequently the generic rate only provides a measure of what has been described as good prescribing practice (Department of Health, 1990). Of particular concern is the fact that individual practices can increase their generic rate substantially without increasing the volume of generic products dispensed and consequently without generating any savings. This suggests that the generic indicator falls into the criteria so clearly rejected by the Greenfield Report.

From 1992/93 practice generic prescribing rates were specifically requested for inclusion on monitoring returns to the Regional Health Authorities. The Executive Letter giving guidance for the IPS for 1994/95 mentioned generic prescribing targets specifically as a key FHSA and District Health Authority objective (Department of Health, 1994).

1.3.6 Resources

Until 1989 little information was available on GP prescribing patterns. Annual prescribing statistics were produced by the Prescription Pricing Authority (PPA), and some trend analysis was published for prescribing at Family Practitioner Committee (FPC) and Regional level. Each quarter, FPCs received a summary of prescribing costs and ratios by doctor and practice. Referred to as 'PD2' reports, this useful source of summarised information continued to be provided after the introduction of individual prescribing analysis.

Prior to 1989 the only detailed analysis of a doctors' prescribing was undertaken by Regional Medical Officers, often in response to high expenditure patterns being detected in the PD2 report. Visits and audits were carried out, but these were few and far between. The only independent information sources on prescribing available to GPs were the Drugs and Therapeutics Bulletin (DTB), and the Prescribers' Journal.

In 1989, PACT data was released to GPs, providing detailed quarterly feedback on their own prescribing patterns and relating this to the local 'average'. In 1990, Improving Prescribing provided details of monthly financial prescribing statements that were to be produced for each practice. Other resources announced included a Medicines Resource Centre (MeReC), primarily concerned with the production of independent information for GPs in a less intellectual form than the Drugs and Therapeutics Bulletin; the Leeds Prescribing Research Unit, to study patterns of prescribing in more detail; Medical Advisers to implement the Indicative

Prescribing Scheme and provide GP support through practice visits; and the Medical Advisors Support Centre (MASC). It was suggested that pharmaceutical advice may be obtained and that this might usefully be employed to reinforce confidence in generic products.

The concept of voluntary incentive schemes were also announced to enable non-fund holding GPs to retain a proportion of any savings that they generated. Originally a scheme was to apply to a whole FHSA, although this requirement was subsequently relaxed in favour of groups of practices. Savings had to be agreed in advance and realised from within the total indicative amounts set for participating practices. If the saving was achieved, then half would be available for expenditure on local projects agreed with the Local Medical Committee. However, the need to gain consensus across a wide practice base reduced its attraction and a number of refinements were required.

Despite significant improvements in prescribing information, this still did not facilitate easy selection of the specific information required to calculate savings derived from targeted activities. For example the volume of each drug product prescribed by the branded name, needed to determine savings from an increase in generic substitution, still had to be calculated manually for each practice or FHSA from level 3 PACT data. Since PACT level 3 lists number of prescriptions for each quantity prescribed, rather than total volume, this task was both extremely time consuming and tedious, and is further compounded by the very wide variations in quantities prescribed by different GPs. After substituting the cost of the equivalent generic to produce potential savings for one product the exercise needed to be repeated for each strength of each drug assessed. Furthermore, this daunting task was not significantly improved with computer technology, and once undertaken was rarely repeated, thereby making performance on savings targets difficult to gauge.

Increases in the generic rate, even at drug group level could only measure changes in prescribing behaviour, and could not be used to quantify savings on particular products. For example, the incentive scheme adopted in parts of North East

Thames Region for 1993/94 included a target of 5% increase in the generic prescribing rate with a minimum of 40% for each practice by the year end. Although it is likely that such an approach would generate savings there is no indication of their potential magnitude. This is a significant weakness of hard copy PACT data, and in Chapter Two a way in which practices can reach generic targets without generating any savings is described.

The first Working Paper on prescribing budgets described the introduction of sanctions for excessive prescribing and also for GPs who exceeded their Indicative Budget (Department of Health, 1990). *Improving Prescribing* (Department of Health, 1990) added the requirement of FHSAs to provide 'clear evidence' of excessive prescribing to invoke sanctions. In 1992, two and a half years after the introduction of the IPS, the NHSME published the procedure for dealing with excessive prescribing (Department of Health, 1992). The procedure applied to individual doctors and not to practices and required considerable time and effort to undertake successfully. On balance it was unlikely that sanctions would be used as a lever to increase the generic prescribing rate.

1.4 The development of generic prescribing in general practice

Prescribing by the generic or approved name is not a new phenomenon. Prior to the discovery of penicillin many medicines were identified and prescribed by their medicinal components and such products often became known by the name of their inventor. The marketing of medicines by proprietary or brand name did not become popular until after the second world war when innovation by the pharmaceutical industry and large scale manufacturing increased sharply. Brand names were seen as the key to securing prescribing loyalty.

1.4.1 Changes in generic prescribing rates

In 1947, just prior to the formation of the NHS, only 7% of prescriptions in general practice were written by the branded or proprietary name, accounting for

24% of prescribing costs (NIC). Ten years later, the Hinchliffe report (Ministry of Health, 1959), noted that this figure had risen to 48% of items, accounting for 70% of prescribing costs (NIC), and by 1983, the proportion of costs (NIC) for branded products had risen to 95% (Department of Health, 1994). Conversely, the proportion of prescriptions written by the generic name (class one and class two) had been declining since the formation of the NHS, and it was not until the introduction of the Limited List in 1985 that it began to rise. Such was the effect of the Limited List that the generic rate rose by 12% in the first year (from 23% to 35%), with the proportion of class one drugs (those prescribed and dispensed as generic) rising from 18% to 26%. Since then the overall generic prescribing rate (class one and class two prescriptions) has continued to rise steadily to 47% in 1993, whilst the proportion of class one prescriptions has only increased by 4% between 1987 and 1993 (to 38%). This smaller rise suggests that the rate of change in prescribing behaviour for class one products is reaching a plateau and that the major contribution to continued increases in the generic prescribing rate is derived from drugs which have no generic equivalent.

1.4.2 Responses to reporting the generic prescribing rate

The changes in the prescribing environment described in 'Improving Prescribing' coincides with a national generic rate increase of 10% in less than four years. Four percent of this change occurred between March 1993 and March 1994 when the national level reached 50%. PACT data was designed to encourage comparison with others, but presented to encourage comparison with the local 'average'. It is therefore highly likely that the reporting of practice generic rates against the FHSA average was perceived by many to suggest that practices with lower than average rates should increase them. Over this same period the average generic rate for FHSAs increased at varying rates. Factors that may have contributed to this variation include local differences in baselines, priority attributed to promoting generics and resources available for prescribing intervention.

1.5 Discussion and Conclusions

The reviews and reforms outlined above illustrate a long standing awareness of the cost burden of prescribing medicines on the health service as well as a reticence to introduce restrictions on prescribing and/or clinical freedom. Although talked about for many years, the eventual introduction of a limited prescribing list in 1985 took many, including the drug industry, by surprise. The scheme demonstrated substantial one-off savings by encouraging more generic prescribing, but may have been diluted to some extent through switches to more expensive, instead of cheaper alternatives as was intended.

The reforms introduced in *'Working for Patients'* (Department of Health, 1989) have served to focus the activity of those concerned with prescribing on a number of key targets. As a result, the generic prescribing rate has become a targeted measure of prescribing performance and, as with most performance measures, it has its limitations in this respect.

Although some central support is provided for those charged with monitoring and influencing prescribing within FHSAs, there is a strong tendency to undertake activity in areas where performance targets have been set nationally. This sequence of events favours short term gains and has a tendency to remove the focus from systematic review of existing knowledge. However, such knowledge could inform the planning and development of long term strategies to influence prescribing behaviour and hence make more effective use of limited resources.

Weaknesses and limitations in any performance indicator are important considerations when set against the resources invested in managing change. It is therefore important to consider these issues in relation to prescribing targets and to consider the appropriateness of their wholesale and often unchallenged pursuit. Generic prescribing is no exception.

CHAPTER 2

MEASURES AND PATTERNS OF PRESCRIBING BEHAVIOUR

Summary

After describing the general measures that are employed in PACT data to measure prescribing activity, this chapter focuses specifically on those relating to generic prescribing activity. The derivation of the measure for generic prescribing rate is considered in detail, as are its weaknesses and limitations as an economic performance indicator. Historical and recent generic prescribing trends in general practice as well as studies described in the literature are reviewed to provide a background to generic prescribing behaviour over the last decade, and in particular the relationship with government initiatives.

A number of models that have been devised to describe influences on prescribing behaviour are then reviewed. Many of these models relate to specific stages within the prescribing cycle but one model, described by Raisch, provides a more holistic overview of the prescribing process. This particular model has then been adopted to explore the evidence for the influence of a number of different factors on generic prescribing. Where there has been little investigation in primary care settings, parallels are drawn with studies undertaken in hospital, bearing in mind differences between the two environments. From this review some of the areas requiring further investigation are highlighted and the aims of this thesis are stated. Four study objectives are then listed.

2.1 Prescribing analysis and costs - PACT data

Prescribing data is collated and published by the Prescription Pricing Authority (PPA) from the information extracted from prescriptions submitted by pharmacists for pricing and payment purposes. Using the PPA's computerised data processing facility work began in 1987 on using the information to provide regular and comprehensive feedback to GPs on their prescribing behaviour and costs. The resulting format, known as **P**rescribing **A**nalysis and **C**os**T**s or PACT data, was piloted in 1988 and released to GPs in England in 1989.

The British National Formulary (BNF) classification (e.g. BNF, March 1995) is the index used to collate PACT data. Drugs which have diverse therapeutic uses and are included in several BNF chapters are assigned to one category. This is a logical approach for a database that does not link prescription with diagnosis and patient details. Although PACT is presented in chapter order, detailed information on specific sections, sub-sections and drugs are selected on the basis of cost.

The cost used is the Net Ingredient Cost (NIC), set by the Government and published monthly in the Drug Tariff (e.g. Drug Tariff, April 1995) and excludes the costs of dispensing, which can vary slightly according to where it is dispensed. The NIC is used to compare prescribing costs between practices using a demographically weighted representation of the practice list, the prescribing unit (see below).

Between 1990 and 1994 PACT was presented to GPs and FHSAs at three increasingly detailed levels (appendices 1 to 3). Level one provided a summary of total practice costs and number of prescriptions (items) compared with the FHSA average, together with similar information for the six, nationally, most expensive BNF chapters. Level two provided information for all BNF chapters, and included selected products from the six chapters identified in level one. Practices or individual GPs with total costs of over 25% above the FHSA average or over 75% above the FHSA average in any one of the six chapters automatically received level

two reports, although these were also available on request. From August 1994 level one was dropped and level two redesigned so that all practices received the same basic information (appendix 4).

Level three continues to provide a summary of the cost and volume of every prescription dispensed by product, according to the BNF classification and is available on request for individual doctors, practices, and FHSAs.

PACT data provided, for the first time, an opportunity for FPCs/FHSAs to review recent prescribing activities and study differences in prescribing patterns between GPs. With a lead time of only three months, it provided relatively fast feedback to GPs on aspects of their prescribing behaviour and associated costs.

2.1.1 Prescribing Units

A number of other practice measures were incorporated into PACT data to facilitate inter-practice comparisons. The most important of these, the prescribing unit (PU), is a weighted representation of list size accounting for demographic differences between practices. A weighting of 3 was adopted within PACT for all patients over 65 years to convert to PU's which were then used as a denominator to compare prescribing costs between practices of different sizes (NIC/PU).

However there was some concern that the number of items prescribed for those aged over 75 years was even higher than for those over 65, and prescribing budgets, or amounts, based on prescribing units would not reflect patient needs in practices with very high proportions of patients over 75. Prescribing rates also differ significantly between sexes in certain age bands. To address this, the Leeds Prescribing Research Unit created a new weighting system to reflect age, sex, and temporary residents. Known as the ASTRO-PU, this was subsequently accepted as one of several factors on which to set indicative prescribing amounts. However ASTRO-PUs do not feature in PACT data, and in urban areas they are difficult to calculate where practices have registered patients who reside in a different FHSA

from that of the practice location. This situation, known as cross boundary flow, is exacerbated further where a practice's catchment area covers two or three FHSA areas.

2.1.2 Number of items

The number of items prescribed is used as a practice measure to compare prescribing costs and activity in PACT data (cost per item, and items per prescribing unit). The number of items represents the number of individual drugs prescribed and dispensed and is sensitive to the duration over which the prescription is written. Since different GPs prescribe the same drug for different durations the measure is not directly comparable between doctors or practices. This can be demonstrated as follows: GP 'A' writes a prescription for one month's treatment of atenolol 100mg tablets once a day, and this is repeated for two further months. In this case three prescriptions (items) generate 84 tablets. GP 'B' writes one prescription for atenolol 100mg once a day for three months. In this case one prescription (item) generates 84 tablets. So whilst both GPs have prescribed the same amount of drug, at the same net ingredient cost (NIC), PACT data will have recorded three items for GP 'A', and one item for GP 'B' and the cost per item will be three times less for GP 'A' than for GP 'B'. The item is therefore a poor inter-practice comparator, unless differences in prescribing quantities are known, and remain stable for each prescriber over the period used for comparison.

2.1.3 The generic rate

PACT Level one originally compared the practice and FHSA generic prescribing rate. When it was discontinued, the rates were then included in the new Level two reports. Generic rates continued to be listed quarterly for all practices in the summary prescribing statistics known as PD2 reports which pre-dated PACT data. Although Level three provides a complete listing of drugs dispensed by quantity, frequency and total cost, the total volume and cost of prescriptions for individual products is not included. This presents a problem for FHSAs wishing to use the

data to monitor prescribing patterns of specific drugs. The problem is not entirely overcome using on-line PACT data (PACTLINE). FHSAs down load PACT data monthly from the PPA, storing up to thirteen months data at any one time. The data, including the generic rate, is available for each BNF chapter and section, but rates for sub-sections, drug entities or products are not. Despite this limitation, advisers are able to view general prescribing trends for each practice with ease. Scanning of trends can be used to identify significant variations from the FHSA average, and indicate parts of Level three data to target in more detail. The graphs generated by PACTLINE are of a suitable quality to present to GPs as illustrated in the appendix 5.

2.2 Weaknesses of the generic rate as a performance indicator

PACT data was developed in 1988 to provide GPs with feedback on their prescribing behaviour, but it was subsequently suggested by Harris, Heywood and Clayden (1990), that the data alone were poor indicators of prescribing performance. Shortly after the introduction of PACT to general practitioners in England, FHSAs were required to report to the Regional Health Authority a number of prescribing indicators from PACT data including the generic prescribing rate, despite the very limited amount known about their relationship with prescribing outcome, and some of the limitations demonstrated in section 2.1. The generic prescribing rate recorded in PACT data until 1994 measured the percentage of *items* prescribed by the generic name and reflects prescribing behaviour. This measure includes both branded products that are still under patent (but have been prescribed by their generic name), as well as products no longer under patent that may be available in generic form. Data for these two groups is also collected separately; for the purposes of Department of Health's Prescription Cost Analysis system products prescribed and dispensed by the generic name are classified as Class One products, whilst products prescribed by the generic name but only available under patent (and therefore dispensed as branded) are classified as Class Two products (Department of Health, 1991). Whilst the respective prescribing rates for Class One and Class Two products have been available for many years only Class One products were presented in PACT data until 1994.

Between 1991 and 1993, the proportion of generic prescriptions rose from 41% to 47%. In 1993, the proportion of class two drugs alone rose by 3% (to 9%), accounting for a rise of 8% in total NIC (to 21%). However, whilst the generic rate for the much larger proportion of class one drugs also rose by 3% (to 38%) this accounted for a reduced proportion of the total NIC than before (14% to 12%) (Department of Health, 1994). This example demonstrates that the relationship between generic rate and economic performance is not the straight forward one that is sometimes suggested and that it is in fact quite complex.

2.2.1 Behavioural measure of generic prescribing

Although the generic rate is an accurate measure of prescribing behaviour as shown above it does not measure cost effectiveness and should not be considered as a performance indicator of the latter. The extent to which it is unsuitable in this respect is demonstrated in more detail by consideration of ways in which prescribing behaviour can unintentionally or intentionally cause increases in generic rate without increasing the amount of generic dispensing or cost effectiveness of prescribing. Changes in prescribing patterns that produce this effect occur when there is an increase in the proportion of prescriptions are written for class two drugs using the generic name in preference to the branded name. In this way a practice could potentially have a generic rate of over 60% with only a very small proportion of prescriptions being dispensed as generic products. For example a small number of frequently prescribed patented drugs can be prescribed using the generic name in preference to the branded name and the practice generic rate will increase.

The manipulation of generic prescribing rates in this way is not easy to detect amongst practices except through the manual scrutiny of individual practice data. The potential to manipulate the rate challenges the assumption that all practices with high generic rates are cost conscious, or cost effective. The lack of a quantifiable measure or indicator of the extent to which a practice is embracing the economic advantages of particular generic products is a shortcoming of the system. This is of greater concern given the pressure to consider measures, such as the generic rate, as performance indicators within the budget setting process. If savings are to be identified, encouraged and realised from greater use of generic products then it is desirable to use measures that reflect this at the practice, FHSA, and regional level.

2.2.2 Economic measure of generic usage

Since the total quantity of each product prescribed is not given in PACT data, the potential cost saving from increasing the proportion of 'real' generic prescribing cannot easily be calculated. In the Drugs and Therapeutics Bulletin (1987a) it was estimated that the potential savings to the country from generic substitution could be in excess of £100 million, but the actual amount has never been fully identified at regional, FHSA or practice level. As a consequence, an analysis of cost effectiveness of different strategies to achieve generic savings cannot be measured except at the national level, where access to the PPA database could be gained on a regular basis.

2.3 Models of influences on prescribing behaviour

Annual prescribing data and comparisons of aggregated prescribing patterns show that large variations exist between Regions and FHSAs. Using linear regression analysis it has been shown that in the majority of areas, a large proportion of the variation can be explained by the proportion of permanent sick as recorded by Office of Population Census and Surveys (Leeds Prescribing Research Unit, November 1993). This factor overshadows the effects of unemployment, deprivation and affluence as well as other variables that contribute to the explanation of variation in prescribing rates and costs. Although all these factors generally vary less between smaller geographical areas such as practices, practice prescribing variations are of an even greater magnitude than FHSA variations, suggesting that other local factors contribute to prescribing variation at this level. It might therefore be anticipated that resources committed to changing generic prescribing behaviour, and the strategies adopted will reflect what is already known about influencing prescribing behaviour.

In 1974 Hemminki undertook a review of the literature on factors that influence prescribing and described two groups of influences distinguished by their mechanisms and speed of outcome: Firstly, some studies have considered the association between specific practice factors and prescribing patterns, although, despite their suitability, the approaches adopted have rarely reflected prescribing models that have been proposed over the last two decades. Miller (1974), Lilja (1976), Segal and Hepler (1982), Plumridge (1984), Raisch (1990), Denig and Haaijer-Ruskamp (1992), and Bradley (1991) have all described the complex relationship of factors and decisions associated with prescribing outcome. Secondly, studies designed to influence generic prescribing behaviour have, for the most part, concentrated on the use of well rehearsed educational strategies, and have rarely considered the effect of factors that have been shown to influence other prescribing or practice behaviours. The prescribing decision models proposed by the authors above are now considered in more detail before examining the issues that might be associated with inter-practice differences in generic prescribing patterns.

Hemminki (1974) found that doctor characteristics that had been studied were too varied for meaningful inter-study comparison. A number of other factors were however more accessible to comparison including education; advertising; colleagues; control and regulation measures; and demands from patients and society. Hemminki concluded that the evidence in the literature supporting the influence of advertising on prescribing patterns was strong but in the case of other factors e.g. duration and frequency of consultation, the evidence was conflicting. Hemminki considered that factors such as advertising and education, as well as administrative measures, were open to modification and likely to deliver relatively prompt improvement in prescribing habits. However she concluded that patient and practice factors were much less easy to modify.

Miller (1974) also reviewed studies of prescribing habits of doctors, concentrating on the complex process of drug adoption. A prescribing model was proposed to describe the process that included doctor profiling, practice characteristics and communication source preference, as well as the doctors perceptions and rewards derived from prescribing new drugs. From this, Miller concluded that there was an opportunity to influence prescribing, using a non-drug company source briefed to reduce excessive and ill-informed prescribing. Clinical pharmacists were identified as well placed to fulfil this role.

Lilja (1976) explored the use of habitual and non-habitual drug choices, attributing non-habitual processes to the use of new drugs. Using two theoretical situations Lilja tested the relative weights attributed to curing effect, side effects and cost by Swedish doctors working in primary care. The study design aimed to invoke non-habitual processes of drug choice, and weightings were assigned to reflect the doctors disposition to each of the drugs offered for selection. Although all doctors gave highest weight to the curing effect, the importance of cost and side effects were given greater weight by younger doctors. The dispositions were compared with those of an expert panel. Doctors with less consultations compared more favourably with the experts dispositions than those with higher consultation rates.

Lilja also concluded that giving information on costs to doctors was inefficient, due to the low weight attributed to this in the decision process.

Segal and Hepler (1982) considered how prescriber's beliefs and values could predict drug choice. Using a prescribing model adapted from Vroom's decision model, they attached values to the decision pathway. The model, when tested amongst 50 family doctors in the USA, was found to correctly predict 72% of treatments chosen, a significantly greater proportion than predicted by chance. Doctors were found to attribute values in the following descending order: Control (efficacy), compliance, side effects (safety), cost, demand and criticism, confirming some of Lilja's findings. The authors suggested that the key to influencing doctors successfully was knowledge of the outcomes that they valued and that clinical pharmacists could encourage the doctor to divulge this. This practice, known as disclosure, is widely practised by drug company representatives.

In 1984, Plumridge reviewed intervention strategies used to modify hospital prescribing behaviour under four headings; re-educative, persuasive, facilitative; power or combined strategies. Re-educative strategies can be used to increase awareness and dispel myths. Evidence suggests that increasing knowledge alone does not result in significant clinical improvements in care and that motivation to change in the form of intrinsic or internal rewards may also be needed (Sibley et al., 1982). Applying this principle to generic prescribing, where improvements in clinical care cannot readily be demonstrated, providing feedback on the generic rate alone may not be a powerful motivator. Providing feedback on specific savings that have been achieved, and allowing these savings to be spent on other areas of clinical activity, or quality assurance may however motivate some doctors. Incentive schemes, as well as offering financial incentives to practices may offer intrinsic rewards to individual prescribers whose practice or status is improved by, for example, access to new equipment.

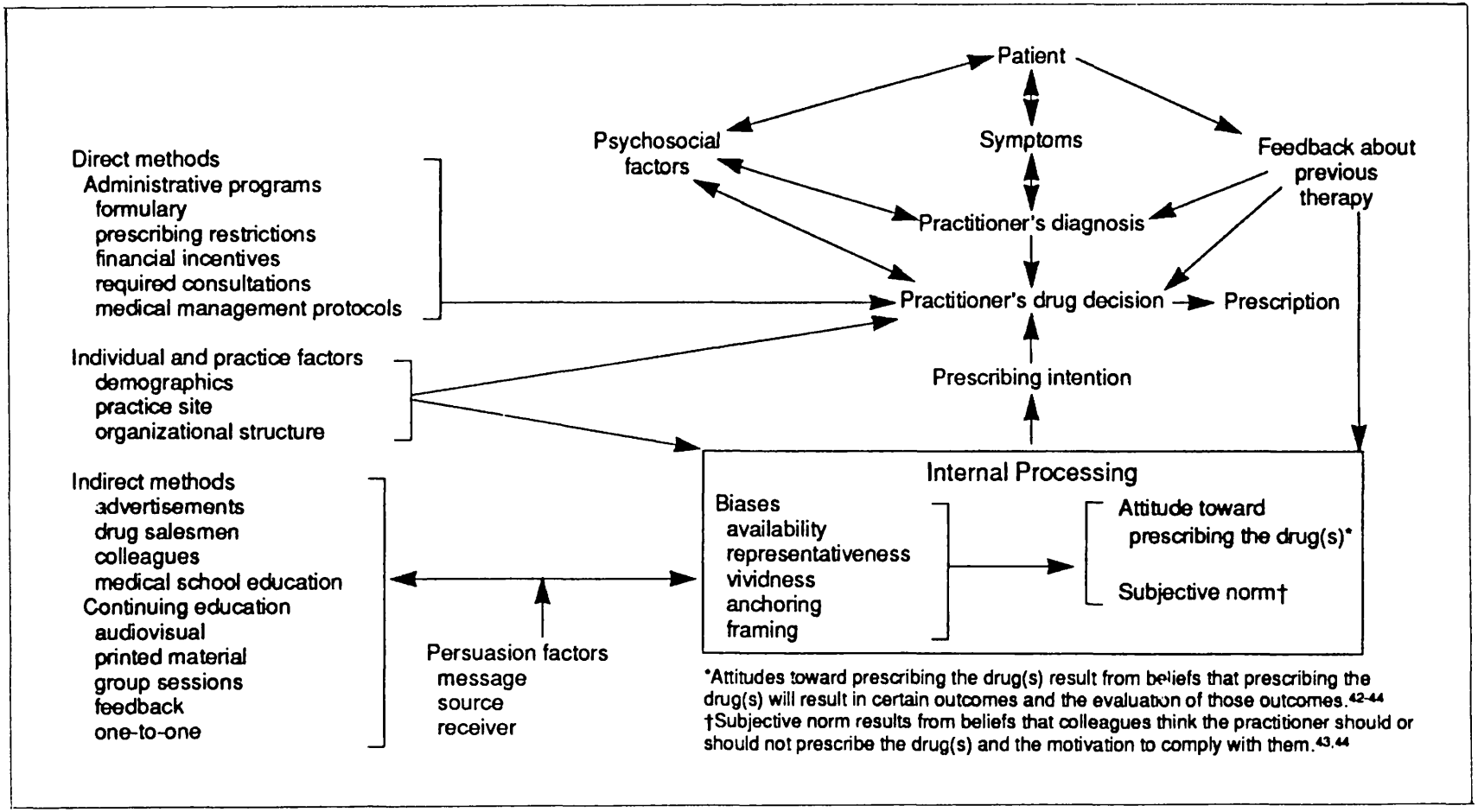


Figure 2.1 A model of methods for influencing prescribing
(Raisch, 1990: reproduced with kind permission from the Editor, The Annals of Pharmacotherapy)

Raisch (1990), using theories of persuasion and human inference, described a model of prescribing embracing both competing and complementary factors. These factors can exert indirect or direct influence on prescribing intentions and decisions respectively (figure 2.1). Factors exerting indirect effects include advertising, colleagues and education, whilst factors exerting direct effects are administrative and included formularies, prescribing restrictions and financial incentives. Factors influencing indirectly effect the internal processing of information referred to by Plumridge (1984). Individual and practice factors were considered to exert both direct and indirect influences, as were patients when providing feedback on current and previous therapy.

Raisch reviewed controlled studies of educational initiatives to influence prescribing, although only one of these related specifically to generic prescribing. He concluded that educational programs were likely to produce long-term changes in prescribing behaviour, but that such programs needed to be repeated to maintain these changes. The model as a whole was proposed as a tool to examine and evaluate the many different factors that influence prescribing behaviour, and to support the development of programs designed specifically for this purpose.

Denig and Haaijer-Ruskamp (1992) considered the generation of a list of options, described as the 'evoked set'[1], and the way in which doctors select drugs for individual patients. The authors differentiated between active prescribing decisions, and habitual decisions, using either reasoned or unreasoned rules. They put forward an argument for establishing the process by which a prescriber makes a decision, to aid identification of the most effective intervention strategy to change that particular doctor's prescribing behaviour. The relationship between decision mechanism and influencing strategy was demonstrated, and they concluded that the interventions commonly adopted focused almost exclusively on improving knowledge about treatments, without giving due regard to their inclusion within the prescriber's

[1] Denig et al. use the term 'evoked set' to describe the generation and retention of a limited set of treatment options by an individual doctor. The set is evoked in response to a diagnosis and can contain both drug and non-drug treatments.

'evoked set', or whether the prescriber is likely to engage in active decision making when the treatment might next be indicated. Addressing Lilja's conclusion that prescriber's attribute a low ranking to cost within their decision process, Denig and Haaijer-Ruskamp suggested that this was a more important factor if the prescriber had a tendency to select expensive preparations. If the prescriber has little awareness of the costs of treatment, then presentation of this information will have little effect unless the value that they attach to prescribing costs is increased, perhaps by relating it to additional benefits that might be purchased.

Bradley (1991), undertook a thorough review of the literature regarding studies of decision making and prescribing patterns. He considered these studies under three headings: Whether or not to prescribe a drug; which drug to prescribe; and drug adoption and relinquishment from the prescribers repertoire. He found that studies in the first, and perhaps most fundamental area, were uncommon whilst studies in the third area were more advanced. Since all these areas are linked to the prescribing outcome, he concluded that there was a need to understand the decision process more fully if rational interventions were to be designed.

2.4 Sources of influence on prescribing decisions

Using Raisch's model factors that influence generic prescribing behaviour can be explored according to the nature of the influence. In this section evidence for this is considered under three headings: firstly for indirect methods, secondly for direct methods and thirdly for factors that may exert their influence through either direct or indirect pathways. However, research in the primary care environment is limited, and where parallels can be drawn evidence from studies in the hospital environment is considered.

2.4.1 Indirect methods

Raisch (1990) and Denig and Haaijer-Ruskamp (1992) both reviewed the literature on the internal processes involved in decision making and considered the ways in which inputs, in terms of information, were processed to produce a particular prescribing intention. Raisch considered the attributes or biases of indirectly acting methods, which themselves are subject to constraints according to the message, source and receiver. These biases can shape both the attitude of the prescriber towards prescribing a particular drug, and their perception of what might be expected by their peers.

2.4.1.1 Medical education

The use of generic names is generally considered to be advantageous within undergraduate and postgraduate teaching institutions. However, in the USA a study of post graduate residents (Shulkin et al., 1992) found that 84% did not discriminate between generic and branded names of drugs for over half of their prescriptions, leaving the pharmacist free to make generic product selections, according to certain regulations. The majority believed that there was little difference between branded and generic drugs. The generic debate received little coverage in medical education, and as residents the doctors may have had relatively little exposure to drug company promotion marketing. In the UK exposure to

generic prescribing policies during training increased in the mid-70's when prescribing policies were introduced into hospitals and therapeutics into medical education. However no studies have sought to establish differences in attitudes to generics amongst GPs who qualified before or after this period.

Bower et al. (1987) conducted a postal survey to measure any associations between generic name recognition, information sources, prescribing attitudes and behaviour within primary care in Kansas City. Using two lists of ten drug names, one of generics and one of branded, doctors were asked to indicate which drugs that they recognised. Recognition of all generic names decreased with length of time since graduation, and whilst recognition of brand names also decreased it did not diminish to the same extent. Younger, more recently qualified doctors reported greater confidence in prescribing generic drugs and reported a higher incidence of generic prescribing, although this was not independently assessed. It was not determined whether the differences reflected training at medical school, or the result of ageing and/or experience. However, Hemminki's review found conclusive evidence that advertising by drug companies strongly influences prescribing behaviour, and it may be exposure to this factor over a period of time that is the causal factor.

Despite universal adoption of generic names by reputable medical and scientific journals, no study appears to have been undertaken to compare the prevalence of generic prescribing between teaching and non-teaching hospitals, or between training and non-training practices in primary care.

2.4.1.2 Continuing education

Hemminki (1974) concluded in her review that further education has a positive influence on the quality of prescribing. She suggested that it could be modified by administrative measures to produce prompt improvements. However a decade later, in the UK, the Greenfield report (Department of Health and Social Security, 1983) identified a divergence in the provision of continuing education between hospital

and general practice, with no obligation to include therapeutics at all within general practice vocational training.

Avorn and Soumerai (1983), having measured the real, rather than perceived, effect of commercial sources of information on doctors beliefs concluded that there was a need to find new ways of conveying scientifically based information to doctors. Three drugs were selected for educational intervention and accurate data on cost and volume obtained from Medicaid databases. This data was used to select only those practices with moderate to high prescribing rates for the three drugs under investigation. The study revealed that educational visits from a clinical pharmacist, as proposed by Miller (1974), together with unbiased drug literature, produced significant changes in prescribing behaviour compared with practices that received the literature only, or no intervention at all. Patient information was also provided in the full intervention and literature only groups.

2.4.1.3 Feedback

Avorn and Soumerai (1983) demonstrated that the provision of feedback without accompanying educational support, is less effective than when both resources are provided. However, face-to-face interventions together with feedback may only be cost effective if such activities are closely targeted according to the potential to make savings. Before the introduction of PACT data in England, feedback on prescribing patterns was only given to GPs whose prescribing volume or costs were excessive, and in this respect was targeted at those practices thought to have the greatest savings potential. For selected practices the feedback was, of necessity, very selective and due to constraints of the system, quite out of date. The majority of GPs were therefore unaware of their prescribing patterns and the associated costs.

Ryan, Yule, Bond and Taylor (1990) examined the knowledge of GPs in Scotland in relation to drug costs prior to the introduction of Scottish Prescribing Analysis (SPA) data. Overall they found that doctors awareness of product costs were poor

with some doctors being unaware that branded products of well known drugs were more expensive than their generic equivalents. A small number of doctors estimated the cost of generic products to be higher than branded ones. This supports the findings of both Lilja (1976) and Segal and Hepler (1982), that GPs attribute low importance to costs.

Ryan et al.'s study was extended to England where, despite the availability of PACT data for over a year, estimates of price differentials between branded and generic products were significantly less accurate ($p<0.01$) (Ryan, Yule, Bond, and Taylor 1992). GPs in England, whilst identifying the cost of ibuprofen more accurately than their Scottish counterparts, similar proportions (11% versus 14%) failed to identify that Brufen was more expensive. Even greater lack of awareness of branded and generic cost differentials were found for Penbritin and it's generic equivalent ampicillin (22% versus 13%). The authors concluded that despite receiving prescribing information on a regular basis GPs remain relatively unaware of specific drug costs, although GPs in England were more likely to know, approximately, how their prescribing costs compared with other practices throughout their FHSA.

In addition to PACT data, many FHSAs have provided feedback of potential generic savings of a small range of drugs using bulletins and newsletters. Although these may raise awareness of costs, the calculation of savings are often crude, and do not relate to individual practices. Although these may be helpful in changing the prescribing behaviour of compliant practices, they are unlikely to influence practices that have little interest in changing their prescribing behaviour. Although the manual calculation of potential generic savings is a time consuming and laborious activity, actual savings are rarely monitored, and the cost effectiveness of providing information on potential generic savings via bulletins has not been properly evaluated.

2.4.1.4 Promotional Activity

Many hospitals have policies limiting promotional activity by drug companies and requiring educational meetings to focus on the proven efficacy of the drug, thereby reducing the doctor's exposure to marketing tools such as brand names and samples. In general practice individual GPs or practices may chose to develop their own policy, although many continue to see drug representatives on a regular basis. Research has shown that this type of encounter is particularly effective in promoting the companies message regarding the drug, and that this is often retained in preference to more scientifically based messages sent via other routes (Avorn et al., 1982).

Greenwood (1988) studied the impact of information sources, and particular medical representatives, on GP prescribing patterns. The study design elicited similar information to that gathered by the Sainsbury report (Ministry of Health, 1967) and included methods also utilised by Avorn et. al. (1982) to determine GPs retention of marketing messages against those supported by published research. Despite professional sources being generally rated more highly in the evaluative stage of drug adoption, sources identified in relation to recently adopted products, identified the drug company representative more frequently than any other information source.

Adopting some of the principles established by Avorn et al., in the 1980s, a study was carried out in the UK in 1987. However, in preference to the educational initiative advocated by Avorn and colleagues the UK study adopted a more commercial approach similar to that used by drug companies to influence prescribing (Newton-Syms et al., 1988). Generic prescribing was one of four promotional campaigns run over a one month period, but despite increasing the generic prescribing rate generally in the study group over that of the control group savings were not great. The generic message was general and, in one example, the availability of a long acting product with no generic equivalent demonstrated the need for more product focused campaigns. Lack of access to cost and volume

changes for individual products impeded the calculation of accurate pre and post cost savings potential at practice level.

The only reference to pharmaceutical advice within *Improving Prescribing* (Department of Health, 1990) suggested that it may be used to reinforce confidence in generic products. With access to PACT data, and the employment of Medical Advisers, Regions and FHSAs were in a position to promote generic prescribing. However, the message of downward pressure on costs prevailed, and early initiatives revolved around providing crude calculations of cost savings for a small range of drugs in bulletins, with little prospect of evaluation. It was some years before patient awareness campaigns were launched via information leaflets and surgery posters, together with promotions aimed at doctors in the form of 'give-away' pads and pens. As with the majority of activities undertaken by prescribing advisers, there have been few studies and little objective assessment of the effect of such activities on prescribing behaviour or the attitudes of patients and doctors.

2.4.1.5 Attitudes

In an attempt to overcome inaccuracies associated with self reporting studies of prescribing behaviour, Avorn et al. (1982) compared perceived sources of influence on doctors in general practice with actual sources by considering the stated beliefs of doctors regarding the efficacy of two commonly prescribed medicines. Doubts over the relative efficacy of the two medicines had been recorded in the scientific literature. Doctors who held commercial beliefs regarding propoxyphene did not differ from their 'non-commercial' colleagues in their reported dependence on commercial sources of information. However, doctors who held commercial beliefs regarding a cerebral vasodilator did report a higher reliance on commercial sources of information. In both cases doctors under-estimated the extent to which their beliefs reflected commercial sources.

Indirect methods of influence exert their effect via internal processes, which determine prescribing intention (Raisch, 1990). Biases and beliefs of the doctor

regarding the outcome of a drug treatment shapes the attitude towards prescribing a particular drug. Stolley et al. (1972) rated the appropriateness of prescribing using an expert panel and recorded levels of antibiotic prescribing. They found that less appropriate prescribers expressed a general distrust of generic drugs, whilst more appropriate prescribers believed the efficacy of generic and branded medicines to be equal.

Schwartz, Soumerai and Avorn (1989) found that doctors were most likely to be motivated to select a particular drug in response to patient demand, whilst the intentional desire to produce a placebo effect accounted for nearly a quarter of all selections in three therapeutic categories. Prescriber's attitude to the efficacy of a particular drug also contributed strongly to the selection, regardless of whether their attitude reflected scientific or promotional views on efficacy.

Bradley (1992) also studied the attitude of GPs by analysing situations where they had experienced discomfort when making prescribing decisions. This study revealed a wide range of reasons for both the decision taken and the discomfort felt. Discomfort experienced by the doctors was attributed in many cases to different aspects of the patient/doctor relationship ie. social rather than clinical factors. He also found that logistical problems, including lack of time, lack of information and difficulties using the computer, also contributed to discomfort associated with prescribing. He concluded that successful prescribing interventions might give greater weight to addressing logistical and social influences than currently prevails.

2.4.1.6 Quality

Prescribing by the generic name is considered by some to be 'good professional practice' (Medicines Resource Centre, 1991). However there is no evidence to suggest that prescribing generic drugs delivers better quality treatment than prescribing branded drugs. Although there have been isolated incidents of poor quality generics, these are no more frequent than reports of poor quality or

counterfeit branded products and many anecdotal reports of poor quality generics are never substantiated (Drugs and Therapeutics Bulletin, 1987b).

The medical press has hosted much debate and discussion on the subject of the quality of generic products over the decades from both supporters and dissenters. In 1991 an editorial suggested that the main problem for the generic case was the absence of comparative data from properly constructed studies (Smith, 1991). Independent testing of generic drugs dispensed by community pharmacists was proposed in the Drugs and Therapeutics Bulletin (1987b) as a means of providing additional quality assurance to prescribers and the public. But despite small scale attempts to provide such assessments along the lines of that provided for the hospital service (Regional Quality Control Department, 1993) this objective has not received Government support and still remains largely unfulfilled.

When the British Generic Manufacturers Association (BGMA) was formed in 1989 it produced its own code of practice (Smith, 1989). This code addressed a number of concerns including the provision of medical information, integrity of supply chain, product identification, uniformity of presentation, and some random testing. Whilst the requirements of this code might have seemed daunting to some companies, it presented little problem for the majority of UK generic manufacturers who were, in the main, subsidiaries of multinational companies manufacturing branded drug products.

Despite the formation of the BGMA and the introduction of a code of practice, the issue of continuity in appearance, vehicles and other excipients within a product, and patient confidence has never been properly addressed and remains a concern to those involved in prescribing drugs.

As performance targets are set to encourage further increases in the generic prescribing rate, regardless of savings, there is a danger that some GPs may fail to make allowances for drugs where a bioavailability difference between products is known to exist. Furthermore, if a blanket generic policy is introduced into a

practice and enforced diligently by practice staff, there is more chance of failing to observe and respond to patients who will merely fail to comply if they loose confidence in the medicine that is being prescribed for them. In both these situations savings to the practice drugs bill may have been tiny, but the cost to the NHS through treatment failure, potentially large. The way in which GPs are encouraged to prescribe generic drugs may therefore have unforseen longer term implications for cost and quality of treatment than is at first apparent.

2.4.2 Direct methods

2.4.2.1 Formulary

Several strategies have been pursued in hospitals to encourage generic prescribing including formularies and generic substitution policies, the latter usually being a component of the former. The implementation of control mechanisms may be easier in the controlled hospital environment than in primary care. Staff changes are frequent, constant intervention and education is accepted, and patient compliance is regulated. Endorsement of generic names on prescription sheets is an example of how a policy of continuous intervention maintains awareness of generic names in a ward environment.

A survey of UK hospital derived formularies (Ridley, 1986) found that over 50% of the respondents had a local district-wide formulary. No comparable figures are available for general practice, where the resources and mechanisms required to create them are less available. Although a number of model formularies have been designed for use in general practice (e.g. Lothian, Northern Ireland) it is thought that the process is perhaps the most important factor in gaining ownership and use. In hospitals, one study showed that the impact of continuous intervention (feedback and promotion) on maintaining increases in the generic prescribing rate after the introduction of a formulary were lost one year after interventions strategies ceasing (Feely et al, 1990). The cost effectiveness of formularies was challenged by Bateson (1987), who suggested that the adoption of other prescribing strategies

such as generic dispensing and ward pharmacy services are as likely to generate similar savings.

Hazlet and Hu (1992) tried to disassociate the contribution made by a formulary from those made by other strategies in the USA. Using a theoretical modelling technique that included aspects of hospital workload and management as well as prescribing strategies and drug expenditure they were able to explain 24.6% of the observed variation in hospital drug costs per patient day. Individual contributions, between a well controlled formulary and therapeutic interchange, leading to lower drug costs could not be identified. In the UK therapeutic interchange (substitution) is not commonly practised.

2.4.2.2 Other control mechanisms

Other control mechanisms, as with formularies can be either voluntary or absolute. The introduction of the limited list in the UK, and similar restrictive lists under medical insurance schemes in some parts of the USA provide examples of absolute controls that can produce unintended prescribing responses. It is claimed that the introduction of a Limited List in the UK in 1985, generated savings of over £75 million. However, the restrictions were circumvented by some GPs who prescribed branded drugs on the list by their constituent ingredients. Of more concern is evidence from the USA which suggests that doctors, faced with restrictions on prescribing relatively harmless preparations for placebo effect that may be purchased over-the-counter, prescribe much more potent, but non-restricted products (Schwartz et al., 1989). One practice in Northern Ireland used its computerised prescribing system to compare prescribing in selected therapeutic groups both before and after the introduction of the Limited List (Irwin et al., 1986). Even accounting for seasonal variation, the authors found an increase in prescribing of penicillin accompanied a reduction in prescriptions for cough and cold remedies, many of which where included in the List. Results comparing similarly listed antacids and non-listed H_2 antagonists were difficult to interpret due to an extension to the product licence of the latter within the study period.

Voluntary administrative schemes, supported by educational initiatives may have more success. In Idaho state (USA) doctors authorise generic substitution by signing on a line indicating Product Selection Allowed (PSA) in preference to a line indicating Dispense as Written (DAW) thereby enabling them to continuing prescribing by the name most familiar to them. This administrative control measure, supported by an educational initiative, was studied by Erramouspe (1989) in an out-patient setting using a contracted pharmacy service. Educational sessions were used to promote selected generic drugs and deal with any queries relating to quality, bio-equivalence etc.. The results showed a significant increase in the post-study proportion of PSA endorsed scripts. For drugs specifically targeted there was a statistically significant increase in the use of the generic name or accepted abbreviation. The contracted pharmacy service might have increased the doctor's responsivity to the cost saving initiative although no control group was included for comparison. Although a similar administrative scheme was recommended for introduction into general practice in the UK by the Greenfield report (Department of Health and Social Security, 1983), it was not implemented.

2.4.2.3 Financial incentives

Until the introduction of the Indicative Prescribing Scheme (Department of Health, 1991), there was little incentive for GPs to be concerned with the costs incurred through prescribing. Fundholding practices were the first to receive financial incentives to focus on drug costs since any savings generated an the prescribing element of the budget could be spent on other activities.

In 1993 the effect of fundholding and the Indicative Prescribing Scheme on prescribing costs was studied by Bradlow and Coulter (1993). The generic rate for seven non-fundholding, non-dispensing practices remained the same after the introduction of the scheme, at 47%. Significant increases did occur in all fundholding practices sampled, with non-dispensing practices increasing their rate on average from 44.5% to 48.7%. Although dispensing fundholding practices even

greater increases, from 26.9% to 34.5% they remained at their pre-scheme position well below the level of all other practices in the study.

Budgets for all practices in the study were set using the same basic formula (adapted for fund holders), but savings were only generated by five of the eight fundholding practices (equally split between the dispensing and non-dispensing). The authors concluded that becoming a fundholding practice curbed increases in prescribing costs, although no attempt was made to assess the pre-study prescribing cost effectiveness of participating practices and it is possible that the fundholding practices were originally less cost effective than their non-fundholding counterparts. Causal links between fundholding, the scheme, generic prescribing and savings may have been established or rejected if the generic savings potential had been included as a dependent variable.

A study conducted by Morten-Jones and Pringle (1993) concluded that the main contributor to higher costs in dispensing practices, when compared to non-dispensing practices, was the lower use of generics. However, the explanatory effect was far greater for data aggregated at FHSA level. The authors concluded that individual prescribing philosophies and local practice factors contributed to this difference, supported by the finding that lower generic rates related to the practice's, as opposed to the patient's, dispensing status. The only other practice factors that were found to contribute to the difference was the proportion of elderly patients and the number of partners.

Two years after the introduction of the IPS, incentive schemes were introduced to enable non-fundholding practices to retain half of any prescribing savings that they generated from within their set allocation. A feature of many schemes were complex entry criteria and labour intensive monitoring. Tensions existed between improving prescribing through the introduction of quality markers, and the need to demonstrate cost savings from within an allocation that was, in most cases, significantly lower than anticipated out-turns. Whilst improving quality by reducing high levels of antibiotic prescribing might realise savings, these could be

overshadowed by increased costs resulting from better detection and treatment of asthma.

Although generic prescribing target rates were included for schemes within North Thames Region, practices were expected to highlight particular drugs which would realise savings. However, for monitoring purposes these could only be calculated manually from PACT level 3 practice data.

Bosanquet and Leese (1988) defined innovative practices as those with two out of three of the following resources: practice nurse, cost-rent scheme and vocational training scheme, although they were also found to have more partners, and be located in affluent areas. They found that innovative practices were most able to respond to recently introduced economic incentives.

2.4.3 Individual and practice factors

As highlighted at the start of this section, wide inter-practice variations in prescribing patterns are detected in relatively small geographical areas, suggesting that local factors contribute to the variation at this level. Before designing and embarking on initiatives to influence GPs to increase their generic prescribing rate, or indeed, make generic savings, it would be useful to consider existing evidence of relationships between individual and practice factors and prescribing behaviour. The model described by Raisch is now used to review the literature relating to generic prescribing and other practice behaviour, individual and practice factors. Unless apparent in studies undertaken, attempts to assign direct or indirect pathways of influence is not attempted.

2.4.3.1 Age of doctor

In a number of studies the age of the doctor has been included as an independent variable, however, some studies suggest that the years since medical qualification is more relevant to behaviour in general practice. Doctors who have qualified more

recently may recall their medical education more clearly, although they will have had less experience and fewer opportunities for further education than their colleagues who qualified many years before them. Lee, Draper and Weatherall (1965), found no significant difference in prescribing patterns according to medical school attended, although the percentage of prescriptions prescribed by the branded name in 1965 was much higher for younger GPs than for older ones. One possible explanation for this may lie in the sharp increase in marketing activity that accompanied the introduction of mass production from the 1950s, by which time most doctors over 40 years old would have completed their medical training. This is supported by findings reported to the Guillebaud Committee (Guillebaud, 1956) on prescribing patterns between 1949 and 1954 who noted the continuing growth in new products and use of proprietary preparations over this period. A later investigation by Forsyth (1963) also showed that branded prescribing was more frequent at that time than generic prescribing.

Soumerai and Avorn (1987) found that age, additional qualifications, and specialisation did not affect the prescribing response to an educational initiative carried out in a primary care setting.

In a well constructed trial measuring therapeutic decisions, Stolley et al. (1972) found younger doctors to have significantly higher 'expert ratings' of prescribing appropriateness than their older colleagues, although the difference was even more marked for those who had qualified most recently and those undertaking continuing education.

The average age of doctors in partnership may be influenced by one particular doctor, however, in practice, any extreme prescribing behaviour by one partner is more likely to be diluted and masked by the activity of the others. This is not so for doctors who work alone.

2.4.3.2 Number of partners

Using a measure of 'prescribing appropriateness', Stolley et al. found that doctors working within a group or partnership had significantly higher scores than those working alone. This study also found associations between more appropriate prescribing and the extent of therapeutic exchange between colleagues. McCarthy et al. (1992) found a significant positive correlation between the number of partners and number of different preparations prescribed, although they concluded that the larger drug repertoires used by larger practices were likely to increase the risk of side effects and interactions. Evidence that peer contact can influence attitudes to prescribing through group discussions of prescribing case studies was reported by Taylor (1979). This type of exchange may occur more frequently in partnerships however Soumerai and Avorn (1987) found that size of practice was not a predictor of physician prescribing change as a result of an educational initiative. From the perspective of economic rather than educational initiatives, Bosanquet and Leese (1988) concluded that the size of partnerships was one factor associated with an ability to respond to economic incentives, with larger partnerships being more able in this respect than smaller ones.

2.4.3.3 Patient/doctor ratio

Dunnel and Cartwright (1972) found an association between small list sizes and high reported prescribing rates. Howie et al. (1989), on the other hand, found that GPs with larger list sizes spent less time with each patient, but that these consultations were associated with higher prescribing rates of some drugs. Shorter consultation times may result in a higher use of habitual prescribing responses. Based on Denig and Haaijer-Ruskamp's description (1990), such habitual responses are unlikely to result in changes in prescribing behaviour even where the doctor has been encouraged to include a desired change within his/her 'evoked set' as this will only be accessed through a non-habitual decision process. Applying this concept a generic switch for a commonly prescribed antibiotic may be less likely to occur

than a switch to a more rarely prescribed drug, when non-habitual decision processes are evoked.

2.4.3.4 Demographics (percentage over 65)

Harris established that patients over 65 receive on average three times as many prescription items than those under 65. Purves and Edwards (1993) subsequently examined the effect of age and sex demography in much more detail and included both items and costs. They concluded that drug costs could not be extrapolated from the prescribing unit due to the differences in costs per item for different age/sex groups. They also found that the age/sex profile did not explain variations between practice prescribing patterns.

The Drugs and Therapeutics Bulletin recommended that branded name prescribing may be more suitable for elderly patients who identified their medicines by appearance (Drugs and Therapeutics Bulletin, 1987b). If this advice was followed practices with a higher proportion of patients over 65 years would be expected to have significantly lower generic prescribing rates than those with a lower elderly population. Conversely, treatments established in the 1960's or 70's for patients who are now over 65 are a) likely to have many generic equivalents and b) are more likely to have been initiated by a doctor who trained before brand names were heavily marketed.

Although some studies included measures of patient demography there is little evidence to suggest that this provides a substantial explanation of variation in prescribing patterns at practice level.

2.4.3.5 Deprivation

Forster and Frost (1991) included the Jarman measure of deprivation in their regression analysis but found that it did not significantly improve the power of the model to predict FHSA variation in prescribing rates and costs. Leeds Prescribing

unit found that combined factors representing deprivation did not add to the explanatory power of permanent sickness included in a multivariate model of prescribing costs across all FHSAs (Leeds Prescribing Research Unit, 1993).

2.4.3.6 Cost per prescribing unit

Since a number of frequently prescribed generic drugs cost less than their branded equivalents, practices with low generic rates are often expected to have high prescribing costs, whilst it is often assumed that practices with high rates will have low prescribing costs. Plotting prescribing costs per unit against generic rate Crompton (1991) demonstrated that this was not necessarily the case. From a visual inspection of a small sample of practices Crompton concluded that whilst a high generic rate was associated with low costs, a low generic rate was as likely amongst average cost practices as it was amongst high cost ones.

2.4.3.7 Location (district)

Joyce et al.(1967) compared prescribing in three towns. Doctors in one town had lower prescribing rates in all drug categories studied compared to doctors in the other two towns. Practices in the town associated with lower rates were also associated with the following distinctive characteristics: lower list sizes, less surgeries in their homes and less assistants. Apart from location, these characteristics correspond to those found in large, well resourced, practices today (Bosanquet & Leese, 1988).

2.4.3.8 Organisational structure: resources/computers

The resources of a practice may determine the services that can be offered and the way in which they are provided. Doctors working alone may have significantly less practice resources at their disposal than doctors working in partnerships. Partnerships may have, amongst other things, more opportunity for professional discussion and peer review; more equipment e.g. computers; less patients per

doctor; more support staff e.g. practice nurse, receptionists; more additional services e.g. diagnostic facilities, minor surgery; and more purpose built premises e.g. cost rent scheme. Leese and Bosanquet (1989) found an association between practice income and its effect on the behaviour and decisions taken by the practice. For example, the ability firstly to purchase, and secondly to use, computers to improve call/recall systems is likely to have a significant impact on the ability of a practice to meet screening and immunisation targets and therefore receive additional payments.

Although it was recognised in *Improving Prescribing* (Department of Health, 1990) that practice computerisation could improve the management of prescribing e.g. monitoring of repeats, the quality of the prescribing element on many of the software packages in 1992 was poor. A staged form of accreditation was only introduced into general practice in 1st April 1994 for newly purchased systems. All software packages have limitations, and those governing prescribing activity may affect the prescribing behaviour by offering restricted choices programmed either by the software producer, a drug company or the user (GP). The computer may therefore influence the prescribing intention or place constraints on the prescribing decision. Choices may be limited on an initial screen with access to greater choice if requested by the prescriber. For systems sponsored by drug companies this may include the presentation of branded drugs only on screen one, with a requirement to default for generic options. Although the GP can default to generic lists, according to Raisch's model, repeated presentation of information e.g brand names, is likely to bias the doctors attitude. The ease of accessing both generic and branded names on drug files varies according to the software source. Anecdotal evidence suggests that doctors would favour the use of a generic button to make quick conversions. In this way they can continue to prescribe by the names most familiar to them and do not have to amend their 'evoked set' (Denig et al., 1992).

2.4.3.9 Feedback from patients

Excipient in medicines were the subject of a review encapsulating many of the reservations raised by patients and some doctors in the popular consumer magazine 'Which?' (1991). Excipient i.e. everything other than the active drug component, are a combination of filler, colour, flavouring and preservatives etc. often accounting for more than 95% of the composition.

The Drugs and Therapeutics Bulletin (1987b) highlighted the fact that excipient may vary between generic and branded products and acknowledged that whilst they were intended to be inert and harmless, some patients experienced sensitivity to fillers such as wheat, cornstarch, lactose and colourants. For patients, continuity of appearance may also be an important factor. Patients may become confused or phobic about changes in the presentation of their medicine, whilst patients on multiple therapy may rely on appearance as an aid to compliance. Although the appearance of generic versions of the same drug differ between manufacturers, branded products are often subject to variation in presentation and packaging. The Drugs and Therapeutics Bulletin recommended that where patients identified their tablets by appearance, prescribing should be by the branded name.

In the hospital environment compliance is closely monitored and if necessary patient reassurance can be provided promptly. However, it is more difficult to provide such support for vulnerable patients in primary care, where regular use of one pharmacy cannot be assumed and medicines are frequently not seen until they are opened in the patient's home.

Access to independent quality assurance of products also differs significantly between the hospital and primary care environment. Despite the Drug and Therapeutics Bulletin recommendations for additional independent quality assurance of generic drugs dispensed in community pharmacies to enhance clinician and patient confidence this has not been forthcoming in most parts of the UK, and remains an issue for some GPs.

2.5 Multiple regression models

A number of prescribing studies have used multiple regression analysis to construct models containing the factors that make the greatest contribution towards explaining variation in prescribing cost or activity. Factors typically found to predict over 50% of variation in costs or prescribing rates at FHSA or Regional level include the age-sex profile, percentage of patients over 65, ratio of patients to doctor, and standardised mortality ratio. Within such studies the practice variables are often measured as ratios. This avoids small but significant results being overshadowed by the very large demographic variation that occurs between practices. Forster and Frost (1991), explained 51% of variation in prescription rates and 44% of the variation in costs using an age-sex profile, improving the model by the inclusion of standardised mortality ratio and the ratio of doctors to patients.

Baker and Klein (1991) explained 69% of regional variation in prescribing rates using standardised mortality ratios, GP to patient ratio, percentage of patients over 65 years, and number of ancillary staff per practice in the model. Whilst these studies have contributed to the debate on budget setting at FHSA and regional level, they do not address the greater challenge of identifying factors that provide explanations of the even larger inter-practice variations.

In Ryan et. al's. study (1990) multiple regression analysis showed little association between the accuracy of GP's cost estimates and their individual or practice characteristics such as year qualified, sex, number of further qualifications, location of practice and size of partnership.

In 1993, using ASTRO-PUs (weighted for age, sex and temporary residents), to account for variations in prescribing patterns, Leeds Prescribing unit were able to explain 62% of the variation in prescribing costs (NIC) per ASTRO-PU between FHSAs using the proportion of permanent sick taken from the 1991 census.

2.6 Discussion

The literature demonstrates that there are many factors that may influence prescribing patterns. Some studies have sought to describe these in terms of their ability to predict differences in doctors' prescribing patterns, whilst others have sought to demonstrate how some factors can be manipulated to achieve desired changes in prescribing behaviour. The effect of advertising, feedback and continuing education initiatives have received particular attention, although specific financial benefits of these have rarely been quantified. This is particularly true of generic prescribing, where cost savings have not routinely been measured at practice level and matched to inputs designed to change behaviour. This is perhaps surprising given the Governments own admission that cost saving is the main objective of promoting generic prescribing.

Plumridge considered the importance of including resources when determining the strategy to be adopted and concluded that whilst re-educative and persuasive strategies may be the most effective approach in the first instance to secure changes in the majority different strategies would be required to tackle the remaining minority. The national increase in the generic rate witnessed since the introduction of the Indicative Prescribing Scheme suggests that changes in the generic prescribing behaviour of a majority of prescribers in England have now been realised. However, it is also likely that considerable savings remain in a smaller number of practices, and that in total this sum remains substantial. If it was possible to quantify this on a regular basis at practice level, then Plumridge's recommendation to employ selective targeting, together with a facilitative approach to tackle this more resistant group of doctors would now be worth consideration.

The work of Soumerai and Avorn (1987) suggests that doctor's characteristics do not predict response to an educational initiative to influence prescribing behaviour. However, educational initiatives are only one method that may be employed to this end, and similar rigour has not been extended to the many other methods of influence that might be employed. Doctor, practice and administrative factors may

contribute to, or cause circumvention of, some of the traditional influencing pathways. Raisch's model suggests that a number of other factors have both direct and indirect influences on prescribing behaviour, and it is worth considering to what extent these a) predict the remaining generic savings potential of a practice and b) suggest benefits from other non-educational initiatives.

From the literature review, three steps are identified towards this goal: The first step is to measure practice generic prescribing behaviour in terms that relate to desired outcome ie potential cost savings, the second is to identify characteristics of practices with substantial generic savings potential (Raisch, 1990). The third is to highlight the diversity of strategies that could be adopted according to the goal. Objectives designed to fulfil two of the three steps described are below. The method of investigation using data from City and East London FHSA is described in Chapter Three. The third step is discussed in Chapter Five in light of the literature review and study findings.

2.7 Study aims and objectives

The overall aim of the study is to produce character profiles of practices with high and low generic prescribing savings potential. This information is then considered against potential strategies for maximising cost effectiveness in generic prescribing behaviour. Whilst generic prescribing may not offer any direct benefits to the patient, the money that can be realised from targeting generic prescribing may be used to address issues of quality assurance raised by both patients and doctors, and to fund new, and frequently costly, advances in drug treatment. However, since there is a cost implication of effecting changes in prescribing behaviour, the strategies adopted should cost less than the savings to be realised, and only be implemented when overall savings are substantial, and therapeutic equivalence is not in question.

Objectives:

1. To determine the limitations of the current generic prescribing measure as an indicator of cost effective prescribing behaviour.
2. To develop a repeatable measure of practice generic savings potential.
3. To examine the relationship between characteristics of the practice, patients and organisation and the generic savings potential.
4. To describe practice profiles that are associated with high or low generic savings potentials.

CHAPTER 3

METHOD

Summary

In 1991 the limitations of the current generic prescribing measure were of concern to City & East London FHSA, since GPs in the area were generally sceptical of the application of the prescribing measures contained within PACT data to their daily work.

Methods for fulfilling the three of the four study objectives are described in this chapter: To determine the limitations of the current generic prescribing measure as an indicator of cost effective prescribing behaviour; to develop a repeatable measure of practice generic savings potential (GSP); and to examine the relationship between characteristics of the practice, patients and organisation and the GSP.

In order to determine the limitations of the current generic prescribing measure as an indicator of cost effective prescribing (objective 1) and to derive a new measure of savings (objective 2), the method includes a description of the coding system used to derive prescribing statistics.

Selection of the dependent variables is described, together with data collection and preparation methods. A general description of the analytical strategy adopted is then given.

The fourth study objective, to describe practice profiles that are associated with high or low GSPs, is discussed in Chapter Five in light of the results described in Chapter Four.

3.1 Selection of Study Area

The FHSA chosen was City & East London FHSA. The author was employed by this authority for the duration of the study and therefore had access to practice and prescribing data, including PACT, as well as a knowledge of the local prescribing environment. As a result of the reviews in Chapters One and Two the study objectives were formulated in the latter. Although some statistical modelling has already been undertaken on variations at regional and Family Health Services Authority (FHSA) level, the objectives were designed specifically to address variation at practice level. For this reason data from practices within one FHSA was used for the analysis.

The generic prescribing rate in City and East London FHSA increased by only two percent, from 44% in 1990 (four percent higher than the national average) to 46% in 1994, (four percent lower than the national average). It is possible that City & East London's decision to invest in longer term qualitative work on prescribing, at the expense of a co-ordinated short term prescribing strategy for generic prescribing resulted in less promotion of generics than in some other FHSA areas.

Consequently the FHSA generic rate began to fall behind other FHSAs in the region. Whilst this may have reflected the priorities of the FHSA, the fact remained that considerable savings from generics would needed to be realised at some point. The question that concerned City & East London FHSA was how this might be achieved through a rational rather than reactive approach. Whilst the method employed in this study was designed to address local issues it was hoped that it would also add to knowledge of generic prescribing behaviour more generally.

3.2 Selection of GP sample

At the time of data collection in March 1992, 337 GPs in 162 practices were contracted to provide services in City & East London FHSA to 701,957 registered patients (Capitation and Population Base Statistics, 1992). All contracted GPs were included in the study sample. The geographical boundaries of the FHSA were, at the time of the study, co-terminus with three health districts. The area as a whole has high social deprivation, and this is reflected in a high score on the Jarman index.

3.3 Generation of the current generic prescribing measure

To determine the limitations of the current generic prescribing measure as an indicator of cost effective prescribing (objective 1) it was necessary to explore the way in which prescribing statistics are compiled. The method for extracting data from the PPA database is now described.

3.3.1 The PPA data and generic prescribing statistics

All prescribing measures and statistics presented in PACT data are generated from the main data files at the PPA. The generic prescribing rate reflects the number of items that are *prescribed* by the generic name out of the total prescribed[1]. Each drug product featured in PACT data is identified using a unique 11 character drug code.

The code is hierarchical with a numerical portion, reflecting the BNF drug classification, and an alpha-numerical portion recording information on the drug product prescribed and dispensed. The code was originally designed, and is still used, to calculate the pharmacist's remuneration. However, it is now also used to search and manipulate prescribing information to produce PACT data and to illustrate how this is achieved the code structure and method for generating the generic prescribing rate will now be described.

[1] Until June 1994 prescriptions for class 1 and class 2 drugs were not differentiated at FHSA or practice level and the proportion of prescriptions *dispensed* generically was not identified.

Position	Contents	Branded/generic example	Branded code	Generic code
1-2	BNF Chapter	Gastrointestinal	010	010
3-4	BNF Section	Ulcer healing drugs	0103	0103
5-7	BNF Sub-section	H_2 receptor antagonists	0103010	0103010
8	Drug (chemical entity)	Cimetidine	0103010D	0103010D
9	Prescribed name (brand/generic)	Tagamet® /Cimetidine	0103010DB	0103010DA
10	Drug (form & strength)	Tagamet® 400mg /Cimetidine 400mg	0103010DBB	0103010DAB
11	Dispensed product (brand/generic)	Tagamet® 400mg /Cimetidine 400mg	0103010DBBB	0103010DABA

Table 3.1 Product code structure for the PPA database.

Table 3.1 illustrates the use of these codes for one branded drug product, Tagamet 400mg and it's generic equivalent, cimetidine. The numerical positions one to seven denote the BNF chapter, section and sub-section classification. The remaining four alpha-numerical positions identify the product prescribed and dispensed. Position eight is specific to the drug entity contained in the medicine. Position nine is specific to the product name used on the prescription i.e. brand or generic and position ten differentiates different strengths and forms of a drug. In this way every strength and formulation manufactured under a brand name will have a unique drug code and every generic equivalent will have it's own separate code (regardless of the manufacturer[2]). Position eleven denotes the name of the medicine dispensed i.e. brand or generic and hence, details of the product prescribed and product dispensed against every prescription is recorded.
The PPA calculates the generic prescribing rate and this figure is published in PACT data. The rate is the proportion of prescriptions written by all GPs in any

[2] 'Branded generics' are allocated unique codes as if they were branded products.

one practice using the generic or approved name. The combined practice rate was used in the study in preference to individual GP rates. This was necessary since GPs working in partnerships frequently share prescribing pads and, with the advent of computer generated prescriptions, many practices produce repeat prescriptions as a batch against one doctors name, regardless of who the patient is actually registered with or sees. These two activities can distort individual GP rates, but will be overcome if the practice rate is used. The calculation of the PPA generic rate is dependent on the number of items prescribed with an 'A' at position nine in the drug code, as a proportion of the total the number of items prescribed.

Since 1994, PACT features the proportion of items dispensed generically as well as the proportion prescribed generically. Whilst the generic dispensing rate provides a more accurate indicator than rate of a practice's ability to make savings from using more generic products, it still requires interpretation and does not identify savings potential.

3.4 Generation of new dependent variable: Generic savings potential (GSP)

The weakness of the generic rate as an economic performance measure has already been discussed in Chapter Two. Since economic performance is considered to be one of the strongest reasons to promote generic prescribing, an indicator of GSP was developed for use in this study (objective 2), and the method used is now described.

At the time of this study calculation of savings potential from generic substitution at FHSA or practice level was undertaken manually on each occasion that it was required using hard copy PACT level 3 data. An extract of this is given in appendix 3 for City and East London FHSA. For calculations at practice level the same volume of data had to be scanned for each practice for every drug product considered; making assessment of GSP an intensive and time consuming activity. Precise calculations have rarely been undertaken and some of the methods that have been used to estimate potential savings are discussed in Chapter One.

For this study, a method was required to accurately calculate savings from generic substitution of a selection of products for each practice in the FHSA. To achieve this access to the PPA database was obtained and a computer programme was written to analyse PPA down loads of PACT level 3 practice data.

3.4.1 Programme design

The computer programme incorporated a number of key components: Drug selection had to be possible at the product level so that individual brands could be selected. This was achieved by extracting data on a range of drugs into the database, and presenting them for selection, either individually or grouped as required. This data was extracted on a practice, not doctor basis for the reasons explained earlier.

To calculate generic savings the volume of product dispensed is required i.e. number of tablets, capsules, millilitres. A second programme was written to undertake this task during the data extraction process, thereby providing an additional variable.

With product specific data, the computer programme was designed to make product (brand) specific generic substitutions and thereby calculate potential savings for each practice. The programme allowed selection of single or several drugs at a time and provided savings, by practice, of each drug together with a practice total for all drugs selected. The programme also provided a grand FHSA total of potential savings, although when several products were selected, savings were not listed individually. At this stage the programme did not allow for practice selection, and all practices were listed on each occasion.

3.4.2 Product sample

The prototype programme developed to calculate GSP for this study required the selection and manipulation of product data from the PPA database. Nationally generated figures indicate that there are a relatively small number of drug products that will realise large savings from generic substitution (Prescription Pricing Authority, 1992). For example, the highest annual potential savings generated by a product was over £16 million, the 15th highest was over £1 million, and the 26th highest was below £400,000 per year. For these reasons the down load from the PPA used in this study was limited.

The products used in this study to calculate GSP were, with the exception of Zyloric® selected from the national 'top-20 savings' together with a crude calculation of potential product savings in City & East London FHSA as a whole. The sample of 21 products used in the final analysis was drawn from 5 BNF chapters, representing 15 drug entities and are listed in table 3.2. Zyloric does not appear in the national top-20 but, at approximately 9 times more that its generic

counterpart, allopurinol, substantial savings can be made if substitution occurs for a high proportion of branded prescription.

BNF Chapter	Branded Product	Generic Product
1	Tagamet® 400mg tabs	Cimetidine 400mg
2	Frumil® tabs	Co-amilofruse
2	Lasix® 40mg tabs	Frusemide 40mg
2	Moduretic® tabs	Co-amilozide
2	Tenormin® LS tabs	Atenolol 50mg
2	Tenormin® tabs	Atenolol 100mg
2	Aldomet® 250mg tabs	Methyldopa 250mg
2	Aldomet® 500mg tabs	Methyldopa 500mg
2	Adalat® 10mg caps	Nifedipine 10mg
3	Ventolin® 100mcg Inhaler (200)	Salbutamol 100mcg
5	Amoxil® 250mg caps	Amoxycillin 250mg
5	Amoxil® 500mg caps	Amoxycillin 500mg
5	Erythroped® Granules 250mg/5ml	Erythromycin 250mg/5ml
5	Septrin® tabs	Co-trimoxazole
10	Brufen® 200mg tabs	Ibuprofen 200mg
10	Brufen® 400mg tabs	Ibuprofen 400mg
10	Indocid® 25mg caps	Indomethacin 25mg
10	Naprosyn® 250mg tabs	Naproxen 250mg
10	Naprosyn® 500mg tabs	Naproxen 500mg
10	Zyloric® 100mg	Allopurinol 100mg
10	Zyloric® 300mg	Allopurinol 300mg

Table 3.2 List of products used to calculate potential practice savings from generic substitution.

Using the PPA drug coding system, data can be extracted for input into other computer programmes. Although generic products are always coded 'A' in position nine of the PPA drug code, the lead brand may not be coded 'B'. For this reason it

was not possible to use wild cards[3] within the programme to generate a universal substitution mechanism that could be applied to data on lead brands of all products at once. Instead each branded product must be specified by its unique code. This degree of specificity does however offer some practical advantages: The preferred brand is not always a uniform choice between doctors/practices, and substitution can be tailored to match idiosyncrasies; significant price differentials may exist between several brands and the generic form.

3.4.3 Calculation of total product volume and cost

Using a unique drug code data can be extracted for the selected product. For the calculation of savings from generic substitution it is necessary to know the total volume and total cost of each branded product prescribed. However, the total volume (quantity) of product and total cost is not held within the PPA database, and has to be consolidated from other fields during the process of data extraction.

The PPA database records the information against each drug code as presented in PACT level 3 i.e. the product code and three other fields; quantity prescribed; number of prescriptions and total cost. To calculate the volume of a product prescribed each quantity must be multiplied by the number of prescriptions and then summed. To calculate the total cost, the cost of each quantity must be summed as shown in table 3.3.

[3] Wild cards are used in computer codes to select groups of items that have the same code structure except in the position where the wild card appears.

	Quantity	No.of prescriptions	Cost	VOLUME OF TABS /CAPS
Amoxil® caps	15	6	---------->	90
250mg	20	5	---------->	100
	21	4	---------->	84
	30	3	---------->	90
	40	2	---------->	80
	42	1	---------->	42
				486
			TOTAL COST	TOTAL VOLUME

Table 3.3 Example of extract from PACT level 3 showing cost and volume calculations that need to be performed on PPA data down load (right of heavy line).

3.4.4 Processing of PPA dataset

From the initial specification a programmer employed by the Leeds Prescribing Research Unit manipulated the PPA database to extract data in ASCII format for the branded products listed in table 3.2 for all practices in City & East London FHSA. The information was then imported into a database package (Dataease).

The generic equivalent was obtained by substituting the letter 'A' at position nine on the drug code and the cost was then taken from the Drug Tariff for the same time period. A programme was then written to run on Dataease using the following dataset:

Practice identifier (PPA practice code)
PPA 11 digit drug code
Total quantities
Total numbers of prescriptions (items)
Total cost of prescriptions

3.4.5 Running the programme

The first menu provided a list of 21 brand drugs that could be selected for generic substitution. Any number of drugs could be selected by highlighting each drug name in turn. In this way savings could be calculated for any combination of products. The substitution programme was then run as illustrated in table 3.4 and could be viewed on screen or saved to disk for import into a statistical software package. Total savings potential for the final selection of 21 drugs by practice were calculated and used as the dependant variable in the final analysis.

For each selected brand product		Example
		Atenolol 100mg
Cost of generic form (from PPA files)	= A	£0.17
Volume of branded form prescribed	= B	820
Total cost of generic substitution of branded form	A x B = C	£139.40
Total cost of branded form prescribed	= D	£205.00
Potential savings from generic substitution*	D - C = E	£65.60
* based on 3 month period in 1991		

Table 3.4 Method for calculating potential generic savings.

3.5 Selection of dependent variables: Practice/doctor characteristics

The literature presented in Chapter Two suggests that practice factors may be associated with different prescribing patterns. However the review also highlights that much of the research to date has concentrated on educational intervention strategies designed to influence prescribing behaviour. Whilst it is important to continue to extend knowledge in this field, the value of having access to a range of different approaches has also been highlighted by those studying the behaviour of GPs; reviews by Horder et al. (1986) and Bradley (1992) both suggested that information on practice and administrative factors are under utilised in this respect. Returning to the prescribing models, all but one of those reviewed are clearly founded on established decision making theory and pathways. It is however the more holistic, and less theoretical approach adopted by Raisch (1990) that gives equal weight to these alternative sources of influence that are less commonly explored in the prescribing field.

In his model Raisch places the acquisition of awareness, adoption and usage in context as processes delivering a particular outcome, and not ends in themselves. This approach is more suited to the primary care prescribing environment which is generally less 'controlled' and 'managed' than in secondary care. In particular, the model highlights mechanisms whereby GPs prescribing decisions, come to through pathways described by other authors (Miller, 1974; Segal and Hepler, 1982; Plumridge, 1983) can be overridden by administrative, practice factors and patient influences.

Some practice/doctor characteristics that have been studied to date were not considered suitable for use in this study. Although Harris (1984) found that older doctors generally had a lower generic prescribing rate than younger doctors, the variable for generic rate selected for use in this study reflected the practice as a whole and so GP age and years since qualification were not included. Practice location, when included in other studies, has generally focused on comparisons of

rural versus urban locations and since the study area did not vary in this respect this variable was not included.

In respect of generic prescribing, evidence from the literature suggests that the following practice factors or characteristics may be important determinants of GSP; generic prescribing behaviour, represented by the generic prescribing rate, prescribing costs, number of partners, proportion of patients over 65, patient/doctor ratio and computer status. Objective 3 of this study was to examine the relationship between characteristics of the practice, patients and organisation and the GSP. These factors described above were selected to test the hypothesis that they are associated with GSP, and that they provide an explanation of the wide variation that is found in this measure between practices in City & East London FHSA. Practice profiles associated with high or low generic prescribing potentials (objective 4) are discussed in Chapter 5 in light of the study results.

Practice factors that have been studied in relation to prescribing patterns but that were not included in this study include GP age, years since qualification, place of qualification, location of practice. The first three relating to individual prescribers were not suitable for translation to a practice measure and were therefore excluded. Practice location was considered, but was found to be unsuitable for analysis within the analytical model eventually selected.

3.5.1 Data collection

Detailed prescribing data was collected from information provided by the PPA, and data on practice factors were collected from FHSA sources.

Although the overall generic rate is shown in practice PACT data[4], for the purposes of data entry, the rates for the quarter ending March 1992 were obtained from PD2 print outs since this contains a comprehensive listing for all practices.

[4] With the introduction of on-line prescribing data via PACTLINE in 1993, the generic rate became available at total, chapter and section level for each practice.

The number of patients over 65 is collated for each doctor and practice at the FHSA and submitted to the PPA. This number is reproduced in FHSA and National PACT data, where it is used to calculate the weighted prescribing units (PUs). The number of patients over 65 and total list size for all practices is also summarised in PD2 print outs. These figures were used to calculate the percentage of patients over 65. The patient to doctor ratio was calculated by dividing the list size variable by the number of partners. The net ingredient cost, adjusted to account for practice differences in prescribing units (NIC/PU) was obtained directly from PD2 printouts.

Details of hardware and software purchases made by each practice were obtained from FHSA records kept primarily for the purposes of reimbursement. Practices were coded according to their computer status i.e. computer or no computer, and for those with computers, the software type. In the case of the latter, less commonly used software e.g. GENPRAC, MEDISCAN, AAH MEDITEL were grouped together as 'other'. It should however be noted that the pattern of software use in the study area does not reflect those of the country as a whole, where AAH Meditel and GENSYST are more commonly used.

3.5.2 Data preparation

From the original sample of 162, three practices were excluded from the sample before any analysis was undertaken because of the special nature of their patient list that gave rise to unusual generic rates. Two of these practices were hospices with 25 and 150 patients respectively prescribing a very limited range of drugs for terminally ill patients that did not include many drugs with GSP. The third practice was excluded since the GP served mainly homeless patients, prescribing a very limited range and quantity of drugs, almost exclusively by the generic name (generic rate 92%).

3.6 Analytic strategy

All data analysis was carried out using the statistical software package SPSSPC. The mean, standard deviation, minimum and maximum values were calculated for each variable and frequency distribution graphs were plotted so that a visual inspection of the data could be made. Scatterplots were constructed to illustrate the relationship between each practice variable and the GSP. A Pearson product-moment correlation matrix was then constructed to provide a statistical summary of these relationships.

Although simple correlation analyses provide a convenient summary of the inter-relationships which exist between practice characteristics and savings, they are inadequate for the purposes of detailed interpretation. The presence of significant but weak associations between several variables in the matrix confounds efforts to determine the extent to which each individual factor contributes to the variation in potential savings found between practices.

Multiple regression analysis overcomes these potential problems by measuring the contribution of each variable, whilst controlling for the effects of the other variables and retains those that contribute independently to the explanation of the variation in savings potential between practices. The variable relating to prescribing cost was expressed as a ratio to the number of prescribing units in each practice. Use of a ratio in this situation is necessary to remove the very large demographic differences that exist between practices which would otherwise overshadow any true differences in cost.

In preparation for a multiple regression analysis, tests were carried out to detect any violations of the assumptions required for the analysis. As well as visual inspection of the distribution for each variable, three additional tests were performed; 1) to identify outliers, 2) to detect collinearity, and 3) to check for equality of variance throughout the sample. If these checks and assumptions are not carried out then the reliability of the results cannot be assured (Norusis, 1990).

Six practices were excluded after preliminary examination of the variables: A visual scan of the distribution of list size identified two practices with unusually small list sizes (practices 717 and 701, list size 104 and 129 respectively) and low patient/doctor ratios. Although the reasons for these were different for each practice, the conditions that prevailed suggested that they were sufficiently unusual to exclude them from the regression analysis. Two practices were excluded due to missing practice data (practices 39 and 88) and two more were excluded due to missing values for GSP (practices 82 and 617). These last two missing values arose as a result of practice mergers occurring at the time of data collection. The distribution of GSP also highlighted two practices with savings potential much higher than the rest and were therefore excluded from the regression analysis (practices 39 and 88). Their savings were both above £3000 (£3584 and £3174) and were £700 and £300 respectively above the next highest practice. In the final analysis 153 practices were included.

Finally following the multiple regression analysis, partial plots were constructed to provide a visual inspection of the relationship between GSP and each independent variable when the contribution from the variables not in the plot were removed. A partial correlation coefficient matrix was then constructed to provide a simple statistical summary of the individual contribution from each independent variable to the explanation of variation in GSP.

CHAPTER 4

RESULTS

Summary

Significant simple correlations were found between the dependent variable, generic savings potential (GSP) and four of the independent variables; patient/doctor ratio, number of partners, prescribing cost and generic rate. Whilst significant, the latter correlation with generic rate was weak. A number of correlations were also found between the independent variables. To overcome this, a multiple regression model was constructed. Simple correlations were not found between GSP and the proportion of patients over 65 or the computer status of the practice.

All independent variables were retained in the final model which explained 65% of the inter-practice variation in GSP. The results showed that practices with more partners, a lower generic prescribing rate, a higher patient per doctor ratio, a higher proportion of patients over 65, higher prescribing costs and no computer were all associated with higher GSPs. When controlling for the effects of independent variables on one another, the number of partners had the strongest correlation with GSP, with patient/doctor ratio and generic prescribing rate having correlations of similar magnitudes in opposite directions.

4.1 Practice characteristics

The mean, standard deviation, minimum, and maximum values for the following practice characteristics are given in table 4.1: quarterly GSP, generic prescribing rate, percentage of patients over 65, patient/doctor ratio, number of partners and prescribing costs per prescribing unit (NIC/PU). Histograms for each variable are given in figures 4.2 to 4.9.

Variable	Mean	Standard deviation	Minimum	Maximum
Generic savings potential GSP (£)	910.19	654.93	60.57	2808.31
Generic prescribing rate (%)	45.19	11.68	25.56	72.93
Patients over 65 (%)	11.21	5.07	2	26
Patient/doctor ratio	2254.19	853.50	1097	5381
No. of partners	2.12	1.37	1	7
Prescribing costs (NIC/PU)	8.58	1.76	4.33	16.10

Table 4.1 Summary of descriptive statistics for practice characteristics.

The overall quarterly distribution of GSP is shown in figure 4.1. The mean generic savings of approximately £910.19 suggests an average annual saving across the FHSA of nearly £4000 per practice, although the range of £240-£11,200 per annum reflects wide inter-practice variation. In this study total FHSA potential savings were found to be £146,000 for the quarter, suggesting a projected annual GSP of £584,000 for the 21 products selected.

The FHSA average generic prescribing rate of 45% compares favourably with regional (42%) and national (44%) averages at this time, although the range within the FHSA of 25.56%-72.93% shows, as with other prescribing variables, wide variation at practice level (figure 4.3).

At the time of the study City and East London FHSA and National proportions of patients over 65 were 11% and 14% respectively (figure 4.4 and 4.9), although the range across all FHSAs is between 9 and 20%.

The patient/doctor ratios in City & East London is large, ranging from 1097 to 5,381. The proportion of practices with patient/doctor ratios in excess of 2500 is 28% (figure 4.5).

The number of partners per practice (partnership size) ranged from 1 to 7. The distribution was skewed, with over 44% of practices having only one doctor.

At the time of the study 40% of practices in the FHSA area were computerised. Computer software used in practices in City and East London in March 1992 was as follows: EMIS (12.6%); PARADOC (5.7%); VAMP (5.0%); and others (17%) (figure 4.7). The PARADOC system was developed within the Joint Academic Department of General Practice and Primary Care, St. Bartholomew's Medical College, London.

In the year ending March 1992 City & East London FHSA and national expenditure on drugs (NIC) was £28,789,399 and £3,013,691,880 respectively. The range of cost per prescribing unit across the FHSA was £4.33 to £16.10 (figure 4.8). The average cost per prescribing unit (NIC/PU) at £8.73 was 15% below the national ratio of £10.21 (figure 4.9).

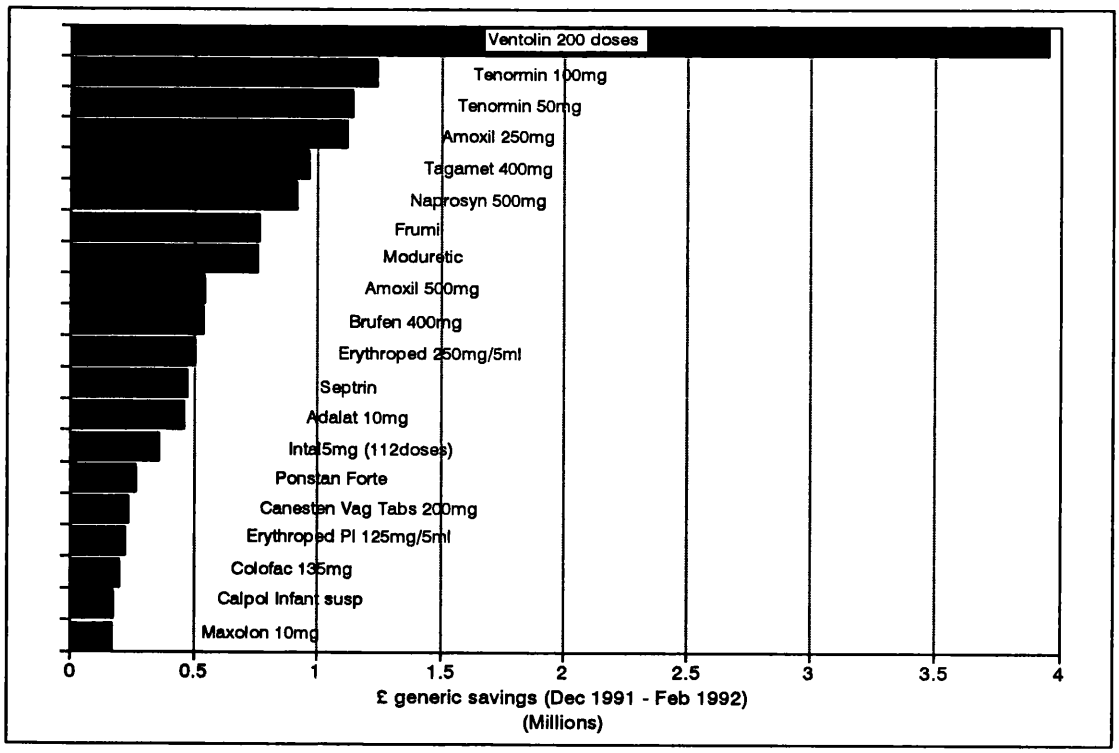


Figure 4.1 'Top-20' products producing the greatest savings potential from generic substitution (England only).

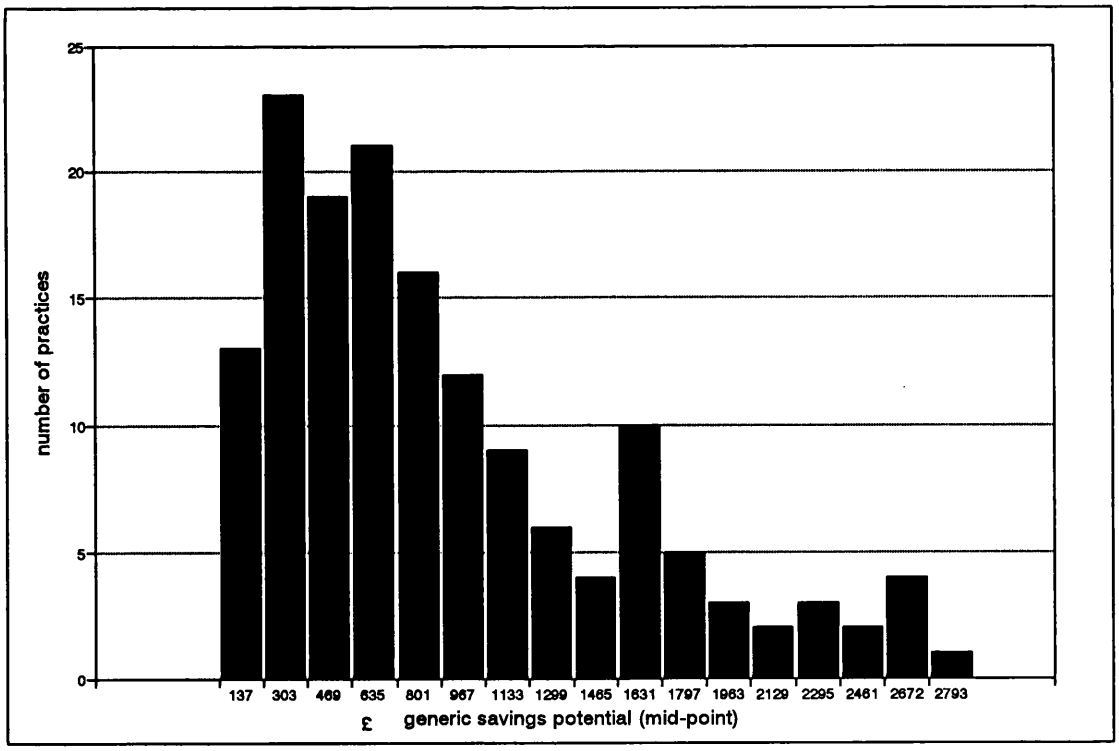


Figure 4.2 Distribution of generic savings potential.

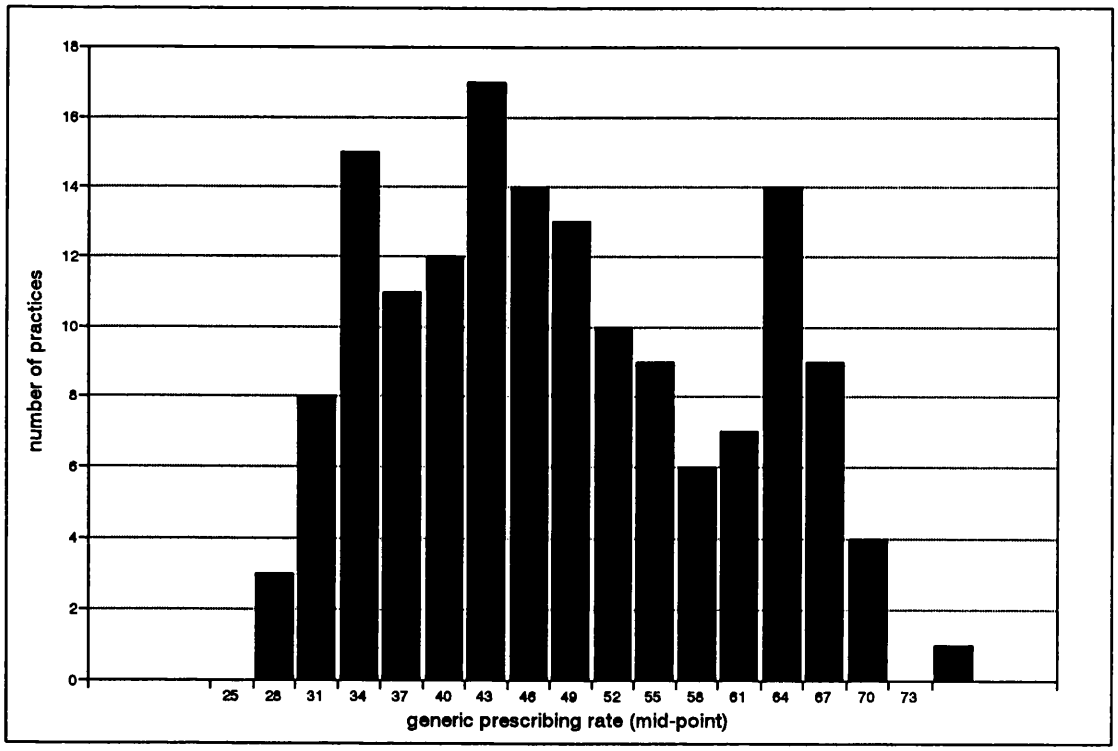


Figure 4.3 Distribution of generic prescribing rate.

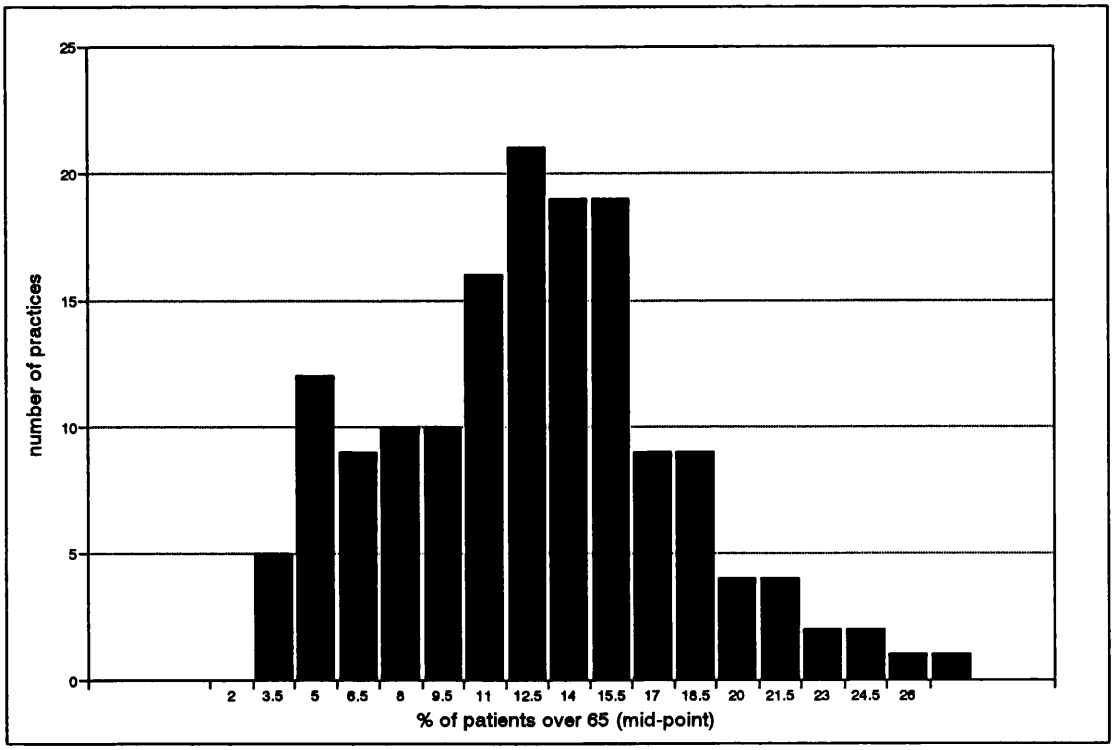


Figure 4.4 Distribution of percentage of patients over 65 years.

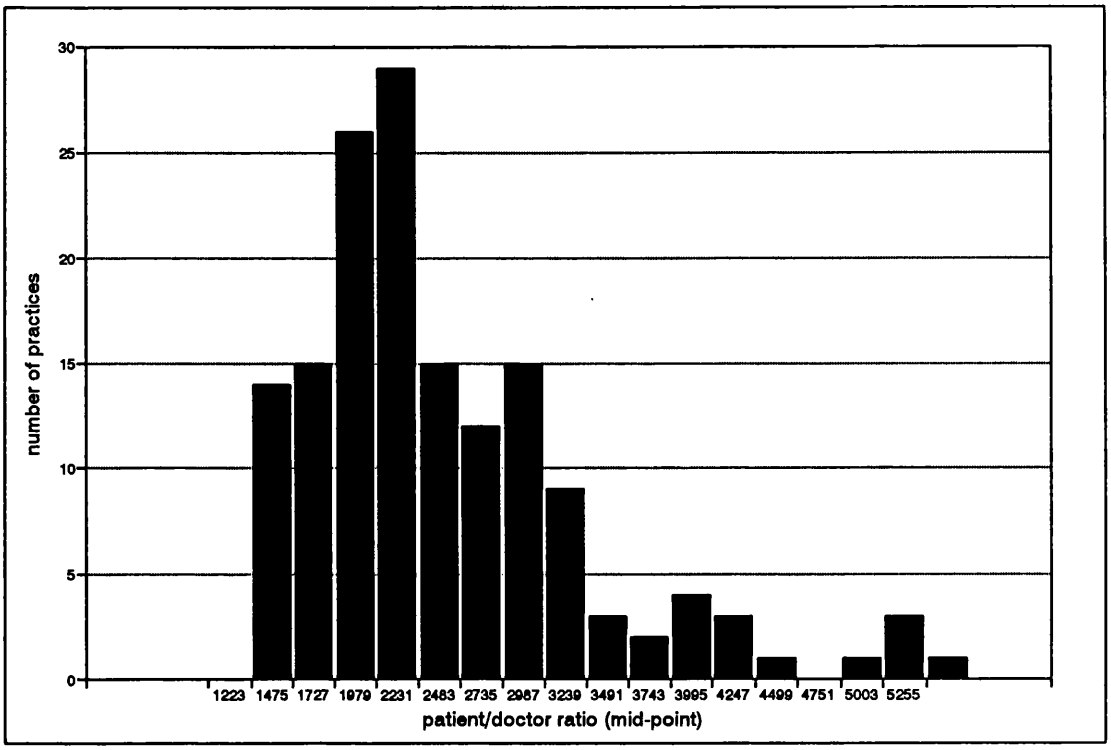


Figure 4.5 Distribution of practice average ratio of patients to doctor.

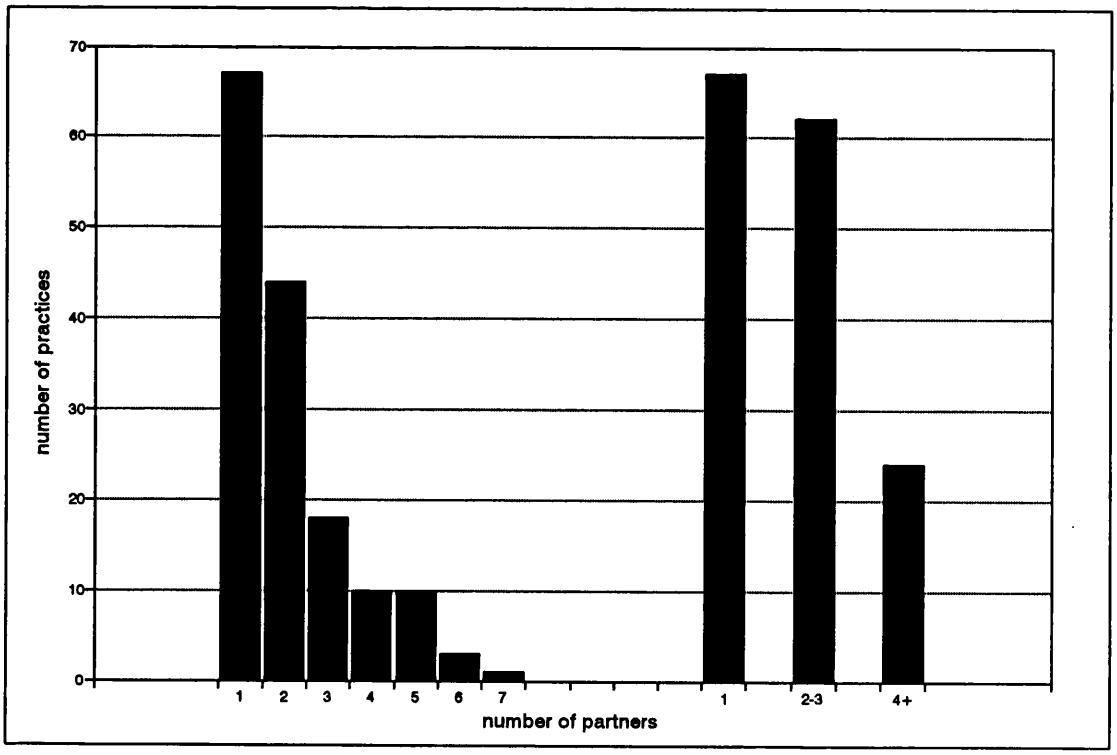


Figure 4.6 Distribution of number of partners, separately and grouped.

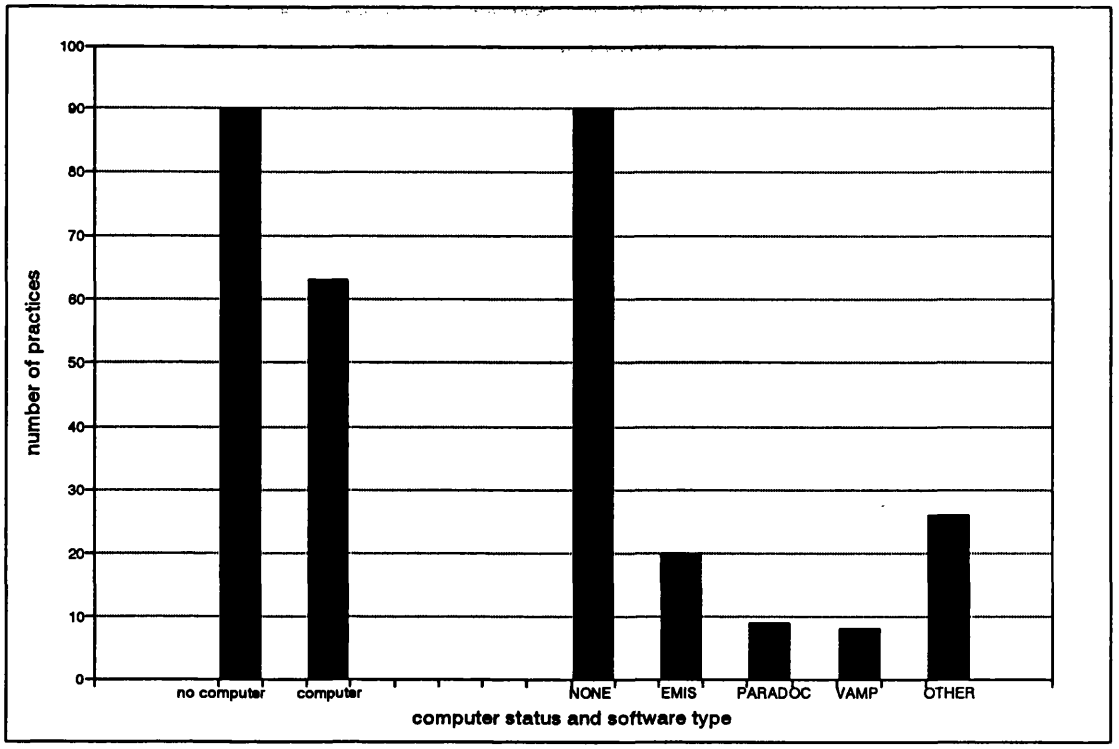


Figure 4.7 Distribution of computer status and computer software type.

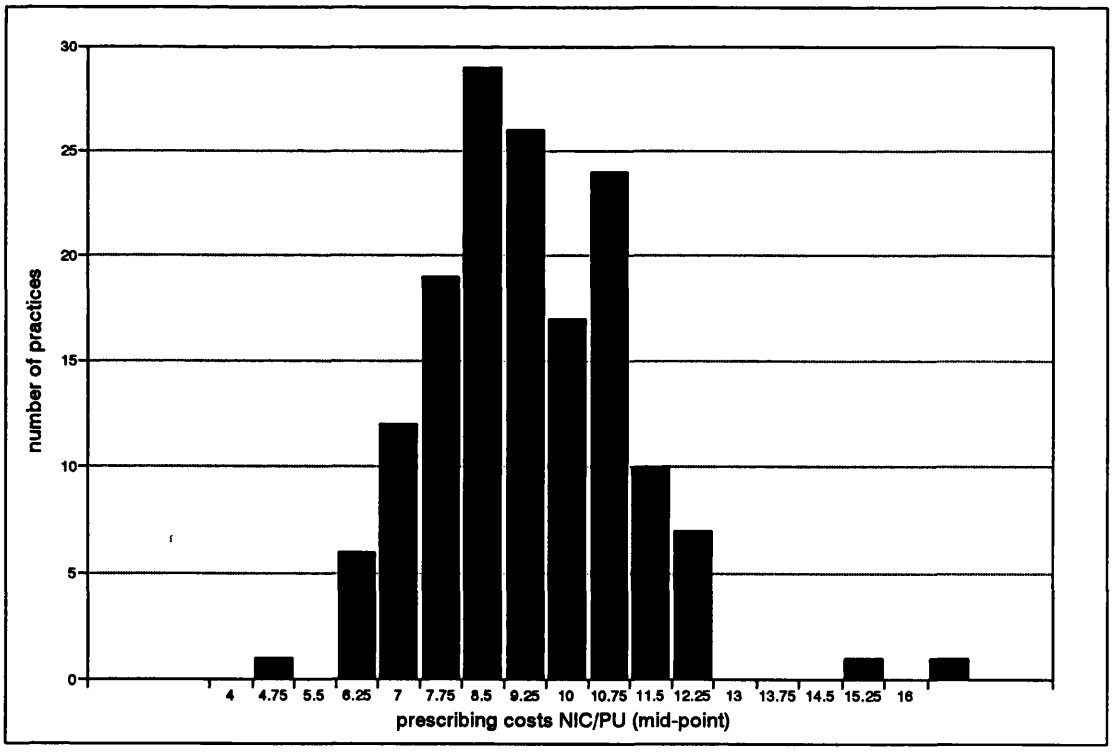


Figure 4.8 Distribution of practice prescribing cost (NIC/PU).

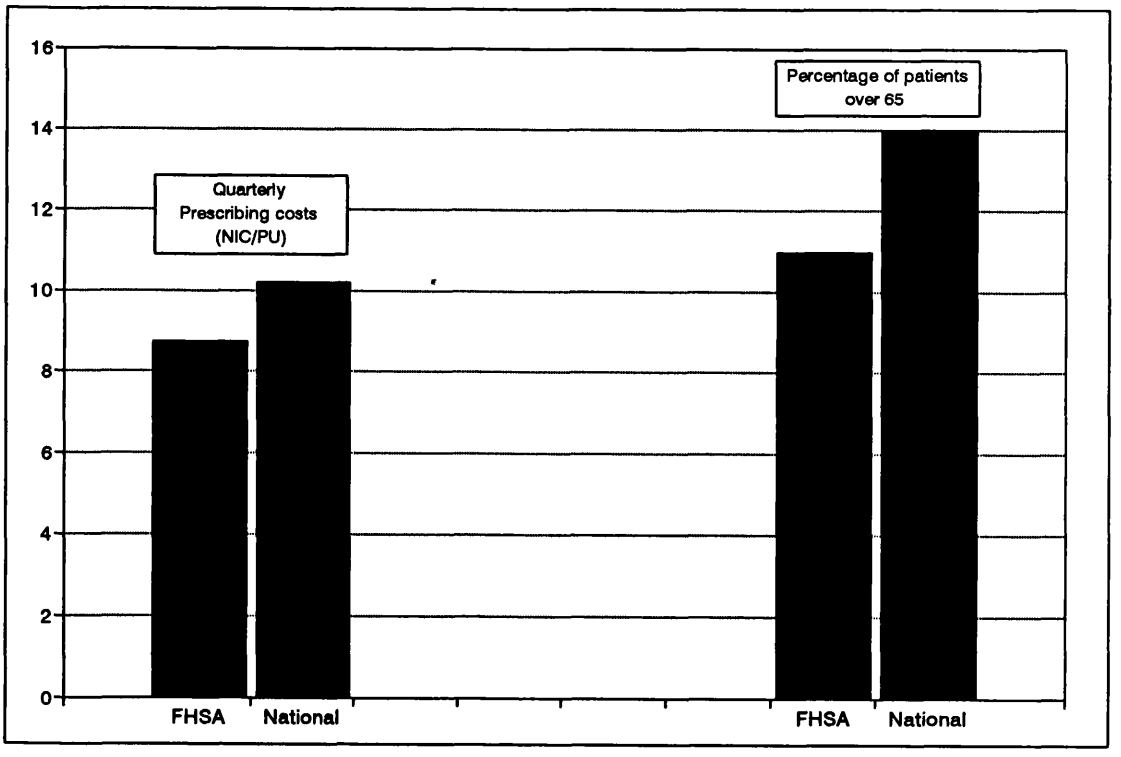


Figure 4.9 City & East London vs National figures for prescribing costs and proportions of patients over 65 years.

4.2 Practice characteristics and generic savings: preliminary analysis

This section is concerned with the influence of the practice characteristics, discussed in section 4.1, on GSP. As a first step in this analysis scatterplots were constructed to illustrate the relationship between each characteristic and the savings potential (figures 4.10 to 4.15). In addition, a correlation matrix was constructed to provide a statistical summary of these relationships (table 4.2).

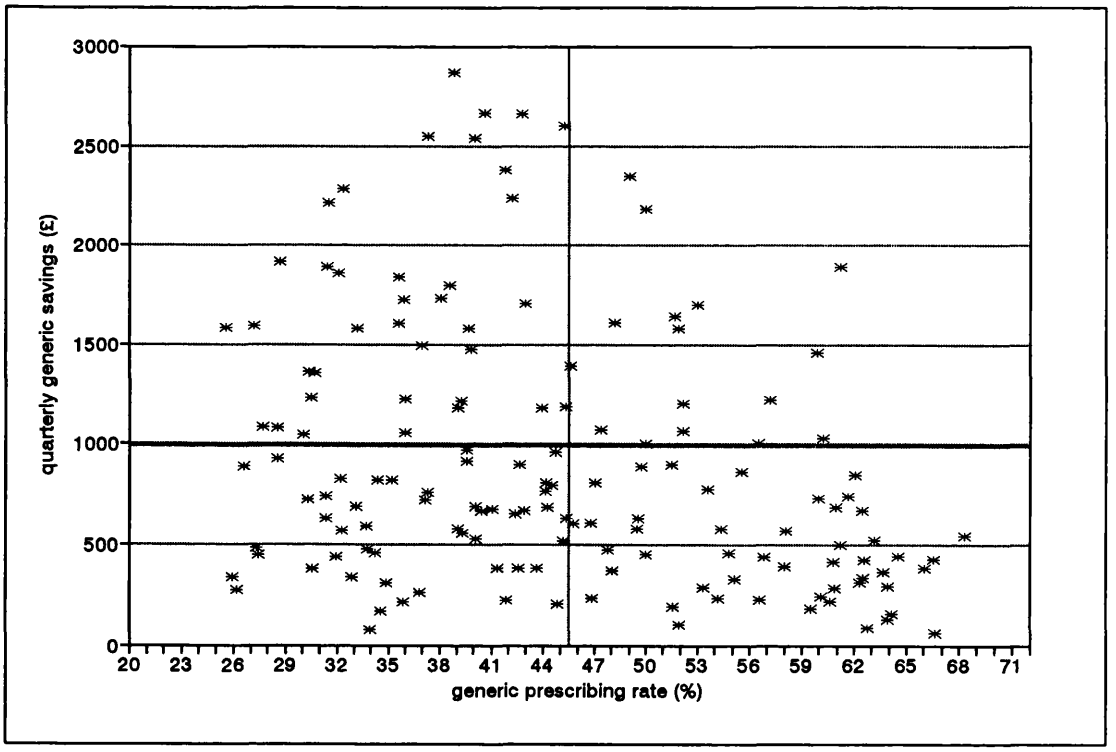


Figure 4.10 Scatterplot of generic prescribing rate and quarterly generic savings potential.

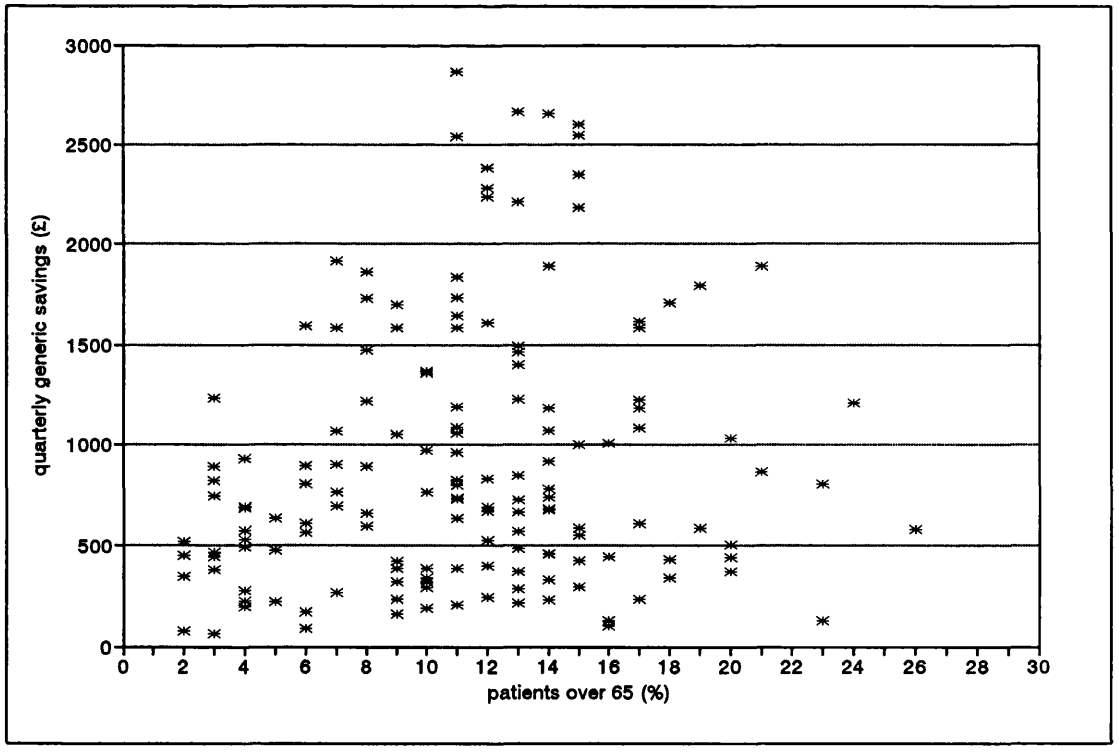


Figure 4.11 Scatterplot of percentage of patients over 65 years and quarterly generic savings potential.

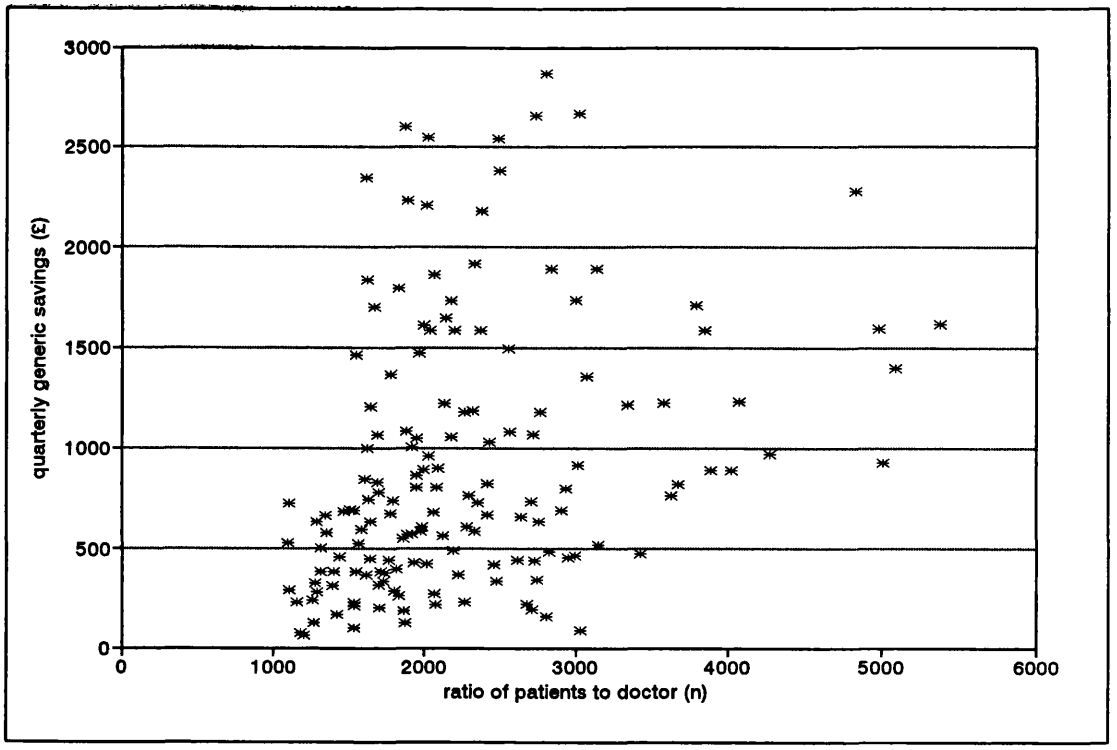


Figure 4.12 Scatterplot of patients to doctor and quarterly generic savings potential.

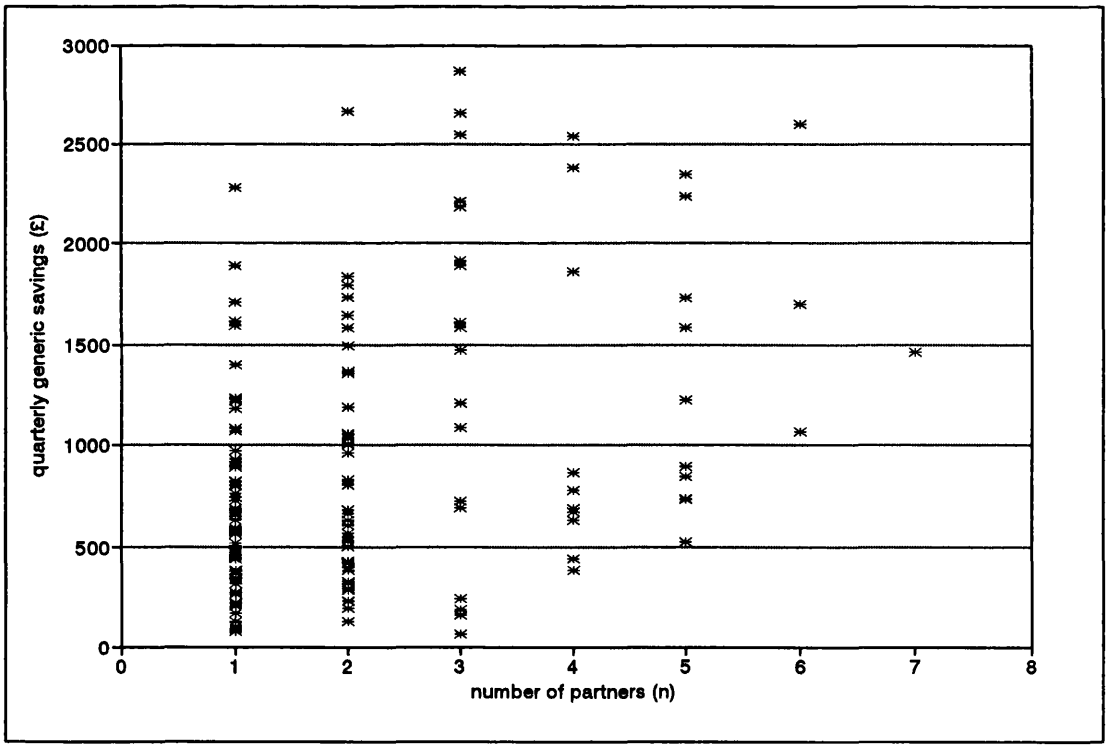


Figure 4.13 Scatterplot of partners and quarterly generic savings potential.

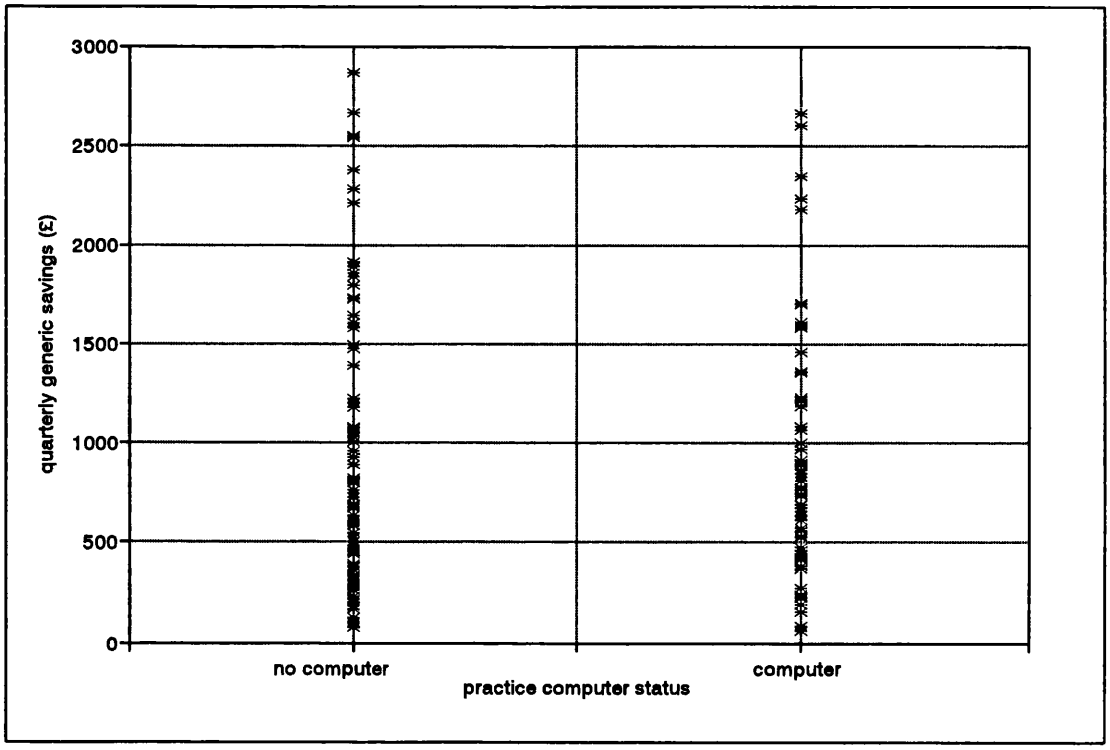


Figure 4.14 Scatterplot of computer status and quarterly generic savings potential.

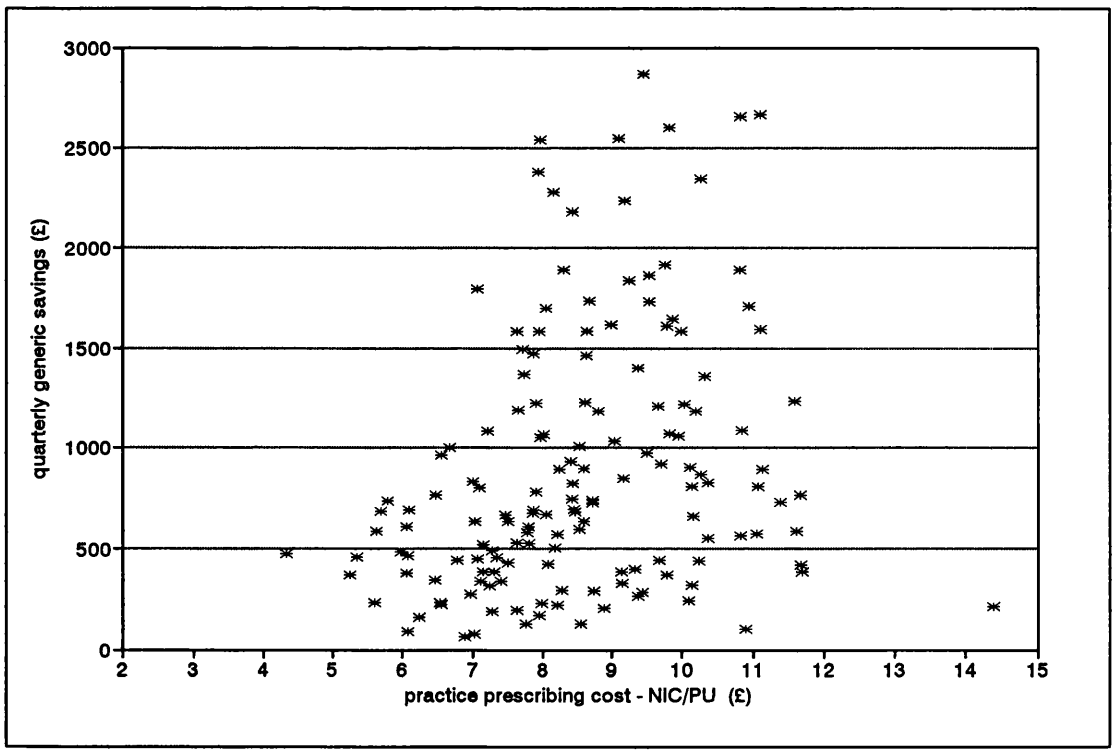


Figure 4.15 Scatterplot of prescribing costs and quarterly generic savings potential.

	Generic savings	Generic rate	Pts over 65 (%)	Pt/Dr ratio	No. of partners	Computer status	Cost (NIC/ PU)
Generic savings (£)	1						
Generic rate (%)	-0.31**	1					
Patients over 65 (%)	0.16	0.36**	1				
Patient/ doctor ratio	0.32**	-0.28**	-0.18	1			
No. of partners	0.38**	0.35**	0.12	-0.32**	1		
Computer status	-0.002	0.243*	-0.12	0.06	0.37**	1	
Cost (NIC/PU)	0.31**	-0.06	0.14	0.09	0.05	-0.02	1

Table 4.2 Pearson product-moment correlation matrix (* $p<0.01$, ** $p<0.001$).

4.2.1 Generic savings and generic rate

The correlation matrix shows a small but significant negative correlation between GSP and the generic rate ($r=-0.31$ $p<0.001$). This suggests that practices with a lower generic rate are more likely to have higher GSP. The scatterplot for generic savings and generic rate can be divided into quadrants using the intersection of the average generic rate and savings over £1,000 per quarter. This division (figure 4.10) reveals that a proportion of practices with generic rates above the average (45.2%) for March 1992 retain potential savings of between £1000 and £2,600 per quarter on the products included in the analysis; this translates to average annual savings of between £4,000 and £10,000 per practice. The total savings potential for these 18 practices is £27,194 i.e. 19% of the FHSA GSP for all practices.

Of the practices with generic rates below the average generic rate, nearly two thirds (50) of these retain potential savings of less than £1000 per quarter (bottom left quadrant) with total savings of £30,000 per quarter i.e. a similar magnitude to that generated by the 18 practices discussed above. The remaining 35 practices with below average generic rates have quarterly savings potentials above £1000 and these jointly account for £60,000 (43%) of the FHSA GSP. These figures suggest that despite the significant correlation between generic rate and savings potential the PACT generic rate does not account fully for the variation in GSP and cannot therefore be used in isolation to identify practices that are less cost efficient than others.

4.2.2 Generic savings and the proportion of patients over 65 years

The proportion of patients over 65 years was not correlated with the GSP of a practice (figure 4.11), although it was quite strongly and significantly correlated with the generic prescribing rate ($r=0.36$, $p<0.001$) (figure 4.16). The latter result suggests that in practice doctors do not support the case for favouring branded instead of generic prescriptions for elderly patients, as suggested by the Drugs and Therapeutics Bulletin (1987).

4.2.3 Generic savings and the practice patient/doctor ratio

The GSP was significantly and positively correlated with the patient/doctor ratio ($r=0.32$, $p<0.001$). The scatterplot (figure 4.12) shows that although all practices with a high patient/doctor ratio (>3500) have savings potentials of at least £750 per quarter (£3,000 per year), over half of the practices with moderate patient to doctor ratios i.e. between the 25th and 50th percentile range (1654-2709) have savings of a similar magnitude. All practices with patient to doctor ratios below the 25th percentile (1654) have less than £750 savings potential.

4.2.4 Generic savings and number of partners

A small but significant positive correlation was found between GSP and number of partners, indicating an association between larger practice sizes and higher savings potential ($r=0.38$, $p<0.001$). This correlation held when the number of partners were collapsed into three groups to create categories with similar numbers of practices ($r=0.33$, $p<0.001$). The scatterplot (figure 4.13) reveals that a wide range of savings potential exists for each partnership size, but that the range of savings becomes more narrow and has a lower minimum savings potential as the size of the partnership increases. Although the ratio of patient to doctor generally decreases with more partners, the overall effect of more partners is more patients. If practices with similar generic prescribing patterns issued prescriptions at the same rate per patient, larger practices (by partners and patients) would have greater GSP than smaller practices.

The average practice savings, and minimum savings when partnership is grouped to reduce the difference between categories in sample size is as follows: practices with 1 doctor (mean= £697.35, SD=454.19, min=£80, max=£2280.39, n=67), practices with 2-3 partners (mean=£993.58, SD=731.65, min=£60.57, max=£2808.31, n=62), practices with 4 or more partners (mean=£1288.96, SD= 722.89, min=£384.91, max=£2600.89, n=24).

4.2.5 Generic savings and computer status

GSP was not correlated with computer status. However, computer status was significantly correlated with both the generic rate ($r=0.24$, $p<0.01$) and the number of partners ($r=0.37$, $p<0.001$). The scatterplot is of limited use due to the limited variable measure for computer status (figure 4.14).

4.2.6 Generic savings and practice prescribing cost (NIC/PU)

GSP was also correlated weakly, and positively, with practice prescribing cost ($r=0.31$, $p<0.001$). Whilst this correlation reached statistical significance, the scatterplot shows that practices with above average prescribing costs were equally divided between those with savings potential above £1000 per quarter and those with savings potential below this figure. This suggests that the marker used to identify excessive costs (25% above the FHSA average) is not a strong indicator of practices that are less cost efficient in the use of generic products than others. Whilst the majority of practices with less than average prescribing costs (£8.58) had less than £1000 of savings potential, a minority had a savings potential of between £1000 and £2500 per quarter (figure 4.15).

4.2.7 Relationships between independent variables

Significant correlations were also found between the independent variables that will be used to predict savings (table 4.2); number of partners was correlated with the patient to doctor ratio, generic prescribing rate and computer status. The number of doctors was negatively correlated with patient/doctor ratios ($r=-0.32$, $p<0.001$) indicating that larger partnerships are associated with lower patient/doctor ratios (figure 4.16). Conversely, the number of partners was positively correlated with the generic prescribing rate ($r=0.35$, $p<0.001$) and with computer status ($r=0.37$, $p<0.001$) i.e. larger practices are associated with a higher generic rate and computerisation.

The patient to doctor ratio was negatively correlated with the generic prescribing rate ($r=-0.28$, $p<0.001$) suggesting that practices with high ratios write less prescriptions by the generic name. Computer status was positively correlated with the generic rate ($r=0.243$, $p<0.01$), as was the percentage of patients over 65 ($r=0.36$, $p<0.001$). This suggests that practices with computers and a high percentage of patients over 65 are likely to write a greater proportion of their prescriptions by the generic name.

4.3 Practice characteristics and generic savings: Multiple regression model

Before constructing the final model, three checks were carried out to ensure that the statistical assumptions required by the multiple regression analysis were met. Casewise plots of the studentised residuals, failed to identify any outliers.

In the test for collinearity, the tolerance calculated for each variable in this model was as follows: Number of partners (0.709); generic prescribing rate (0.707); patient/doctor ratio (0.807); percentage of patients over 65 (0.794); prescribing cost (0.948); and computer status (0.765). These relatively high tolerances indicate that no significant linear relationships exist between any of the independent variables (Norusis, 1990). This result, suggest that the relationships detected in the correlation matrix are unlikely to exert a detrimental effect on the results of the regression.

Scatterplots for standardised values of predicted GSP and residuals of each variable are given in figures 4.16 to 4.21. In all cases there are no strong trends or patterns in the distribution of the standardised residuals i.e. there is no apparent increase in variance with increasing or decreasing standardised values for the predicted values of GSP, and the assumptions of equality of variance are not therefore violated (Norusis, 1990).

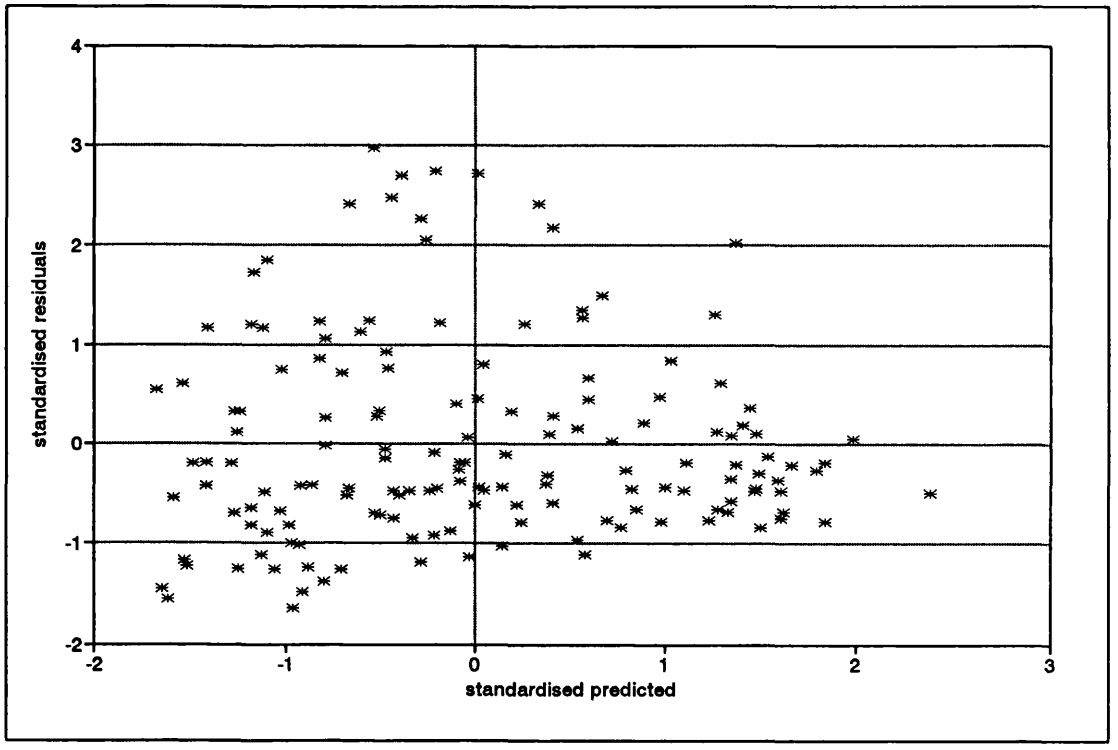


Figure 4.16 Scatterplot of standardised residuals from regression of generic savings on generic rate and standardised predicted values of generic savings.

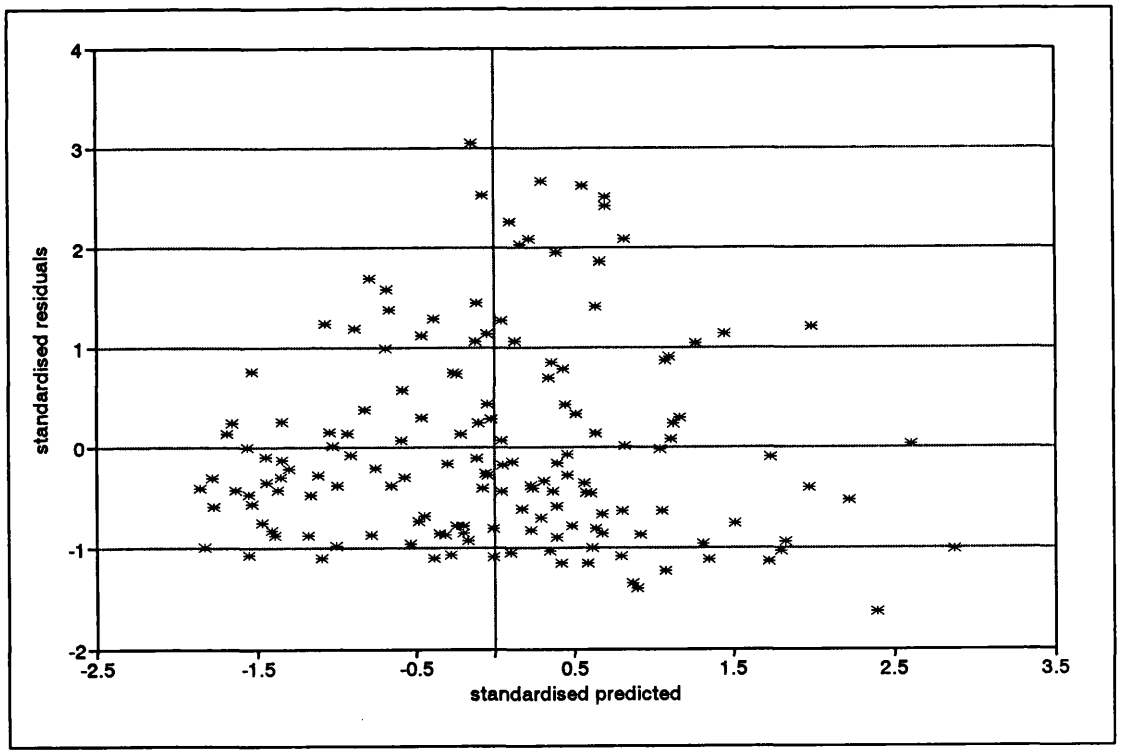


Figure 4.17 Scatterplot of standardised residuals from regression of generic savings on percentage of patients over 65 years and standardised predicted values of generic savings.

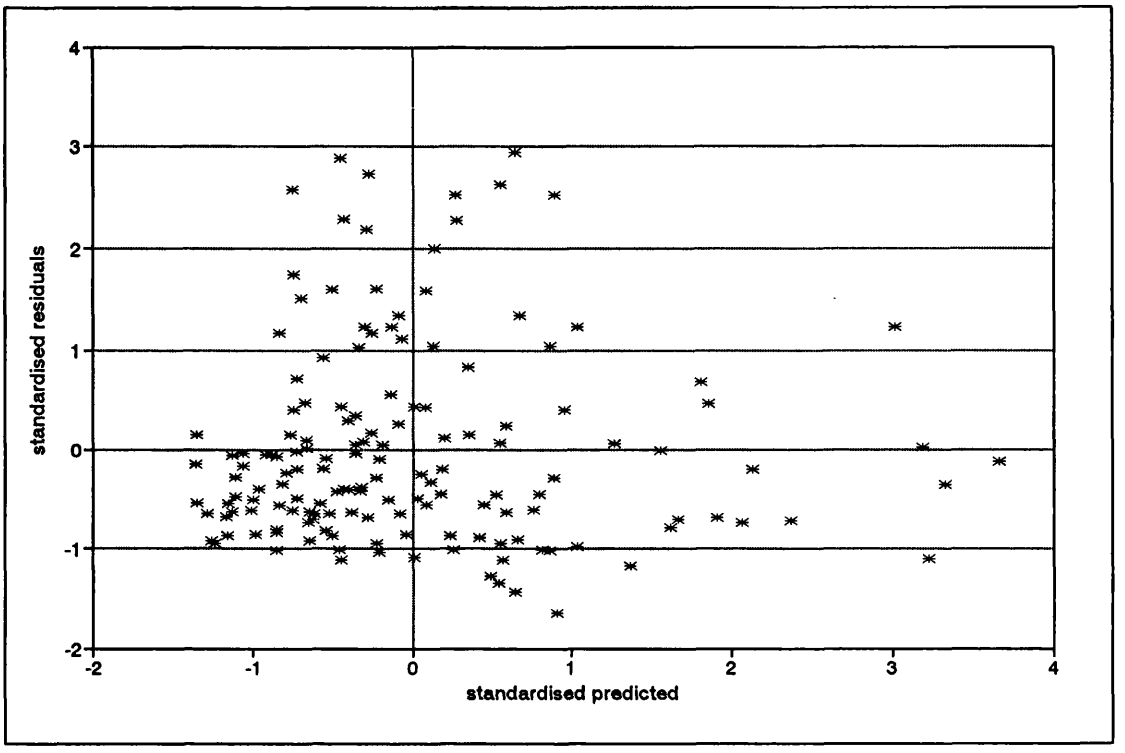


Figure 4.18 Scatterplot of standardised residuals from regression of generic savings on practice ratio of patients to doctor and standardised predicted values of generic savings.

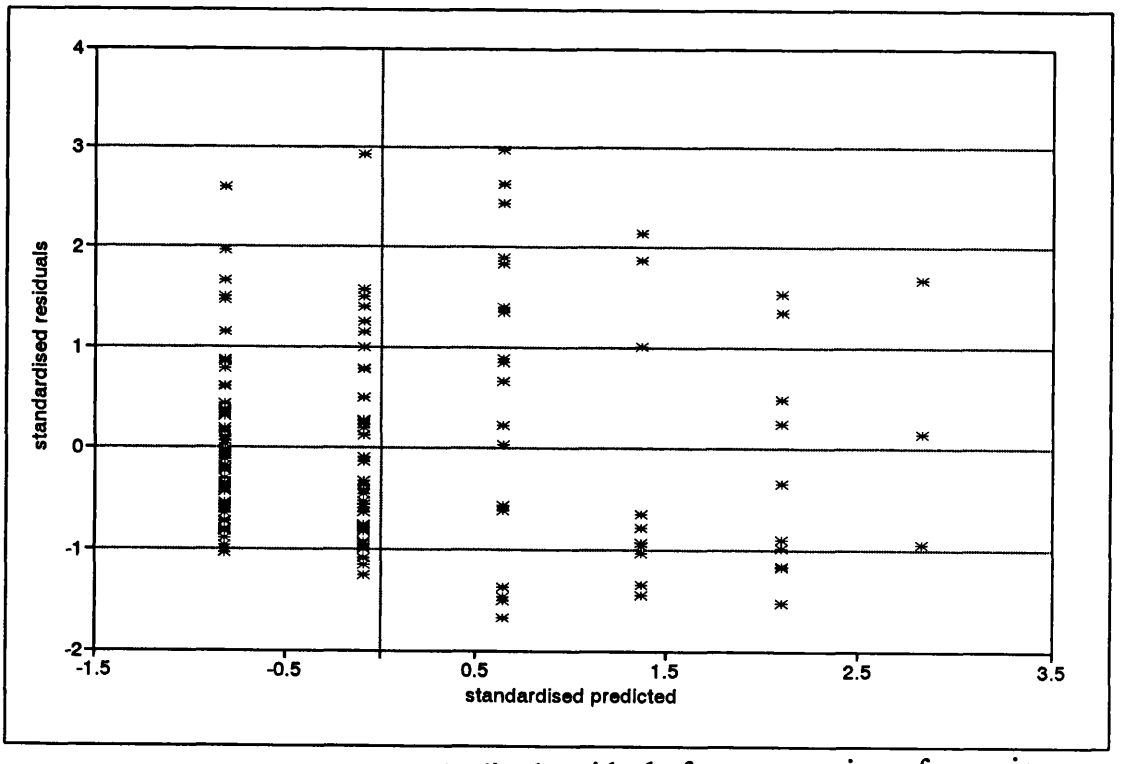


Figure 4.19 Scatterplot of standardised residuals from regression of generic savings on number of partners and standardised predicted values of generic savings.

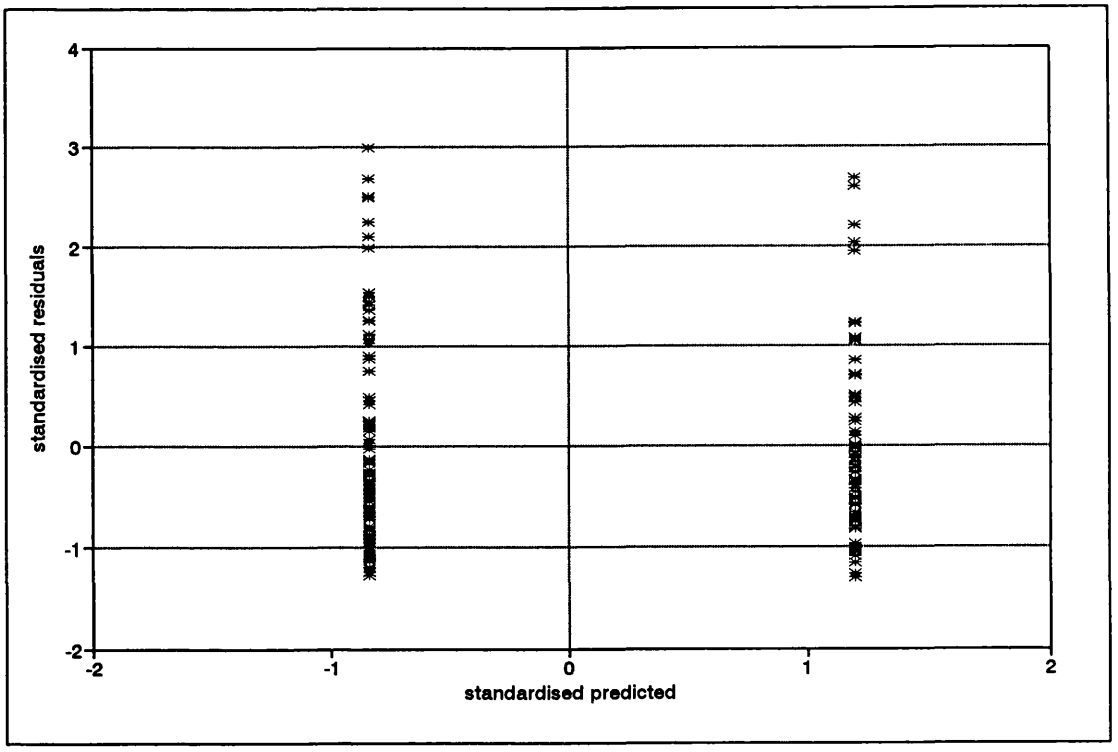


Figure 4.20 Scatterplot of standardised residuals from regression of generic savings on practice computer status and standardised predicted values of generic savings.

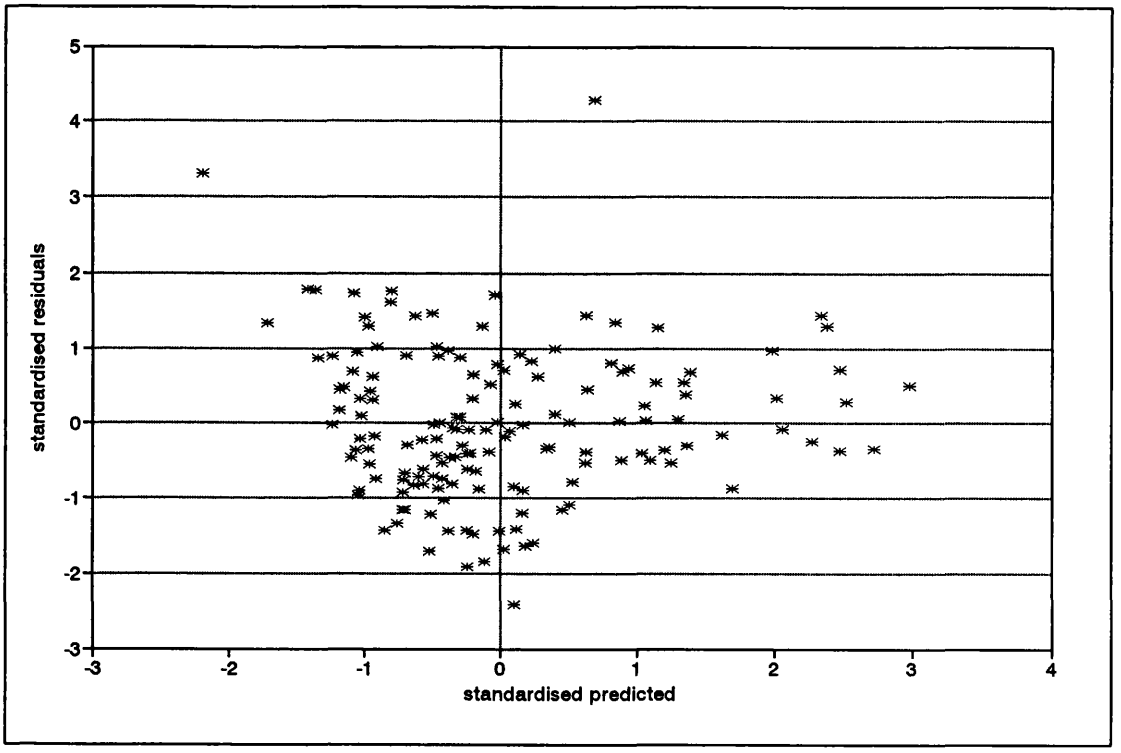


Figure 4.21 Scatterplot of standardised residuals from regression of generic savings on practice prescribing costs and standardised predicted values of generic savings.

4.3.1 Constructing the final regression model

The final regression model was fitted using the SPSSPC backward elimination procedure (Norusis, 1990); the SPSS 'forward' and 'stepwise' elimination procedures being found to produce similar results. After entering the independent variables (generic prescribing rate, number of partners, prescribing costs, percentage of patients over 65, patient/doctor ratio and computer status) as predictors of GSP the backward elimination procedure removed the least important predictors to arrive at the simplest adequate model. In this case however, all six variables were retained, making significant contributions to the model. Table 4.3 summarises the results of the final model.

Variable	B	SE B	*beta*	F	p
No. of partners	335.374	27.202	0.702	152.000	$p<0.001$
Generic rate (%)	-27.507	3.198	-0.491	73.977	$p<0.001$
Patient/Dr ratio	0.352	0.041	0.459	73.969	$p<0.001$
Patients over 65(%)	38.523	6.947	0.298	30.749	$p<0.001$
Cost (NIC/PU)	60.721	18.379	0.163	10.916	$p<0.01$
Computer status	-172.91	72.721	-0.130	5.654	$p<0.02$
(constant)	-232.753	234.797		0.983	0.323

Table 4.3 Statistics for the final regression model.

Using this procedure all six variables were retained yielding a final model in which 65% of the variation in GSP between practices was explained ($r^2=0.664$). The overall goodness of fit for the model was highly significant ($F(6,146)=48.12$, $p<0.01$). The model confirms the correlations found in the correlation matrix, that practices with a larger numbers of partners, a lower generic prescribing rate, a higher patient per doctor ratio, a higher proportion of patients over 65, higher

prescribing costs, and no computer are associated with higher GSP. However, each variable makes a significant contribution in the context of the regression.

The *beta* values indicate that number of partners, patients per doctor, percentage of patients over 65, and prescribing costs are all positively and significantly correlated with GSP ($p<0.001$ for all except cost ($p<0.01$)). The generic prescribing rate is negatively correlated with GSP ($p<0.001$). The model revealed computer status to be negatively correlated with savings potential, and significantly so ($p<0.02$), although this relationship was not evident within the correlational analysis.

4.4 Correlations after the removal of linear relationship between variables

These correlations were studied by constructing partial regression plots and a partial correlation matrix of all the variables included in the regression model. The result of these two analytical tools are presented below, followed by a brief description of the findings.

4.4.1 Partial regression plots

Partial regression plots allow a visual inspection of the relationship between GSP and each independent variable. For each plot shown below the linear effects of the other variables (those not in the plot) on both variables plotted have been removed (figures 4.22-4.27). For each plot the Y axis shows the residuals for generic savings when the contribution from the variables not in the plot were removed. Similarly, the X axis shows the residuals for the independent variable, when the contribution from the variables not in the plot were removed. This technique has been recommended in order to define further the relationships between variables in a multiple regression model and is described in more detail by Norusis (1990).

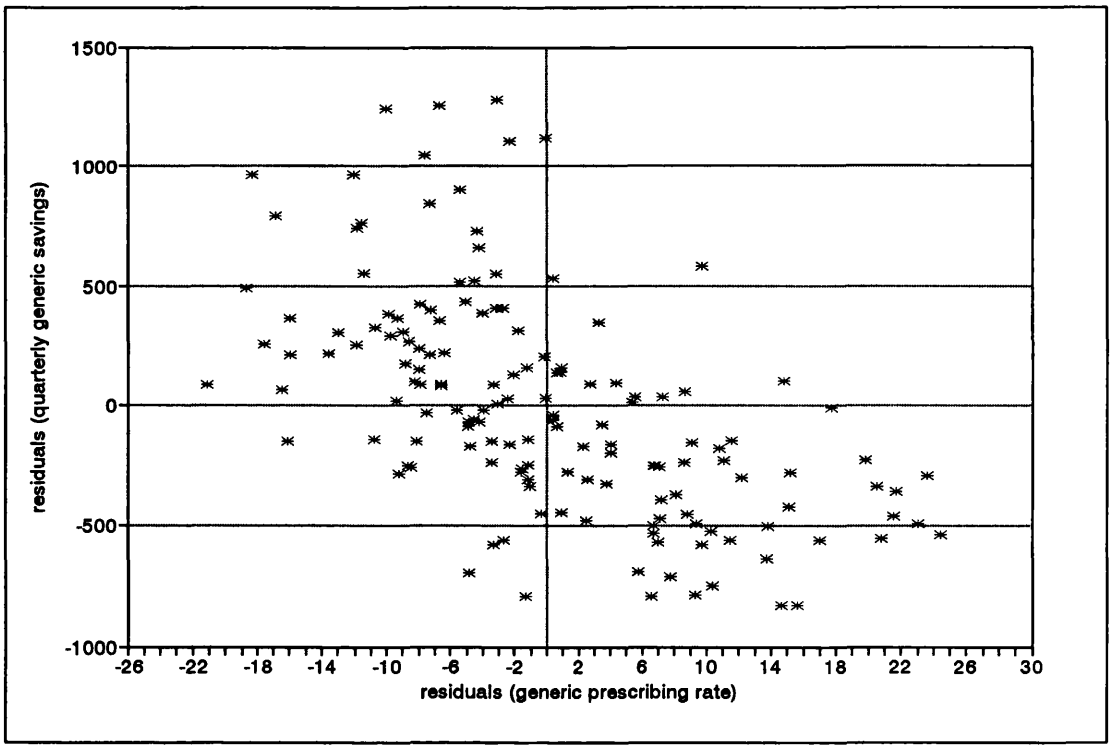


Figure 4.22 Partial plot showing relationship between residuals for practice generic prescribing rate and generic savings potential.

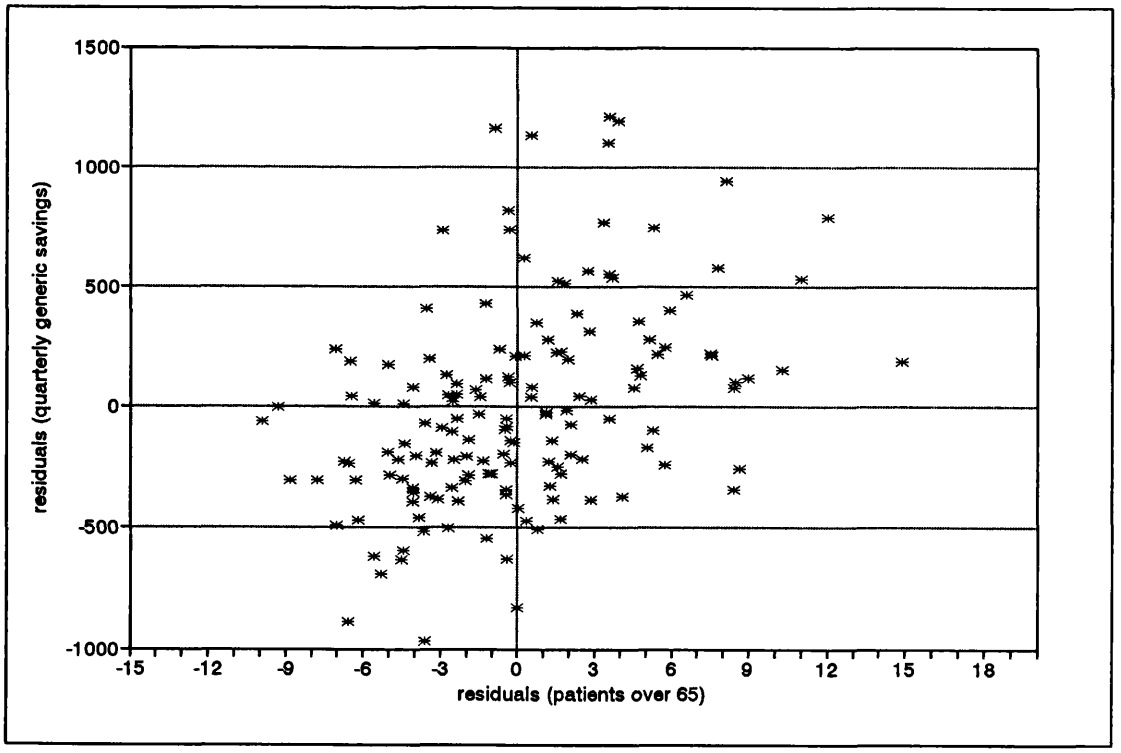


Figure 4.23 Partial plot showing relationship between residuals for practice percentage of patients over 65 years and generic savings potential.

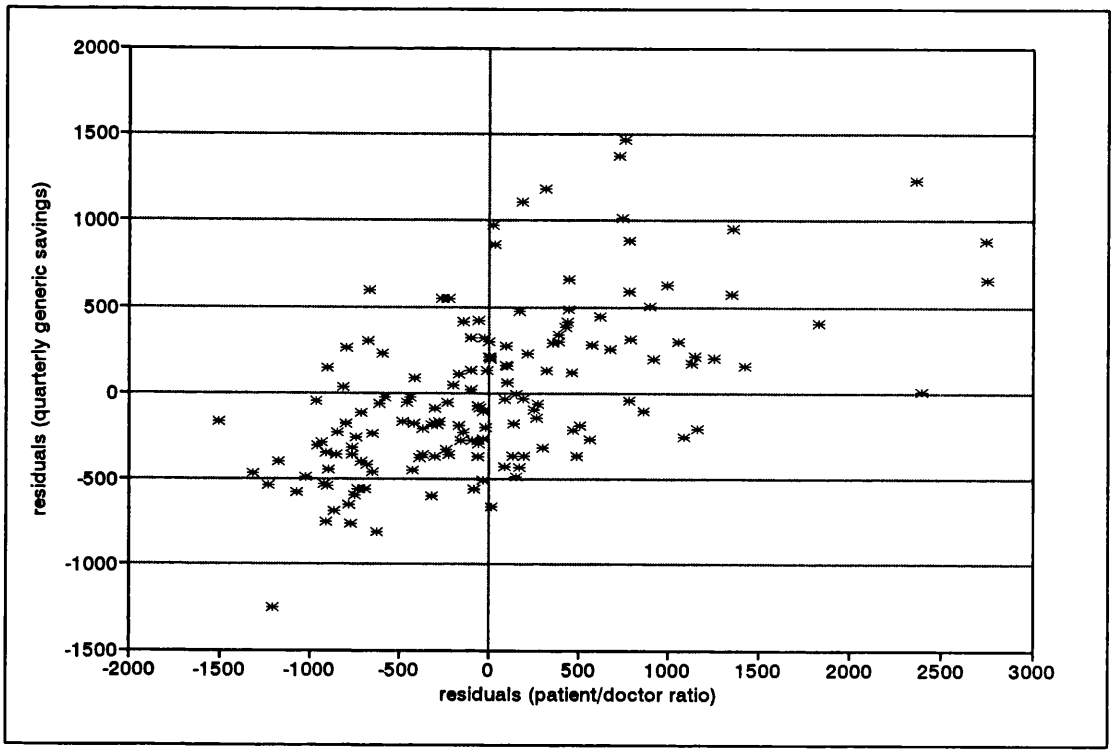


Figure 4.24 Partial plot showing relationship between residuals for practice ratio of patients to doctor and generic savings potential.

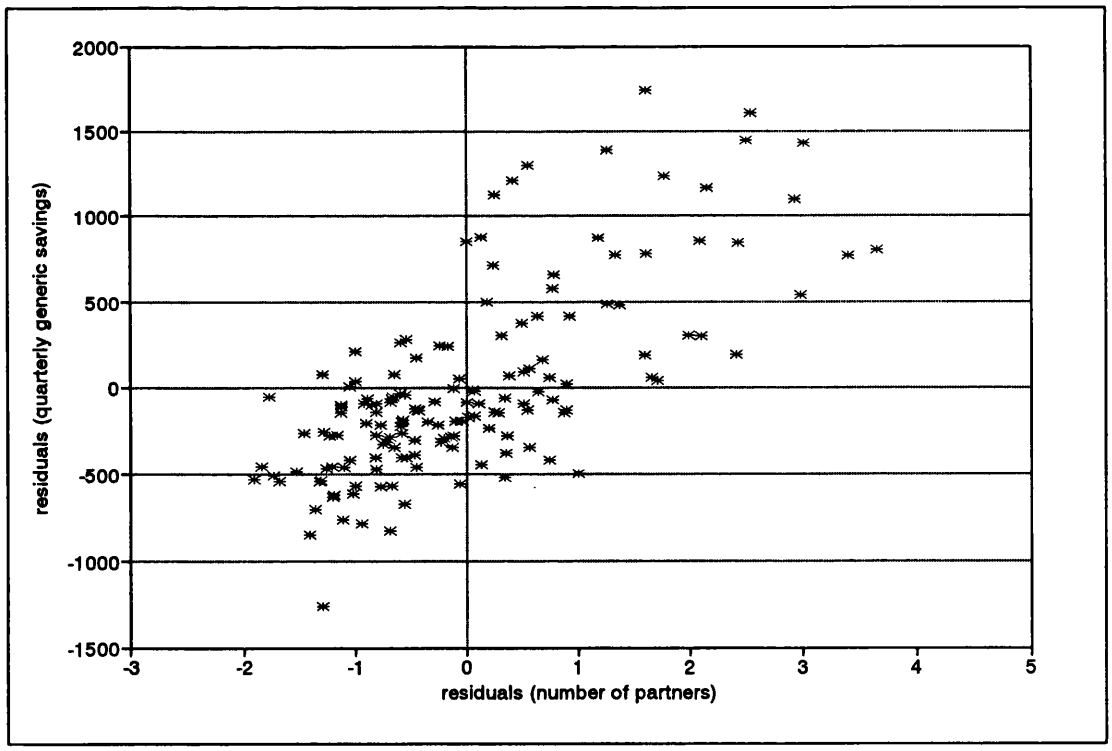


Figure 4.25 Partial plot showing relationship between residuals for number of partners and generic savings potential.

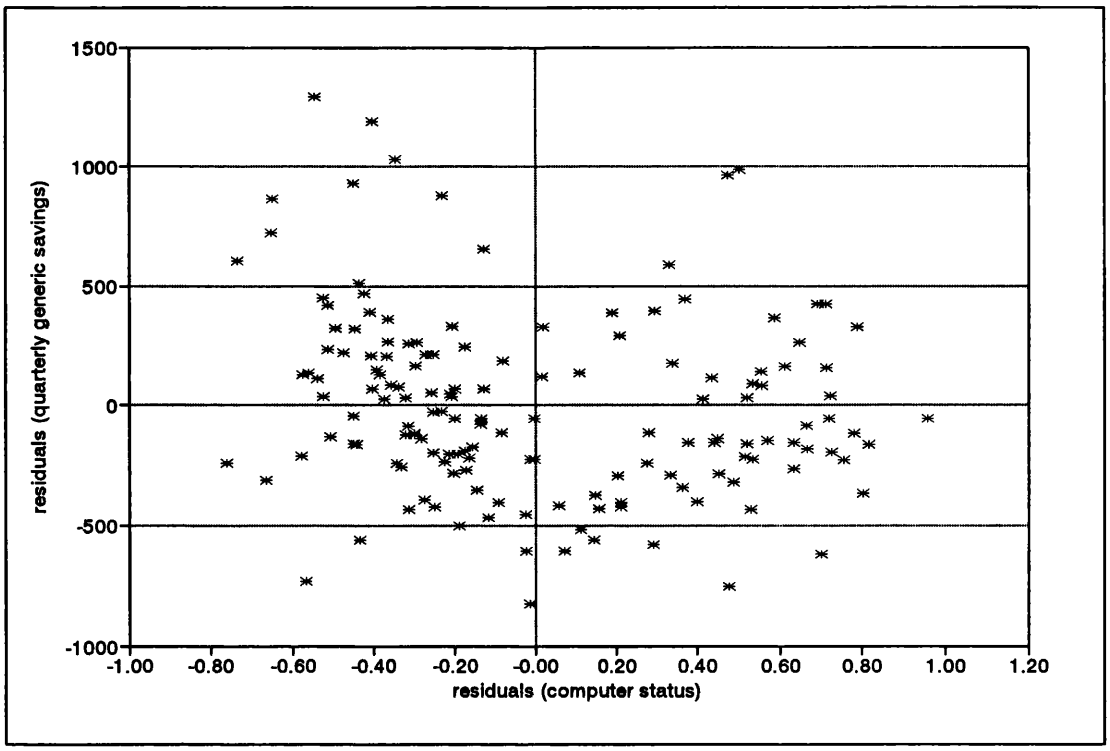


Figure 4.26 Partial plot showing relationship between residuals for practice computer status and generic savings potential.

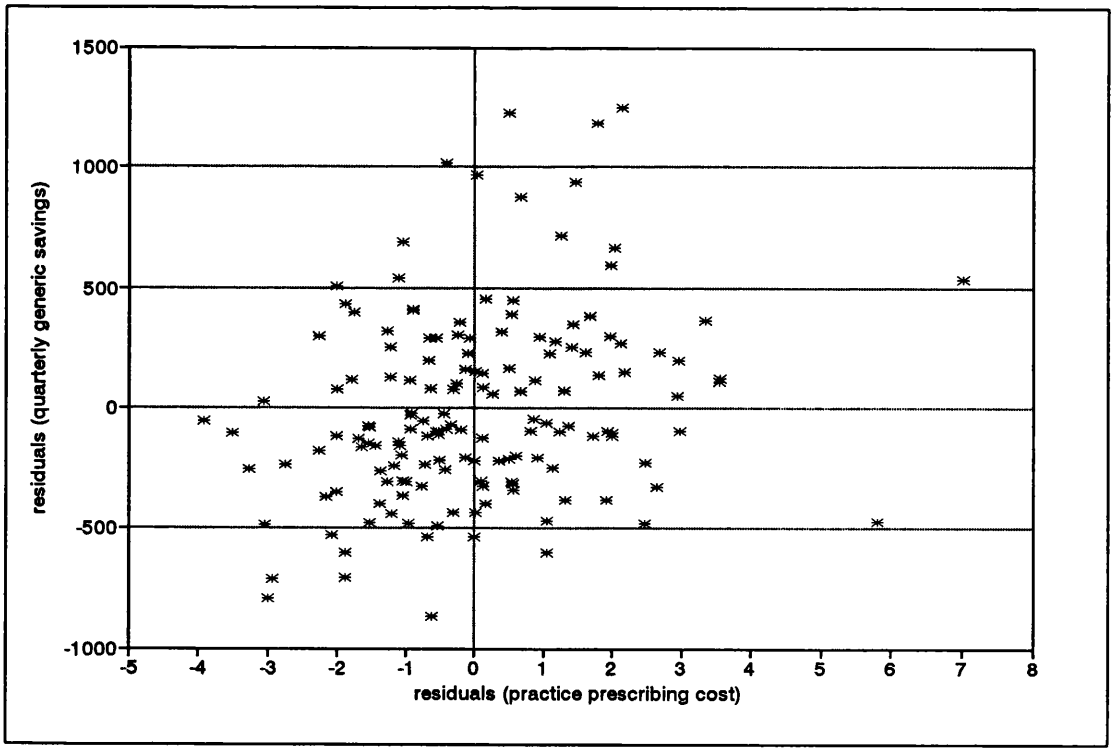


Figure 4.27 Partial plot showing relationship between residuals for practice prescribing costs and generic savings potential.

4.4.2 Partial correlation coefficients

The relationships in the scatterplots shown above can be summarised by calculating correlation coefficients between each pair of variables; these correlations are known as partial correlation coefficients (Norusis, 1990). Using a similar process of calculation a complete partial correlation matrix can be constructed for all the variables concerned. The results of this are shown in table 4.4 below.

	Generic savings	Generic rate	Pts over 65	Pt/Dr ratio	No. of partners	Comp-uter status	Cost (NIC/ PU)
Generic savings (£)	1						
Generic rate	-0.58***	1					
Patients over 65 (%)	0.42***	0.52***	1				
Patient/ doctor ratio	0.58***	-0.22**	-0.29***	1			
No. of partners	0.71***	0.52***	-0.27***	-0.59***	1		
Computer status	-0.19*	0.08	-0.11	0.29***	0.39***	1	
Cost (NIC/PU)	0.26***	-0.06	-0.04	-0.06	-0.12	-0.04	1

Table 4.4 Partial correlation coefficient matrix (* $p<0.02$, ** $p<0.01$, *** $p<0.001$).

When controlling for the effects of independent variables on one another, the matrix for partial coefficients shows that the number of partners has by far the strongest positive correlation with GSP (partial $r=0.71$, $p<0.001$). In particular, the partial plot highlights the strength of the direct linear relationship (figure 4.25).

The generic rate and ratio of patients to doctor make the second greatest contribution to the explanation in variation. The correlations, although of similar

magnitude, are in the opposite directions (partial r=+/-0.58, $p<0.001$) i.e. high patient/doctor ratio and low generic prescribing rates being associated with high generic savings. The linear relationship between each independent variable and GSP are highlighted in the partial plots of the residuals (figures 4.22 and 4.24).

In the partial correlation, the proportion of patients over 65 is also positively associated with GSP (partial r=0.42, $p<0.01$), but to a lesser extent than the patient/doctor ratio. The partial plot is shown in figure 4.23.

The partial correlation matrix shows that prescribing costs are positively and still significantly associated with savings potential (partial r=0.26, $p<0.001$), although less so than patients over 65. The linear relationship is shown in the partial plot (figure 4.27).

The partial correlation matrix shows that the contribution of computer status to the variation in GSPs is significant but weak (partial r=-0.19, $p<0.02$). The weak linear relationship between these two variables can be seen clearly in the partial plot (figure 4.26).

CHAPTER 5

DISCUSSION

Summary

Three of the four study objectives have been achieved through development of the methodology and analysis for this study. The fourth is addressed in this chapter.

The calculation of generic savings potentials (GSP) provides a direct measure of the economic performance of a practice with regard to the generic prescribing of a limited range of drugs. A similar method could be used to design model enquiries for the new on-line prescribing database from the Prescription Pricing Authority. Against this, the appropriateness of the current generic performance indicator is considered. Overall it is concluded that there is little evidence to support the continued investment of FHSA resources in the blanket promotion of higher generic prescribing rates.

The regression model constructed in the analysis includes six practice characteristics that when combined explain 65% of the inter-practice variation in GSP within City & East London Family Health Services Authority area. Considering common characteristics of practices with particular savings potentials and generic prescribing profiles suggests that investment to change prescribing behaviour would be more effectively used to target specific drugs in specific practices as and when it is economically advantageous. The measure of GSP enables FHSAs to do this with ease.

The strengths of the holistic prescribing model described by Raisch provides a starting point for the study of generic prescribing at practice level. Strategies for maximising economic advantage from generic prescribing are considered in light of this model, together with the findings of this study and others discussed in Chapter Two. Finally more focused FHSA strategies aimed at realising the diminished but substantial returns that remain in some practices are considered.

5.1 Findings

5.1.1 Assessment of new generic savings measure

The programme developed to assess the GSP of practices was designed using a database containing a small selection of frequently prescribed drugs. These drugs all had both high generic/brand cost differentials and high prescribing volume. The programme demonstrated that the GSPs for 21 drugs for all practices in City & East London FHSA was £146,000 (quarter ending March 1992).

A simple analysis showed that although an inverse linear relationship exists between the generic rate and GSPs the correlation is not strong (table 4.2). From this result it may be concluded that the generic rate is a significant but weak proxy for a practice's ability to make savings from increasing generic prescribing.

The GSPs, calculated using the programme designed as part of this study, provide a direct measure of the economic performance of a practice with regard to the generic prescribing of a limited range of drugs. The relationship between GSPs and generic rate was examined further in the multiple regression analysis.

5.1.2 Results of multiple regression analysis

The main results of the regression analysis will be summarised before being discussed in detail. The final regression model incorporated all six variables; number of partners, generic rate, patient/doctor ratio; proportion of patients over 65, prescribing cost (NIC/PU) and computer status.

These six variables explained 65% of the inter-practice variation in GSPs on the 21 drugs selected for this study. The model suggests that practices with more partners, lower generic prescribing rates, a higher patient per doctor ratio, higher proportion of patients over 65, higher prescribing costs and no computer are associated with higher GSP than practices without these characteristics.

5.2 General discussion

The findings outlined above are now discussed in the context of the evidence presented in Chapter two. The relevance of the findings to the fourth objective in this study i.e. practice profiles for GSP, is also considered. The use of the model proposed by Raisch (1990) to explore this aspect of prescribing behaviour is reviewed in section 5.3.

5.2.1 A new way of monitoring generics

The programme provides a flexible way of monitoring GSPs without the need to manipulate large drug data files and therefore fulfils the first study objective. It can be tailored to reflect the generic prescribing priorities of an individual FHSA. Prescribing advisers could deselect practices with low savings potential from any generic initiative thereby targeting resources more effectively. The programme would facilitate identification, regular monitoring and feedback to practices with the greatest GSP. This information may then be used to negotiate targets within an incentive scheme and to measure actual savings achieved against the target.

During the course of this study the Audit Commission published an audit of general practice prescribing. Entitled 'A Prescription for Improvement' (1994), the report considered the response of FHSAs and GPs to prescribing since the introduction of the Indicative Prescribing Scheme. The commission subsequently produced a statistical analysis of specific areas of prescribing for each FHSA. Known as ACTAP (Audit Commission Thematic Analysis of Prescribing) the analysis was derived from the PPA database and included a list of practice GSPs for individual drugs (as opposed to products). The data was provided to FHSAs in spreadsheet format which, whilst compatible with most FHSA systems, did not offer the flexibility of a database to manipulate large amounts of data.

Although ACTAP represents a significant development in the comparative analysis of prescribing patterns, there are a number of shortcomings for measuring and

monitoring GSP when compared to the programme developed for this study. The first relates to the dangers of data corruption during manipulation on the ACTAP spreadsheet, although this can be overcome with well designed spreadsheet macros. Whilst macros can be designed to extract specific data fields, individual selection of specific ranges of drugs requires a higher level of computer expertise. The second limitation relates to the provision of ACTAP data on an annual basis only, making 'in year' feedback relating to targets or incentive schemes impossible. A third drawback is the limitation to drug and not product, thus limiting the focus of the message. For example, if it is known that generic savings will be derived from the prescribing of ibuprofen 200mg and 400mg, but not 600mg or slow release, then it is helpful to be able to tailor information to the specific product, particularly since PACT level 3 data shows that GPs tend to prescribe some drug strengths/forms more than others.

The availability of on line access to PPA PACT data (known as FEPACT) from 1995 presents greater possibilities for regular monitoring of progress drawing on the experience gained using ACTAP. As with ACTAP data considerable computer literacy is required to obtain maximum benefit from data extracted from FEPACT when compared with the expertise required to use the programme designed for use in this study. Pre-prepared, or model, enquiries for FEPACT would be helpful for prescribing advisers who have limited access to such expertise.

In the majority of cases generic savings are concentrated on drugs that are prescribed frequently and the programme designed for this study provides clearly focused targets at the practice level. The programme could easily be developed to include the ability to estimate anticipated percentage change in prescribing behaviour of targeted drugs thereby generating a more realistic target saving; the proportion of change being negotiated with each practice in advance, possibly in relation to a local incentive scheme. A programme with attributes similar to that designed for this study may offer significant benefits to prescribing advisers and could be replicated in the area of therapeutic substitution.

5.2.2 Accuracy and relevance of generic measures as indicators of prescribing performance

Potential savings generated for City & East London FHSA using the programme developed for this study suggests that annual savings of £584,000 could be realised from generic substitution of the 21 products screened. This saving represents approximately 2% of the total annual prescribing expenditure for City & East London FHSA and is comparable to the national proportion calculated by scanning the 'top 20' drugs across the whole of the PPA database (2.7% of total, PPA unpublished data). In 1992 the annual national savings potential from generic substitution of these 20 products was calculated to be over £60 million, amounting to 32% of the combined turnover for these same drugs (PPA, 1992, *unpublished data*).

The generic prescribing rate featured in PACT data provides an accurate measure of generic prescribing behaviour i.e. the name used by GPs when writing a prescription. However the rate is a less accurate indicator of practices that use generic products to the greatest economic advantage i.e. those with the least GSP remaining in the practice.

The plot of the correlation between generic rate and savings (figure 4.10) shows that practices with the highest savings potential i.e. above £2000 per quarter, whilst generally having generic rates below average, do not have generic rates at either extremes of the range. However, practices with medium savings potentials i.e. £1000-£2000 have generic rates at both extremes of the range.

The multiple regression analysis shows that whilst the generic rate does contribute significantly to the explanatory power of the model to predict practices with high or low GSP (table 4.3), it is not as strong a predictor as the number of partners in the practice. Figure 4.16 shows that the variance of the residuals for generic rate increases as the predicted value of GSPs decreases and this indicates that the overall fit of the model is better for those practices that have above average savings

potential. Controlling for other variables (figure 4.22), strengthens the linear relationship between generic rate and GSPs, but still demonstrates that practices with extremely low generic rates are more likely to have medium than high GSP. The results also confirm that low, as well as high, generic rates can be found in practices with low savings potential i.e. having a low rate does not equate to a high savings potential and cannot be relied upon universally as a performance indicator. No practice with a generic rate above 50% has savings above £2000 per quarter (figure 4.10) and it can therefore be concluded that the majority of practices with generic rates in the upper quartile range (>54.5%) are using generic prescribing to good economic effect. However, there may be practices with generic rates in this range that prescribe expensive, branded products by the generic name in preference to the established range of products screened in the study. These practices may be targets for therapeutic substitution initiatives which are outside of the scope of this study.

These findings highlight that, used in isolation from other measures, the generic rate is an imperfect performance indicator of practices' generic prescribing response to the governments anticipated 'downward pressure' on prescribing costs (Chapter One). This measure may have served its purpose in effecting change amongst practices that choose and/or are able to respond favourably to government initiatives. However, as an indirect measure, weakly correlated with the intended outcome of producing generic savings it is open to manipulation by practices and misinterpretation by FHSAs.

In terms of the study objectives the generic rate has been found lacking as an indicator of cost effective prescribing. Furthermore it can lead to the targeting of practices with generic messages where little economic advantage is to be gained at the risk of alienating the GPs. If, as recent generic prescribing data suggest, the majority of practices that are going (voluntarily) to raise their generic rate have already done so, then a different strategy may be required to influence the small, but substantial, minority who have not responded to existing pressures and incentives. Merely advocating that such practices should follow suit and increase

their generic prescribing rate may not be the most cost effective approach when it can be demonstrated that focusing on fewer changes in prescribing patterns can yield similar financial results. When the cost and effort required to effect wholesale versus focused changes in prescribing behaviour of resistant GPs is added into the equation, the overall financial advantages resulting from securing such change becomes less attractive as documented recently by a GP practice who painstakingly substituted generic drugs wherever possible for branded drugs; after savings were calculated the practice undertook another exercise and realised that similar savings could have been achieved by adopting generic substitution for a few carefully selected products with considerably less effort (Leathley, 1992).

The generic rate is a measure of prescribing behaviour and two arguments may favour continued support for across the board increases in the generic rate. The first stems from the view expressed by many professional bodies that generic prescribing equates to good prescribing practice and is a valid performance indicator in this respect. Whilst this may be so, promotion of generic prescribing for this reason alone is difficult to justify in terms of time, expense and the damage to public relations that may be incurred in changing a large proportion of the prescribing behaviour of the reticent few to diminishing economic advantage.

The second argument suggests that establishing the generic name as the preferred name when a drug is first introduced will maximise savings when patents expire and generic forms become available. In terms described by Denig (1992) this would require the introduction of the generic name into the prescriber's 'evoked set'. Miller (1974) and others have described the entry of new drugs into a prescribers repertoire in some detail, and much of this research is utilised to good effect by drug companies whose marketing strategies cannot be ignored: Pricing policies introduced when patents expire can be used to discourage generic competitors by pricing the established brand at the same price as the generic e.g. diclofenac (Voltarol). When this occurs government funded campaigns to change GPs prescribing behaviour *on economic grounds* become obsolete for this product. However, when companies maintain their price differential based on their ability to

retain their existing market base through brand loyalty, advertising and deals with large pharmaceutical retailers, government funded campaigns become worthwhile on economic grounds e.g. allopurinol (Zyloric®).

Drug companies also utilise promotional strategies that are employed to encourage prescribers to question their original decision and perhaps change products. It is likely that such promotional activity contributes to the use of branded names even by a proportion of recently qualified GPs who, having been exposed to generic drug names during their hospital training, adopt brand names when prescribing the same drugs in general practice. The continued investment by drug companies in such activities may be viewed as further support for their effectiveness.

Soumerai and Avorn (1990) found that GPs often attributed greater credibility to independent prescribing advisers. However, the marketing power of companies through investment and experience dwarfs anything that health service administrators are likely to provide. For this reason it may be unrealistic to expect that a prescriber's 'evoked set', once formed in the generic will remain as such throughout a career in general practice, and so the case for investing in future economic prescribing behaviour through the promotion of across the board generic prescribing during the drug adoption stage may be weak.

To have any chance of generating a positive cost/benefit ratio from generic substitution there needs to be substantial brand/generic price differential in favour of the generic product combined with a high volume of use. Since this combination does not arise frequently the task of selected promotion is within the abilities of most FHSAs. Where therapeutic, or other inequality issues relating to quality or continuity have been substantiated the cost/benefit ratio for generic substitution is untenable. However, the situation is less clear cut where evidence for inequality is lacking, but strongly promoted by a drug company in support of their product. In this situation the cost/benefit ratio must be sufficient to support the cost of supporting the generic product in the face of brand marketing to the satisfaction of

both patients and prescribers. This situation could not readily be addressed by individual FHSAs and would clearly benefit from a central initiative.

Overall there is little evidence to support continued investment of FHSA resources in the promotion of generic prescribing per se, and in particular increases in the generic rate. There is however a strong argument for using limited resources to target specific drugs in specific practices as and when it is economically advantageous to do so and the measure of GSP enables FHSAs to do this with ease.

5.2.3 The strength of the regression model

The six variables included explained 65% of the inter-practice variation in GSPs derived from the 21 drugs selected for this study. Whilst other investigators have constructed regression models that explain over 60% of FHSA variation in prescribing parameters such as cost (Leeds Prescribing Research Unit, 1993) and costs and prescribing rates (Forster and Frost, 1991), few have constructed models to explain similar variations at the practice level. One such analysis by Ryan et al. (1990) showed little association between GP estimates of drug costs and individual and practice characteristics.

In this study number of partners proved to have the greatest explanatory power within the model (table 4.3), and also the highest correlation coefficient with GSP, when controlling for other variables (table 4.4). Practices with more partners were associated with higher GSP and, controlling for the effect of other variables, shows a strengthening, not weakening, of this linear relationship (figure 4.25).

Practices with more partners are generally able to register more patients than practices with less partners. If prescribing rates per patient and generic prescribing behaviour were distributed equally across practices then, on average, practices with more patients would be expected issue more prescriptions and to have greater GSP than those with less patients. The number of patients and/or prescribing units per

practice is not included in the model but seems worthy of further consideration.

The contribution of generic rate has been discussed in the section above, however, in summary its contribution to the model was of the same magnitude as patient/doctor ratio, but in the opposite direction i.e. lower generic rates were associated with higher savings potential. Overall the generic rate was less significant than the number of partners in explaining inter-practice variation in GSP (table 4.4).

A visual scan of generic rates undertaken at the beginning of this study confirmed that the generic prescribing rate, and hence generic prescribing behaviour, in any one practice varies according to drug, drug group, and BNF chapter. Variation in generic rate across products may be associated with factors such as the age of the prescriber, the time since product launch, promotional activity of drug companies (which tends to be high for 'me-too'[1] antibiotics (McGavock et al. 1993) and non-steroidal anti-inflammatory drugs), hospital initiated drugs and patient demography.

The simple and multiple analysis show that patient/doctor ratio is significantly and positively correlated with GSP (table 4.2), although the broad distribution of savings found for practices with around average patient/doctor ratios (figure 4.12) includes some practices with the highest savings potentials.

Previous research on the effect of list size on prescribing behaviour has produced conflicting results. Work by Howie (1989) suggests that larger personal lists are associated with shorter consultations, and that these in turn result in higher prescribing rates. However, Dunnel and Cartright (1972) found that doctors with smaller list sizes reported a higher prescribing rates than those with larger list sizes, although this conflicted with the response to other questions that suggested that doctors perceived that they would issue fewer prescriptions if they had more

[1] The term 'me-too' is used to describe drugs which offer few therapeutic advantages in a treatment area where there is already a wide range of drugs to choose from. They are frequently introduced in therapeutic areas where a very small market share will represent substantial sales.

time. On the basis of ideas put forward by Denig (1992) it is possible that shorter consultations result in less time spent on the prescribing decision and that the habitual decision process is utilised more frequently in favour of the most familiar name. Work by Erramouspe (1989) suggests that branded names are recalled more frequently than generic names. This finding together those of Howie and the arguments put forward by Denig might suggest that larger lists, shorter consultations, and habitual decision making will culminate in more branded than generic prescribing. It is possible that these last two factors could also be exerting an influence in this study, although no causal links were sought.

In the simple analysis there is no apparent correlation between the proportion of patients over 65 and GSP although a significant positive correlation between the proportion of patients over 65 and the generic prescribing rate does occur. When controlling for the effect of other variables in the model, the regression analysis includes the proportion of patients over 65 and the strength of this relationship shows that higher proportions of elderly patients are associated with greater savings potential (figure 4.23). The matrix of partial correlation coefficients (table 4.4) shows a strengthening of the relationships found in the simple analysis between proportion of patients over 65 and both savings potential and generic rate. These two associations raise a number of points about the nature of prescribing for elderly patients and these are now discussed.

5.2.3.1 Generic rate and patients over 65 years

In light of the recommendation that brand name prescribing may offer advantages to elderly patients in terms of increased compliance (Drugs and Therapeutics Bulletin, 1987), it might be anticipated that practices with a high proportion of elderly would have a low generic prescribing rate. However, the opposite was found in this study (table 4.2). It seems unlikely that prescribers would make an active decision to prescribe generic drugs to elderly patients and branded drugs to younger patients and so a number of other potential contributing factors might be considered; the use of repeats in relation to patient demography; availability of

drug in generic form (often linked to years since drug launch); and duration of consultations.

Nearly all practices have a manual or computerised repeat prescribing system that, once established for a particular patient, often by-passes the drug choice stage in the prescribing process. Unless there is policy of regular medication review requiring active decision making the repeat system will maintain drugs as initiated or amended for considerable periods of time, regardless of the preferred drug name of the prescriber signing the repeat prescription. Where one doctor in the practice actively selects generic names during initiation or review of long term therapy the prescribing behaviour will often be carried forward regardless of the preferred drug name adopted by other partners in the practice.

The purchase of a new computer system offers the opportunity to review all prescription details as they are entered, and generic substitution may be actively increased within a practice at this point, particularly for repeat prescriptions. However, in the absence of an actively supported generic prescribing policy within the practice it is likely that subsequent review will be infrequent and newly initiated drugs will continue to reflect each prescriber's preferred drug name.

Since repeat prescribing systems are likely to maintain a particular prescribing behaviour for some time any GSP that remains is likely to continue unchallenged. If these same patients are receiving the highest proportion of drugs in the practice, it may only require a small proportion of prescriptions for drugs with the highest price differential to be recorded under the brand name to generate significant savings potentials. Practices with more partners, more patients and a higher proportion of patients over 65, retaining a similar *proportion* of branded repeats to smaller partnerships with less patients, and a lower proportion of patients over 65, will have much greater GSPs.

Of the 21 drugs selected for calculations of GSP, seven are non-steroidal anti-inflammatory drugs, eight are drugs associated with cardiovascular disease, four

are antibiotics, one is an H_2 antagonist and one is used in the treatment of asthma. Erythromycin granules (Erythroped®) are likely to be prescribed for young children, whilst the drug used to treat asthma, salbutamol (Ventolin®), and the H_2 antagonist, cimetidine (Tagamet®) are more commonly prescribed to those under 65 than those over 65. Cardiac and anti-inflammatory drugs on the other hand are more frequently prescribed in patients over 65. Due to the often self-limiting nature of infections, antibiotic drugs are perhaps the least likely to be prescribed via repeat prescribing systems.

Elderly patients are more likely to be receiving drugs that were initiated many years ago and whose patent has expired. As a result such drugs may now be available in the generic form and in this respect it may not be surprising to find a high generic rate in practices with a high proportion of patients over 65. However, this depends on the inclusion of the generic drug name within the 'evoked set' of the doctor initiating or reviewing the prescription. It is also possible that the marketing support for brand names utilised two decades ago was less aggressive than that utilised for drugs launched and initiated more recently.

The partial correlation coefficient shows that the proportion of patients over 65 is associated with higher GSPs, although this relationship is not apparent in the simple analysis. The contribution of each drug to savings potential is a result of the brand/generic differential multiplied by the volume of drug prescribed and it interesting to note in this study that savings of similar magnitude were found for salbutamol 200 microgram inhalers as for the combined savings of the four anti-inflammatory drugs used in the analysis.

Practices with higher proportions of patients over 65 are associated with lower patient/doctor ratios. This may result in longer consultations and more active decision making within the prescribing process thereby enabling GPs committed to generic prescribing to over-ride any tendency they may have towards brand name prescribing, and amend the repeat prescribing record during a medication review in favour of generics, but if this were the case savings potentials might be lower.

This combination of factors might contribute to the explanation of the association between high savings potentials and elderly patients, but has not been shown to be casual in this study.

5.2.3.2 Generic rate and prescribing cost

In the simple analysis prescribing cost (NIC/PU) is positively and significantly correlated with GSP (table 4.2) and this correlation holds when adjusting for the effect of other variables (figure 4.27). The simple analysis also supports Crompton's finding (1991) that generic rate is poorly correlated with prescribing cost (NIC/PU) (table 4.2).

5.2.3.3 Generic rate and computer status

The simple analysis shows no correlation between computer status and GSPs, and a significant correlation with generic rate (table 4.2), but these results are reversed when controlling for other variables (table 4.4). Computer status is therefore included in the final regression model although it makes the smallest contribution to the explanatory power of the model. It is weakly but negatively correlated with savings potential as illustrated in the partial plot (figure 4.26) and the partial correlation matrix (table 4.4). These results are surprising given the time and effort that some practices have reportedly invested in creating or amending the drug datafile. It is perhaps disappointing that systems that should lend themselves to cost effective prescribing do not appear to do so. The suggestion that drug company sponsored systems are likely to bias the prescriber against generic drugs has not been studied in detail however, closer inspection of practices with the independent EMIS system showed that whilst the majority had generic rates above the average, there remained practices with significant savings potentials (range £60-£2800 per quarter).

The associations found by Bosanquet and Leese (1988) suggest that more partners and the ability to purchase and use computers in particular ways can have a

significant impact on the ability to meet particular targets and receive additional payments. The results of the partial correlation analysis suggest that practices with more partners already have a higher generic rate, *and* are more likely to be computerised. Whilst it is therefore true that practices with more partners 'perform better' against the current generic indicator, the findings do not suggest that practices are currently *using* computers to meet either the behavioral goal (increased generic rate) or the economic goal (cost effective use of generic drugs) although it is possible that they would do so if there was sufficient incentive.

The overall complexity of relationships between all variables within the regression model prohibits the definition of any causal pathways. However, associations between GSP and practice characteristics was explored therefore achieving the third study objective.

Using the relationships described by the regression model, practice characteristics were compared for practices with similar generic profiles at the extremes of both savings and rate. The former fulfilling the fourth study objective. This provided the basis for an assessment of the suitability of the two measures for the attention of FHSA prescribing advisers and as indicators of performance against the governments objective to reduce prescribing costs.

5.2.4 Comparing the model with reality

The regression model shows that partnership size, patient doctor ratios, proportion of patients over 65 and generic rate offer the greatest explanation of GSPs between practices in City & East London FHSA. The study characteristics of practices at each end of the generic savings spectrum and the generic rate spectrum were compared with one another.

5.2.4.1 High savings versus low rates

Of the twelve practices with savings above £2000 per quarter (range £2178-£2868), ten had three or more partners, ten had below average generic rates, seven had above average patient/doctor ratios, ten had above average proportions of patients over 65, eight had above average prescribing costs and five had computers. Total annual savings potential for these twelve practices was £120,000 i.e. 20% of FHSA total GSP.

The range of savings for the twelve practices with the lowest generic rates was £274-£1583 per quarter. Eight of these practices were doctors working alone, five had above average patient/doctor ratios, 11 had below average proportions of patients over 65, five had above average prescribing costs and four had computers. Total annual savings potential was £46,700 i.e. 8% of FHSA total. The range of savings found amongst the 59 practices with generic rates less that 40% was £80 to £2280 per quarter but annually they accounted for savings potential of £252,000 i.e. 40% of FHSA total.

Using the measure of GSPs it can therefore be seen that similar savings at FHSA level can be derived from a few practices (identified using the study programme) as from three times as many practices selected on the basis of their low generic rate.

5.2.4.2 Low savings versus high rates

Of ten practices with potential savings less than £200 per quarter, five had only one partner, eight had above average generic rates, seven had below average patient/doctor ratios, seven had below average proportions of patients over 65, nine had below average prescribing costs and four had computers. These ten practices had total annual savings potential of £5,160. By way of comparison, of the ten practices with the highest generic rates (above 63.5%), nine had GSPs below £500 per quarter, numbers of partners was equally distributed between one and four, nine had below average patient/doctor ratio, three had below average proportions

of patients over 65, seven had below average prescribing costs, and five had computers.

Although the ten practices with the highest generic rates had low savings potential, the range amongst the 26 practices with generic rates above 60% was £86 to £1886 per quarter generating a combined annual savings potential of £48,000. This finding is significant since it illustrates that there are practices with rates above the average that could still be using generic drugs to better economic advantage. Using the criteria adopted for prescribing interventions by City & East London FHSA in 1993/94 the majority of these practices would not have been targeted for any prescribing intervention, and none would have received advice regarding greater use of generic drugs.

5.2.5 Mismatched generic profiles

There are a number of practices where the generic rate and GSP have a directly opposite relationship with each other to that predicted by the model. Practices with high generic rates and moderate savings were discussed briefly above and represent groups of practices that traditionally receive little attention from an economic perspective and are often labelled as 'good prescribers'. For FHSAs aiming to manage drug expenditure with few resources some of these practices will represent missed opportunities.

Of perhaps greater concern are the practices at the other end of the spectrum who may be 'targeted' to little economic advantage.

5.2.5.1 High rates and high savings potential

Practices with a combination of above average generic rate and above average savings potential are of particular interest, since this is the area in which the generic rate fails most critically as a performance indicator. Practices with high rates may not be set generic targets or be exposed to generic prescribing messages.

In City and East London FHSA 18 practices in the analysis had generic rates above 45.19% *and* GSPs above £910 per quarter (minimum saving £1002 per quarter). Their combined annual GSP of £108,000. i.e. 18% of the total FHSA GSP from the 21 drugs selected. The findings invite the question what, if any, practice features are common to these practices. The practices selected have generic rates that are not associated with the savings in the direction predicted by the model. However, visual inspection shows that the other practice features are generally as anticipated (table 5.1).

Characteristic associated in the regression model with high savings (>£1000 per quarter) and above average generic rates	Number of practices with this feature (total 18)
More partners	10 practices above FHSA average
Lower patient/doctor ratios	11 practices below FHSA average
Higher proportion of patients over 65	13 practices above FHSA average
Higher prescribing costs (NIC/PU)	11 practices above FHSA average
More likely to have computers	11 practices with computers

Table 5.1 Characteristics of practices with above average generic rates and generic savings potential.

Practices with high GSPs prescribe, by definition, a number of the selected drugs in large volumes by the brand name. It is interesting to note that the study characteristics of practices with this GSP and rate profile are spread quite evenly around the FHSA average. This suggests that varied intervention strategies might be required to encourage prescribing change amongst this group, rather than a uniform approach.

Although it is not within the remit of the study it would be interesting to compare the range of drugs from which the savings potential are derived in these particular

practices, as this may vary. Branded drugs generating high savings potentials may be prescribed for particular groups of patients e.g. asthmatics or those with respiratory infections, whilst generic prescribing might dominate the repeat prescribing system. In practices with this particular generic profile, it is unlikely that blanket promotion of ever higher generic rates will realise the remaining savings. If however, the savings can be located to particular drugs or patient groups then this information can be used to design a focused, and more effective, intervention strategy to realise the remaining savings.

5.2.5.2 Low rates and low savings potential

Practices with a combination of below average generic rate and low savings potential (less than £500 per quarter) are also of particular interest, since once again the generic rate fails as a suitable performance indicator. Its use may lead to the investment of large amounts of time and other resource spent on information, promotion and incentive agreements aimed at increasing the generic rate in 'target' practices to little economic advantage. In City & East London FHSA, nineteen practices had low rates and low savings (combined annual savings potential £21,460).

It is possible that GPs in practices with this generic profile may be more likely than GPs in other practices to prescribe branded drugs that are still under patent. The use of newer innovative drugs are however relatively expensive (premium price) and are likely to be reflected in above average prescribing costs (NIC/PU) (which can now be identified using the ACTAP analysis). If this were the case very different strategies would be required to realise savings through selected therapeutic rather than straight forward generic substitution. However, in this example fifteen of the nineteen practices in this group have *below* average prescribing costs (table 5.2), and so the high use of innovative products is unlikely. There are at least two other explanations for this generic profile that should be considered: The first is that the drugs of choice for GPs in these practices are relatively inexpensive but still under patent and supported by brand name promotion e.g. Sudafed

(pseudoephedrine). Such a prescribing pattern would require further investigation to explore the overall appropriateness of diagnosis and treatment in these practices as well as issues of medical information and continuing education. The second possibility is that patients are receiving a substantial proportion of their medication via another route, such as NHS hospital treatment, over-the-counter medicines, or private treatment.

A number of other common practice characteristics are worthy of note and are summarised in table 5.2. The practices selected have generic rates that are not associated with the savings in the direction predicted by the model. However, with the exception of patient/doctor ratio the other practice characteristics are present as expected.

Characteristic associated in the regression model with low savings potential (<£500 per quarter) and below average generic rates	Number of practices with this feature (total 19)
Less partners	19 practices below FHSA average (17 with one partner)
Higher patient/doctor ratios	4 practices above FHSA average
Lower proportion of patients over 65	14 practices below FHSA average
Lower prescribing costs (NIC/PU)	15 practices below FHSA average
Less likely to have computers	16 practices without computers

Table 5.2 Characteristics of practices with below average generic rates and low generic savings potentials.

In contrast to the high generic savings, high generic rate group (table 5.1), these practices have many more study characteristics in common. It is therefore important to note that whilst these practices might all respond to the same type of prescribing initiative, generic prescribing would be a poor choice of topic for promotion.

5.2.6 Implications of this study for City & East London FHSA

In 1993/94 City & East London FHSA, in common with other FHSAs, targeted practices on the basis of their performance against a group of prescribing indicators, rather than one particular one. The prescribing indicators were selected on the basis that they could be easily measured, and were acceptable to GPs i.e. they represented areas where some consensus had been reached on the interpretation of excessive prescribing activity. Excess in each area was judged to be within the upper quartile range across all practices in the FHSA (or lower quartile in the case of generic rate). The indicators used were: prescribing cost (NIC/PU), musculoskeletal and antibiotic cost per prescribing unit (NIC/PU), antibiotic items per prescribing unit, and generic rate. Practices with three out of five indicators judged to be 'excessive' were targeted. On this basis twelve practices were identified, all of which were targeted with generic messages. Aids to generic prescribing were also provided for some practices e.g. generic stamps for non-computerised practices. Although measures on each of the five performance indicators were available for the periods immediately before and after practice visits by advisers and also towards the end of the year, a measure of GSP was not.

The study characteristics of the twelve practices were as follows: Practices had between one and three partners, with eight having only one partner. Patient/doctor ratios were distributed across the FHSA range, the generic rate was below average in all practices, and eight practices had below (FHSA) average proportions of patients over 65. Prescribing costs in seven practices were above the FHSA average. Only three practices were computerised in 1992. The annual savings potential generated for these twelve practices was £60,000 i.e. half of the savings generated by twelve other practices using the study programme (see 5.2.4.1). In light of the study findings this is perhaps not surprising since in the study more than half of the practices with below average generic rates had quarterly GSP less than £1000.

5.2.7 Wider Implications

The indicative prescribing scheme, by the Government's own admission, was introduced to exert downward pressure on prescribing costs (section 1.4.2). And it was suggested that reduced budgets may be allocated to practices with a low generic prescribing rate. The generic prescribing rate was one of handful of prescribing indicators that was reported to Regions and the DoH from an early stage in the schemes development. In practice, the use of a single measure was found to be a barrier to achieving support and consensus amongst GPs for prescribing changes. Such measures of 'excess' produced inconsistencies in the practices that were targeted, sometimes varying for each measure chosen. Recognition by advisers that the use of a single measure for targeting purposes was both unsound and unacceptable to GPs led to the adoption by many FHSAs of a range of indicators that were combined to highlight practices for attention.

Consequently many FHSAs, including City & East London, sought to adopt a multifactorial approach. Whilst apparently rational, this study illustrates how an approach to such a complex activity, undertaken without access to established analytical methods, can still result in mismatches between target practices, messages and 'savings'. In light of what is known of prescribing behaviour in general and the limitations of current prescribing measures (Chapter Two), it is perhaps not surprising that the approach adopted by City & East London FHSA failed to identify practices with the most to save from generic substitution. Unfortunately since such 'failures' remain generally unresearched and unreported little support is forthcoming to help prescribing advisers devise and apply more constructive and scientifically founded strategic interventions and evaluate them in practice.

This study has however attempted to apply an analytical approach to establish economic grounds for promoting generic prescribing. It has identified characteristics of practices with high and low GSPs and fulfilled the fourth objective. In doing so the study has demonstrated the extent to which an FHSA

may, whilst attempting to address local concerns of fairness, equity and acceptability, misdirect its resources, and miss the intended target.

5.2.7.1 Extrapolation of findings and potential improvements to the model

Savings potential per doctor was not measured in this study but may be worthy of consideration when determining influencing strategies. In City & East London the national generic performance indicator, the generic rate, is distributed more closely about the mean as the number of partners increase. This suggests that either all of the doctors in the partnership exhibit similar generic prescribing behaviour, or that extremes of generic prescribing behaviour are present and cancel one another out. Whatever the mechanism, GPs working alone are not subject to this 'averaging effect' nor to some of the influences present in partnerships. This further supports the case for FHSAs adopting different strategies for those doctors working in partnership and those working alone.

The skewed distribution of practice size in City & East London is not representative of the country as a whole, although similar patterns may be found in other inner city areas. Whilst the proportion of GPs working alone in City & East London is over 40%, FHSA performance indicators for 1990-1991 show that this is significantly greater than for England (12%) and even other inner city areas: Inner London (22%), Birmingham (20%) and Liverpool (16%) (Jarman and Bosanquet, 1992). At the other end of the distribution of partnership size only 15% of practices in City & East London had four or more partners. Seven of these with generic rates above average had GSPs of over £4000 per year and one of these with a rate of 50% had a GSP of £10,000 per year! If, as Bosanquet and Leese suggest (1988), practices with less resources are less able to respond to government incentives, the distribution in City & East London FHSA (skewed towards practices with only one partner) may offer some insight into the lack of movement in the generic rate for the FHSA, when compared to the national trend.

Despite the atypical nature of City & East London FHSA in many respects, the fact that larger partnerships are more likely to be found in other parts of the country suggest that GSP may be even greater by practice for FHSAs in more rural areas, and that further investigation is warranted.

5.3 Strength of Raisch's model as an exploratory tool and to inform prescribing strategies

5.3.1 Suitability of model as an exploratory tool

The prescribing model described by Raisch (1990) was selected on the basis of its holistic description of the prescribing process in primary care. Although other models reviewed in Chapter Two all provide useful insights into particular stages in the prescribing process, none of these embrace the breadth of influences on the prescriber in the long and short term to the same extent. The distinction between direct and indirect influences, as well as their interaction with each other provides an important distinction since this may determine to a large extent the nature, complexity and cost of intervention strategies.

Although this study was not designed to establish causal links between practice characteristics and prescribing outcome, it has served to described independent associations between selected practice characteristics and GSP. This has facilitated a comparison of practice characteristics associated with high and low GSPs. From the regression model it is clear that practice characteristics associated with high GSPs differ considerably from those practices targeted by City & East London FHSA in 1993/94 for prescribing interventions.

Raisch's model provided a framework for an objective study in an area that is not well researched and as such provides a useful exploratory tool. Using the model it was possible to identify from the literature areas of least exploration with regard to generic prescribing behaviour i.e. administrative and practice factors. Whilst practice factors were selected for detailed examination it is important to recognise that some practice factors e.g. partnership size are associated with potentially direct sources of influence e.g. computer purchase and potentially indirect sources of influence such as peer interaction.

The results of this study suggest that greater weight should be given both to understanding and applying existing knowledge of prescribing behaviour to strategies for prescribing intervention and to furthering our understanding of this complex activity. The model highlights at least two pre-requisites to aid an appropriate planned intervention: Firstly the need to understand how intervention strategies when applied to general practice might interact with existing pathways of influence e.g. practices with more partners may have the potential to respond differently to those with less partners. Secondly the need to appreciate the use of indirect strategies aimed at influencing factors which themselves have a direct effect e.g. a strategy to encourage partners to discuss drug choice and formulary with a view to influencing their internal processing of information: An indirect source of influence of this sort may result in a practice agreement to restrict the computer drug file thereby introducing a direct, but practice derived, source of influence.

A review by Soumerai et al. (1989) of non-regulatory, non-commercial controlled studies did not consider direct manipulation of administrative factors (either through external or internal practice directives) but did conclude that some influencing strategies would be better suited to practices with more partners (e.g. specific computer feedback), whilst one-to-one visits may be better suited to doctors working alone. Both these strategies exert indirect influence on prescribing behaviour aiming to influence the doctors internal processing. Raisch's model is helpful in understanding the complexity of such a process, whilst Denig's work considers the construction and maintenance of an 'evoked set' resulting from such processes.

5.3.2 Study findings in light of model

The regression analysis showed that the practice factors studied were all associated with inter-practice variations in GSP to a greater or lesser extent. The study did not investigate the precise nature of the influence i.e. direct or indirect, although it is clear that practices with more partners and more patients (including more over 65)

are more likely to prescribe higher volumes of medicines than those with less partners and less patients. Whilst it might be anticipated that larger practices would be more 'organised' in terms of cost effective and generic prescribing, the results suggest that even a small proportion of unreviewed patients remaining on branded medicines (which in a large practice can represent many patients) will generate significant GSPs.

Raisch's model suggests that administrative programmes, within which computer systems may be defined, might influence prescribing behaviour. Work undertaken by Bosanquet and Leese (1988) suggests that larger partnerships may be more able to purchase and use computers and this study supports that hypothesis. Whilst an association between computer status and GSP was established, no attempt to prove a causal relationship was made. The potential to construct a drug file with generic names thereby reducing the effort on the part of the prescriber to relearn drug names might appear an attractive proposition. However, the results of the partial correlation analysis does not suggest that practices with computers are using them to maximum effect with respect to generic prescribing and that their presence in a practice makes only a marginal contribution to lowering the practice GSP.

This raises the question of why such a well suited administrative method of influencing prescribing has not been put to the task of standardising otherwise disparate practices. Put in context, in City & East London FHSA computers were more likely to be purchased to aid non-prescribing aspects of practice administration than to streamline repeat prescribing. This is not necessarily the case elsewhere in the country where the saving in clerical hours spent generating repeat prescriptions was a strong selling point of many systems. The fact that computer prescribing systems can intervene between prescribing intention and decision by requiring the prescriber to over ride the default, or by removing certain choices completely, may not however be desirable or acceptable to some GPs. Bradley (1992) found that difficulties experienced with using practice computer systems added to discomfort experienced during prescribing.

Financial gain may be seen by some as an additional contingency encouraging such an application of the computer. However, the potential financial appeal in East London at the time of the study was compromised by the lack of enthusiasm for participation in both GP fundholding and local incentive schemes. A similar analysis of practices in other FHSAs that have participated in incentive schemes and fundholding may give a different picture. Whilst a study of fundholding versus non-fundholding practices demonstrated higher generic rates for specific products in the former non-dispensing practices, actual generic savings and practice resources were not recorded (Bradlow and Coulter, 1993).

Practice factors relating to organisation and process may also be applied to prescribing although the effect of this may be less obvious. For example, where the generation of repeat prescriptions is frequently delegated to practice staff, investment in updating the system may be more effective than face-to-face meetings with GPs. The intervention strategy in this case acknowledges that an efficient but mechanistic approach to repeat prescribing circumvents the normal decision process, by-passing the prescribing intention stage. Such an approach may be particularly helpful to practices that chose to introduce a practice generic prescribing policy.

The relationship between patient demography and savings is a complex one, with both the proportion of patients over 65 and the patient/doctor ratio making significant contribution to the explanation of variation in GSP between practices. Older patients are most likely to take medicines that were initiated many years ago, and these are likely to be prescribed as repeats. Failure to introduce generic prescribing for this group of drugs may arise for a number of reasons that are not mutually exclusive. The reasons can be described in terms of Raisch's model: Firstly they may be administrative in nature and reflect a repeat prescribing system that has not been thoroughly reviewed and updated for some time thereby maintaining older prescribing behaviours that do not necessarily reflect the natural prescribing behaviours of all the partners. This is more likely to apply to a manual repeat system, but could also apply to a computer system. A second explanation is

that a minority of the doctors in the practice favour the use of older drugs which they identify within their 'evoked set' by the branded name adopting an habitual prescribing response. A third explanation could be that older doctors, with 'older' drug repertoires in their 'evoked set', prescribe for a larger proportion of patients over 65 than their younger counterparts. These explanations are however neither mutually exclusive, nor exhaustive.

Raisch's model suggests that individual and practice factors may exert an influence either directly or indirectly. Whilst the number of partners may be highly correlated with practice factors that have not been included in the model e.g. volume of prescriptions, other variables within the model that *are* correlated with number of partners e.g. patient/doctor ratio, make their own independent contribution to the explanation of inter-practice variations in GSP. These relationships may warrant further more detailed investigation.

Overall prescribing costs make only a marginal contribution to the explanation of inter-practice variation in GSP. Whilst GSP remaining within practices remains unmeasured, the model illustrates how they may remain unrealised in all practices but those with the very lowest prescribing costs. Only where there are direct financial incentives such as in fundholding practices or incentive schemes will the overall cost of prescribing be likely in itself to exert an influence on generic prescribing behaviour to obtain maximum cost benefit. Generic prescribing patterns in practices who are not subject to such financial incentives are unlikely to change in response to overall prescribing costs unless more focused intervention strategies are adopted.

Thoughtful and limited changes in generic prescribing behaviour, instigated by the prescriber, will undoubtedly be the most efficient approach incurring minimal investment in changing established prescribing behaviour and disruption to routine, whilst maximising savings. However, in general this will require more specific measures of practice savings and greater targeting of advice than is provided at present to realise the savings that remain.

5.4 Conclusions and Implications for future strategies

5.4.1 Matching indicators to objectives

In 1983, long before the introduction of the Indicative Prescribing Scheme, a working group chaired by Greenfield expressed concern over the strong temptation to adopt arbitrary measures relating to prescribing that had no positive impact on patient outcome (Chapter One). So has the Government given in to this temptation in its eagerness to promote generic prescribing?

Literature searches undertaken during this study do not suggest that providing generic in preference to branded drugs offers *better* quality of care to the patient. The case for equivalence between branded and generics in terms of quality of product will continue to be debated until requests for a national quality assurance scheme for generic drugs, similar to that undertaken already in hospitals, is available in primary care. Patient concerns expressed to doctors and pharmacists with respect to certain products must also be addressed since compliance is likely to be related to confidence in a medicine. There is currently insufficient patient oriented information on generics available at the point of prescribing or the point of dispensing, and little research has been undertaken into ways in which such information is more likely to have the desired effect e.g. product specific versus general information.

Whilst the adoption of arbitrary performance measures warned against in the Greenfield report may have been resisted in relation to more clinical areas of prescribing, in respect of the promotion of generic prescribing there is no evidence to suggest that the promotion of higher generic rates does have a direct and positive impact on patient outcome. Although there is evidence to suggest that the promotion of higher generic rates has resulted in more generic drugs being dispensed and that substantial savings have been made on the cost of these medicines at a national level, illustrations of how these savings have been used to provide 'more' health care are more elusive. Even if they were not, they would

offer only indirect examples of impact on outcome, which are impossible to quantify at the individual level. Furthermore, the view that generic prescribing is 'good professional practice' is a subjective description of quality of the prescriber and not of care delivered to the patient. It must therefore be concluded that in the case of generics the Government has adopted an arbitrary measure of prescribing performance in the terms expressed within the Greenfield report.

This study has confirmed, at least in relation to City & East London FHSA, the weakness of the generic rate as an indicator of cost effective use of generics or prescribing economy e.g. some practices with above average generic rates retain substantial GSPs. As the overall generic rate rises in response to pressure at national and FHSA level it is likely that the promotion of generics will result in indiscriminate generic substitution, often failing to realise the savings that remain, whilst inconveniencing patients and prescribers alike. It must also be concluded then that there is a need to devise better ways of measuring and monitoring generic prescribing performance that encompass the wider aspects of patient focused health provision.

The findings of the study support the promotion of selected generic drugs tailored to individual practices thereby gaining maximum price advantage (i.e. savings), with minimum inconvenience to those involved (i.e. patient and prescriber). This principle is explicit and should be acceptable at government, FHSA and practice level, providing the necessary quality assurance and support is provided. An explicit generic objective, with complementary performance indicators would enable FHSAs to focus on areas where savings really could be made, instead of directing resources where they cannot. In this way practices would be able to relate their performance to their ability to utilise generic drugs to the maximum economic advantage with the least inconvenience. Such an approach might enable FHSAs to match influencing strategies and 'tools' to effect change at practice level, and to measure changes in target behaviours directly. Ray et al. (1985) suggested that interventions might be tailored to effect behavioural change in doctors with similar characteristics and that the outcome of the target behaviour should be the measure

of success. Adoption of such an approach would enable FHSAs to adopt and assess more objectively the success of their chosen interventions. In light of the findings of this study this approach is now explored in more detail.

5.4.2 Matching strategies to practices and tools to tasks

Using the programme designed for the study, practices with substantial GSP can be easily identified as targets for generic initiatives. Using the regression model, practices can be grouped according to their practice characteristics and some of these may be used to determine the strategy that will be adopted. The programme also lists the contribution to savings by product, enabling identification of product substitutions that would make the most impact if switched to generic form. In some practices the majority of savings will result from substituting one or two products only whilst in other practices savings will be distributed amongst many products and strategies will need to reflect this (table 5.3). For this reason the objectives set and tools provided to secure change may vary between practices.

Generic savings potential	Definition of savings level e.g.
Low	Less than x% of total expenditure on drugs selected for generic promotion
Medium to high - generated from several drugs (e.g. more than 5 products contributing to 80% of savings potential)	More than x% of total expenditure on drugs selected for generic promotion
Medium to high - generated from a few drugs (e.g. 80% of savings potential derived from less than 5 of the 21 products)	More than x% of total expenditure on drugs selected for generic promotion

Table 5.3 Practice profile of generic savings potential.

5.4.2.1 Matching strategies to practices

Many different influencing strategies are reviewed in the literature, although the use of non-regulatory, commercial and non-commercial sources have received the most attention. Work by Ray (1985) found no association between outcome of an educational initiative with prescriber characteristics and measures of receptivity. Soumerai et al. (1987) also concluded that physician characteristics were not predictors of the rate of prescribing change during an educational initiative to improve medication use. However, following a review of experimental literature Soumerai et al. (1989) concluded that the setting and organisation of a practice may influence the relative efficacy of an intervention strategy: Considering the findings of Stolley et al. (1972) that practices with several partners were associated with more appropriate prescribing Soumerai et al. suggested that the intervention strategy itself may be selected according to the practice characteristics, particularly organisation and setting. The authors suggested that administrative intervention strategies that have been shown to be effective e.g. reminders and computerised feedback may be best suited to practices with several partners, a patient database and influential colleagues. Practices that are less well organised may respond better to one-to-one educational strategies, based on the concepts utilised by drug companies (table 5.4). In the UK practice organisation and resources are closely linked, with single-handed practices most likely to have the lowest proportion of support staff (Bosanquet, 1988).

Doctors working alone	Doctors working in partnership
Face-to-face interventions	Prescribing Audit e.g. repeats

Table 5.4 Matching strategy to practice.

The views expressed by Soumerai et al. give support to the model described by Raisch, that shows both direct and indirect influences of individual and practice factors on the prescribing process, with the indirect ones impinging in the internal processes that are also influenced by activities such as education and advertising.

Horder et al. (1986) on reviewing the ways to influence the behaviour of GPs concluded that a combination of different methods of influence might provide the key to success. As a result of his findings, Bradley (1992) suggested that greater weight be given to non-clinical approaches as well as the more traditional clinical ones. This is particularly relevant to generics where clinical approaches are more likely to support continued prescribing a limited number of branded products for therapeutic reasons.

These views are also in keeping with those of by Soumerai et al. (1989) who concluded that one type of intervention should not be pursued at the exclusion of others. This particular observation was served as a reminder to policy makers who are under pressure to simplify events and favour one course of action, uniformly applied. Evidence of such an approach is demonstrated in UK policy towards generic prescribing, where performance targets continue to be set in terms of generic rate not generic savings, and few influencing strategies are being tested with any rigour. An new intervention programme known as IMPACT, developed in one UK Region goes some way to address this issue (Chapman et al, 1995).

5.4.2.2 Matching tools to tasks

Designed to reflect aspects of drug industry promotions IMPACT uses pharmacists to present short prescribing messages with graphic support to GPs, combined with prescribing feedback. Practices are targeted according to their potential to change and this is determined through a mapping procedure. All practices targeted receive the same intervention. The generic message does not form the main focus of the campaigns but is integrated within them. Although for example it is suggested that generic savings in asthma treatment (substituting salbutamol for Ventolin® inhalers) can off-set the cost of increasing the use of corticosteroids the savings and additional cost are not quantified for each practice.

The work undertaken by Errasmouspe (1989) shows that doctors drug name recognition is greater for brand than generic names. This suggests that where one

drug is promoted in preference to another e.g. cimetidine instead of ranitidine for the treatment of ulcer, it is important to know in advance the drug name preference of the targeted doctor i.e. whether Zantac® or ranitidine is prescribed in order to encourage appropriate changes to the prescribers 'evoked set' (Denig, 1992). It is therefore vital that this information is available to the pharmacists delivering the messages in advance of practice visits within the IMPACT initiative.

To date the IMPACT programme features predominantly re-educative and persuasive strategies (Plumridge, 1983), leaving the way open to introduce more facilitative and, if necessary, power based strategies. However, IMPACT remains the only initiative to have been based on previously researched and tested principles and no alternative strategies have been developed in a similar way to address practices that may respond more favourably to different initiatives e.g. administrative initiatives. IMPACT has now been adopted by several FHSAs across England with adjustments to suit local prescribing strategy and resources and in the short term those using IMPACT are likely to detect significant changes in the intended direction. The outcome of a full evaluation in terms of health economics is still awaited before the results can be assessed in light of differences in inputs and outputs between participating FHSAs. Such information should add to the knowledge that we have on the cost effectiveness of this type of prescribing intervention. However, the need to increase our knowledge of prescribing behaviour and the decision process are also an important consideration (Bradley, 1991) that demand substantial investment if new initiatives are to be designed to meet longer term prescribing objectives.

In the review by Plumridge interventions designed to effect behavioural change are discussed in terms of re-educative, persuasive, facilitative and power strategies. Although Plumridge was concerned primarily with the process of drug adoption, the principles he described can be applied to the promotion and adoption of generic drugs. For example re-educative and persuasive strategies are most appropriate at the outset of a prescribing initiative. The blanket promotion of generic prescribing supported to date by the Government and FHSAs illustrates how such strategies can

secure behavioural change in a significant proportion of GPs in the short term. However, as Plumridge goes on to describe, there is a need to follow these strategies with a more facilitative approach directed at those whose behaviour has not changed, with power strategies remaining in reserve. In this way limited resources are focused where there is most to gain. In the absence of a repeatable measure of generic savings, this approach is not an option for most FHSAs.

Plumridge also discussed the importance of the order in which different types of strategies are employed. For example the imposition of a target generic rate within an incentive scheme or the inclusion of negative weightings for practices with below average generic rates when setting indicative prescribing amounts are power strategies which may alienate GPs, rendering them hostile to future strategic interventions of a more supportive nature. Some researchers have therefore suggested that a broader range of strategies should be employed as GPs will differ in their response according to their own internal processing mechanisms.

All these views suggest that the facility to calculate GSPs easily and regularly at the product level for individual practices would facilitate more effective targeting of resources and a more sensitive performance measurement.

5.4.3 A future for generics

There are already several 'tools' available to prescribing advisers to promote the use of generic drugs including newsletter articles (MeReC), local clinical audit (facilitative), incentive schemes, penalties within the budget setting process (particularly for fundholding practices), and sanctions (power strategies). The provision of quality assurance (re-educative) on generics, as provided within the hospital environment, is not generally accessible to general practice. Despite the apparent variety, few of these tools have been assessed for their effectiveness in terms of specific prescribing initiatives or in terms of appropriateness to different types of practices. So whilst advisers have access to a wide variety of information

many remain poorly equipped to make the most effective use of their very limited resources.

With more central investment in research and strategic support for its application in practice this situation could be addressed in relation to generics. FHSAs could receive software or query examples to quickly identify the size and nature of GSPs within each practice derived from a small common core (or national list) of products worthy of generic substitution. This would provide a basis for agreeing a smaller number of products for generic substitution with each practice where savings potential are above a locally set threshold. Secondly, it would be possible to assess the cost of addressing any quality assurance issues associated with the core products and commission work on those centrally where the cost of such assurance did not outweigh the savings potential. Thirdly, a number of different basic tools could be provided (drawing on existing examples of good practice) in a way that could easily be modified by FHSAs for local use. Guidance on the selection of tools according to practice types may also be provided in light of continuing research. Tools could include examples of patient oriented, product specific, generic leaflets; product specific fact sheet for GPs, pharmacists and patients who require additional information; visual feedback on monthly basis; questionnaire for GP partnerships to identify GPs who prescribe targeted brand products; quick audit of repeat prescribing system; incentives for specific generic savings; and group audits. With a suitable study design evidence on the relative effectiveness of these media could be collected and analysed, thereby adding to knowledge of prescribing for future initiatives.

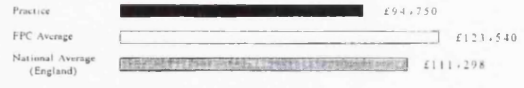
Although the savings potentials from generic substitution have diminished since the introduction of the Indicative Prescribing Scheme, there is clearly a considerable residual of savings potential that remains untapped. The principal of matching prescribing initiatives to practice types will remain, and can then be applied to other more clinical areas of prescribing behaviour. This proposal of a broad and supportive central strategy, designed to empower individual FHSAs is not new, and in some ways is already reflected in the provision of information via ACTAP data,

MeReC publications and MASC meetings. However, it is still left to each FHSA to place the material within the context of their own prescribing strategies, which in most part are designed to meet relatively short term and obvious objectives. National investment in designing and testing alternative prescribing strategies along the lines suggested by Soumerai et al. (1989) i.e. randomised controlled trials or well-designed quasi-experiments, are required if we are to optimise our use of PACT data: Potentially one of the most advanced information systems on the prescribing behaviour of GPs available.

PRESCRIPTION PRICING AUTHORITY
INFORMATION SERVICES

PRESCRIBING INFORMATION LEVEL 1 FOR QUARTER ENDED MAR 1989

1. Practice Prescribing Costs



Practice is below the FPC Average by
£28,790 or 23%
(and is below the National Average by £16,548 or 15%)

2. Practice Number of Items

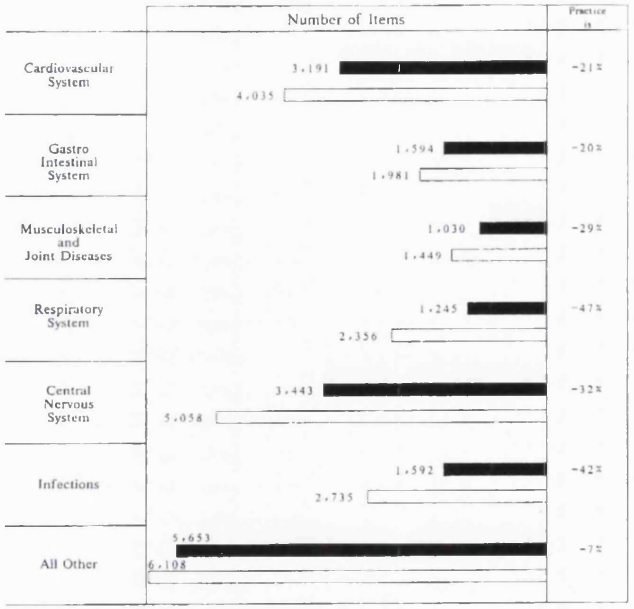
Practice is below the FPC Average by 5,974 or 25%
(and is below the National Average by 3,378 or 16%)

3. Practice Average Cost Per Item

Practice is above the FPC Average by 2.5%
(and is above the National Average by 1.3%)

SEE BACK PAGE FOR YOUR OWN PRESCRIBING INFORMATION

4. Practice Items and Total Cost by Major Therapeutic Group — Quarter Ended Mar 1989



EXPLANATORY NOTES

FPC Average - Throughout this report all the figures represented by "FPC Average" are based on the actual figures for the local FPC adjusted to reflect an average practice with the same number of Prescribing Units as this practice.

National Average - As above but based on the actual figures for ENGLAND adjusted to this practice.

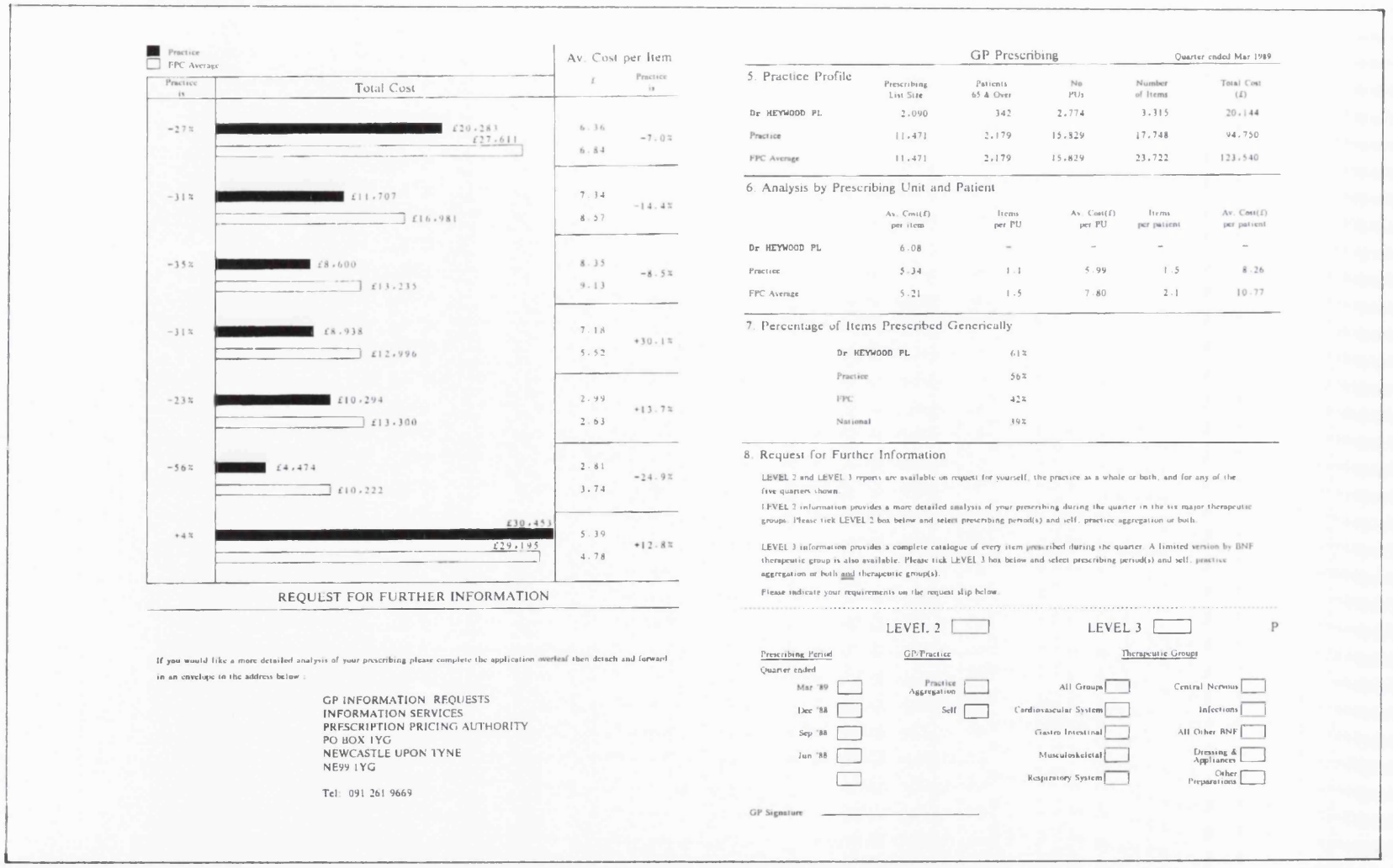
Prescribing Unit (PU) - Since the proportion of elderly patients (i.e. aged 65 and over) varies between practices and the elderly receive on average three times as many prescriptions as younger patients, practice list sizes have been converted to prescribing units as follows :

No. of PUs = (No. of patients under 65) + (No. of patients 65 & over x 3)

Therapeutic Groups - The six Therapeutic Groups listed are those which incurred the highest costs in England in 1988, ranked in descending order of total cost. The term "All Other" includes other preparations, dressings and appliances.

Cost - Total Net Ingredient Cost.

Example of PACT Level 1 data



Example of PACT Level 1 data

PRESCRIPTION PRICING AUTHORITY
INFORMATION SERVICES

PRESCRIBING INFORMATION LEVEL 2

FOR QUARTER ENDED MAR 1992

GENERAL MANAGER
ST LEONARDS
NUTTALL STREET
LONDON
N1 5LZ

CITY & EAST LONDON: FHSA

FHSA
National Average

1. FHSA Prescribing Costs & Percentage Prescribed Generically

FHSA	: £7,595,552	45%	
National Average	: £8,884,165	44%	

		FHSA is
Cardiovascular System	£1,337,727	-24%
	£1,769,755	
Gastro Intestinal System	£931,115	-22%
	£1,195,019	
Respiratory System	£893,936	-12%
	£1,018,454	
Musculoskeletal	£550,549	-26%
	£747,527	
Central Nervous System	£616,575	-31%
	£893,335	
Infections *	£785,479	+10%
	£716,606	
All Other	£2,480,170	-2%
	£2,543,469	

FHSA Total Costs were £1,288,613 or 15% below the National Average for the quarter shown.

The following pages contain a more detailed analysis of your FHSAs prescribing by Therapeutic Group

PLEASE SEE EXPLANATORY NOTES ON BACK PAGE

1

BNF Chapter 2 Cardiovascular System

FOR QUARTER ENDED MAR 1992

Drugs prescribed in CITY & EAST LONDON: FHSA

(Figures in brackets represent National Average)

		No. Items		Cost (£)	
Total No. of Items and Costs by section		152,514 = 100%		£1,337,727.27 = 100%	
2.1	Positive Inotropic Drugs	6,977	(12,275)	2,015.61	(3,714.06)
2.2	Diuretics	45,105	(70,567)	178,916.44	(232,131.91)
2.3	Anti-Arrhythmic Drugs	1,129	(1,777)	19,539.58	(24,494.24)
2.4	Beta-Adrenoceptor Blocking Drugs	29,648	(45,700)	313,190.00	(400,963.88)
2.5	Antihypertensive Therapy	15,562	(22,282)	269,905.89	(351,017.05)
2.6	**Nitrates/Vasodilators/Ca Chann Blockers**	**36,915**	**(56,230)**	**461,558.34**	**(617,466.91)**
2.7	Sympathomimetics	11	(51)	400.13	(1,340.59)
2.8	Anticoagulants And Protamine	4,099	(4,604)	3,831.28	(5,727.24)
2.9	Antiplatelet Drugs	10,547	(13,258)	18,342.23	(25,366.01)
2.10	Fibrinolytic Drugs	-	(1)	-	(469.31)
2.11	Antifibrinolytic Drugs & Haemostatics	301	(325)	2,659.36	(3,591.35)
2.12	Lipid-Lowering Drugs	2,219	(4,001)	67,363.57	(103,447.90)
2.13	Local Sclerosants	1	(8)	4.84	(24.61)

Leading Cost Sub-Section(s)	99,772 = 65%	£1,132,679.16 = 85%	
2.2.4 Potassium Sparing Diuretics & Compounds	22,823	139,651.17	
2.4.0 Beta-Adrenoceptor Blocking Drugs	29,648	313,190.00	
2.5.5 Angiotensin-Converting Enzyme Inhibitors	11,458	235,167.37	
2.6.1 Nitrates	15,186	83,014.46	
2.6.2 Calcium-Channel Blockers	**23,657**	**361,656.16**	
Leading Cost Drugs	47,965 = 31%	£688,130.41 =	
2.2.4 Co-Amilofruse (Amiloride HCL Frusemide)	8,982	71,167.74	
2.4.0 Atenolol	14,364	165,694.24	
2.5.5 Captopril	3,763	77,238.01	
2.5.5 Enalapril Maleate	5,886	119,117.79	
2.6.2 Nifedipine	**14,970**	**254,912.63**	
Leading Cost Preparations	27,677 = 18%	£364,236.86 = 27%	
2.2.4 Frumil® Tab	8,057	64,673.75	
2.4.0 Atenolol Tab 50mg	5,528	53,896.13	
2.4.0 Atenolol Tab 100mg	5,280	73,621.59	
2.6.2 Nifedipine Tab 20mg	**5,233**	**109,591.65**	
2.6.2 Adalat Ret® Tab (20mg)	3,579	62,453.74	

4

Example of PACT Level 2 data

BNF Chapter 1 Gastro-Intestinal System

FOR QUARTER ENDED MAR 1992

Drugs prescribed in CITY & EAST LONDON. FHSA

(Figures in brackets represent National Average)

	No. Items		Cost (£)	
Total No. of Items and Costs by section	100,161 = 100%		£931,115.34 = 100%	
1.1 Antacids	30,945	(28,202)	69,883.95	(80,426.52)
1.2 Antispasmod.&Other Drgs Alt.Gut Motility	7,954	(7,847)	36,398.96	(57,541.58)
1.3 Ulcer-Healing Drugs	**22,359**	**(27,796)**	**653,831.19**	**(809,752.80)**
1.4 Antidiarrhoeal Drugs	6,582	(4,780)	16,647.10	(15,546.15)
1.5 Treatment Of Chronic Diarrhoeas	1,856	(3,012)	40,671.31	(62,797.74)
1.6 Laxatives	23,945	(30,720)	72,588.77	(118,467.43)
1.7 Preparations For Haemorrhoids	6,212	(5,863)	29,709.82	(29,266.64)
1.8 Stoma Care	2	(4)	89.36	(25.40)
1.9 Drugs Affecting Intestinal Secretions	306	(421)	11,294.88	(21,194.28)
Leading Cost Sub-Section(s)	62,174 = 62%		£786,678.76 = 84%	
1.1.1 Aluminium & Magnesium Containing Antacid	30,813		69,668.04	
1.2.0 Antispasmod.&Other Drgs Alt.Gut Motility	7,950		36,394.68	
1.3.1 H2-Receptor Antagonists	**20,386**		**578,424.41**	
1.3.5 Proton Pump Inhibitors	1,169		69,520.32	
1.5.0 Treatment Of Chronic Diarrhoeas	1,856		40,671.31	
Leading Cost Drugs	42,698 = 43%		£677,844.05 = 73%	
1.1.1 Aluminium & Magnesium & Alginates	13,725		41,450.89	
1.3.1 Cimetidine	8,503		170,630.26	
1.3.1 Ranitidine Hydrochloride	**10,568**		**368,615.74**	
1.3.5 Omeprazole	1,169		69,520.32	
1.6.4 Lactulose	8,733		27,626.84	
Leading Cost Preparations	14,843 = 15%		£470,667.96 = 51%	
1.3.1 Cimetidine Tab 400mg	4,349		90,265.13	
1.3.1 Ranitidine Tab 150mg	**5,229**		**179,968.85**	
1.3.1 Ranitidine Tab 300mg	1,077		47,712.17	
1.3.1 Zantac® Tab 150mg	3,529		110,617.73	
1.3.5 Omeprazole Cap 20mg	659		42,104.88	

5

BNF Chapter 3 Respiratory System

FOR QUARTER ENDED MAR 1992

Drugs prescribed in CITY & EAST LONDON. FHSA

(Figures in brackets represent National Average)

	No. Items		Cost (£)	
Total No. of Items and Costs by section	178,318 = 100%		£893,936.34 = 100%	
3.1 Bronchodilators	**61,996**	**(67,179)**	**367,114.15**	**(449,323.83)**
3.2 Corticosteroids	17,391	(22,384)	352,589.69	(422,204.01)
3.3 Cromoglycate And Related Therapy	1,790	(2,977)	33,212.98	(52,064.10)
3.4 Allergic Disorders	21,074	(13,250)	58,437.20	(46,995.44)
3.5 Respiratory Stimulants And Surfactants	-		-	
3.6 Oxygen	1,150	(1,265)	14,340.40	(17,493.15)
3.7 Mucolytics	4	(5)	35.29	(59.86)
3.8 Aromatic Inhalations	702	(263)	503.53	(177.95)
3.9 Antitussives	49,050	(19,590)	28,535.53	(12,571.89)
3.10 Systemic Nasal Decongestants	25,161	(10,318)	39,158.57	(17,560.87)
Leading Cost Sub-Section(s)	118,716 = 67%		£779,529.54 = 87%	
3.1.1 Adrenoceptor Stimulants	51,953		291,372.83	
3.1.2 Antimuscarinic Bronchodilators	3,159		38,190.28	
3.2.0 Corticosteroids	**17,391**		**352,589.69**	
3.4.1 Antihistamines	21,052		58,216.17	
3.10.0 Systemic Nasal Decongestants	25,161		39,158.57	
Leading Cost Drugs	90,328 = 51%		£637,810.29 =	%
3.1.1 Salbutamol	26,698		116,063.96	
3.1.1 Salbutamol Sulphate	19,116		124,573.33	
3.1.2 Ipratropium Bromide	3,101		37,151.88	
3.2.0 Beclomethasone Dipropionate	**16,314**		**321,077.79**	
3.10.0 Pseudoephedrine Hydrochloride	25,099		38,943.31	
Leading Cost Preparations	30,716 = 17%		£329,015.81 = 37%	
3.1.1 Ventolin® Inha (200 Metrd Doses)	16,701		85,875.74	
3.1.1 Ventolin® R/Cap 400mcg	3,365		40,868.88	
3.2.0 Becloforte® Inha 250mcg (200 Metrd Doses)	**2,917**		**106,190.70**	
3.2.0 Becotide® R/Cap 200mcg	1,962		37,102.89	
3.2.0 Becotide 100® Inha(100mcg) 200 Metrd Dose	3,771		58,977.60	

6

Example of PACT Level 2 data

BNF Chapter 10 Musculoskeletal and Joint Diseases

FOR QUARTER ENDED MAR 1992

Drugs prescribed in CITY & EAST LONDON. FHSA

(Figures in brackets represent National Average)

	No. Items		Cost (£)	
Total No. of Items and Costs by section	75,896 = 100%		£550,548.64 = 100%	
10.1 Drugs Used In Rheumatic Diseases & Gout	**49,393**	**(64,156)**	**413,345.24**	**(628,701.22)**
10.2 Drugs Used In Neuromuscular Disorders	694	(1,410)	8,883.86	(18,486.50)
10.3 Drugs For Relief Of Soft-Tissue Inflamm	25,809	(15,897)	128,319.54	(190,339.27)
Leading Cost Sub-Section(s)	75,094 = 99%		£546,062.47 = 99%	
10.1.1 Non-Steroidal Anti-Inflammatory(Nsaids)	**46,393**		**387,474.25**	
10.1.3 Rheumatic Disease Suppressant Drugs	346		5,781.09	
10.1.4 Drugs Used In The Treatment Of Gout	1,927		16,501.29	
10.2.2 Skeletal Muscle Relaxants	632		8,297.90	
10.3.2 Rubefacients & Other Top.Antirheumatics	25,796		128,007.94	
Leading Cost Drugs	42,122 = 55%		£269,054.45 = 49%	
10.1.1 Diclofenac Sodium	**7,224**		**98,998.68**	
10.1.1 Ibuprofen	15,925		46,953.00	
10.1.1 Indomethacin	4,694		32,002.28	
10.1.1 Naproxen	5,400		54,725.19	
10.3.2 Heparinoid	8,879		36,375.30	
Leading Cost Preparations	14,350 = 19%		£125,368.01 = 23%	
10.1.1 Voltarol Ret® Tab (100mg)	**2,056**		**38,412.07**	
10.1.1 Naproxen Tab 500mg	1,931		20,860.05	
10.3.2 Traxam® Gel 3%	1,755		19,689.76	
10.3.2 Feldene® Gel	2,442		21,204.33	
10.3.2 Movelat® Crm	6,166		25,201.80	

7

BNF Chapter 4 Central Nervous System

FOR QUARTER ENDED MAR 1992

Drugs prescribed in CITY & EAST LONDON. FHSA

(Figures in brackets represent National Average)

	No. Items		Cost (£)	
Total No. of Items and Costs by section	241,196 = 100%		£616,575.41 = 100%	
4.1 Hypnotics And Anxiolytics	42,190	(55,899)	50,026.36	(86,057.76)
4.2 Drugs Used In Psychoses & Rel Disorders	8,431	(11,799)	55,085.89	(51,067.58)
4.3 Antidepressant Drugs	18,328	(30,753)	132,851.75	(217,791.38)
4.4 Central Nervous Stimulants	286	(150)	275.14	(171.15)
4.5 Appetite Suppressants	2,062	(1,278)	6,506.70	(5,469.28)
4.6 Drugs Used In Nausea And Vertigo	12,506	(15,484)	46,496.09	(75,279.27)
4.7 Analgesics	**138,496**	**(109,328)**	**196,354.87**	**(280,242.90)**
4.8 Antiepileptics	11,234	(15,513)	68,109.40	(94,175.25)
4.9 Drugs Used In Park'ism/Related Disorders	5,004	(6,977)	48,418.51	(78,840.62)
4.10 Drugs Usad In Substance Dependence	2,659	(814)	12,450.70	(4,240.05)
Leading Cost Sub-Section(s)	168,119 = 70%		£374,941.48 = 61%	
4.3.1 Tricyclic & Related Antidepressant Drugs	15,446		64,768.76	
4.3.4 Other Antidepressant Drugs	2,226		65,932.48	
4.6.0 Drugs Used In Nausea And Vertigo	12,506		46,496.09	
4.7.1 Non-Opioid Analgesics	**126,708**		**129,663.60**	
4.8.1 Control Of Epilepsy	11,233		68,080.55	
Leading Cost Drugs	113,230 = 47%		£181,895.36 = [illegible]	
4.3.1 Dothiepin Hydrochloride	5,724		27,306.76	
4.3.4 Fluoxetine Hydrochloride	1,048		38,668.42	
4.7.1 Paracetamol	**78,403**		**55,196.60**	
4.7.1 Co-Proxamol(Dextroprop HCL & Paracet)	26,167		35,228.36	
4.8.1 Sodium Valproate	1,888		25,501.22	
Leading Cost Preparations	86,690 = 36%		£105,293.38 = 17%	
4.3.4 Fluoxetine Cap 20mg	441		17,364.21	
4.3.4 Prozac® Cap (20mg)	607		21,304.21	
4.7.1 Paracet Tab 500mg	36,992		14,172.68	
4.7.1 Calpol Infant® Susp 120mg/5ml	22,483		17,223.92	
4.7.1 Co-Proxamol Tab 32.5mg/325mg	**26,167**		**35,228.36**	

8

Example of PACT Level 2 data

BNF Chapter 5 Infections

FOR QUARTER ENDED MAR 1992

Drugs prescribed in CITY & EAST LONDON. FHSA

(Figures in brackets represent National Average)

Total No. of Items and Costs by section	No. Items		Cost (£)	
	179,685 = 100%		£785,479.39 = 100%	
5.1 Antibacterial Drugs	**166.335**	**(149,040)**	**651,716.17**	**(622,667.57)**
5.2 Antifungal Drugs	4,163	(3,417)	37,534.68	(30,033.55)
5.3 Antiviral Drugs	571	(521)	77,312.54	(47,897.22)
5.4 Antiprotozoal Drugs	6,484	(7,487)	15,158.41	(13,202.56)
5.5 Anthelmintics	2,132	(1,762)	3,757.59	(2,805.08)

Leading Cost Sub-Section(s)	142,764 = 79%	£618,956.00 = 79%
5.1.1 Penicillins	**99,489**	**304,011.31**
5.1.2 Cephalosporins,Cephamycins & Betalactams	11,110	73,932.90
5.1.3 Tetracyclines	12,410	80,787.41
5.1.5 Macrolides	28,184	82,911.84
5.3.0 Antiviral Drugs	571	77,312.54

Leading Cost Drugs	85,483 = 48%	£389,792.49 = 50%
5.1.1 Amoxycillin	**62,385**	**211,484.02**
5.1.1 Co-Amoxiclav (Amoxycillin/Clavul Acid)	6,128	37,568.62
5.1.3 Minocycline	1,934	53,879.50
5.1.5 Erythromycin Ethylsuccinate	14,527	43,603.74
5.3.0 Acyclovir	509	43,256.61

Leading Cost Preparations	36,851 = 21%	£176,554.55 = 22%
5.1.1 Amoxycillin Cap 250mg	**15,445**	**44,124.27**
5.1.1 Amoxycillin Cap 500mg	6,214	35,223.69
5.1.1 Amoxil® Cap 250mg	9,441	33,394.92
5.1.1 Augmentin® Tab (375mg)	4,396	30,212.42
5.1.3 Minocin 50® Tab (50mg)	1,355	33,599.25

All Other Drugs & Appliances

FOR QUARTER ENDED MAR 1992

Prescribed in CITY & EAST LONDON. FHSA

(Figures in brackets represent National Average)

Total No. of Items and Costs by Group	No. Items		Cost (£)	
	432,550 = 100%		£2,480,169.65 = 100%	
6 Endocrine System	**57,763**	**(70,548)**	**558,469.03**	**(601,747.30)**
7 Obstetrics, Gynaecology	34,377	(36,274)	162,987.78	(196,618.34)
8 Malignant Disease	4,303	(5,971)	210,535.40	(233,651.02)
9 Nutrition and Blood	69,579	(44,506)	298,344.00	(262,968.22)
11 Eye	27,458	(33,397)	72,081.08	(114,299.10)
12 Ear Nose and Oropharynx	34,015	(24,434)	107,626.23	(89,650.04)
13 Skin	136,961	(98,802)	534,505.45	(402,342.68)
14 Immunological Products	25,052	(25,025)	99,472.45	(81,407.65)
15 Anaesthesia	770	(2,074)	1,947.04	(3,080.39)
18 Prep. used in Diagnosis	-		-	(6.86)
19 Other Drugs and Prep.	4,520	(3,441)	20,475.90	(13,926.34)
20 Dressings	22,995	(24,857)	158,594.50	(169,562.40)
21 Appliances	11,509	(11,567)	79,687.39	(83,249.49)
22 Incontinence Appliances	1,022	(2,501)	37,246.35	(77,201.37)
23 Stoma Appliances	2,256	(3,721)	138,195.05	(213,757.47)

Leading Cost Preparations	18,603 = 4%	£331,993.10 = 13%
6.1.2 Gliclazide Tab 80mg	2,930	28,675.72
6.1.6 Bm-Test 1-44 (Reagent)® Strips	2,514	37,839.06
6.4.1 Prempak-C® Comb Pack Tab 0.625mg/150mcg	2,434	31,586.40
6.5.1 Genotropin Kabipen® Cart 16iu	63	32,940.00
7.3.1 Marvelon® Contracep Tab	4,432	29,537.84
8.2.2 Cyclosporin Oral Soln 100mg/ml S/F	**161**	**30,912.54**
8.2.2 Cyclosporin Cap 100mg	141	33,033.16
8.3.4 Tamoxifen Cit Tab 20mg	1,273	30,590.17
13.10.3 Zovirax® Crm 5%	1,876	25,474.93
20.3 Dt App Dress Pack: Ster	2,779	31,402.88

EXPLANATORY NOTES

National Average - Throughout this report all the figures represented by National Average are based on the actual figures for ENGLAND adjusted to reflect an average FHSA with the same number of Prescribing Units as this FHSA.

Prescribing Unit (PU) - Since the proportion of elderly patients (i.e. aged 65 and over) varies between practices, and the elderly receive on average three times as many prescriptions as younger patients, practice list sizes have been converted to prescribing units as follows:

No. of PUs = (No. of patients under 65) + (No. of patients 65 & over x 3)

Therapeutic Groups - The six Therapeutic Groups listed are those which incurred the highest costs in England from April 1990 to March1991, ranked in descending order of total cost. The term "All Other" includes other preparations, dressings and appliances.

Cost - Total Net Ingredient Cost

***** - Proprietary Product.

Example of PACT Level 2 data

APPENDIX THREE

1 Gastro-Intestinal System

	Qty	No. Prescriptions	Cost £
1.1 Antacids			
1.1.1 Aluminium & Magnesium Containing Antacid			
Alexitol Sodium			
Alexitol Sod Tab 360mg	60	2	2.20
		2	2.20
Aluminium Hydroxide			
Alum Hydrox Mix BP	200	1	0.36
	300	10	5.40
	600	2	2.18
	1000	1	1.81
Alum Hydrox Tab 500mg	100	8	11.60
	150	1	2.18
	200	1	2.90
		24	26.43
Magnesium Trisilicate			
Mag Trisil Mix BPC	50	1	0.05
	100	1	0.11
	150	1	0.16
	200	3	0.66
	300	7	2.31
	400	1	0.44
	500	9	4.95
	600	4	2.64
	1000	6	6.60
Mag Trisil Co Tab	60	2	1.22
	100	12	12.12
	120	1	1.21
	126	1	1.27
	200	4	8.05
	300	5	15.14
		58	56.93
Compound & Other Preparations			
Maalox® Susp	300	4	4.90
	500	7	13.30
	1000	2	7.60
Maalox® Tab (800mg)	200	1	2.52
		14	28.32
1.1.1.1 Alum & Mag Containing Antacids & Add Ing			
Compound & Other Preparations			
Asilone® Gel	90	1	0.34
	500	2	3.80
Asilone® Susp 125mg/5ml	300	3	3.57
	500	1	1.90
	600	1	2.28
	1000	3	11.40
Asilone For Infants® Susp	100	1	1.00

Quarter ended Mar 1989

Example of PACT Level 3 data

1.1.1.1

	Qty	No. Prescriptions	Cost £
Compound & Other Preparations CONT/			
Gastrocote® Tab	60	7	15.82
	100	30	112.80
	140	1	5.26
	180	2	13.54
	200	4	30.08
	250	2	18.80
Gaviscon® Liq	200	4	4.60
	240	1	1.38
	300	18	31.14
	500	70	201.60
	600	4	13.84
	1000	25	144.00
	1500	7	60.48
Gaviscon® Tab	40	5	7.50
	50	1	1.88
	60	14	31.50
	70	2	5.26
	90	1	3.38
	100	84	315.00
	120	12	54.00
	140	1	5.25
	150	3	16.89
	160	1	6.00
	200	15	112.50
	240	3	27.00
Infacol® Susp 40mg/ml	1	1	1.38
	50	1	1.38
	100	1	2.76
Mucaine® Susp	100	1	0.24
	150	1	0.36
	300	2	1.44
	500	6	7.20
	1000	2	4.80
	2000	3	14.40
Topal® Antacid Tab	40	1	1.59
	50	1	1.99
	60	2	4.78
	100	12	47.76
	200	3	23.85
		366	1377.72
1.2 Antispasmod.&Other Drgs Alt.Gut Motility			
Dicyclomine Hydrochloride			
Dicyclomine HCL Tab 10mg	42	1	1.22
	90	4	10.48
	120	1	3.49
	180	1	5.24
Merbentyl® Tab (10mg)	42	1	1.22
	90	3	7.86
		11	29.51
Hyoscine Butylbromide			
Hyoscine Butylbromide Tab 10mg	200	1	8.50

Quarter ended Mar 1989

Example of PACT Level 3 data

THE NUMBER OF ITEMS YOUR PRACTICE PRESCRIBES

		Change from last year (%)	Prescribed generically (%)	Dispensed generically (%)
Your practice	**26,571**	4	53	44
FHSA equivalent	31,071	4	39	0
National equivalent	25,804	5	42	0
Your own prescribing	**5,339**	10	55	47

The number of items your practice prescribed is **below** the FHSA equivalent by **15%**
The number of items your practice prescribed is **above** the national equivalent by **3%**

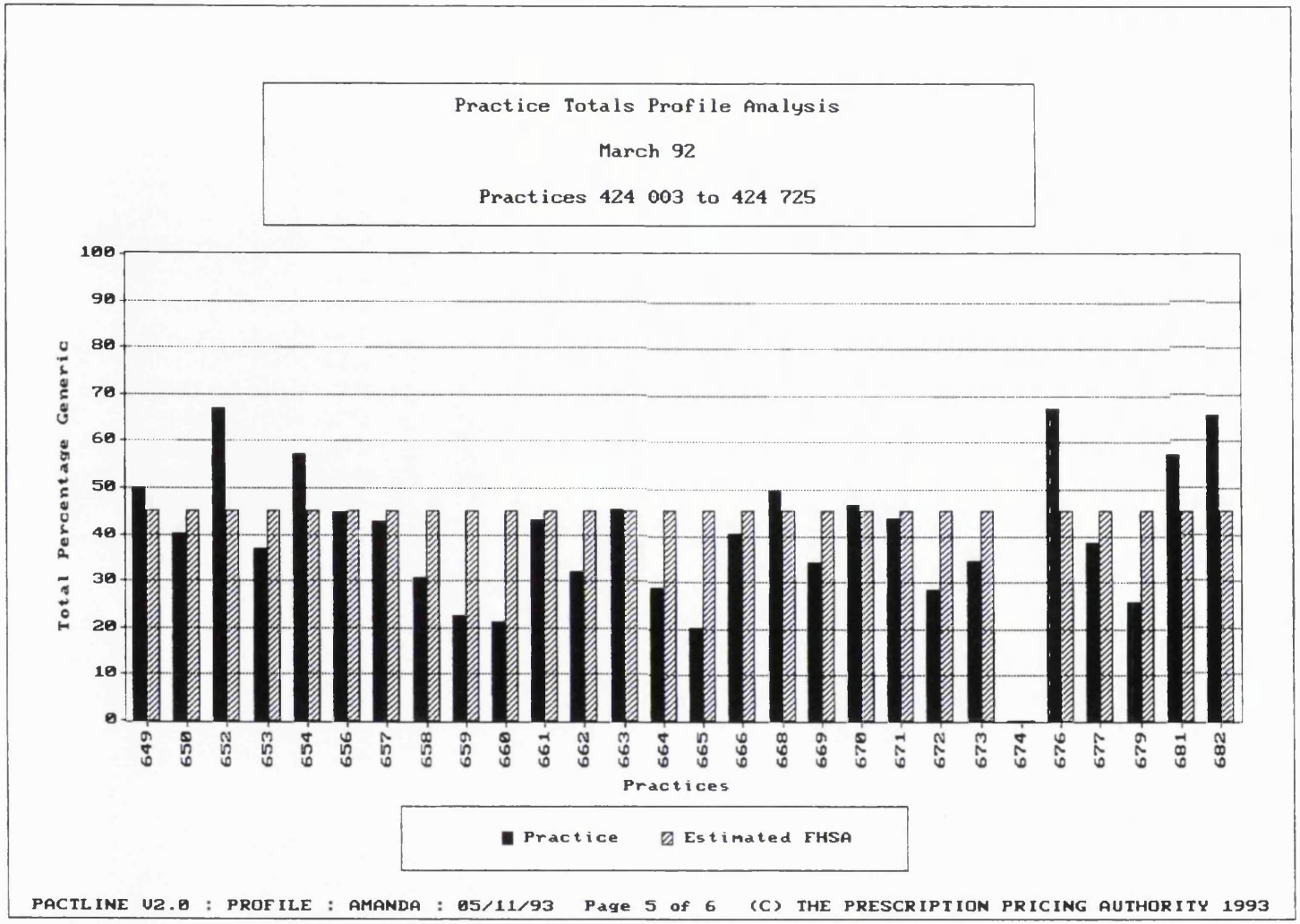
PRESCRIBING BY BNF THERAPEUTIC GROUP IN YOUR PRACTICE

	No. of items prescribed / FHSA equivalent	Comparison with FHSA (%)	Change from last year (%) Practice	Change from last year (%) FHSA	Dispensed generically (%)
Gastro-intestinal	2,401 / 2,530	-5	2	5	0
Cardiovascular	4,771 / 5,337	-11	1	3	0
Respiratory	2,232 / 3,323	-33	1	2	0
Central nervous system	4,980 / 6,143	-19	-1	2	0
Endocrine	3,343 / 3,763	-11	5	2	0
Musculoskeletal & joint diseases	1,586 / 1,798	-12	-5	5	0
All other	7,258 / 8,175	-11	15	9	0

April to June 1994

3

Example of PACT data from 1994 (combined Levels 1 & 2)



Example of graph generated by PACTLINE

REFERENCES

Audit Commission, 1994, A Prescription for Improvement: Towards more Rational Prescribing in General Practice, Health and Personal Social Services Report No.1, Audit Commission, HMSO, London.

Avorn J. and Soumerai S.B., 1983, Improving Drug Therapy Decisions Through Educational Outreach, The New England Journal of Medicine, 308 24, 1457-1463.

Avorn J., Chen M., and Hartley R., 1982, The American Journal of Medicine, 73, 4-8.

Baker D. and Klein R., 1991, Explaining the Outputs of Primary Health Care: Population and Practice Factors, British Medical Journal, 303, 225-229.

Bateson M.C., 1987, Letter, British Medical Journal, 294, 1227.

Becker M.H., Stolley P.D., Lasagna L., McEvilla J.D. and Sloane L.M., 1972, Differential Education Concerning Therapeutics and Resultant Physician Prescribing Patterns, Journal of Medical Education, 47, 118-127.

Becker M.H., Stolley P.D., Lasagna L., McEvilla J.D. and Sloane L.M., 1972, Correlates of Physicians Prescribing Behaviour, Inquiry, 9 3, 31-43.

Bosanquet N. and Leese B., 1988, Family Doctors and Innovation in General Practice, British Medical Journal, 296, 1576-1580.

Bower A.D. and Burkett G.L., 1987, Family Physicians and Generic Drugs: A Study of Recognition, Information Sources, Prescribing Attitudes, and Practices, The Journal of Family Practice, 24 6, 612-616.

Bradley C.P., 1991, Decision Making and Prescribing Patterns - a Literature Review, Family Practice, 8, 276-287.

Bradley C.P., 1992, Factors Which Influence the Decision Whether or Not to Prescribe: The Dilemma Facing General Practitioners, British Journal of General Practice, 42, 454-458.

Bradlow J. and Coulter A., 1993, Effect of Fundholding and Indicative Prescribing Schemes on General Practitioners' Prescribing Costs, British Medical Journal, 307, 1186-1189.

British National Formulary, 1995, British Medical Association and the Royal Pharmaceutical Society of Great Britain, The Pharmaceutical Press, London.

Butler J., 1994, Origins and Early Developments, in Evaluating the NHS Reforms, Robinson R. and Le Grand J., Kings Fund Institute.

Capitation and Population Base Statistics, 1992, City & East London FHSA.

Chapman S., Avorn J. and May F., 1995, Providing Independent Advice to Prescribers: A Multinational Presentation on Academic Detailing (Abstract), Pharmacoepidemiology and Drug Safety, 4, S45.

Crompton B., 1991, Questioning the Quality not the Cost of Prescribing, Prescriber, 19 October, 91-93.

Denig P and Haaijer-Ruskamp F.M, 1992, Therapeutic Decision Making of Physicians, Pharmaceutisch Weekblad, 14 1,9-15.

Department of Health, 1987, White Paper: Promoting Better Health, HMSO, London.

Department of Health, 1989, White Paper: Working for Patients, HMSO, London.

Department of Health, 1989, Executive Letter 90(12), Department of Health.

Department of Health, 1990, Working for Patients: Working Paper number 4, Indicative Prescribing budgets for GPs, HMSO, London.

Department of Health, 1990, Working Paper: Improving Prescribing, HMSO, London.

Department of Health, 1991, in Statistical Bulletin 4(6) 91 'Prescriptions Dispensed by Pharmacy and Appliance Contractors England 1979-1989.

Department of Health, 1992, Executive Letter 92(90), Department of Health.

Department of Health, 1994, Executive Letter 94(2), Department of Health.

Department of Health, 1994, in Statistical Bulletin 1994/6 'Statistics of Prescriptions Dispensed in Family Health Services Authorities: England 1983-1993.

Department of Health and Social Security, 1977, Report of the Inquiry into the Prescription Pricing Authority (Tricker Report), DHSS, London.

Department of Health and Social Security, 1983, Competitive Tendering and the Provision of Domestic, Catering and Laundry Services HC83/18, Department of Health and Social Security, London.

Department of Health and Social Security, 1983, Informal Working Group on Effective Prescribing (Greenfield Report), DHSS, London.

Drug Tariff, April 1995, HMSO, London.

Drugs and Therapeutics Bulletin, 1987a, 25: 21-24, Consumers Association, London.

Drugs and Therapeutics Bulletin, 1987b, 24: 93-95, Consumers Association, London.

Dunnel K. and Cartwright A., 1972, Medicine Takers, Prescribers and Hoarders, Routledge and Kegan Paul, London and Boston.

Erramouspe J., 1989, Impact of Education by Clinical Pharmacists on Physician Ambulatory Care Prescribing of Generic Versus Brand-Name Drugs, Drug Intelligence and Clinical Pharmacy, The Annals of Pharmacotherapy, 23, 770-773.

Feely J., Chan R., Cocoman L., Mulpeter K and O'Connor P., 1990, Hospital Formularies: Need for Continuous Intervention, British Medical Journal, 300, 28-30.

Forster D.P and Frost C.E.B., 1991, Use of Regression Analysis to Explain the Variation in Prescribing Rates and Costs Between Family Practitioner Committees, British Journal of General Practice, 41, 67-71.

Forsyth G., 1963, An Enquiry into the Drugs Bill, Medical Care, 1, 10-16.

Greenwood J., 1990, personal correspondence.

Greenwood J., 1988, The Market and the State: The Pharmaceutical Representative and General Medical Practice, PhD Thesis, University of Nottingham.

Griffiths R., 1983, The Griffiths Report, NHS Management Inquiry, Department of Health and Social Security.

Guillebaud C.W., 1956, Report of the Committee of Enquiry into the Cost of the NHS, Ministry of Health, HMSO, London.

Harris C.M., Heywood P.L. and Clayden A.D. 1990, The Analysis of Prescribing in General Practice - A Guide to Audit and Research. HMSO, London.

Harris C.M., Heywood P.L. and Clayden A.D. 1990, The Analysis of Prescribing in General Practice - A Guide to Audit and Research. HMSO, London.

Harris C.M., Jarman B., Woodman E., White P. and Fry J.S., 1984, Prescribing - A Suitable Case for Treatment, Occasional Paper 24, The Royal College of General Practitioners, London.

Hazlet T.K. and Hu T.W., 1992, Association Between Formulary Strategies and Hospital Drug Expenditure, American Journal of Hospital Pharmacy, 49, 2207-2210.

Hemminki E., 1975, Review of Literature on the Factors Affecting Drug Prescribing, Social Science and Medicine, 9, 111-115.

Horder J., Bosanquet N. and Stocking B., 1986, Ways of Influencing the Behaviour of General Practitioners, Journal of the Royal College of General Practitioners, 36, 517-521.

Howie J.G.R., Porter A.M.D. and Forbes J.F., 1989, Quality and the Use of Time in General Practice: Widening the Discussion, British Medical Journal, 298, 1008-1010.

Irwin W.G., Mills K.A. and Steele K., 1986, Effect on Prescribing of the Limited List in a Computerised Group Practice, British Medical Journal, 293, 857-859.

Joyce C.R.B, Last J. M. and Weatherall W., 1967, Personal Factors as a Cause of Difference in Prescribing by General Practitioners, British Journal of Preventative Social Medicine, 21, 170-177.

Leathard A., 1990, Health Care Provision - past, present and future, Chapman and Hall.

Leathley A., 1992, Pulse, January 18th, p17.

Lee J.A.H, Draper P. and Weatherall M., 1965, Prescribing in Three English Towns, Milbank Memorial Fund Quarterly, 43, 285-290.

Leeds Prescribing Research Unit, July 1993, The allocation of Prescribing Budgets by Regional Authorities to their Family Health Services Authorities, Proposal to the Department of Health, Revised Edition November 1993.

Leeds Prescribing Research Unit, Supplementary report to the Department of Health, September 1993, revised edition November 1993.

Leese B. and Bosanquet N., 1989, High and Low Incomes in General Practice, British Medical Journal, 298, 932-934.

Lilja J., 1976, How Physicians Chose Their Drugs, Social Science and Medicine, 10, 363-365.

Martin J.P., Williams S., 1959, The Effects of Imposing Prescription Charges, Lancet, 1, 36-39.

Martin J.P., 1957, Social Aspects of Prescribing, William Heineman, London.

McCarthy M., Wilson-Davis K. and McGavock H., 1992, British Journal of General Practice, 10-12.

McGavock H., Webb., Johnston G.D. and Milligan E., 1993, Market Penetration of New Drugs in One United Kingdom Region: Implications for General Practitioners and Administrators, British Medical Journal, 307, 1118-1120.

Medicines Resource Centre, 1991, Medicines Resource Centre Bulletin, 2, 7, 21-24.

Miller R.R., 1974, Prescribing Habits of Physicians, A Review of Studies on Prescribing of Drugs (parts VII-VIII), Drug Intelligence and Clinical Pharmacy, 8, 81-91.

Ministry of Health, 1958, Committee on Cost of Prescribing Interim Report (Hinchliffe Report), HMSO, London.

Ministry of Health, 1967, Report of the Committee of Enquiry into the Relationship of the Pharmaceutical Industry with the National Health Service 1965-1967 (Sainsbury Report), HMSO, London.

Ministry of Health, 1959, Final Report of the Committee on Cost of Prescribing (Hinchliffe Report), HMSO, London.

Morton-Jones T.J. and Pringle M.A.L, 1993, Prescribing Costs in Dispensing Practices, British Medical Journal, 306, 1244-1246.

National Health Service and Community Care Act, 1990, Chapter 19. Great Britain, Parliament, HMSO, London.

Newton-Syms F.A.O., Dawson P.H., Calvert R.T., Cooke J., Feely M. and Booth T.G., 1988, The Influence of a Pharmacist on General Practitioner Prescribing, The Pharmaceutical Journal, 24 (November 12), Practice Research Supplement, R2.

Norusis M.J., 1990, SPSS/PC+ Statistics 4.0, Part and Partial Coefficients, Chapter 6, SPSS Inc., Chicago.

Norusis M.J., 1990, SPSS/PC+ Statistics 4.0, Measures of Collinearity, Chapter 6, SPSS Inc., Chicago.

Norusis M.J., 1990, SPSS/PC+ Statistics 4.0, Chapter 6, SPSS Inc., Chicago.

Norusis M.J., 1990, SPSS/PC+ Statistics 4.0, Equality of Variance, Chapter 6, SPSS Inc., Chicago.

Norusis M.J., 1990, SPSS/PC+ Statistics 4.0, Partial Regression Plots, Chapter 6, SPSS Inc., Chicago.

Office of Health Economics, 1989, Compendium of Health Statistics, 7th Edition, Office of Health Economics, Whitehall, London.

Plumridge R.J., 1983, A Review of Factors Influencing Drug Prescribing (Part 1), Australian Journal of Hospital Pharmacy, 13 1, 16-48.

Prescription Pricing Authority, 1992, Unpublished data, Prescription Pricing Authority.

Purves I.N and Edwards C., 1993, Comparison of Prescribing Unit with Index Including Both AGe and Sex in Assessing General practice Prescribing Costs, British Medical Journal, 306, 496-498.

Raisch D.W., 1990, A Model of Methods for Influencing Prescribing: Part II. A Review of Educational Methods, Theories of Human Inference, and Delineation of the Model, Drug Intelligence and Clinical Pharmacy, The Annals of Pharmacotherapy, 24, 537-541.

Ray W.A., Fink R., Shaffner W. and Federspiel C.F., 1985, Improving Antibiotic Prescribing in Outpatient Practice: Non-association of Outcome with Prescriber Characteristics and Measures of Receptivity, Medical Care, 23,11, 1307-1313.

Regional Quality Control Department, 1993, Generic Assessment Report Number 2: Amoxycillin Capsules 250mg, Mersey Regional Health Authority.

Ridley H., 1986, Drugs of Choice, A Report on the Drug Formularies Used in NHS Hospitals, Social Audit, London Press.

Ryan M., Yule B., Bond C. and Taylor R.J., 1990, Scottish General Practitioners' Attitude and knowledge in Respect of Prescribing Costs, British Medical Journal, 300, 1316-1218.

Ryan M., Yule B., Bond C. and Taylor R.J., 1992, Knowledge of Drug Costs: A Comparison of General Practitioners in Scotland and England, British Journal of General Practice, 42, 6-9.

Schwartz R.K., Soumerai S.B., and Avorn J., 1989, Physician motivations for non-scientific drug prescribing, Social Science and Medicine, 28 6, 577-582.

Segal R. and Hepler C.D., 1982, Prescriber's Beliefs and Values as Predictors of Drug Choices, American Journal of Hospital Pharmacy, 39, 1891-1897.

Shulkin D.J., Giardino A.P., Freenock T.F (Jr.), Henriksen D.S., Richman C., Friedlander M.S., Pandelidis S.M. and Heywood T.J., 1992, Generic Versus Brand Name Drug Prescribing by Resident Physicians in Pennsylvania, American Journal of Hospital Pharmacy, 49, 625-626.

Sibley J.C., Sackett D.L., Neufeld V., Gerrard B., Rudnick K.V. and Fraser W., 1982, A Randomised Trial of Continuing Education, New England Journal of Medicine, 306, 511-515.

Smith A., 1989, The Pharmaceutical Journal, 243, 12-13.

Smith A., 1991, MIMS Magazine, 1st May, 45-57.

Soumerai S.B. and Avorn J., 1987, Predictors of Physician Prescribing Change in an Educational Experiment to Improve Medication Use, Medical Care, 25 3, 210-221.

Soumerai S.B. and Avorn J., 1990, Journal of the American Medical Association, 263, 549-556.

Soumerai S.B., McLaughlin T.J. and Avorn J., 1989, Improving Drug Prescribing in Primary Care: A Critical Analysis of the Experimental Literature, The Milbank Quarterly, 67, 268-317.

Stolley P.D., Becker M.H., Lasagna L., McEvilla J.D. and Sloane L.M., 1972, The Relationship Between Physician Characteristics and Prescribing Appropriateness, Medical Care, 10 1, 17-28.

Taylor R.J., 1979, Journal of the Royal College of General Practice, 29, 420-422.

Webster C., 1988, Problems of Health Care, the NHS before 1957, HMSO, London.

Webster C. (Ed.), 1991, Aneurin Bevan on the National health Service, University of Oxford, Wellcome Unit for the History of Medicine.

Which?, 1991, Are You Getting the Right Medicine?, Which? Magazine, November 1991, 646-649.