



SCOTTISH EXECUTIVE  
Health Department

# **THE DEVELOPMENT OF A NEEDS BASED RESOURCE ALLOCATION FORMULA FOR PHARMACEUTICAL SERVICES IN SCOTLAND**

**Final Report v2.1**

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## 1. Executive Summary

### Background

This report describes the results of research commissioned by the Scottish Executive Health Department (SEHD) into the development of a needs based formula for the allocation of Pharmaceutical Services (PS) expenditure. This is one of three reports outlining the methods for allocating Family Health Services (FHS) expenditure in Scotland.

The Scottish Executive Health Department spent in the region of £117 million on fees and allowances paid to dispensing doctors and community pharmacists in 2003/04. In the absence of a formula specifically for allocating these fees and allowances, this expenditure is currently allocated to NHS Boards based on current expenditure. In this report, we wish to challenge this status quo and develop a new method for allocating this expenditure to Boards based on the relative needs of different population groups. The aim is to ensure that resources are distributed equitably across Scotland reflecting the populations relative need for resources rather than reflecting the current pattern and location of dispensing contractors.

### Legislative Context

Currently, the primary role of *pharmaceutical services* is to dispense the drugs and appliances prescribed by doctors and other health professionals. Pharmaceutical services in most cases are provided by community pharmacists, although in areas where there is no community pharmacy provision an NHS Board can arrange for General Medical Practitioners to provide *dispensing services*. These 'dispensing doctors' are usually located in remote areas which have a need for a pharmacy but with a population too small to make a business economically viable.

The Smoking, Health and Social Care (Scotland) Bill was passed by the Scottish Parliament in June 2005 and becomes an Act two months later. Part 3 of the Act outlines a number of changes in the planning, provision and contracting for community pharmacy services in Scotland. Collectively they provide the legislative framework to underpin the introduction of a new contract for community pharmacies covering the provision of *Pharmaceutical Care Services* (PCS). This contractual change may alter a population's need for resources in the future.

### Data Sources

We used a number of data sources to compile this report including:

- population counts for each GP practice in Scotland based on the June 2003 Community Health Index (CHI) register;
- a list of all fees and dispensing activity undertaken by dispensing contractors in Scotland for the 2003/04 financial year;
- data from PSD's pharmacy payment system linking each prescription item from the GP practice of origin to the dispensing contractor;
- the prescribing expenditure needs index from the *Fair Shares for All* report;

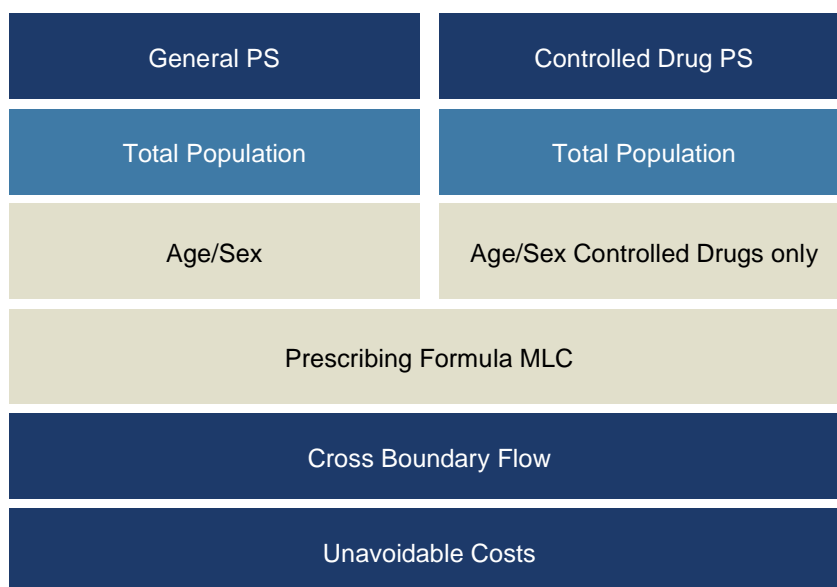
- a cost survey conducted across 158 community pharmacies in 2003/04; and
- data from the Community Pharmacies Monitoring Report 2003/04 to provide information on current expenditure at an NHS Board level.

**Methodology**

We used the principles outlined in *Fair Shares for All* to construct a weighted capitation formula, based on five factors: the population share of the Board, the age and sex characteristics of the population, the morbidity and life circumstances of the population, an adjustment for unavoidable cost of providing services in remote and/or urban areas and an adjustment for the extent of cross boundary flow (i.e. if a patient is dispensed a prescription in a Board in which they are not resident).

Figure 1.1 illustrates the conceptual framework used to construct the PS formula.

**Figure 1.1 PS Formula Sub-Programme Approach**



We split expenditure into two sub-programmes: general prescribing services (General PS) and schedule 2 controlled drug services (Controlled Drugs PS). The Controlled Drug programme accounted for £11.3m of expenditure, the majority of which related to locally negotiated methadone fees (£10.9m). The General PS sub-programme accounted for the remaining £105.8m of expenditure relating predominately to nationally negotiated expenditure and expenditure on dispensing doctors.

*Age and Sex Adjustment*

For each GP practice an adjustment was made for the age and sex characteristics of the population. The rationale for this adjustment is to reflect differences in the need for pharmaceutical services, for example, the elderly would be expected to have a greater need for

pharmaceutical services than the young. We used data on the number of prescription items dispensed by age and sex category derived from the ISD random sample of prescription items. We calculated separate age and sex weights for controlled drugs.

#### *MLC Adjustment*

In order to take into account the greater need for pharmaceutical services in more deprived areas a number of options were considered for developing an MLC adjustment to the PS programme. The Advisory Group agreed that an approach based on the existing prescribing MLC used to allocated prescribing expenditure (GIC) to Boards would be most appropriate. This measure is likely to be strongly correlated with the need for pharmaceutical services. The main drawback of this approach is that it is not very representative of the need characteristics in the Controlled Drug PS sub-programme given the strong correlation between the use of controlled drugs and social deprivation.

#### *Unavoidable Cost Adjustment*

On average, dispensing contractors located in rural areas are smaller than those in more urban areas. Given this fact, there are a number of reasons why we may expect that smaller dispensing contractors will incur unavoidable additional costs, for example:

- there may be higher levels of unproductive time or low levels of staff utilisation given volume constraints in rural areas;
- there may be extra costs associated with providing outreach services, such as domiciliary visits; and
- there may be more limited scope to spread fixed costs such as shop overheads.

We empirically measured the extent of unavoidable costs using data from a cost survey of community pharmacies and using information on contractor fee structures. We considered four options for development of the unavoidable cost adjustment:

- Option 1: an adjustment based on the relationship between various observable contractor characteristics and the estimated cost of dispensing items from a cost survey of community pharmacies;
- Option 2: an adjustment based on the relationship between contractor fees (community pharmacy and dispensing doctors) and a single measure of remoteness. This could be conceptualised as a ‘pure’ remoteness adjustment as it discounts other potential explanatory factors of unavoidable cost;
- Option 3: an adjustment based on the relationship between contractor fees (community pharmacy and dispensing doctors) and a range of observable contractor characteristics which could explain variations in fees;
- Option 4: an adjustment based on the relationship between contractor fees and a range of observable contractor characteristics which could explain variations in fees. However, we restricted this analysis to community pharmacy contractors and apply the community pharmacy reimbursement system to all contractors.

Each option highlights a slight ‘U-shaped’ relationship between unavoidable costs and remoteness, with unavoidable costs considerably higher in very remote rural areas and some evidence of unavoidable costs in large urban areas (probably due to higher unit costs associated with rents, rates and/or staffing). This pattern was consistent across all of the adjustment options.

Following discussion at the Advisory Group it was agreed to use an adjustment based only on community pharmacy data (Options 1 or 4) because of the pending discussions of dispensing doctor arrangements. Of these two options, Option 4 was applied to the weighted capitation formula because at a Board level it generated the most intuitive results.

#### *Cross Boundary Flow*

Dispensing contractors unlike other hospital and community health services do not currently have a defined or registered resident population. Patients are free to visit any contractor they choose and Boards reimburse contractors based on their volume of activity regardless of where the patient is from. This freedom of movement makes it difficult to assess whether an area is relatively under- or over- provided with pharmaceutical services relative to need because patients may ‘commute’ across boundaries to visit a pharmacist. The pharmacy market is very fluid in Scotland, with each dispensing contractor dispensing items from a large number of ‘feeder’ GP practices. The median number of feeder GP practices per dispenser is 78. Some contractors based in large shopping centres dispensed items from over 700 different GP practices in 2003/04 (note that there are only just over 1,000 GP practices in Scotland).

However, the vast majority of prescriptions written in a GP practice are dispensed within the same Board area (98.76%). We have therefore adjusted for cross boundary flow taking into account prescription flows from individual GP practices to other Board areas. The adjustment takes into account the net effect of the ‘outflow’ of prescriptions which are dispensed in a different Board area and the ‘inflow’ of prescription from other Boards.

#### **Results**

The variation in population needs by NHS Board were illustrated by a series of graphs for each separate formula adjustment. In summary:

- the age and sex adjustment in the General PS sub-programme highlights that the need for resources is highest in Boards with a relatively elderly population, such as Borders, Dumfries and Galloway, and the Western Isles. However, the age and sex adjustment for the Controlled Drug PS sub-programme illustrates a different pattern, with Greater Glasgow and Lothian having slightly above average needs because of their relatively higher concentration of younger age groups;
- the MLC adjustment is highest in Boards with the greatest socio-economic and health problems including Greater Glasgow, Lanarkshire and the Western Isles;
- the unavoidable cost adjustment targets additional resources at Boards with a high proportion of remote and rural communities especially the Highlands and Islands. The magnitude of each adjustment is consistent with those outlined in the *Fair Shares for All* report, with the Islands gaining substantially. For example, it is estimated that

fees (as a proxy for costs) are approximately 30-40% higher in the Island Boards relative to the national average;

- the proportion of items flowing across Board boundaries is relatively low therefore the cross boundary flow adjustment has a relatively small impact on Board allocations. The main points to note are the large inflow of items into Greater Glasgow which are offset by an even larger outflow, and the large net gain of Forth Valley (1.79%);
- the most notable aspect of the combined results is the huge adjustment for the Western Isles. This is driven by the Western Isles having an older than average population, a relatively deprived population plus a large adjustment for unavoidable costs. Lothian and Grampian are estimated to have the least need for General PS resources in Scotland. Greater Glasgow is also predicted to have above average need due to its high level of social deprivation, although, this is offset by its relatively young and urban population. The results for the Controlled Drug PS sub-programme are reasonably similar with slightly higher need in Boards with younger populations such as Glasgow and Lothian.

### **Financial Implications**

The results illustrate a number of significant changes relative to the status quo. We presented the financial implications of allocating PS expenditure less controlled drug expenditure using the General PS sub-programme formula as a base case scenario. This was due to concerns regarding the sensitivity of the formula to 'controlled drug need'. Under this scenario the results illustrated that:

- Lothian, Highland, Orkney and the Western Isles all gain substantial resource share (11 to 17%); whilst
- Argyll and Clyde, Lanarkshire, and Dumfries and Galloway lose significant resource share (8 to 10%).

Table 1.2 illustrates the financial consequences of applying the General PS sub-programme formula to current expenditure less controlled drugs. It illustrates that Lothian is predicted to be nearly £1.88m under-funded relative to assessed need. Argyll and Clyde, and Lanarkshire are estimated to be over-funded relative to assessed need by just under £0.9m.



**Table 1.2 Financial Consequences 2003/04 Budget**

Board	Expenditure (£000s)	Resource Share	Formula Share	Change in Share	Change (£000s)
Argyll & Clyde	9,947	9.404%	8.571%	-8.9%	-881
Ayr & Arran	8,443	7.982%	7.647%	-4.2%	-354
Borders	2,374	2.244%	2.170%	-3.3%	-79
Dumfries & Galloway	3,832	3.622%	3.272%	-9.7%	-371
Fife Health	7,022	6.638%	6.619%	-0.3%	-19
Forth Valley	6,092	5.759%	5.488%	-4.7%	-287
Grampian	9,448	8.932%	9.429%	5.6%	526
Greater Glasgow	19,620	18.547%	17.979%	-3.1%	-601
Highland	4,410	4.169%	4.645%	11.4%	503
Lanarkshire	11,849	11.202%	10.444%	-6.8%	-801
Lothian	12,858	12.155%	13.932%	14.6%	1,880
Orkney	456	0.431%	0.505%	17.0%	77
Shetland	591	0.558%	0.536%	-4.1%	-24
Tayside	8,003	7.565%	7.875%	4.1%	327
Western Isles	837	0.791%	0.866%	9.4%	79
English Practices	0	0.000%	0.023%	-	24
<b>Total</b>	<b>105,782</b>	<b>100.000%</b>	<b>100.000%</b>	<b>-</b>	<b>0</b>

Source: Deloitte

### Recommendations

A number of conclusions and recommendations were drawn from the analysis. The most significant conclusions relate to the use of the General PS formula and the Option 4 unavoidable cost adjustment. Recommendations were also made with regard future research and the need to update the formula following the implementation of the new PCS contract.

## 2. Introduction

This report describes the results of research commissioned by the Scottish Executive Health Department (SEHD) into the development of a needs based formula for the allocation of Pharmaceutical Services (PS) expenditure. This is one of three reports outlining the methods for allocating Family Health Services (FHS) expenditure in Scotland. The other two reports present similar research into the allocation of expenditure on primary and community dental services and ophthalmic services<sup>1 2</sup>.

The methods and results outlined in this report are presented on behalf of the FHS Advisory Group for discussion with interested partner organisations.

### 2.1. Background

The Scottish Executive Health Department spent in the region of £930 million on the provision of pharmaceutical and dispensing services in 2003/04. This expenditure comprises of four main elements:

- nationally negotiated remuneration (e.g. dispensing services, providing advice and counselling to the public on medicines and appliances);
- locally negotiated remuneration (e.g. advisory services to residential homes, methadone dispensing services, oxygen supply services);
- reimbursement for General Medical Practitioners who provide dispensing services;
- reimbursement for the provision of medicines and appliances.

The majority of this expenditure relates to the provision of medicines and appliances (prescribing expenditure). This element of the budget is currently allocated to NHS Boards using the methods developed by the most recent review of resource allocation in Scotland, as described in *Fair Shares For All* (2000).

However, the remainder of this expenditure (£117m) relates to fees and allowances paid to dispensing doctors and community pharmacists for the pharmaceutical and dispensing services they supply to patients. This expenditure was not covered by the original *Fair Shares for All* review of resource allocation because it was considered impractical within the original timescales:

*‘there was consensus that these smaller elements... should be examined at a later date in the medium term future, once the methods for distributing larger budgets had been decided’. p5.*

In the absence of a formula specifically for allocating the fee and allowance element of the budget, this expenditure is currently allocated to NHS Boards based on current

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<sup>1</sup> The Development of a Needs Based Formula for General Ophthalmic Services in Scotland. Deloitte MCS Limited, 2005.

<sup>2</sup> The Development of a Needs Based Formula for Primary and Community Dental Services in Scotland. Deloitte MCS Limited, 2005.

expenditure. Current expenditure is mainly determined by the number of prescriptions dispensed and current distribution of dispensing contractors and hence expenditure is demand led.

In this report, we wish to challenge this status quo and develop a new method for allocating this expenditure to Boards based on the relative needs of different population groups. The aim is to ensure that resources are distributed equitably across Scotland reflecting the populations relative need for resources rather than reflecting the current pattern and location of dispensing contractors.

## 2.2. Terms of Reference

The terms of reference for this research is to identify a method of allocating resources for pharmaceutical services provided in the community which will ensure equity of access to services for the population living in each Board area<sup>3</sup>.

The tender documentation highlighted a number of key issues for the research to address:

- the methods of estimating the relative need for pharmaceutical services between the population living in different areas of Scotland;
- the influence of deprivation on the relative need for pharmaceutical services;
- the effects of remote and rural areas (and other relevant supply-side factors) on the costs of providing pharmaceutical services and the implications for equity of access;
- the implications of differences between Board areas of the age and sex structure of the population;
- the implications of cross boundary flow, i.e. patients resident in one Board area may use pharmaceutical services in a different Board area; and
- differences in the methods of providing Pharmaceutical Services in different Board areas, especially in remote and rural areas of Scotland, for example, where these services are provided by dispensing doctors.

No constraints were placed on the methods proposed, however, it was stated that the research should explore alternative methods for assessing needs, including the scope for using analytical methods similar to those used in the *Fair Shares for All* report.

## 2.3. Project Management Arrangements

An Advisory Group was established to review and advise on the research methods used. This Group consisted of members of the Analytical Services Division and Primary Care Division of the SEHD as well as representatives from the Information and Statistics Division (ISD) and an independent academic. In addition, the methods and findings of the research were presented to the Scottish Pharmaceutical General

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<sup>3</sup> based on the tender documentation issued in September 2002.

Council (SPGC) to ensure relevant parties were able to comment on and challenge the research as appropriate.

Full membership of the Advisory Group is outlined in Appendix 1.

## 2.4. Structure of Report

The report is structured into seven sections, set out as follows:

**Section 2 *Pharmaceutical Services Market*:** this section outlines the characteristics of the community pharmacy market and provides an overview of the size of the market and recent policy initiatives influencing this research;

**Section 3 *Data Sources*:** this section describes the main sources of data used for this research and describes the limitations and constraints placed on the research;

**Section 4 *Methodological Issues*:** this section discusses in more detail the methodological approach undertaken by the research and highlights some of the issues raised by the use of various data sources;

**Section 5 *Results*:** this section presents the results of the research and identifies the implications for the allocation of PS expenditure in Scotland;

**Section 6 *Discussion*:** this section provides an overview of the research, highlighting its strengths and weakness and identifies areas for further work.

A series of appendices provide additional technical details and results. An excel spreadsheet model has also been prepared for use in conjunction with this report. It presents details of the analysis and can be used for budget setting purposes.

### 3. Pharmaceutical Services Market

In this section we describe the characteristics of the Pharmaceutical Services (PS) market in Scotland. First, we define the terms used to describe the service and then we outline the range and number of suppliers in Scotland. We then provide a brief synopsis of the policy environment including reference to the current funding arrangements and the proposed new contract for community pharmacies.

#### 3.1. Framework for Service Provision

General pharmaceutical services in Scotland are currently governed by the National Health Service (Scotland) Act 1978 (1978 Act). Under the 1978 Act NHS Boards are required to secure the provision of pharmaceutical services in their area from individual or corporate pharmaceutical contractors.

Currently, the primary role of *pharmaceutical services* is to dispense the drugs and appliances prescribed by doctors and other health professionals. Pharmaceutical services in most cases are provided by community pharmacists, however, there are also a small number of specialist appliance suppliers. The Advisory Group agreed that within the context of this report we should omit appliance suppliers from further review. The Smoking, Health and Social Care (Scotland) Bill was passed by the Scottish Parliament in June 2005 and becomes an Act two months later. Part 3 of the Act outlines a number of changes in the planning, provision and contracting for community pharmacy services in Scotland. Collectively they provide the legislative framework to underpin the introduction of a new contract for community pharmacies covering the provision of *Pharmaceutical Care Services* (PCS). This contractual change may alter a population's need for resources in the future.

In areas where there is no community pharmacy provision an NHS Board can arrange for General Medical Practitioners to provide *Dispensing Services*. These 'dispensing doctors' are usually located in remote areas which have a need for a pharmacy but with a population too small to make a business economically viable. Dispensing doctors are governed by different legislation, however, for the purpose of this needs assessment we apply the term pharmaceutical services to community pharmacies and dispensing doctors.

It was noted that discussions are about to begin between SEHD and the Scottish General Practitioners Committee (SGPC) that will lead to the establishment of a revised set of arrangements for dispensing doctors in Scotland.

#### 3.2. Supply Characteristics

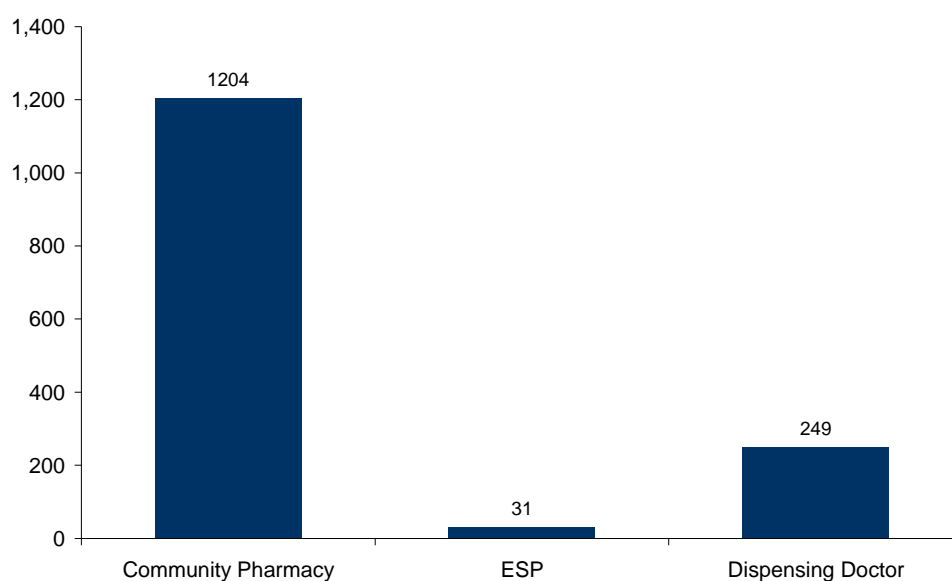
As noted above, the PS and dispensing market consists of a number of contractors, including:

- Community Pharmacies (CP); and
- Dispensing Doctors (DD).

A small number of community pharmacies are in the Essential Small Pharmacy Scheme (ESP) which was introduced to help maintain pharmacy services in localities which have a need for a pharmacy but with a population too small to make a business economically viable.

Table 3.1 illustrates the number of contractors in Scotland. Contractor counts were based on fee claims during the 2003/04 financial year<sup>4</sup>, therefore, contractors open part of the year due to openings or closures are included. Figures from ISD Scotland which present a 'snapshot' of businesses that were open estimate that there are 1148 pharmacies in Scotland (2004).

**Figure 3.1 Number of Dispensing Contractors in Scotland (2003/04)**



*Source: ISD Scotland*

Figure 3.1 illustrates that community pharmacies are the largest supplier of pharmaceutical services to the NHS. In addition to the 1,204 community pharmacies there are also 31 pharmacies in the Essential Small Pharmacy Scheme (ESP).

In areas with a population density considered too low for an ESP, dispensing doctors provide the dispensing element of pharmaceutical services. In total, there are 249 dispensing doctors across Scotland. There are on average 2.5 dispensing doctors per dispensing practice, although just over 50% of dispensing doctors work in single handed practices.

### 3.3. Current Funding Arrangements

Remuneration for dispensing contractors comprises of two elements: fees and allowances for service provision, and reimbursement for the cost of NHS drugs and appliances dispensed.

<sup>4</sup> defined as having a Gross Ingredient Cost (GIC) greater than zero

The fees and allowances payable for dispensing and other services are paid by the Board on whose list the contractor is included. Payment in respect of locally negotiated services are funded from Boards' cash limited allocations, or unified budgets. Payments to community pharmacists for nationally negotiated services are funded from a centrally held 'global sum' with Boards drawing down the amounts they require on a monthly basis.

The 'global sum' is determined annually through consultations between the SEHD and the SPGC. In effect it is a capped sum with any over or under payment in any one year being accounted for in the subsequent year's discussions and by appropriate adjustments to the fees and allowance scales. These fees are set out in the Scottish Drug Tariff for community pharmacies and in the Statement of Financial Entitlements for dispensing doctors, as below:

- the current fee for dispensing a standard prescription item for a community pharmacist is 95p (note there can be up to three items per prescription). Community pharmacists also receive a range of fees for dispensing instalment items (repeat prescribing), appliances, and controlled drugs including methadone;
- the community pharmacy professional allowance provides a monthly lump sum to a practice to cover professional services and overheads. This varies dependent on the volume of items dispensed per month up to a maximum of £1,575 per month. In addition, pharmacies in the ESP scheme can claim further lump sum payments;
- dispensing doctors, however, are paid a single dispensing fee on a sliding scale based on the number of items dispensed per month. For example, a dispensing doctor who prescribes less than 100 items per month receives £1.53 per item;
- community pharmacists are also reimbursed for the medicines and appliances that they purchase and subsequently dispense. The reimbursement rates are set by agreed pricing protocols and the total ingredient cost reduced by a 'clawback' to reflect the market discounts pharmacists can secure in purchasing their medicine stocks;
- dispensing doctors, however, are reimbursed with an on-cost which reflects a fixed percentage of the ingredient cost of the prescriptions they dispense.

### **3.4. New PCS Pharmacy Contract**

A new community pharmacy contract is currently being negotiated in Scotland. The traditional model of reimbursement, outlined above, is to be refocused in line with a new vision for the role of community pharmacies in Scotland as outlined in *The Right Medicine: A Strategy for Pharmaceutical Care* (Scottish Executive, 2002). This strategy set out a number of challenges and opportunities for the community pharmacy sector including calling for:

- better access for patients to NHS pharmacies, in terms of flexible opening hours and services offered; and
- expanding the role of pharmacist expertise in the provision, delivery and planning of services to improve patient care.

The new contract aims to develop quality services based on a patient centred approach to pharmaceutical care. The proposed contract will consist of four 'essential' service elements as outlined in HDL (2004) 36:

- **Minor Ailment Service (MAS):** this is the provision of a service which allows community pharmacists to treat common conditions and ailments on the NHS, enabling patients who are exempt from prescription charges to use their community pharmacy as the first port of call for the treatment of such conditions;
- **Chronic Medication Service (CMS):** this is the continuity of pharmaceutical care for patients with long term conditions and brings together serial dispensing. CMS will allow a patient to have their medicine supplied, monitored and reviewed for up to 12 months as part of a shared care arrangement between their community pharmacist and general practitioner;
- **Acute Medication Service (AMS):** this is the provision of pharmaceutical services for acute prescriptions, based on current dispensing and counselling services; and
- **Public Health Service (PHS):** this is the contribution of pharmacists to health improvement and medicine safety.

As now, NHS Boards will still be expected to negotiate locally for a range of Additional Services but against an agreed national framework and tariff. The services will continue to include extended out of hours, oxygen services, advisory services to care homes and harm reduction programmes.

These extensive changes to the contract will develop dependant on infrastructure requirements and the progress of the ePharmacy Programme<sup>5</sup>. Discussions are currently underway regarding the financial envelope for the New Contract, however, there is outline agreement regarding a mix of capitation, allowances and 'per item' fees. Given the substantial changes outlined in the contract and potential changes in data availability from the ePharmacy Programme it will be critical to ensure any formula will have sufficient flexibility to adapt to the new Contract framework.

### **3.5. Control of Entry Regulations**

In January 2003 the Office of Fair Trading (OFT) published *The Control of Entry Regulations and Retail Pharmacy Services in the UK*. The report examined whether the current control of entry regulations for retail pharmacies were acting to prevent

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<sup>5</sup> the ePharmacy Programme aims to electronically link all GP practices and community pharmacies eliminating the need for the processing of paper based prescriptions and enabling the linking of patient records to medication histories.



markets working well for consumers. The report recommended that the control of entry regulations for community pharmacies (which limit the number and location of community pharmacies) in the UK should be ended. This would have meant that all registered pharmacies with qualified staff would be able to dispense NHS prescriptions.

Following extensive public consultation, the Scottish Executive responded to the OFT report and concluded that deregulation would not be appropriate for Scotland. The Executive was concerned that in focussing on the needs of consumers the OFT report neglected the fact that consumers are also patients, and noted its concern that deregulation would have a negative impact on patients in Scotland's remote and rural communities and deprived urban areas:

*'Scotland has, proportionally, more remote and rural areas than other parts of the UK, as well as higher levels of deprivation. The key consideration for the Executive is access to services in these areas. We believe the OFT's report would run the significant risk of a least reducing, and at worst, removing services in some areas. We are not prepared to take that risk.'* Scottish Executive 2003.

This conclusion is especially important to consider when we investigate the effect of diseconomies of scale within the pharmaceutical services market. However, it must be borne in mind that under the new community pharmacy contract arrangements there will be changes to the current control of entry arrangements. Whilst the detail of these has still to be determined, the approach will be that new PCS contracts will be let where there is an identified need in accordance with an agreed PCS Plan at an individual NHS Board level.

## 4. Data Sources

In this section we outline the main data sources used in this research report. We describe each data source in turn, outlining the limitations of each data set and the implications for the analysis and proposed methods.

### 4.1. Population Data

The study used population counts for each GP practice in Scotland based on the June 2003 Community Health Index (CHI) register. This includes age and sex information for all patients registered with a GP in Scotland. It is known that GP list size information often over estimates population counts primarily due to the time taken to deregister patients. To control for this effect the population estimates are minimised by age, sex and council district to the 2003 Mid Year Estimates (General Register Office). The CHI populations were provided by ISD Scotland and are currently the basis for calculating capitation shares under *Fair Shares for All*. Table 4.1 illustrates the total size of the Scottish population at June 2003 by age and sex group.

**Table 4.1 CHI Population Data for Scotland (June 2003)**

Age Band	Male	Female	Total
0-4	128,948	134,880	263,828
5-14	299,561	314,296	613,857
15-24	318,392	329,353	647,745
25-34	332,404	315,109	647,513
35-44	409,521	383,199	792,720
45-54	347,437	336,619	684,056
55-64	303,024	285,594	588,618
64-74	247,816	204,450	452,266
75+	235,731	131,066	366,797
<b>Total</b>	<b>2,622,834</b>	<b>2,434,566</b>	<b>5,057,400</b>

Source: ISD Scotland

The total population of Scotland was estimated to be just over 5.05m. These data are used to estimate Board level populations as defined by GP practices<sup>6</sup>.

### 4.2. Fees and Activity Data

A list of all fees and dispensing activity undertaken by dispensing contractors in Scotland for the 2003/04 financial year was provided by ISD Scotland from the Prescribing Information System (PIS). The data provided a list of all items dispensed, and all fee items reimbursed, for each community pharmacist and dispensing doctor in Scotland.

<sup>6</sup> patients registered with a GP practice are managed by the Board in which the practice is registered

Item and fee data for both types of contractor were merged into a single data set. In total, there was information on 1,278 community pharmacies and 249 dispensing doctors. However, 43 community pharmacies claimed no Gross Ingredient Cost during the year and were excluded from further analysis. Following exclusions, data on 1,484 contractors remained.

As noted in section 2.3, there is a wide range of fee and item types which can be claimed by dispensing contractors. To simplify the analysis these were classified into groups, ensuring that data on dispensing fees were separated from data on ingredient costs. Table 4.2 illustrates how fee and item data were classified.

**Table 4.2 Classification of Dispensing Fees and Items**

Category of Fee	List of Fees
Dispensing	Standard, Instalment, Appliance, Ostomy, Dispensing (Dispensing Doctors only)
Controlled Drug / Methadone	Controlled Drug, Methadone, Supervision
Other Fees	Urgent, Out of Pocket Expenses, Measurement & Fitting, Quantity Related, Other
On-Cost	On-Cost
Oxygen Fees	Delivery Allowance, Oxygen Urgent Fee, Oxygen On-Cost, Oxygen Professional Allowance
Professional Allowance	Professional Allowance
ESP Allowance	ESP Allowance

Source: ISD Scotland

Dispensing doctors are remunerated using a slightly different reimbursement mechanism and associated fees were identified as a single dispensing fee and an on-cost allowance. Table 4.3 provides a number of summary statistics for the fee and item data split by type of contractor.

**Table 4.3 Annual Fee and Item Data Descriptive Statistics**

Descriptive Statistic	Community Pharmacy			Dispensing Doctor		
	Items	Fee	Fee/Item	Items	Fee	Fee/Item
Observations	1235	1235	1235	249	249	249
Mean	67,215	£82,778	£1.30	10,976	£24,643	£2.39
5th Percentile	17,375	£27,045	£1.08	1,174	£2,902	£1.96
25th Percentile	40,249	£55,470	£1.16	4,249	£11,149	£2.15
75th Percentile	87,294	£104,401	£1.38	16,419	£36,006	£2.61
95th Percentile	140,121	£158,806	£1.59	24,916	£52,196	£2.87

Source: ISD Scotland, Deloitte

Table 4.3 illustrates that community pharmacies dispense a high number of items per annum relative to dispensing doctors. Average fees per item are substantially higher for dispensing doctors compared to community pharmacists.

### 4.3. Contractor Geography

For each of the 1,484 contractors we were able to identify the name and full address of the practice. A full postcode was also supplied by ISD Scotland. A number of the postcodes were either invalid or included errors. Using information from the GRO and from manual searching we were able to identify full and valid postcodes for 1,481 contractors (the three missing contractors were all dispensing doctors). The availability of postcode data enabled us to match each contractor to a grid reference which identifies the postcode centroid to the nearest metre (small and large user postcode lookup file supplied by ISD Scotland). Each contractor was also matched to a Census Output Area.

More than one dispensing doctor can be located in the same GP practice, so we aggregated these data to represent locations. The 249 dispensing doctors were based in 158 identifiable locations across Scotland.

### 4.4. GP Practice Link Data

Using data from PSD’s pharmacy practice payment system it was possible to link each prescription item from the GP practice of origin to the dispensing contractor. For each dispensing contractor a list of ‘feeder’ GP practices could be identified as well as the number of prescription items originating from each ‘feeder’ GP practice.

In the vast majority of cases it was possible to identify both a valid GP practice code and dispensing contractor code (some GP practice codes were altered to reflect recent practice mergers or splits). However, for some items it was not possible to identify a GP practice code, either because the code was missing, invalid or the GP practice was based in England. Table 4.4 illustrates the degree of matching possible.

**Table 4.4 Proportion of Dispensed Items with a GP Practice Code**

Category	Proportion (%)	Items
Practice Code Available	98.81	71,131,568
Board Code only	0.67	485,482
Invalid Practice Code	0.40	286,992
English Practice	0.09	61,292
Miscellaneous	0.03	22,766
<b>Total</b>	<b>100.00</b>	<b>71,988,100</b>

*Source: ISD Scotland*

Overall, 98.81% of items could be tracked from a dispensing contractor to the GP practice of origin. In some cases it was possible only to identify the Board of the GP

practice. The number of prescriptions originating from England and then being dispensed in Scotland was very low.

#### 4.5. Measures of Remoteness

Two main measures of remoteness were used in this study:

- population density statistics from the 2001 Census available at a Census Output Area (OA); and
- the Scottish Executive Urban Rural Classification (SEURC) which classifies each Census OA based on the size and type of settlement.

The remoteness characteristics for each dispensing contractor were assigned based on the output area of the contractor postcode. This measures remoteness based on contractor location and not necessarily the characteristics of the contractor’s ‘catchment’ population<sup>7</sup>. However, the remoteness characteristics of a contractor location is likely to be a reasonable proxy and once aggregated to a Board level it is strongly correlated with a measure of population density.

Table 4.5 classifies each dispensing contractor into one of six urban rural categories based on the SEURC of the contractor’s output area.

**Table 4.5 Urban Rural Classification of Dispensing Contractor Locations**

SEURC	Community Pharmacy	ESP Community Pharmacy	Dispensing Doctor	Total
1. Large Urban Areas	514	3	1	518
2. Other Urban Areas	350	4	1	355
3. Accessible Small Towns	152	1	5	158
4. Remote Small Towns	52	0	4	56
5. Accessible Rural	98	12	44	154
6. Remote Rural	38	11	103	152
<b>Total</b>	<b>1,204</b>	<b>31</b>	<b>158</b>	<b>1,393</b>

Source: Deloitte

Table 4.5 illustrates that the majority of dispensing doctors are located in either accessible or remote rural areas, whilst community pharmacies are concentrated in more urban areas. ESP Pharmacies are located in both urban and rural areas dependant upon the locally accessed needs.

<sup>7</sup> it is theoretically possible to calculate a population density or SEURC classification for a contractor’s ‘catchment’ population by attributing GP practice characteristics. However, this would involve a degree of attribution error and assumptions regarding the attribution of a SEURC category. This would be more feasible when patient postcode data is available.

#### 4.6. Age and Gender Profiles

It is relatively difficult to access information on the age and gender profile of patients who use dispensing contractor services because the PIS does not routinely record these fields (because they are not critical to contractor payment). However, each year ISD collects a random sample of dispensed items and then match in data on the age and sex of the patient (using a patient's unique CHI number). The sample contains details on approximately 18,000 items. We were able to access three years worth of data (2001, 2002, 2003), providing information on the age and sex profile of patients prescribed just over 56,300 items. The sample includes information on drug name and type enabling the identification of appliance, oxygen and controlled drug items.

From May 2004, the PIS has been processing prescriptions which contain a unique CHI number. This enables patient details such as age and sex to be linked to the prescription based on this unique number. As this data collection capability is relatively new, uptake is not yet universal and currently stands at 47% of all items across Scotland<sup>8</sup>. As a result there are some concerns regarding the representativeness of the data at a Scotland level.

Information on the drug item fee (i.e. either standard or instalment item etc) is not recorded.

#### 4.7. Morbidity and Life Circumstance Indices

A number of existing data were available to measure the morbidity and life circumstances of populations in each GP practice. We used two existing variables as described in *Fair Shares for All*:

- the National Review of Resource Allocation (NRRA) or Arbutnott Index, which is a composite index based on the weighting together of four variables: the standardised mortality rate among people under the age of 65; the unemployment rate, the proportion of elderly people claiming income support and households with two or more indicators of deprivation. The 2003 updated variable was available;
- the prescribing expenditure needs index from the *Fair Shares for All* report which was constructed to reflect the relative need for prescribing expenditure. This index is derived from a weighting of the Arbutnott Index.

No other indicator variables were considered (see section 5.5).

#### 4.8. Pharmacy Cost Survey

The Scottish Executive made available information from a cost survey conducted across 158 community pharmacies in 2003/04. The survey estimated the cost of providing the NHS pharmaceutical service at each participating pharmacy using a

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<sup>8</sup> electronic recording of the CHI depends on a number of factors including whether it is present on a prescription, whether it is legible or whether the software recognises the number.

methodology agreed by an internal Pharmacy Cost Working Group. The survey collected information on a number of variables including:

- overhead, staffing, premises and other costs;
- approximate NHS floor areas;
- volume and type of items dispensed as well as fees;
- characteristics of each pharmacy including whether it is part of a chain and its opening hours;
- geographical information about the pharmacy including the Arbuthnott Index and the SEURC.

The sample included data on a wide range of community pharmacies to ensure it was as representative as possible.

#### 4.9. Current Expenditure Statistics

We used data from the Community Pharmacies Monitoring Report 2003/04 to provide information on current expenditure at an NHS Board level. This provided us with a baseline for comparison. ISD Scotland provided these data by NHS Board split by nationally negotiated, locally negotiated and dispensing doctor remuneration. Table 4.6 illustrates expenditure by Board.

**Table 4.6 Current Expenditure by Board (2003/04)**

NHS Board (£000s)	Centrally Negotiated	Locally Negotiated	Dispensing Doctors Pay	Total
Argyll & Clyde Health Board	9,029	1,423	802	11,254
Ayr & Arran Health Board	7,837	1,080	409	9,327
Borders Health Board	2,026	50	327	2,403
Dumfries & Gal'y Health Board	2,996	362	742	4,100
Fife Health Board	6,742	488	207	7,437
Forth Valley Health Board	5,644	380	351	6,375
Grampian Health Board	8,706	920	634	10,260
Greater Glasgow Health Board	19,093	5,302	0	24,395
Highland Health Board	3,289	141	1,049	4,479
Lanarkshire Health Board	11,372	1,017	298	12,687
Lothian Health Board	12,586	1,131	92	13,808
Orkney Health Board	209	4	244	457
Shetland Health Board	187	22	391	599
Tayside Health Board	7,783	784	113	8,680
Western Isles Health Board	254	3	581	839
<b>Scotland</b>	<b>97,754</b>	<b>13,106</b>	<b>6,240</b>	<b>117,100</b>

Source: Community Pharmacies Monitoring Report 2003/04, ISD Scotland

In total, £117.1m was spent on pharmaceutical service fees and allowances in Scotland during 2003/04. Centrally negotiated fees account for the largest element of the budget and just over £6m is spent on dispensing doctors.



## 5. Methodological Issues

In this section we discuss and describe the key methods and issues associated with the construction of a needs based formula for allocating PS expenditure. We provide a conceptual overview of the approach taken and then describe in turn each adjustment in the formula to reflect a population's need for resources. A number of issues and options for developing the formula are identified and described.

### 5.1. Conceptual Framework

Using the principles outlined in *Fair Shares for All* the majority of NHS expenditure in Scotland is now allocated using a series of weighted capitation formulae which allocate resources to Boards, based on four factors:

- the population share of the Board;
- the age and sex characteristics of the population;
- the morbidity and life circumstances of the population; and
- an adjustment for the unavoidable costs associated with providing services in remote areas.

In line with the model developed within *Fair Shares For All* we have adopted a similar conceptual approach. The only alteration is the development of a fourth adjustment which takes into account the extent of cross boundary flow (i.e. if a patient is dispensed a prescription in a Board in which they are not resident) and generalising the unavoidable cost adjustment to include other factors over and above remoteness. The weighted capitation formula can be expressed as:

$$WPop_i = Pop_i * A_i * B_i * C_i * D_i \quad [1]$$

where  $Wpop_i$  = the weighted population share for Board  $i$ ;

$Pop_i$  = the population share for Board  $i$ ;

$A_i$  = an index of the cost of meeting the needs of Board  $i$  relative to Scotland because of its age and sex structure;

$B_i$  = an index of the needs of Board  $i$  relative to Scotland because of its morbidity and life circumstances;

$C_i$  = an index of the unavoidable excess costs of Board  $i$  relative to Scotland because of its degree of remoteness or other factors;

$D_i$  = an index of net inflow/outflow of need in Board  $i$ .

In the following sections we describe a number of options for empirically measuring these four adjustments whilst maintaining consistency with the *Fair Shares for All* approach where feasible.

## 5.2. Unit of Analysis

We adopted GP practice populations as our main geographical unit. We adopted this unit of population because prescription item data is only available at practice level.

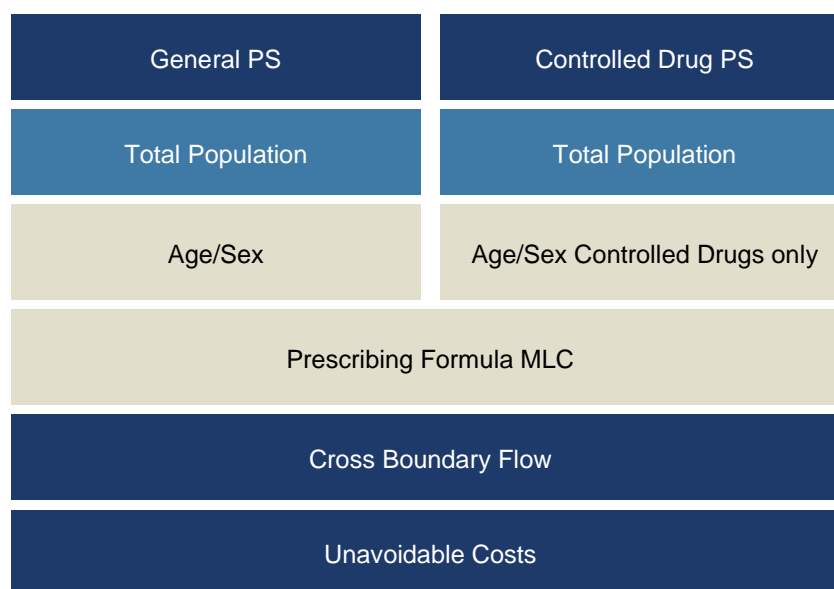
The Advisory Group considered whether it was feasible to attribute a ‘notional’ catchment population to a dispensing contractor. This would involve attributing GP practice populations based on the current flow of prescription items from GPs to dispensing contractors. However, practice level characteristics are already attributed based on the postcode of the CHI registered population and further attribution from practice to dispensing contractors would increase this error. Given the large number of ‘feeder’ GP practices for each dispensing contractor the group did not consider it feasible to construct ‘notional’ catchment populations (see section 5.7 for more detailed statistics).

In the future, as a higher proportion of prescriptions contain CHI numbers (and hence patient postcodes) it will be more feasible to characterise dispensing contractor populations.

## 5.3. Sub-Programmes

Figure 5.1 illustrates the conceptual framework used to construct the PS formula and how we have split expenditure into two sub-programmes: general prescribing services (General PS) and schedule 2 controlled drug services<sup>9</sup> (Controlled Drugs PS).

**Figure 5.1 PS Formula Sub-Programme Approach**



Source: Deloitte

<sup>9</sup> Schedule 2 Controlled Drugs include items such as methadone, dihydrocodeine and morphine etc (Scottish Drug Tariff).

We distinguished between these two types of activity because of the different fee structure for controlled drug dispensing (which attracts a higher average fee per item). The need characteristics of each population group is also very different:

- people in need of controlled drugs have a younger age profile; and
- there is a very strong association between controlled drug dispensing and social deprivation.

The Controlled Drug programme accounted for £11.3m of expenditure, the majority of which related to locally negotiated methadone fees (£10.9m). The General PS sub-programme accounted for the remaining £105.8m of expenditure relating predominately to nationally negotiated expenditure and expenditure on dispensing doctors.

The remainder of the methodology section describes the rationale for each stage of the formula construction.

#### **5.4. Age and Sex Adjustment**

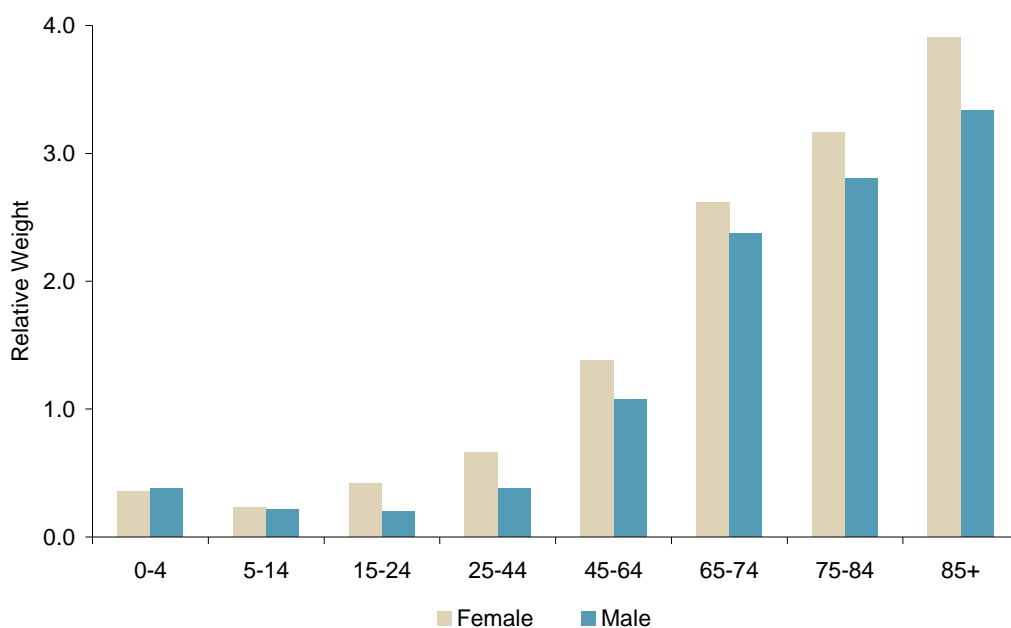
For each GP practice an adjustment was made for the age and sex characteristics of the population. The rationale for this adjustment is to reflect differences in the need for pharmaceutical services, for example, the elderly would be expected to have a greater need for pharmaceutical services than the young.

The most appropriate measure of need for pharmaceutical services would be the number of prescription items dispensed and the amount of time required to dispense the item. The amount of time taken to dispense an item would in turn depend upon a number of factors, including the amount of advice required and the time taken to prepare the prescription etc. The current dispensing fee schedule for community pharmacists outlined in the Scottish Drug Tariff is designed to reflect workload and would be considered the most appropriate proxy for need. However, fee data is not matched to prescription items or age and sex profiles.

In the absence of these data, we used data on the number of prescription items dispensed by age and sex category derived from the ISD random sample of prescription items. We calculated separate age and sex weights for controlled drugs.

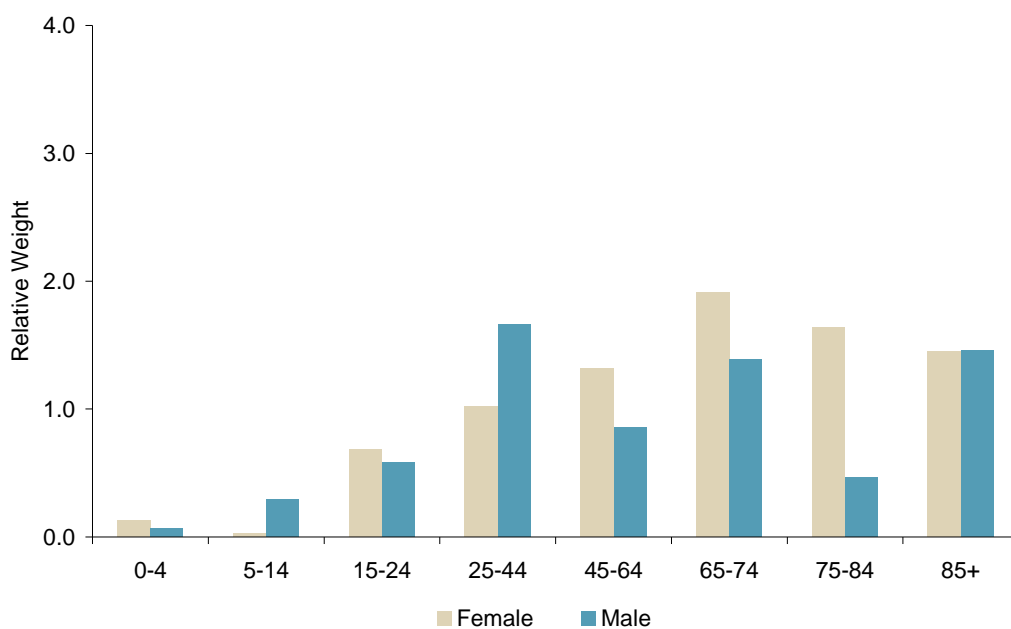
Figures 5.2 and 5.3 overleaf illustrate the relative prescribing item weights.

**Figure 5.2 General PS Items by Age/Sex Band**



Source: ISD Scotland

**Figure 5.3 Controlled Drug PS Items by Age/Sex Band<sup>10</sup>**



Source: ISD Scotland

<sup>10</sup> Schedule 2 Controlled Drugs only

They were calculated as the average number of items per capita in each age and sex band divided by the total number of items per capita over all of the bands in the sample. As expected they illustrate the different age profiles for General and Controlled Drug prescribing. For most items there is a very strong relationship with age, with the number of items dispensed substantially higher in the elderly population. Females are also more likely to be dispensed an item relative to males. However, it is more likely that males aged 25-44 years old will be dispensed a controlled drug item, reflecting the prescribing of agents such as methadone.

Appendix 3 illustrates age and sex weights based on CHI data compared to data from the prescription item sample. The relative weights are reasonably similar, although there appears to be a slight over- representation of items in the over 65 year olds in the CHI data. This may be due to CHI numbers appearing most frequently on repeat prescriptions, the bulk of which are for older people.

At present, we would recommend using the weights derived from the prescription sample until the distributional properties of the CHI extract are better understood.

## 5.5. Morbidity and Life Circumstance Adjustment

The Morbidity and Life Circumstance (MLC) of a given population has an impact on the health and associated need for health care resources. Many studies have documented the relationship between social deprivation and ill-health and the *Fair Shares for All* review made an explicit adjustment to target additional resources to deprived areas in recognition of this greater need.

In order to take into account the greater need for pharmaceutical services in more deprived areas a number of options were considered for developing an MLC adjustment to the PS programme.

### *Option 1. Existing Prescribing MLC*

Develop an adjustment based on the existing prescribing MLC used to allocated prescribing expenditure (GIC) to Boards. This measure is likely to be strongly correlated with the need for Pharmaceutical Services. The main downside to this approach is that it may not be very representative of the need characteristics in the Controlled Drug PS sub-programme given the strong correlation between the use of controlled drugs and social deprivation.

### *Option 2. New Prescribing MLC*

Develop a new MLC adjustment at a GP practice level using information on the number of controlled drug and other items prescribed. This would enable the incorporation of new data from the 2001 Census and other indicators of social deprivation such as the Scottish Index of Multiple Deprivation (SIMD). A new adjustment would also be based on item numbers as a proxy for workload/need and not prescribing expenditure.

### *Option 3. Individual Level MLC*

The development of a capitation formula using individual level data using information from the matching of CHI numbers to each prescription. This would transform the type and level of analysis that can be performed. One of the most promising approaches would be to identify patients with chronic conditions using Chronic Disease Scoring (CDS) algorithms (Von Korff et al 1992, Clarke et al 1995).

There are a number of pros and cons to each approach. In the long term the use of individual level data would be the most appropriate option, although, these data are not yet available. There are a number of limitations of the use of the existing prescribing MLC. However, it is likely to provide a good approximation for need due to morbidity and life circumstances, especially in the General PS sub-programme. The development of a new MLC would offer the opportunity for a number of methodological and data advances, although this approach may soon be superseded by a formula based on individual level data. On balance the Advisory Group agreed that an approach based on the current MLC adjustment would be most appropriate at this stage.

## 5.6. Unavoidable Cost Adjustment

NHS Boards that provide pharmaceutical services may face unavoidable costs associated with the delivery of services to the local population. The most important factor contributing to unavoidable costs are the additional costs associated with delivering services on a relatively small scale to small and isolated communities across Scotland. In this section, we outline four different options for developing an unavoidable cost adjustment, the first option is based on a pharmacy cost survey and the remainder are based on an analysis of the current fee structure.

### 5.6.1. Relative Contractor Size and Remoteness

Table 5.1 illustrates the average volume of dispensing activity at contractor locations in each SEURC category across Scotland<sup>11</sup>.

**Table 5.1 Urban Rural Classification and Size of Dispensing Contractor**

SEURC	Average Volume
1. Large Urban Areas	69,205
2. Other Urban Areas	76,632
3. Accessible Small Towns	61,661
4. Remote Small Towns	63,279
5. Accessible Rural	39,857
6. Remote Rural	21,460
<b>Total</b>	<b>61,534</b>

Source: Deloitte

It illustrates that the average contractor size is substantially smaller in rural areas compared to urban areas. Given the relatively small size of contractors in remote rural areas it is likely that they will face additional costs as a result of diseconomies of scale.

### 5.6.2. The Effects of Scale on Unavoidable Costs

As illustrated above, dispensing contractors located in rural areas are smaller than those in more urban areas. Given this fact, there are a number of reasons why we may expect that smaller contractors will incur additional costs, for example:

- there may be higher levels of unproductive time or low levels of staff utilisation given volume constraints in rural areas;
- there may be extra costs associated with providing outreach services, such as domiciliary visits; and

<sup>11</sup> note that there may be more than one dispensing doctor per contractor location

- there may be more limited scope to spread fixed costs such as shop overheads.

Whilst it is likely that unavoidable costs will be strongly related to remoteness we also investigated whether there were any other factors influencing the cost structure of contractors. For example, contractors in urban areas may face unavoidable cost pressures due to higher rent, staffing or security costs.

### 5.6.3. Measurement Options

We empirically measured the extent of these unavoidable costs using data from two main sources: a cost survey from a sample of 158 community pharmacies and data on current fees and remuneration. We specified four options:

- Option 1: an adjustment based on the relationship between various observable contractor characteristics and the estimated cost of dispensing items from a cost survey of community pharmacies;
- Option 2: an adjustment based on the relationship between contractor fees (community pharmacy and dispensing doctors) and a single measure of remoteness (SEURC category). This could be conceptualised as a ‘pure’ remoteness adjustment as it discounts other potential explanatory factors of unavoidable cost;
- Option 3: an adjustment based on the relationship between contractor fees (community pharmacy and dispensing doctors) and a range of observable contractor characteristics which could explain variations in fees;
- Option 4: an adjustment based on the relationship between contractor fees and a range of observable contractor characteristics which could explain variations in fees. However, we restricted this analysis to community pharmacy contractors as the dispensing doctor arrangements may be revised in the future. Therefore we apply the community pharmacy reimbursement system to all contractors.

Each option has a number of limitations. The use of cost survey data would provide the best evidence of variations in costs, although as it is sample based it may not be fully representative of all types of contractor. The options based on an analysis of current fees may be more representative, however, they may simply reinforce the relationship between contractor characteristics and current fees.

### 5.6.4. Estimation Approach

We regressed a series of potential explanatory variables at a contractor level on a dependant variable defined as either the average cost per item dispensed (this included all staff costs and overheads) or the average fee per item dispensed, such that:



$$C/F_i = \beta_0 + \beta_1 V_i + \beta_2 X_i + \beta_3 Z_i + \varepsilon_i \quad [2]$$

where  $C/F_i$  = unit cost/fee per item dispensed at contractor  $i$ ;

$V_i$  = the annual volume of items dispensed at contractor  $i$ ;

$X_i$  = the characteristics of contractor  $i$ ;

$Z_i$  = the characteristics of the location of contractor  $i$ .

The  $X_i$  characteristics included a number of binary variables indicating the ownership of the pharmacy and the type of dispensing conducted. The  $Z_i$  characteristics included the Arbutnott Index and six SEURC categories expressed as dummy variables (SEURC1-SEURC6). We estimated the equations using a variety of functional forms including additive, multiplicative and quadratic specifications. We present the results of the multiplicative models although even these were not always appropriately specified.

Significant variables were selected using a selective stepwise procedure and White's corrected standard errors were used throughout to allow for heteroskedasticity.

#### 5.6.5. Empirical Results

Table 5.2 overleaf illustrates the results of the analysis for each of the four options.

The variables highlighted in bold are used to construct the unavoidable cost adjustment. The variables indicating the type of pharmacist were not considered as legitimate drivers of unavoidable cost and were not used to generate the cost adjustment.

**Table 5.2 Dispensing Contractor Characteristics and Unit Costs/Fees**

Unit Cost/Fees	Option 1 – Cost Survey		Option 2 – Remoteness Only		Option 3 – All Variables		Option 4 – CPs Only	
	Coefficient	t-score	Coefficient	t-score	Coefficient	t-score	Coefficient	t-score
Small Multiple	-0.235	-3.139						
High Street Chain 1	-0.319	-4.236						
High Street Chain 2	-0.395	-5.536	-0.116	-8.195	-0.003	-0.295	-0.003	-0.377
Supermarket	-0.510	-6.078	-0.089	-4.564	0.024	1.954	0.023	1.942
Independent	-0.349	-4.783	-0.112	-7.486	0.008	0.962	0.006	0.774
SEURC2	<b>-0.066</b>	-1.465	<b>-0.037</b>	-3.420	<b>-0.041</b>	-4.760	<b>-0.041</b>	-4.653
SEURC3	<b>-0.095</b>	-2.004	<b>-0.019</b>	-1.362	<b>-0.042</b>	-4.747	<b>-0.041</b>	-4.738
SEURC4	<b>-0.122</b>	-1.289	<b>0.037</b>	1.351	<b>-0.014</b>	-0.897	<b>-0.016</b>	-1.006
SEURC5	<b>-0.261</b>	-2.883	<b>0.158</b>	6.443	<b>-0.031</b>	-2.293	<b>-0.047</b>	-3.038
SEURC6	<b>-0.096</b>	-1.223	<b>0.398</b>	17.268	<b>-0.009</b>	-0.482	<b>0.013</b>	0.538
Volume	<b>-0.503</b>	-13.374			<b>-0.070</b>	-5.105	<b>-0.075</b>	-4.237
Dispensing Doctor					<b>0.504</b>	21.739		
ESP					<b>0.435</b>	6.122	<b>0.426</b>	5.965
Constant	6.706	15.720	0.345	28.087	1.015	6.777	1.079	5.525
Number of observations	158		1393		1393		1235	
R-squared	0.665		0.432		0.766		0.421	
RESET	2.070	0.108	-	-	91.340	0.000	92.450	0.000

Source: Deloitte

Table 5.2 illustrates that over 66% of the variation in unit costs at a community pharmacy level can be explained by the available explanatory variables (Option 1). The model was estimated using a multiplicative functional form and passed a specification test. After controlling for all other factors, the annual volume of items has a strong negative impact on cost, so the lower the annual volume the higher the unit cost per item providing evidence of diseconomies of scale.

Pharmacy ownership such as whether it is part of a chain influences cost with supermarkets having the lowest cost structure, although these factors were not used to construct the unavoidable cost adjustment. Urban areas (SEURC1) had higher unit costs after controlling for the volume of items, for example, if there were two low volume pharmacies, one in an urban area and one in a rural area, the urban contractor would have a higher cost structure. This may be related to market force factors such as higher rents, rates or staff costs in urban settings. Variables such as whether the pharmacy dispensed methadone prescriptions, its deprivation score or ESP status were not found to be significant cost indicators.

The results of the average fee options (Options 2-4) illustrate that similar factors influence fees, with average fees higher in low volume contractors and urban areas. ESP pharmacies and dispensing doctors also have higher than average fees, whilst ownership of pharmacy has no significant effect.

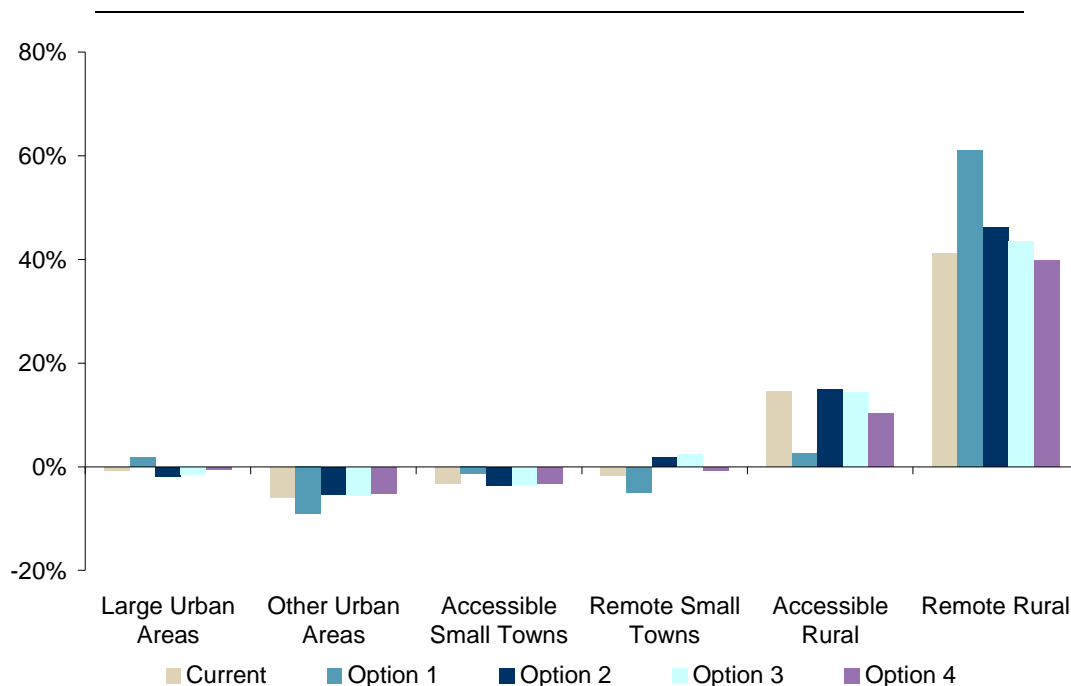
Option 3 explains the highest proportion of fee variation (76%). None of the fee based models passed the RESET specification test. We presented models based on a multiplicative functional form because they explained a greater proportion of the variation in fees relative to additive or quadratic specifications.

#### **5.6.6. Comparison of the Adjustment Options**

Figure 5.4 overleaf illustrates the scale of the unavoidable cost adjustment option and SEURC classification. For comparative purposes we also illustrate current fees by SEURC. In each case the adjustments have been indexed around the Scottish average.

Each option highlights a slight 'U-shaped' relationship between unavoidable costs and remoteness, with unavoidable costs considerably higher in very remote rural areas and some evidence of unavoidable costs in large urban areas. This pattern was consistent across all four adjustment options.

**Figure 5.4 Current Fees and Unavoidable Cost Adjustment by SEURC**



Source: Deloitte

Figure 5.4 illustrates that the relative scale of each adjustment is similar across SEURC category. The analysis of the cost survey data indicates that costs in remote rural areas are over 60% above the Scottish average (Option 1) although the pattern across other categories is less clear cut. Under Option 4, which applies the community pharmacy fee structure to all contractors, we estimate that fees are just over 40% higher than the Scottish average<sup>12</sup>.

Following discussion at the Advisory Group it was agreed to use an adjustment based only on community pharmacy data because of the pending discussions of dispensing doctor arrangements. Due to concerns regarding the size of the unavoidable cost adjustment, the counter-intuitive results (see section 6.3) and the robustness of the cost survey we discounted the Option 1 adjustment. Therefore, we applied the Option 4 unavoidable cost adjustment to the sub-programme formulae.

<sup>12</sup> under the Option 4 adjustment we assume that each dispensing doctor has the same characteristics as an ESP

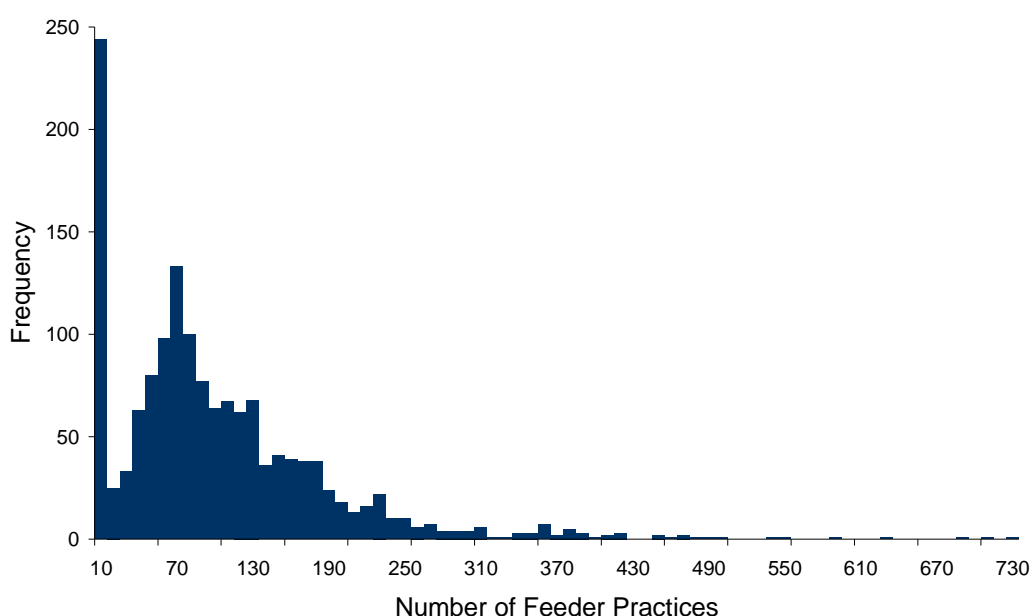
### 5.7. Cross Boundary Flow

Dispensing contractors unlike other hospital and community health services do not currently have a defined or registered resident population. Patients are free to visit any contractor they choose and Boards reimburse contractors based on their volume of activity regardless of where the patient is from.

This freedom of movement makes it difficult to assess whether an area is relatively under- or over- provided with pharmaceutical services relative to need because patients may ‘commute’ across boundaries to visit a pharmacist. For example, a dispensing contractor at a city centre train station or shopping centre may dispense items from all over the country. Whilst the immediate geographical area may seem over provided with pharmacies it actually provides a service to people from out with the area.

Figure 5.5 illustrates the fluidity of movement of patients across Scotland, by illustrating the number of ‘feeder’ GP practices for each dispensing contractor in Scotland. It illustrates the huge number of GP practices from which each dispensing contractor dispenses items. The median number of feeder GP practices per dispenser is 78. Some contractors based in large shopping centres dispensed items from over 700 different GP practices in 2003/04 (note that there are only just over 1,000 GP practices in Scotland).

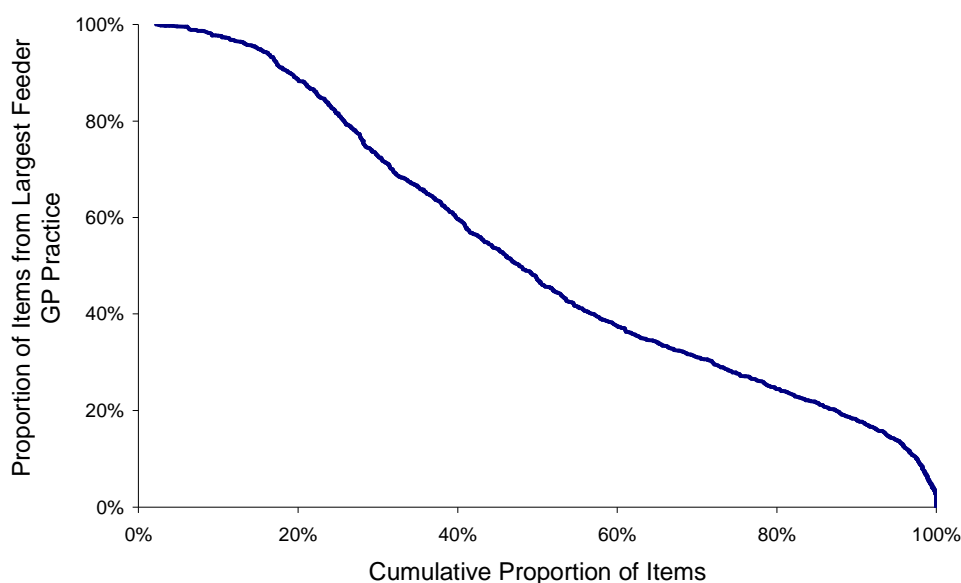
**Figure 5.5 Number of Feeder GP practices per Dispensing Contractor**



Source: Deloitte

Figure 5.6 overleaf illustrates the proportion of each dispensing contractor activity that originates from the largest feeder GP practice.

**Figure 5.6 Concentration of Largest Feeder GP practices**



Source: Deloitte

Figure 5.6 illustrates that whilst some dispensers rely on one or two GP practices for the majority of their business (most likely to be dispensing doctors in rural areas), over 50% of contractors rely on a much greater spread of practices for their business. This analysis implies that it would be difficult to assign ‘notional’ populations or population characteristics to dispensing contractors based on the characteristics of the feeder GP practice populations. It will also be difficult to develop a cross boundary flow adjustment at a GP practice to dispensing contractor level.

Table 5.4 illustrates the degree of flow from GP practices to dispensers and Board of dispenser.

**Table 5.4 Proportion of Items Dispensed in Different Board Areas**

Statistic	Largest Feed GP to Dispenser (%)	GP to Dispenser Board (%)
Mean	60.28	98.76
25% percentile	31.38	98.75
50% percentile	56.36	99.43
75% percentile	95.73	99.76
Range	2.20 – 100.00	25.56 – 100.00

Source: Deloitte

Table 5.4 illustrates that on average the largest ‘feeder’ GP practice accounts for 60% of a dispenser’s trade, although this varies substantially from dispenser to dispenser.

However, the vast majority of prescriptions written in a GP practice are dispensed within the same Board area (98.76%).

We have therefore adjusted for cross boundary flow taking into account prescription flows from individual GP practices to other Board areas. The adjustment takes into account the net effect of the 'outflow' of prescriptions which are dispensed in a different Board area and the 'inflow' of prescription from other Boards. This fourth adjustment to the PS formula sums across resource shares taking into account location of items dispensed rather than location of contractor. For example, if in GP practice X, 5% of items are dispensed in Board A and 95% from Board B, we allocate 5% of the GP practice population's estimated need to Board A and 95% to Board B.

This adjustment assumes that cross boundary flow represents a patient's preference for dispensing location. However, in some areas it could be argued that patients may need to travel to a dispensing contractor because of the lack of a local service. So this adjustment may reinforce current provision patterns. On the other hand, it is probably more likely that a patient's freedom of movement across boundaries reflects patient preferences (i.e. convenient locations) rather than indicate under- supply although this would require empirical testing to confirm.

## 6. Results

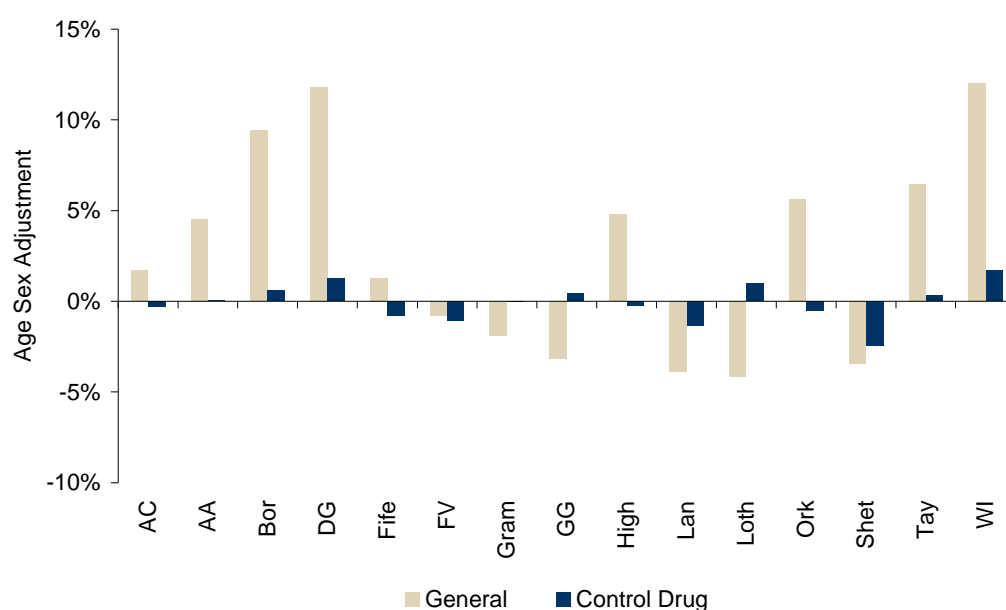
In this section we present the results of the preceding analysis and illustrate the need characteristics of each Board’s population. We illustrate the impact of each adjustment in turn by Board, and then combine all of the adjustments and illustrate the effect on current financial positions.

### 6.1. Age and Sex Adjustment

Board populations differ in their age and sex characteristics and this has a significant effect on their relative need for pharmaceutical care resources. To address this we developed a weighting to allow for age and sex differences based on prescription item volume for controlled drugs and other prescription items.

Figure 6.1 illustrates the effect of these weightings on the relative need for resources in each Board. The adjustments are presented as an index with zero representing the Scottish average and values above zero indicating greater need and vice versa.

**Figure 6.1 Relative Need for PS Resources: Age/Sex Adjustment**



Source: Deloitte

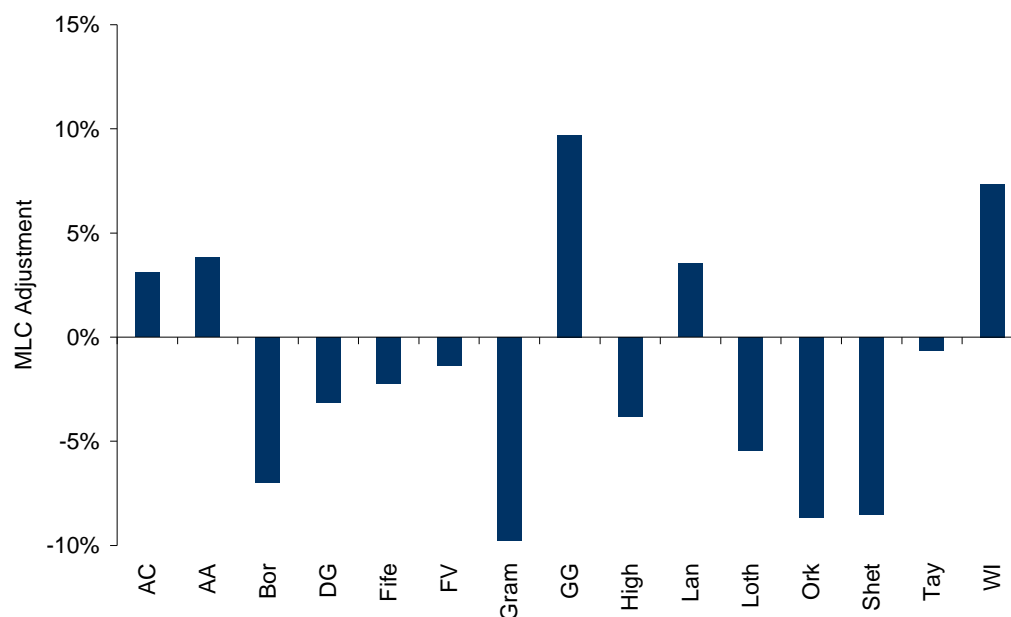
As expected the adjustment in the General PS sub-programme highlights that need for resources is highest in Boards with a relatively elderly population, such as Borders, Dumfries and Galloway and the Western Isles. However, the age and sex adjustment for the Controlled Drug PS sub-programme illustrates a different pattern, with Greater Glasgow and Lothian having slightly above average needs because of their relatively higher concentration of younger age groups.



## 6.2. Morbidity and Life Circumstance Adjustment

The *Fair Shares for All* report recommended that an adjustment should be made to reflect differences in the morbidity and life circumstances of each Board’s population. A number of potential options were considered each using a different indicator of socio-economic and health circumstances. Figure 6.2 illustrates the effect of using the existing prescribing expenditure morbidity and life circumstance index on the relative need for resources in each Board.

**Figure 6.2 Relative Need for PS Resources: MLC Adjustment**



Source: Deloitte

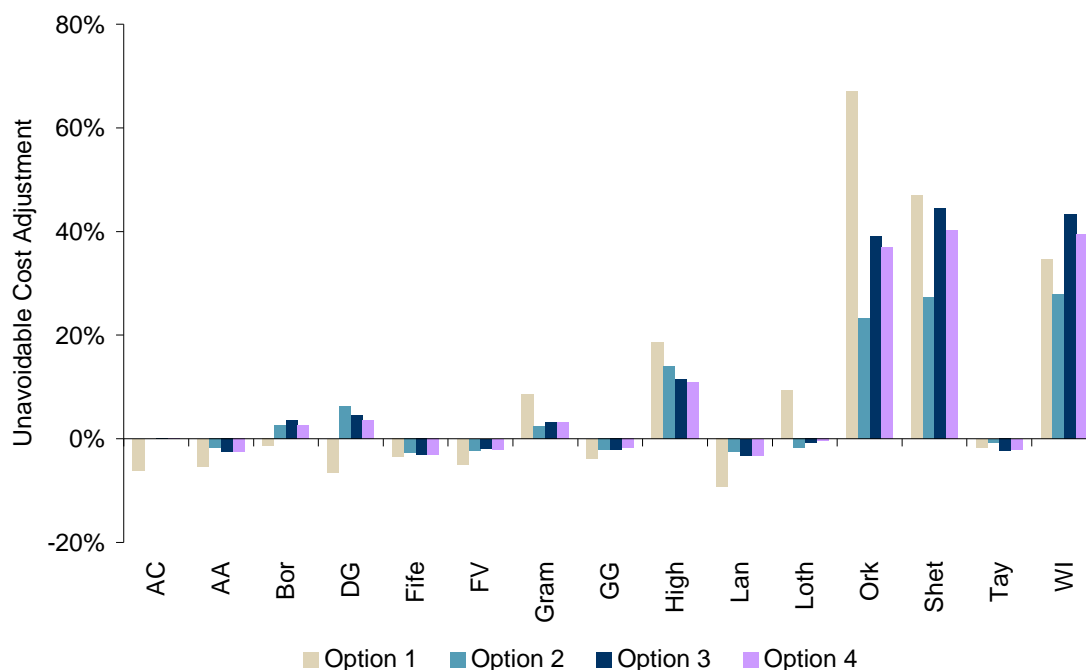
As expected the adjustment is highest in Boards with the greatest social economic and health problems, and thus need for prescribing expenditure. This adjustment was applied to both the General and Controlled Drug sub-programmes.

## 6.3. Unavoidable Cost Adjustment

NHS Boards that provide pharmaceutical services may face unavoidable costs associated with the delivery of services to the local population. The most important factor contributing to unavoidable costs are the additional costs associated with delivering services on a relatively small scale to small and isolated communities across Scotland. To address this, four options were developed for taking into account the unavoidable cost of service provision across Scotland.

Figure 6.3 overleaf illustrates the effect of each option on the relative cost of providing pharmaceutical services in each Board.

**Figure 6.3 Relative Need for PS Resources: Unavoidable Cost Adjustment**



Source: Deloitte

Figure 6.3 illustrates that under each option Boards with a high proportion of remote and rural communities are expected to need additional resources to compensate for the additional costs of provision (especially the Highlands and Islands). The magnitude of each adjustment is consistent with those outlined in the *Fair Shares for All* report, with the Islands gaining substantially. For example, it is estimated that fees (as a proxy for costs) are approximately 30-40% higher in the Island Boards relative to the national average.

The relative magnitude of the adjustment varies across each option. Option 1 would target the most resources to the Islands (over 60% greater than the Scottish average under Option 1) and also produces some unexpected results with Lothian predicted to need additional resources whilst Borders and Dumfries and Galloway lose resource share. The results of the Option 4 adjustment are more intuitive with Highland, Borders, Dumfries and Galloway and the Islands needing additional resources due to unavoidable costs.

**6.4. Cross Boundary Flow Adjustment**

Patients are free to use whatever dispensing contractor they choose when collecting their prescription. In order to account for this cross boundary flow of ‘need’ we developed an adjustment based on the net inflow and outflow of dispensed items from each Board. The rationale is that if a large number of residents of a Board choose to have items dispensed in another Board then funding should follow the patient.

Table 6.1 illustrates the inflow and outflow of prescriptions from each Board. The net change is presented in both actual numbers and percentage terms.

**Table 6.1 Net Inflow and Outflow of Dispensed Items by Board**

Board	Prescribed Items	Outflow	Inflow	Net Change	% Change
Argyll & Clyde	6,708,955	95,843	139,290	43,447	0.65%
Ayr & Arran	5,360,751	67,354	55,719	-11,635	-0.22%
Borders	1,529,989	7,539	5,261	-2,278	-0.15%
Dumfries & Galloway	2,500,509	4,135	7,258	3,123	0.12%
Fife Health	4,834,364	72,958	66,608	-6,350	-0.13%
Forth Valley	4,141,546	90,169	164,129	73,960	1.79%
Grampian	6,134,812	19,444	10,605	-8,839	-0.14%
Greater Glasgow	13,602,555	270,455	192,180	-78,275	-0.58%
Highland	2,779,124	8,133	11,831	3,698	0.13%
Lanarkshire	8,867,566	138,564	123,088	-15,476	-0.17%
Lothian	8,294,046	75,676	77,243	1,567	0.02%
Orkney	234,456	565	416	-149	-0.06%
Shetland	300,875	344	301	-43	-0.01%
Tayside	5,368,540	44,501	41,722	-2,779	-0.05%
Western Isles	459,512	1,331	1,360	29	0.01%
<b>Total</b>	<b>71,117,600</b>	<b>897,011</b>	<b>897,011</b>		

Source: Deloitte

The proportion of items flowing across Board boundaries is relatively low therefore the cross boundary flow adjustment has a relatively small impact on Board allocations. The main points to note are the large inflow of items into Greater Glasgow which is offset by an even larger outflow, and the large net gain of Forth Valley (1.79%).

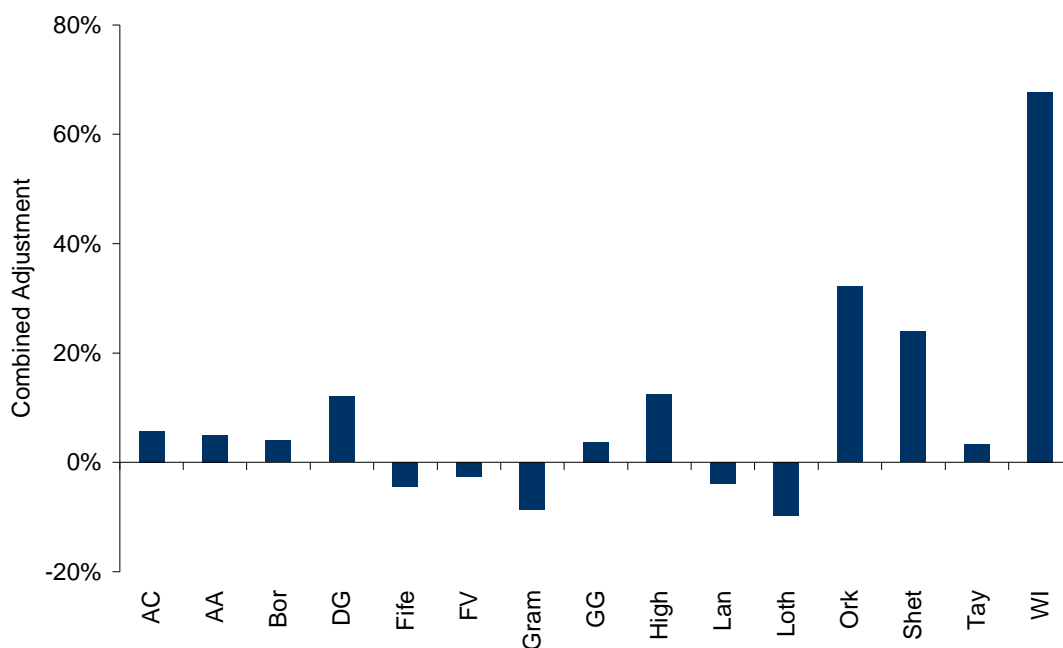
## 6.5. Combined Adjustments

Figure 6.4 illustrates the combined effects of each of the four adjustments: age/sex, morbidity and life circumstances, unavoidable costs and cross boundary flow. It represents results for the General PS programme assuming that the option 4 unavoidable cost adjustment applies. The results are presented as an index number, so an adjustment over 1.0 indicates a higher than average need for General PS resources.

The most notable aspect of the results is the huge adjustment for the Western Isles. This is driven by the Western Isles having an older than average population, a relatively deprived population plus a large adjustment for unavoidable costs. Lothian and Grampian are estimated to have the lowest per capita need for General PS resources in Scotland. Greater Glasgow is also predicted to have above average need

due to its high level of social deprivation, although, this is offset by its relatively young and urban population.

**Figure 6.4 Relative Need for General PS Resources: Combined Adjustment**



Source: Deloitte

The results for the Controlled Drug PS sub-programme are reasonably similar with slightly higher need in Boards with younger populations such as Glasgow and Lothian. A breakdown of all of the adjustments and estimated shares of need are presented overleaf in Tables 6.2 and 6.3.

**Table 6.2 Estimated Resource Shares (%) and Adjustment Indices for the General PS Programme**

Board	Population	Population Share	Age/Sex Share	Age/Sex MLC Share	Catchment Adjusted Share	Combined Share	Age/Sex Index	MLC Index	Catchment Index	Unavoidable Cost Index	Combined
Argyll C	409,981	0.0811	0.0824	0.0849	0.0857	0.0857	1.016	1.031	1.009	1.000	1.057
Ayrshire A	368,191	0.0728	0.0758	0.0787	0.0784	0.0765	1.042	1.038	0.996	0.975	1.050
Borders	105,501	0.0209	0.0228	0.0212	0.0212	0.0217	1.093	0.930	0.999	1.025	1.040
Dumfries G	147,638	0.0292	0.0326	0.0315	0.0316	0.0327	1.116	0.969	1.002	1.036	1.121
Fife	350,049	0.0692	0.0699	0.0684	0.0683	0.0662	1.011	0.978	0.999	0.969	0.956
Forth Valley	284,815	0.0563	0.0557	0.0550	0.0560	0.0549	0.990	0.987	1.019	0.979	0.974
Grampian	521,988	0.1032	0.1016	0.0916	0.0915	0.0943	0.984	0.902	0.998	1.031	0.914
Greater G	876,377	0.1733	0.1679	0.1842	0.1831	0.1798	0.969	1.097	0.994	0.982	1.038
Highland	208,757	0.0413	0.0435	0.0418	0.0419	0.0465	1.054	0.962	1.001	1.109	1.125
Lanarkshire	550,089	0.1088	0.1043	0.1080	0.1079	0.1044	0.959	1.035	0.999	0.968	0.960
Lothian	780,202	0.1543	0.1482	0.1401	0.1400	0.1393	0.961	0.945	0.999	0.995	0.903
Orkney	19,309	0.0038	0.0040	0.0037	0.0037	0.0050	1.056	0.913	0.999	1.370	1.321
Shetland	21,869	0.0043	0.0042	0.0038	0.0038	0.0054	0.965	0.915	1.000	1.403	1.239
Tayside	385,505	0.0762	0.0811	0.0805	0.0804	0.0787	1.063	0.993	0.999	0.979	1.033
Western Isles	26,101	0.0052	0.0058	0.0062	0.0062	0.0087	1.120	1.074	1.000	1.394	1.678

Note: excludes a small percentage of need allocated to populations registered with English practices

**Table 6.3 Estimated Resource Shares (%) and Adjustment Indices for the Controlled Drug PS Programme**

Board	Population	Population Share	Age/Sex Share	Age/Sex MLC Share	Catchment Adjusted Share	Combined Share	Age/Sex Index	MLC Index	Catchment Index	Unavoidable Cost Index	Combined
Argyll C	409,981	0.0811	0.0814	0.0838	0.0846	0.0847	1.004	1.030	1.009	1.001	1.045
Ayrshire A	368,191	0.0728	0.0731	0.0760	0.0758	0.0739	1.005	1.039	0.997	0.975	1.015
Borders	105,501	0.0209	0.0212	0.0197	0.0197	0.0202	1.016	0.929	0.999	1.026	0.967
Dumfries G	147,638	0.0292	0.0298	0.0288	0.0289	0.0299	1.021	0.967	1.002	1.036	1.025
Fife	350,049	0.0692	0.0689	0.0672	0.0671	0.0651	0.995	0.975	0.999	0.970	0.940
Forth Valley	284,815	0.0563	0.0559	0.0551	0.0561	0.0550	0.992	0.986	1.019	0.980	0.977
Grampian	521,988	0.1032	0.1032	0.0930	0.0928	0.0957	1.000	0.901	0.998	1.031	0.927
Greater G	876,377	0.1733	0.1730	0.1900	0.1890	0.1856	0.998	1.098	0.995	0.982	1.071
Highland	208,757	0.0413	0.0415	0.0399	0.0399	0.0443	1.005	0.960	1.002	1.110	1.073
Lanarkshire	550,089	0.1088	0.1074	0.1110	0.1109	0.1074	0.987	1.034	0.999	0.969	0.988
Lothian	780,202	0.1543	0.1544	0.1460	0.1458	0.1452	1.001	0.946	0.999	0.996	0.941
Orkney	19,309	0.0038	0.0038	0.0035	0.0035	0.0048	1.007	0.912	1.000	1.371	1.258
Shetland	21,869	0.0043	0.0042	0.0039	0.0039	0.0054	0.975	0.914	1.000	1.403	1.251
Tayside	385,505	0.0762	0.0767	0.0763	0.0763	0.0747	1.007	0.995	0.999	0.979	0.980
Western Isles	26,101	0.0052	0.0053	0.0056	0.0056	0.0079	1.021	1.070	1.001	1.395	1.525

Note: excludes a small percentage of need allocated to populations registered with English practices

## 7. Financial Implications

In this section we present the results of the analysis, comparing the current share of the PS budget with the estimated needs based share by Board (based on the option 4 unavoidable cost adjustment in each case).

In Table 7.4 overleaf we present three scenarios:

- Scenario 1: ‘PS expenditure shares’ by NHS Board compared to estimated need shares derived from both the General PS and Controlled Drug sub-programme formulae;
- Scenario 2: ‘PS expenditure *less* Controlled Drug expenditure shares’ by NHS Board compared to need shares derived from the General PS sub-programme formula; and
- Scenario 3: ‘centrally negotiated fee expenditure shares’ by NHS Board compared to need shares derived from the General PS sub-programme formula.

The results illustrate a number of significant changes relative to the status quo. Estimated need for all PS expenditure under scenario 1 is substantially different from current expenditure for a number of Boards, for example:

- Lothian, Highland, Orkney and the Western Isles all gain substantial resource share (19 to 28%); whilst
- Greater Glasgow, Argyll and Clyde, and Dumfries and Galloway lose significant resource share (7 to 13%).

Some of the variation relates to the impact of locally negotiated fees, and especially methadone fees, which are particularly high in Greater Glasgow NHS Board.

Under scenario 2 we removed the effect of controlled drug expenditure and the variations in actual and estimated resource shares were correspondingly lower, although, the pattern of gainer and loser Boards remains similar:

- Lothian, Highland, Orkney and the Western Isles all gain substantial resource share (11 to 17%); whilst
- Argyll and Clyde, Lanarkshire, and Dumfries and Galloway lose significant resource share (8 to 10%).

The comparison of centrally negotiated fees with the General PS formula also highlighted variations, particularly in the Highlands and Islands (Scenario 3).

Table 7.4 Actual and Estimated Resource Shares

Final Tables	All PS Expenditure (%)			PS Expenditure less Schedule 2 Controlled Drugs (%)			Total Centrally Negotiated Remuneration (%)		
	Actual	Estimated	Change	Actual	Estimated	Change	Actual	Estimated	Change
Argyll & Clyde Board	9.611	8.561	-10.9	9.404	8.571	-8.9	9.236	8.571	-7.2
Ayr & Arran Board	7.965	7.622	-4.3	7.982	7.647	-4.2	8.017	7.647	-4.6
Borders Board	2.052	2.155	5.0	2.244	2.170	-3.3	2.073	2.170	4.7
Dumfries & Galloway Board	3.501	3.245	-7.3	3.622	3.272	-9.7	3.065	3.272	6.7
Fife Board	6.351	6.608	4.1	6.638	6.619	-0.3	6.897	6.619	-4.0
Forth Valley Board	5.444	5.489	0.8	5.759	5.488	-4.7	5.774	5.488	-5.0
Grampian Board	8.762	9.443	7.8	8.932	9.429	5.6	8.906	9.429	5.9
Greater Glasgow Board	20.832	18.036	-13.4	18.547	17.979	-3.1	19.532	17.979	-7.9
Highland Board	3.825	4.624	20.9	4.169	4.645	11.4	3.365	4.645	38.0
Lanarkshire Board	10.834	10.473	-3.3	11.202	10.444	-6.8	11.633	10.444	-10.2
Lothian Board	11.792	13.989	18.6	12.155	13.932	14.6	12.875	13.932	8.2
Orkney Board	0.390	0.502	28.7	0.431	0.505	17.0	0.213	0.505	136.4
Shetland Board	0.512	0.536	4.7	0.558	0.536	-4.1	0.192	0.536	179.4
Tayside Board	7.413	7.836	5.7	7.565	7.875	4.1	7.961	7.875	-1.1
Western Isles Board	0.716	0.858	19.9	0.791	0.866	9.4	0.260	0.866	233.0
	100.0000	99.9775		100.0000	99.977		100.000	99.977	

Note: estimated expenditure will not sum to 100% because a small percentage of need is allocated to populations registered with English practices



Table 7.5 illustrates the financial consequences of applying the General PS sub-programme formula to current expenditure less controlled drugs (scenario 2).

**Table 7.5 Financial Consequences 2003/04 Budget**

Board	Expenditure (£000s)	Resource Share	Formula Share	Change in Share	Change (£000s)
Argyll & Clyde	9,947	9.404%	8.571%	-8.9%	-881
Ayr & Arran	8,443	7.982%	7.647%	-4.2%	-354
Borders	2,374	2.244%	2.170%	-3.3%	-79
Dumfries & Galloway	3,832	3.622%	3.272%	-9.7%	-371
Fife Health	7,022	6.638%	6.619%	-0.3%	-19
Forth Valley	6,092	5.759%	5.488%	-4.7%	-287
Grampian	9,448	8.932%	9.429%	5.6%	526
Greater Glasgow	19,620	18.547%	17.979%	-3.1%	-601
Highland	4,410	4.169%	4.645%	11.4%	503
Lanarkshire	11,849	11.202%	10.444%	-6.8%	-801
Lothian	12,858	12.155%	13.932%	14.6%	1,880
Orkney	456	0.431%	0.505%	17.0%	77
Shetland	591	0.558%	0.536%	-4.1%	-24
Tayside	8,003	7.565%	7.875%	4.1%	327
Western Isles	837	0.791%	0.866%	9.4%	79
English Practices	0	0.000%	0.023%	-	24
<b>Total</b>	<b>105,782</b>	<b>100.000%</b>	<b>100.000%</b>	<b>-</b>	<b>0</b>

Source: Deloitte

Table 7.5 illustrates that Lothian is predicted to be nearly £1.88m under-funded relative to assessed need. Argyll and Clyde, and Lanarkshire are estimated to be over-funded relative to assessed need by just under £0.9m. Given these potentially large resource redistributions any implementation would need to be carefully phased and managed.

The interpretation of the results becomes more complex when we consider how the analysis would apply to contractor numbers within each NHS Board area. Table 7.6 overleaf illustrates the complex relationship between the funding of contractors and the number and composition of the local market. Some NHS Board areas appear to have fewer contractors than predicted based on needs adjusted population shares despite being predicted to lose resource share (most notably Glasgow), whilst other NHS Boards have a greater number of contractors than expected, despite being considered relatively under-funded (Shetland, Orkney and Highland). This pattern is probably related to the expected size of contractors in each Board, with contractors expected to be larger in urban areas and smaller in rural areas.

**Table 7.6 Variation in Contractor Numbers by NHS Board**

Board	Current		Needs Adjusted		Change
	Number	Share	Number	Share	
Argyll & Clyde	124	8.883	119.6	8.571	-4.4
Ayr & Arran	100	7.163	106.8	7.647	6.8
Borders	33	2.364	30.3	2.170	-2.7
Dumfries & Galloway	51	3.653	45.7	3.272	-5.3
Fife Health	91	6.519	92.4	6.619	1.4
Forth Valley	75	5.372	76.6	5.488	1.6
Grampian	140	10.029	131.6	9.429	-8.4
Greater Glasgow	232	16.619	251.0	17.979	19.0
Highland	82	5.874	64.8	4.645	-17.2
Lanarkshire	133	9.527	145.8	10.444	12.8
Lothian	190	13.610	194.5	13.932	4.5
Orkney	16	1.146	7.0	0.505	-9.0
Shetland	12	0.860	7.5	0.536	-4.5
Tayside	100	7.163	109.9	7.875	9.9
Western Isles	17	1.218	12.1	0.866	-4.9
<b>Total</b>	<b>1396</b>	<b>100.000</b>	<b>1396</b>	<b>99.977</b>	

Source: Deloitte

## 8. Conclusions and Recommendations

The preceding analysis has outlined our approach to developing a needs based capitation formula for Pharmaceutical Service expenditure in Scotland. The approach reflected the methods and framework adopted by the original *Fair Shares for All* report. However, as with any research project it has raised a number of methodological issues which we highlight in the following discussion.

### 8.1. Age and Sex Adjustment

In order to reflect the greater need of the elderly population for pharmaceutical services we used data on the number of prescriptions dispensed per capita. This measure is based on current workload which may not reflect future changes in working practices following the implementation of the new Community Pharmacy Contract. **We consider that in the short to medium term the relationship between dispensing volume and age and sex provides the best proxy for need for pharmaceutical services related to age and sex.**

We recommend that in the future the age and sex adjustment should be based on individual level data using information from the CHI register. We understand that this should be available within three to four years time.

### 8.2. Morbidity and Life Circumstance Adjustment

We reflected the need for resources due to morbidity and life circumstances using the current prescribing expenditure MLC which reflects a population's need for prescribing expenditure. **We consider that this provides a reasonable approximation for need within the General PS sub-programme only. A major limitation of the MLC adjustment is that it would be inappropriate for allocating controlled drug expenditure which accounts for the majority of locally negotiated fees.**

In the longer term we would recommend the use of individual level data for the modelling of the relationship between socio-economic characteristics and pharmaceutical care need. In the interim, it may be appropriate to develop a specific MLC based on prescription volume (rather than cost) for both the General PS and Controlled Drug sub-programme formulae. This would enable the incorporation of data from the 2001 Census and other data such as the Scottish Index of Multiple Deprivation. There are also a number of concerns regarding the extent of unmet need within the current prescribing expenditure MLC. This issue could also be addressed by re-estimating the adjustment.

### 8.3. Unavoidable Cost Adjustment

We developed four options for adjusting for the unavoidable cost of providing pharmaceutical services by analysing cost survey data and data on current remuneration. Each option highlights a slight 'U-shaped' relationship between unavoidable costs and remoteness, with unavoidable costs considerably higher in very remote rural areas and some evidence of unavoidable costs in large urban areas.

**Our preferred unavoidable cost adjustment was based around Option 4 which reflects the association between the community pharmacy fee structure and the current configuration and characteristics of contractors.** We assumed that the current configuration of contractors provides an appropriate balance of service provision across urban and rural areas.

In the future, research should concentrate on determining whether an unavoidable cost adjustment based on historical fee data promotes the most efficient use of resources in remote areas. It will be important to ensure that we do not compensate contractors for being small when the geographic characteristics of the location do not warrant this.

#### **8.4. Cross Boundary Flow Adjustment**

We developed an explicit adjustment for the effect of cross boundary flow on an NHS Board's need for resources. This allows an NHS Board's need for resources to be based on pharmaceutical services provided by contractors within the Board area regardless of their Board of residence.

In developing this adjustment we used data linking GP practice to dispensing contractor. **In the future we would recommend using data from the CHI to enable matching of patient postcode to community pharmacy.**

#### **8.5. Interpretation of the Results**

At an NHS Board level **we consider that the most appropriate comparison of need and expenditure relates to the use of the General PS sub-programme relative to total expenditure net controlled drug expenditure.** This is because controlled drug expenditure is so skewed towards deprived Boards and we do not consider that the prescribing expenditure MLC adjustment adequately reflects these need characteristics.

The results illustrate that few NHS Boards are at parity when we compare the pattern of current expenditure to estimated need. The most notable gainers under the formula are Lothian (+14.6%), Highland (+11.4%) and two of the three Island Boards. However, eight NHS Boards are net losers, the largest being Dumfries and Galloway (-9.7%), Lanarkshire (-6.8%) and Argyll and Clyde (-8.9%). We understand that this is the first time such an exercise has been undertaken so the divergences in need and expenditure should not be entirely unexpected.

Given that current expenditure on pharmaceutical services is largely demand led the results are difficult to interpret from a policy perspective. One possibility is that the formula is highlighting variations in the number and relative size of dispensing contractors in each NHS Board. These data may also demonstrate similar variations in the relative under- or over- provision of services at a sub-NHS Board level. These data would provide a valuable aid to the local planning of pharmaceutical services.

#### **8.6. Formula Update and Review**

We recommend that certain aspects of the formula are updated annually depending upon its application. Three elements in particular should be updated annually:

- the population data;
- the age and sex resource use curves; and
- the cross-boundary flow adjustment.

We would recommend that the methods used to calculate the MLC and remoteness adjustment are reviewed every three to five years depending upon the pace of methodological or data advances, for example, the wider availability of individual level data from the CHI which should be available in three to four years time. In particular, **the formula should be revised following the implementation of the new Pharmacy Contract as a Board's relative need for Pharmaceutical Care Services (PCS) may vary from its relative need for Pharmaceutical Services (PS).** This may take a number of years as the new contract becomes 'bedded in'.

We would also welcome a review of the formula by the newly established National Resource Allocation Committee (NRAC). This work has been conducted within the *Fair Shares for All* framework and may benefit from the more recent perspectives of NRAC.

## 9. Appendix 1 – Advisory Group Membership

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[Eric Gray](#), Primary Care Division, SEHD

[Lynne Morrison](#), Primary Care Division, SEHD

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[Uzma Khan](#), Economic Adviser, Analytical Services Division, SEHD

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[Jim Waldron](#), Assistant Head of Healthcare Information Group, Information Services, NHS National Services Scotland

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[Matt Sutton](#), Professor of Health Economics, Health Economics Research Unit, University of Aberdeen

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## 10. Appendix 2 – Bibliography

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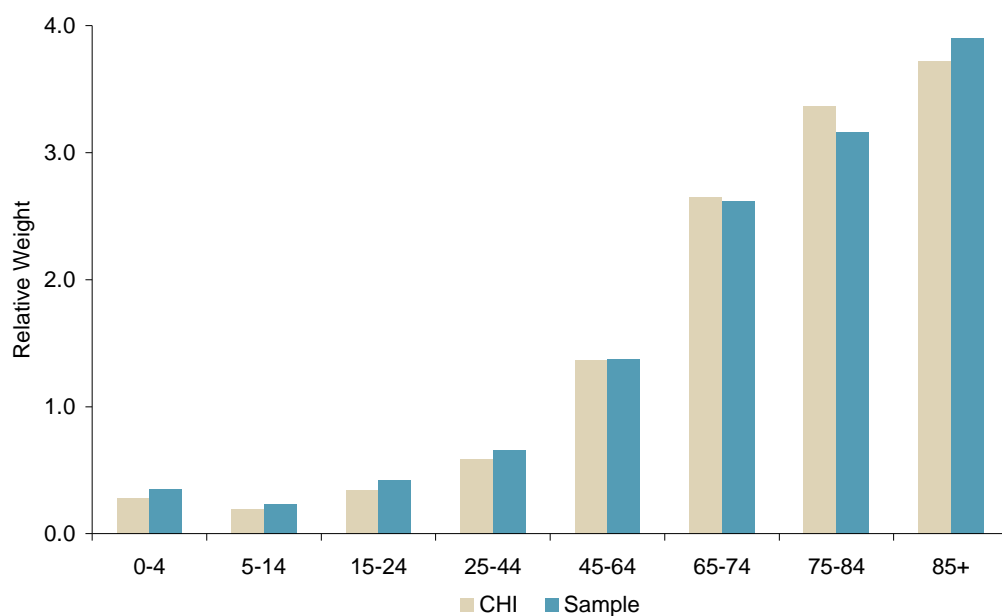
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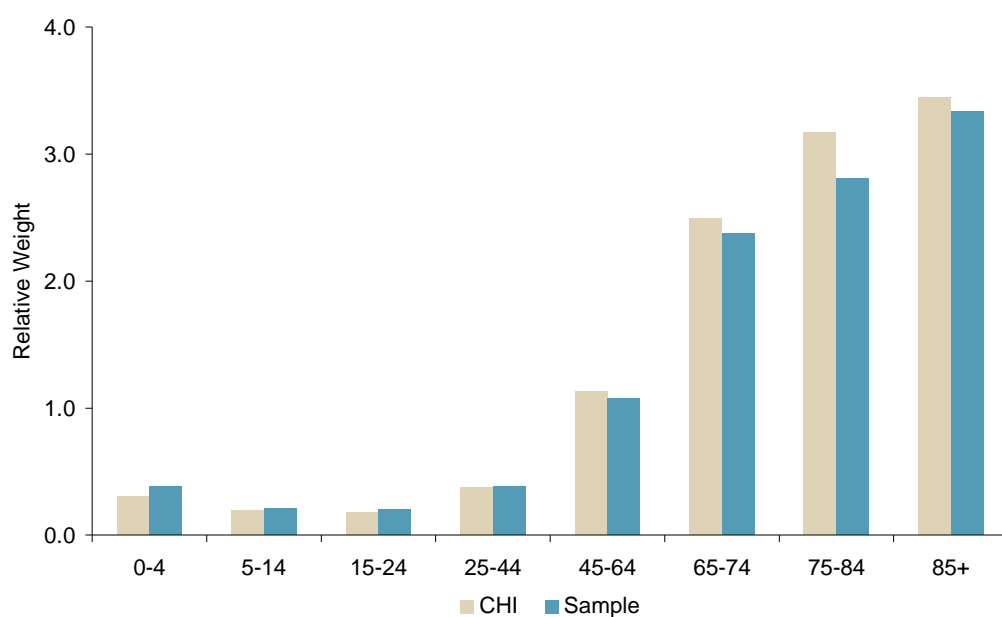
## 11. Appendix 3 – CHI Extract Age and Sex Relative Weights

**Figure A3.1 Female Items by Age Band (excl. Controlled Drugs)**



Source: ISD Scotland

**Figure A3.2 Male Items by Age Band (excl. Controlled Drugs)**



Source: ISD Scotland