

**ALLOCATING PRESCRIBING RESOURCES
TO HEALTH & SOCIAL SERVICES BOARDS:
INTRODUCTION OF A WEIGHTED CAPITATION FORMULA**

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1. Background

- 1.1 Expenditure on GP prescribing covers the costs incurred by General Practitioners in prescribing drugs to their patients. In 2001/02 this public expenditure programme accounted for 16% (£274m) of the total Health and Social Services budget.
- 1.2 The distribution of the GP prescribing budget was based entirely on historic spend until the introduction of a weighted capitation formula in 1998/99. The capitation concept was first introduced by using a combination of the resource allocation formula in operation in Scotland at that time and historic spend. However, this was considered to be only an interim arrangement, the long-term aim being a Northern Ireland-specific capitation formula. Since 1998/99 research has continued to develop a Northern-Ireland specific formula. In the interim, a partial Northern Ireland-specific formula was introduced for the 1999/2000 allocations with movement to a full Northern Ireland formula for the 2000/01 allocations. The formula has been gradually phased in and currently applies to some 62.5% of the total GP prescribing spend. The other 37.5% continues to be driven by historic spend.

2. The Capitation Formula Approach

- 2.1 This report describes the approach and methodology of the capitation-based formula for the allocation of primary care resources for prescribing to the four Health and Social Services Boards in Northern Ireland. The principle of weighted capitation means that resources are shared out across the four HSS Boards depending on:
- The relative size of the relevant population;
 - The relative cost of each relevant age/gender group; and
 - The relative level of additional need (for example, higher levels of illness are associated with higher levels of deprivation even within the same age/gender grouping).

These three main components of the capitation approach will be described in detail below but first it is worth noting some general principles about the weighted capitation-based methodology.

- 2.2 Whilst the weighted capitation formula is based on an analysis of need at small area (practice) level, the Department only uses it to allocate resources to Boards. It is Boards who then have responsibility for allocating resources to GPs within their area and use the formula to inform this allocation but can also draw on local knowledge.
- 2.3 It is also worth noting that the formula is not concerned with the absolute level of need for prescribing resources in Northern Ireland, but rather the relative level across Northern Ireland. The formula is about equitably sharing out across the four Boards, the “pot” of money already allotted to the GP Prescribing Budget for Northern Ireland, rather than varying its size or proposing any ideal level of overall NI prescribing budget.
- 2.4 In the absence of a pure measure of need for prescribing resources, a utilisation-based measure is used as a proxy. The weighted capitation approach is evidence-based, taking account of the existing use of prescribing resources together with key factors such as population, age, gender and additional health and social care needs associated with deprivation, which determine the resources needed to fund GP prescribing in each HSS Board. The overall aim of the formula is to ensure equal resource for equal need.
- 2.5 The three main components of the capitation formula and a number of other adjustments are described in turn in the next four sections.

3. Population

- 3.1 The major determinant of a HSS Board’s level of health and social care need is the size of the population for which it is responsible. It is therefore

essential to have as accurate a count of the population as possible in a HSS Board area. Assuming that no other factors were important, each Board would receive the same percentage share of available resources as it made up of the total Northern Ireland population.

3.2 As GP Prescribing Budgets are intended to cover costs incurred by GPs in prescribing drugs to their patients, it is important that GPs receive an allocation for the proportion of patients registered with them. This means it is necessary to count patients registered with a GP (and hence attributed to the HSS Board which manages that GP Practice) irrespective of whether the patient lives in that Board area. The Central Health Index (CHI) is a record of all patients registered on Northern Ireland GP lists, and is the only data source which captures Board service users who are not resident in that Board (2.5% of patients in Northern Ireland were registered with a GP outside their own HSS Board area in January 2001).

3.3 However, there exists a 'population list discrepancy' between the CHI and the official population estimate produced by the Registrar General for Northern Ireland (the mid-year estimate). This is due in part to delays in removing patients from GP lists who have left the area or died. This discrepancy differs in size by age and HSS Board, making the CHI unsuitable for resource allocation if used as the sole population base. The CHI HSS Board totals are therefore controlled to match the civilian (that is, total population minus Her Majesty's Forces who do not access civilian GP services) mid-year estimate (MYE) of population. This estimate is further adjusted to take account of the legitimate number of cross-border workers. This method of controlling the CHI to match the mid-year estimates reduces the GP practice populations to adjust for list discrepancy (see Annex A for an example of how this controlling procedure is carried out). It should be noted, however, that this method of controlling for list discrepancy does not eliminate it entirely but rather averages it across a Board area. The most appropriate population base to be used in allocating all elements of GMS budgets is currently the subject of a Ministerial submission. Minister is also asked to consider consistency across the GMS elements and the preferred level of

constraining (constraining at LGD level is now possible and the option of using ward based populations will follow publication of the 2001 Census).

- 3.4 The mid-year estimate (MYE) is the official annual estimate of the Northern Ireland population's size and structure, based on census figures rolled forward one year at a time by adding births, subtracting deaths and adjusting for migration.
- 3.5 Cross-border/frontier workers are, whilst in the country in which they are employed, entitled to medical treatment on the same basis as residents. Such workers are entitled to receive a medical card in the normal way. At 31st March 2000 there were 623 frontier workers (529 in the Western HSS Board and 94 in the Southern Board) holding medical cards according to the Central Services Agency (CSA), the Agency responsible for maintaining the CHI.
- 3.6 Table 3.1 details the registered population, at January 2001, of each HSS Board after constraining to match the civilian mid-year estimate adjusted for the number of cross-border workers. If the resource allocation formula was based solely on population size, prescribing resources would be allocated to HSS Boards according to the percentage shares shown.

Table 3.1 HSS Board Population Shares 2001/02

	EHSSB	NHSSB	SHSSB	WHSSB
Constrained Registered Population	685,541	403,890	313,031	280,985
Population Shares (%)	40.72%	23.99%	18.59%	16.69%

- 3.7 While the permanent registered population associated with each Health Board may account for the major part of demands placed on prescribing resources, these demands are also influenced by temporary residents, in particular students and tourists. Students are registered with a GP at their term-time address and therefore appear as temporary residents if they consult a GP at their home address. Likewise tourists are registered at their permanent home address, appearing as temporary residents if they

visit a GP at their holiday location. General Practitioners claim quarterly to the CSA for payment for temporary residents and the total number of temporary residents can be determined for the financial year for each practice. The number of temporary residents is then summed to HSS Board level and added to each Board's constrained registered population.

4. Age/Gender

4.1 After population size, the next significant consideration in a resource allocation formula is to account for needs, which arise from having a population age and/or gender structure, which is different from the Northern Ireland average. The formula adjusts for differences in the use of prescribing resources based on the age/gender profile of each Board's registered populations, rather than based simply on per head of population. For example, a HSS Board with a more elderly population than the Northern Ireland average will find that its prescribing resources will have to cater for a greater amount of health need and prescriptions than a Board with a less elderly population. (Table 4.1 illustrates that the Western HSS Board has a younger population whereas the Eastern HSS Board has a more elderly population.)

Table 4.1 Age Structure of the 4 HSS Boards at January 2001

Age Group	EHSSB	NHSSB	SHSSB	WHSSB
0-15	23.09%	23.68%	25.98%	27.12%
16-64	62.21%	63.33%	62.30%	62.13%
65+	14.70%	12.98%	11.71%	10.75%
Total	100%	100%	100%	100%

SOURCE: Central Health Index, CSA

4.2 Adjustment for age and gender is derived by calculating age/gender cost weights based on prescribing activity by men and women in a number of age groups. These cost weights are derived from age/gender specific prescribing information extracted from the clinical computer systems of 20 General Practices across Northern Ireland. The weights are currently based on activity over 2 financial years, covering 6% of the total annual drug bill and 7% of the total population of Northern Ireland. The proportion of the population covered is in line with the HSS Board

population shares. Annex B contains paper PU19/2000, which sets out the original creation of these age/gender cost weights for the 2000/01 allocations. Annex B also contains paper PU25/2001, which details how this exercise was expanded for the 2001/02 allocations.

4.3 Individual patient prescribing data is currently being extracted from the 20 General Practices who have participated previously, allowing the exercise to be expanded to cover 3 years prescribing activity. Further practices are also being recruited with the aim of covering both a higher proportion of the drug bill and the Northern Ireland population. Data will be extracted in retrospect for these newly recruited practices ensuring a 3-year coverage of prescribing activity for all practices within the exercise for deriving age/gender cost weights.

4.4 Table 4.2 sets out the age/gender cost weights for GP prescribing in NI used in the 2001/02 allocation round. These highlight the significant differences in GP prescribing costs across the age bands. Most significant is the increased prescribing costs of the elderly compared to children. It is also worth noting that male children cost more than females but females cost more than males in adulthood due to childbearing and other medical problems associated with childbearing years. In the elderly groups the prescribing costs are more similar for the two genders.

Table 4.2 Relative Northern Ireland Age/Gender Cost Weightings

Age Group	Males	Females
0-4	1.29	1.11
5-15	1.17	1.00
16-24	1.30	1.54
25-44	2.17	3.07
45-59	5.07	6.33
60-64	8.13	9.83
65-74	11.42	11.38
75+	13.03	12.85
Temporary Resident	0.49	0.49

- 4.5 In addition, an adjustment for temporary residents is an explicit element of the age/gender weighting to take account of the additional demands associated with these patients. A weight for a temporary resident was derived from CSA information on numbers of temporary residents and spend incurred on them during the financial year. Age/gender specific information is not available on temporary residents and therefore one cost weight was calculated irrespective of age or gender.
- 4.6 Table 4.3 shows the Health Boards relative GP prescribing population shares resulting from applying these age/gender weightings. The weight effects are shown as an index around 1 (Northern Ireland being 1). Boards with an index below 1 have an age/gender structure which places a less than average burden on GP prescribing costs because they have a lower proportion of elderly people in their populations. Comparison with Table 3.1 shows that the Eastern and Northern Board shares have increased while the Southern and Western Board shares have decreased. Examination of Table 4.1 shows that both the Eastern and Northern Board have a higher proportion of elderly and therefore these Boards have gained in terms of their percentage share based on the age/gender structure of their populations.

**Table 4.3 Age/Gender Index at Board level & HSS Board
Population Shares (after adjusting for age & gender)**

	EHSSB	NHSSB	SHSSB	WHSSB
Registered Population Age Index	1.0492	1.0091	0.9558	0.9160
Population Shares (%) after adjusting for age and gender	42.73%	24.21%	17.77%	15.29%

5. Additional Need

- 5.1 After adjusting for age and gender structure of the population, the second weighted capitation adjustment is that required to reflect the relative need for prescribing resources over and above those due to population size and age/gender profile. This allows for 2 populations of similar size and

demographic structure but who due to morbidity and socio-economic reasons have additional need for prescribing resources.

5.2 Utilisation-based modelling at GP practice level was used to determine the need for prescribing resources after allowing for practice size and structure. The aims of the modelling were:

- To identify the indicators of morbidity and socio-economic circumstances which determine the need for prescribing resources;
- To estimate the influence of these needs indicators on the utilisation of prescribing; and
- To estimate the relative share of resources, which should be allocated to each Board to meet those needs.

Dependent Variable

5.3 The dependent variable (that is, the need for prescribing resources) was based on the net ingredient cost (NIC) of all drugs prescribed and subsequently dispensed during one financial year (the most current data available at the time of modelling was 1997/98). Total drugs prescribed are a measure of utilisation, utilisation being a proxy for need. The calculation to arrive at the dependent variable essentially compares the total NIC for each practice with the expected cost given the age/gender structure of the practice list size and the number of temporary residents.

Prescribing Dataset

5.4 The GP prescribing modelling was carried out at individual practice level using a comprehensive assembled dataset containing prescribing expenditure, additional needs and supply variables (discussed later). A large number of needs variables were assembled including data on health status, morbidity, mortality and socio-economic conditions. The source of the majority of electoral ward level data is the 1991 Northern Ireland Census. A selection of social security indicators was also included (for

example, proportion of the population claiming Income Support, Disability Living Allowance or Incapacity Benefit). The source of these indicators was 'live' administrative systems and so this data was up-to-date.

Attribution Process

5.5 All these needs indicators were only available on an area-basis and so to construct practice level indicators, it was necessary to attribute the characteristics of the electoral ward, from which each practice list was drawn, to the practice. This process is made possible by the fact that the Central Health Index contains a unique identifier for each GP practice (that is, GP Practice Code) and the postcode of each patient's home address, to which the electoral ward of residency can be attached. The method assumes that each individual on a GP's list is randomly selected from the electoral ward in which he/she lives. The characteristics of the electoral ward to which that person belongs are then attributed to the individual – for example, each individual on the GP practice list takes on the unemployment rate for their electoral ward as a whole. The practice unemployment rate can then be computed by calculating the population-weighted average of the electoral ward unemployment rates of all the patients on each GP's list (see Annex C for diagrammatic explanation of the attribution process). Population weighted average figures for each of the indicators were calculated in this way for each GP practice, giving a GP practice level database (see Annex D for a full list of indicators).

5.6 This process of attribution is an approximation and raises the issue of the 'ecological fallacy', that is, service users may not be typical members of the communities in which they reside. The extent to which they are not typical is known as attribution error. Attribution error has been researched quite extensively in England where a key finding has been that the accuracy of attribution increases with practice size. Analysis has shown that attribution error falls markedly as we move from average practice list size (circa 10,000 in England) to practice groupings with a combined list size of 60,000.

- 5.7 Utilisation of health care resources does not depend only on patient need and demand. The availability or supply of resources also has an influence. Techniques for measuring the supply of relevant resources have been developed so that variations in supply between areas can be controlled for in the modelling. A number of area level supply variables (such as, access to primary care and access to acute care) were included. These area supply variables were attributed as described in paragraph 5.5 to create GP practice level indicators. Key practice level supply characteristics (such as being a fund-holder, training or dispensing practice) were also included. These supply variables are subsequently dropped out of the formula to isolate the needs variables which are independent of supply.
- 5.8 It can be reasonably assumed that Health Boards operate in different ways when providing health care services to their respective populations. These may impact on utilisation patterns and/or the needs of populations. Therefore, Health and Social Services Board dummies were included to account for different policies in each HSS Board. The “dummy” indicates whether the General Practice being examined is part of a particular administrative area. The “dummies” are not used in calculating budgets, as allocations should not be based on different historical levels of utilisation caused by different policies in different areas. However, the amount of variation explained by dummies is examined to ensure it is not too large. If policy is set for areas, which are similar within themselves then what might look like policy differences could actually mask differences in real need. In this case, the amount of variation explained by the dummies is negligible (1.5%).
- 5.9 To control for differential list discrepancy an estimate of practice list discrepancy was derived. This was calculated by attributing Local Government Districts’ level of list discrepancy (1997) to practice populations within the respective LGDs. It is recognised that list discrepancy is correlated with need. It is also recognised that list discrepancy is correlated with supply variables (that is, practice characteristics), which in turn could be correlated with need. For these

reasons the estimate of practice list discrepancy was included as an explanatory variable to control for any such correlations whilst estimating the needs coefficients. The amount of variation explained by list discrepancy is negligible (2%). List discrepancy itself is **not** a needs driver and therefore should be removed in the process of calculating HSS Board Indicative Prescribing Allocations (IPAs).

General Approach to Modelling Additional Need

- 5.10 Utilisation-based modelling was developed by York University for the Department of Health in England in 1994 (known as the York Methodology). The Department of Health, Social Services and Public Safety (DHSSPS) commissioned Dr Nigel Rice (Centre for Health Economics, University of York) to develop an additional needs index for prescribing resources, based on the York Methodology. [Dr Rice's Report is available from Project Support Analysis Branch on request.]
- 5.11 The aim of the modelling was to estimate the need for prescribing resources over and above the need demanded by population size and structure. Unfortunately there is no way of directly measuring this need without detailed needs assessments of individuals. The York Methodology tries to measure "need" indirectly by examining utilisation and supply of services. The ratio of the actual cost of level of utilisation compared to that which would be expected given the age, gender and size of the population in the area, is examined using a statistical modelling technique to see how it relates to socio-economic and morbidity factors. If all utilisation were a response to need then the modelling would be simple, however, it is known that supply can create higher levels of demand in response to the same level of need. It is therefore important to neutralise the effect of supply so that resources are allocated equitably on the basis of need alone. This modelling technique is discussed in detail in Annex E.

Recommended Model

5.12 The recommended model was multiplicative in form (ie. each of the variables were raised to the power of their coefficients and multiplied together to arrive at the needs index) and explained 49% (before dropping supply variables as discussed in paragraph 5.7) of the variation in prescribing expenditure over and above the amount explained by list size, age, gender and temporary residents. Four key variables were identified as being associated with the use of prescribing resources:

- The age/gender standardised limiting long term illness ratio, under 75 years (positive association, ie. increased levels of long term illness are associated with increased prescribing costs);
- The proportion of low birth weight babies defined as weighing less than 2500 grammes (positive association, ie. increased proportions of low birth weight babies are associated with increased prescribing costs);
- The proportion of the list population who are babies, defined as under 1 year (positive association, ie. increased proportions of babies are associated with increased prescribing costs); and
- The proportion of persons aged 18 and over with some qualification (negative association, ie. increased proportions of people with qualifications are associated with decreased prescribing costs).

5.13 The variables and coefficients which constitute the recommended needs index are shown in Table 5.1.

Table 5.1 Variables and Coefficients in the Prescribing Needs Index

Variables	Coefficients
Limiting long-term illness ratio, under 75 years old	0.408
Proportion of low birth weight babies*	-2.601
Proportion of the list who are babies*	-6.160
Proportion of persons aged 18+ with some qualification*	0.479

Footnotes: All variables have been log transformed
 * These variables were calculated as $\log(100\text{-variable})$

5.14 Table 5.2 shows the Health Boards' relative GP prescribing population shares resulting from applying the need weighting. Again the weight effects are shown as an index around 1 (Northern Ireland being 1). HSS Boards with a value greater than 1 have a need for prescribing resources greater than the Northern Ireland average whilst values less than 1 indicate a need for prescribing resources less than the Northern Ireland average. It can be seen that overall the WHSSB has the highest 'additional need' index (1.0357) followed by the SHSSB (1.0258). Both the Eastern and Northern have indices below the NI average. Comparison of Table 5.2 with Table 3.1 shows that both the Eastern and Northern Board shares have decreased while the Southern and Western Board shares have increased. This indicates that the Southern and Western Boards have a need for prescribing resources greater than the Northern Ireland average when based on 'additional needs' only. There is a 38% absolute difference in population shares after adjusting for additional need between the Western Board and the Northern Board.

Table 5.2 Need Index at Board level & HSS Board Population Shares (after adjusting for additional need)

	EHSSB	NHSSB	SHSSB	WHSSB
Registered Population Need Index	0.9937	0.9729	1.0258	1.0357
Population Shares (%) after adjusting for additional need	40.31	23.96	19.05	17.29

5.15 Table 5.3 details the effect of applying both the age/gender and additional need weightings (that is, the effect of applying 'total need'). It can be seen that the Eastern Board has the highest overall total needs index (1.0417).

All other HSS Boards have a total needs index below the Northern Ireland average. It can be seen that although the Northern Board would have gained in terms of age/gender, it loses in terms of additional need and loses overall when both age/gender and need weightings are applied. Both the Southern and Western Boards lose in terms of age/gender, and although they gain in terms of additional need, they both lose in terms of the overall total need index when the interaction of both types of need is captured.

Table 5.3 Effect of Age/Gender & Additional Need Weightings

	EHSSB	NHSSB	SHSSB	WHSSB
Constrained Registered Popn Population Shares (%)	685,541 40.72%	403,890 23.99%	313,031 18.59%	280,985 16.69%
Registered Popn Age Index Population Shares (%)	1.0492 42.73%	1.0091 24.21%	0.9558 17.77%	0.9160 15.29%
Registered Popn Need Index Population Shares (%)	0.9937 40.31	0.9729 23.36	1.0258 19.05	1.0357 17.29
Registered Popn Total Index Age & Need Weighted Popn Population Shares (%)	1.0417 714,118 42.42%	0.9820 396,620 23.56%	0.9788 306,387 18.20%	0.9478 266,321 15.82%

6. Other Adjustments

IVF Treatment

- 6.1 During allocation of the 2001/02 prescribing budgets, arrangements were put in place to relieve practices of the financial responsibilities of dealing with IVF treatment. Prior to calculating HSS Board allocations, the Northern Ireland Indicative Prescribing Amount (IPA) for 2001/02 was 'top-sliced' and these funds transferred to secondary care. Funds were transferred on the basis of 75% of IVF utilisation during 2000/01. Practices are relieved of both the financial and professional responsibility of dealing with IVF treatment and are in a better position to manage their practice budgets.

High Cost/Specialist Drugs

6.2 Since the 2000/01 allocation round, HSS Boards have been given the freedom to 'top-slice' their practice budgets as a method for dealing with high cost/specialist drugs or expensive patients. Each HSS Board retains a proportion of their total Health Board prescribing budget (an amount left to their discretion) and practices apply to their Health Boards for certain drugs to be managed out of the 'top-sliced' fund. In this way, practices are relieved of the financial responsibilities of dealing with low numbers of very high cost drugs and are therefore better able to manage their practice budget.

7. New Targeting Social Need

7.1 New Targeting Social Need (NTSN) was announced in the Government White Paper 'The Partnership for Equality' published in March 1998 (superseding both Targeting Social Need and Targeting Health and Social Need). The NTSN policy aims to help disadvantaged people, groups and areas in Northern Ireland by, where possible, focusing Government efforts and resources towards those in greatest need. However, it is important to stress that NTSN is not a spending programme in that there is no special fund set aside for it. Rather it involves giving greater priority to the needs of disadvantaged people within a programme's objectives so that a greater proportion of the available funding can be channelled towards people, groups and areas in greatest need. One of the characteristics of an effective capitation formula is that it should be sensitive to NTSN.

7.2 It is important to note that any analysis examining whether the Prescribing Formula effectively skews resources in response to need can only focus on needs, which are currently being met. This is because the formula has been developed using an utilisation-based approach (controlling for supply) and no account is taken of any differential unmet need, which may exist between areas. Therefore reference to need in this report means 'met' need.

7.3 The sensitivity of the Prescribing Formula to additional needs can be masked at HSS Board level. This is because the different needs of affluent and deprived sub-populations which make up HSS Boards can, to a large extent, cancel each other out. Therefore, in order to best illustrate the sensitivity of the Prescribing Formula to differential need (both arising from age/gender structure and 'additional' need), analysis was carried out at electoral ward level. The difference between morbidity and socio-economic conditions between areas is much more apparent at small area level, than at HSS Board level. It is necessary to bear in mind the following:

- (a) the analysis has been carried out at synthetic electoral ward (SEW) level, where electoral wards with populations of less than 2,000 were combined with one or more neighbouring wards to form an SEW.
- (b) to ensure consistency with the 1991 Census, the SEWs are based on the 1984 electoral ward boundaries and do not take account of the 1992 boundary changes.
- (c) SEWs may comprise more than a single electoral ward.

Table 7.1 Top and Bottom SEWs Ranked by Age/Gender Index

LGD	SEW	Index	R	LGD	SEW	Index	Rank
Castlereagh	Cregagh	1.469	1	Carrickfergus	Milebush	0.700	489
Castlereagh	Beechill	1.416	2	Ballymena	Ballykeel	0.678	490
Castlereagh	Minnowburn	1.390	3	Ballymena	Dunclug	0.677	491
Belfast	Rosetta	1.388	4	Coleraine	Ballysally	0.672	492
Castlereagh	Lower Braniel	1.376	5	Craigavon	Tullygally	0.671	493
Craigavon	Parklake	1.370	6	Craigavon	Drumgask	0.657	494
Lisburn	Seymour Hill	1.368	7	Lisburn	Kilwee	0.643	495
Coleraine	Royal Portrush	1.367	8	Derry	Crevagh & Springtown	0.609	496
Lisburn	Lagan Valley	1.367	9	Lisburn	Collin Glen	0.606	497
Belfast	Woodvale	1.346	10	Derry	Shantallow West	0.603	498

Table 7.2 Top and Bottom SEWs Ranked by 'Additional Needs' Index

LGD	SEW	Index	Rank	LGD	SEW	Index	Rank
Newtownabbey	Bradán	1.518	1	Ballymena	Ardeevin	0.682	489
Belfast	Whiterock	1.487	2	North Down	Crawfordsburn	0.675	490
Craigavon	Drumgask	1.482	3	Antrim	Aldergrove	0.675	491
Belfast	Shankill	1.435	4	Belfast	Stormont	0.659	492
Coleraine	Drumgor	1.401	5	Castlereagh	Hillfoot	0.636	493
Derry	St Peters	1.393	6	North Down	Ballyholme	0.627	494
Belfast	Duncairn	1.393	7	North Down	Cultra	0.622	495
Derry	Creggan South	1.388	8	North Down	Craigavad	0.601	496
Belfast	Ardoyne	1.381	9	Belfast	Stranmillis	0.581	497
Belfast	Crumlin	1.377	10	North Down	Princetown	0.558	498

Table 7.3 Top and Bottom SEWs Ranked by 'Total Needs' Index

LGD	SEW	Index	Rank	LGD	SEW	Index	Rank
Belfast	Duncairn	1.851	1	Castlereagh	Knockbracken	0.748	489
Belfast	Shankill	1.844	2	Castlereagh	Four Winds	0.743	490
Newtownabbey	Bradán	1.826	3	Carrickfergus	Milebush	0.978	491
Belfast	Crumlin	1.773	4	Castlereagh	Hillfoot	0.636	492
Belfast	Island	1.706	5	Antrim	Greystone	0.829	493
Belfast	St Annes	1.646	6	Belfast	Stranmillis	0.581	494
North Down	Dufferin	1.601	7	Castlereagh	Boneybefore	0.744	495
Craigavon	Church	1.582	8	Lisburn	Wallace Park	0.719	496
Belfast	Woodvale	1.578	9	North Down	Ballymagee	0.852	497
Belfast	Woodstock	1.543	10	Antrim	Aldergrove	0.675	498

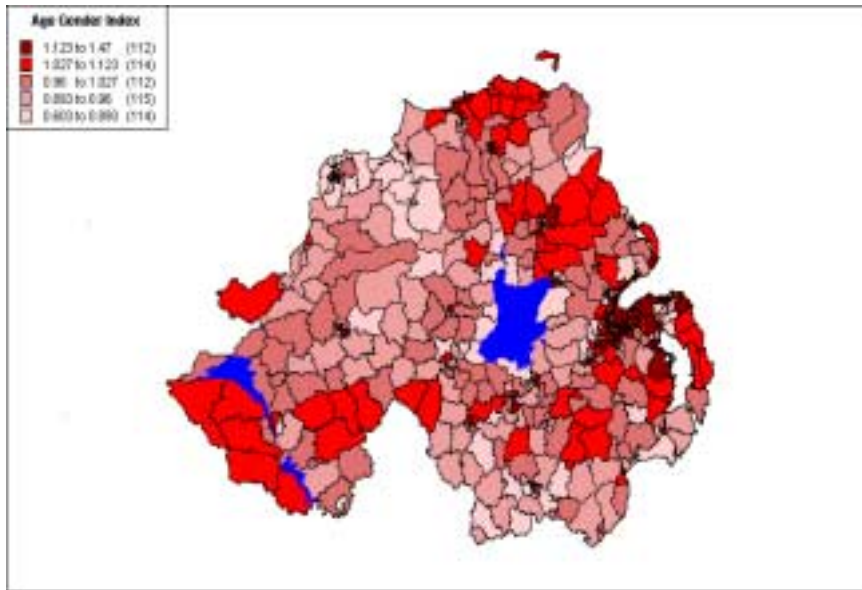


Figure 7.1 Age/Gender Index by Ward

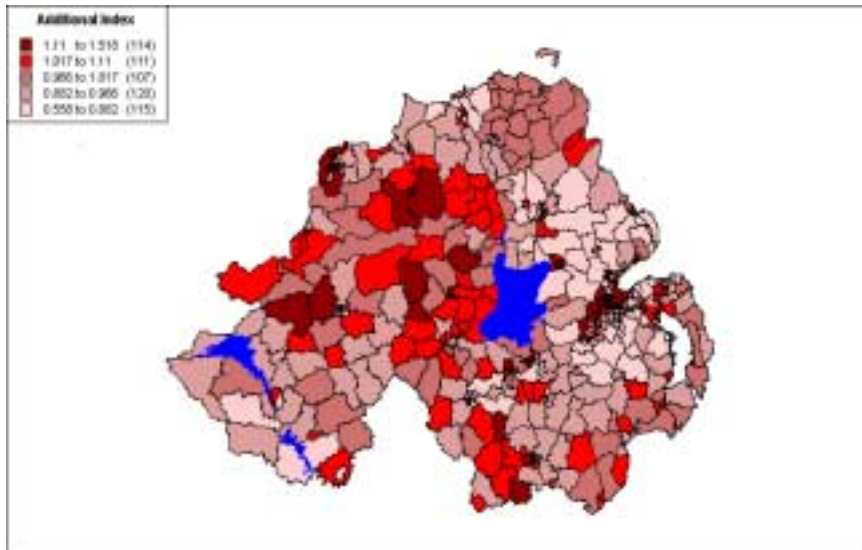


Figure 7.2 'Additional' Needs Index by Ward

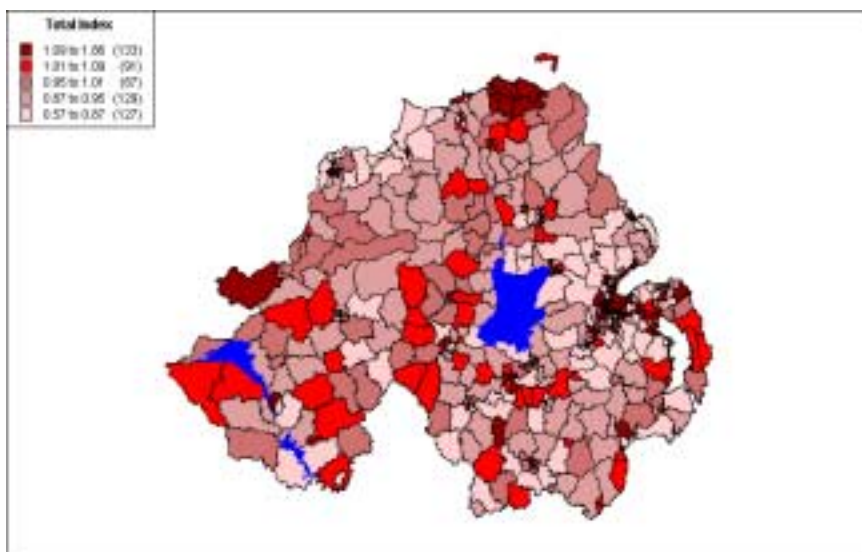


Figure 7.3 Total Needs Index by Ward

- 7.4 Tables 7.1 – 7.3 show the top and bottom 10 SEWs (out of the 498 SEWs in NI) ranked from highest to lowest in terms of their Age/Gender Index, ‘Additional Needs’ Index and ‘Total Needs’ Index. This ranking is also represented graphically in Figures 7.1 – 7.3, albeit at electoral ward level with each ward being assigned the index of the SEW which it comprises.
- 7.5 It can be seen from the tables and maps that the ranking of wards is very different depending on whether one is looking at ‘additional need’ as opposed to need arising from age/gender factors. This is not surprising, as deprived areas tend to consist of relatively young populations whereas more affluent areas tend to have more elderly populations. The interaction between both types of need is captured in the ‘total need’ index which although different from either of the individual indices, the pattern is more similar to the additional needs index than the age/gender index.
- 7.6 The tables and maps have a high face validity in relation to the ‘additional needs’ index where the results match well with people’s perceptions of which SEWs would be considered affluent and which would be considered deprived. For example, wards within North Down are amongst the 10 most affluent according to the ‘additional needs’ index and likewise areas such as Whiterock and Shankill are amongst the most deprived. Note, however, that the tables only provide a small sample of those SEWs which are at the extremes of the scales of need. For example, whilst the 10 most affluent SEWs on the ‘additional needs’ index are in the EHSSB and NHSSB, the SEWs of Seapatrick (Banbridge) and Derrylin (Fermanagh) are ranked 466 and 441 respectively (ie 23rd and 48th when ranked from most affluent to most deprived).
- 7.7 It should also be noted that the error range associated with the ‘additional needs’ index is larger for small population groupings compared to population sizes at Board level and the resultant SEW rankings are therefore not as robust as rankings at Board level. However, as the formula is used to allocate resources at HSS Board, the sole purpose of the electoral ward analysis is to show that the formula is sensitive in this

regard and highlight the ability of the formula to differentiate between areas with high/low needs.

- 7.8 Overall the formula applied at SEW level re-distributes 6.25% (equivalent to approx £17m) based on age/gender factors and 6.44% (equivalent to approx £17.5m) based on ‘additional need’ factors.
- 7.9 As a final test of the sensitivity of the Prescribing Formula to deprivation-related need, the overall formula ‘additional needs’ index was correlated at electoral ward level with a number of commonly used deprivation indicators (the Robson and Noble Indices) and with general indicators of morbidity (the Jarman Index and the ‘under 75 SMR’). Again, for the purposes of carrying out this analysis, it was necessary to attribute the ‘additional needs’ index values from SEWs to electoral wards. In addition, because each of the indices (with the exception of SMR) is not measured on a ratio scale (which would mean, eg that twice the value implies twice the deprivation) unlike the ‘additional needs’ index which is measured on such a scale, it was necessary to correlate the rankings of the wards rather than their individual values. The results are shown in Table 7.4.

Table 7.4 Correlation at Electoral ward level of ‘Additional Needs’ Index with other deprivation and general morbidity indicators

Indicator	Correlation Coefficients
Noble – Multiple Index	0.75
Noble – Health Domain	0.68
Robson	0.63
Jarman	0.74
SMR under 75	0.51

Notes:

Correlation coefficients calculated using Spearman’s Rho.

Robson Index – this is a measure of material deprivation developed from 1991 NI Census data and comprises 14 variables at electoral ward level related to socio-economic status, living conditions and long-term illness.

Jarman Underprivileged Area Score – this is a measure of GP workload based on a survey of GPs (most of which were based in inner city London) and comprises 8 variables related to socio-economic status, household composition, living conditions, population mobility and ethnicity.

‘Under 75’ SMR – this variant of the standardised mortality ratio is widely accepted as a good proxy for morbidity.

Noble Index – This measure of deprivation was developed in July 2000 to replace the Robson Index. It is based on the premise that multiple deprivation is made up of separate ‘domains’ of deprivation. Each domain is made up of a number of indicators. Seven domains (including a health domain) are combined to create an overall multiple deprivation index.

- 7.10 It is clear that the 'additional needs' index is well correlated across a range of commonly used indicators of deprivation. We would not expect as high a correlation with Noble's Health Domain, as this consists of a very narrow set of variables, compared to Noble's overall multiple index. We would also not expect as high a correlation with Under 75 SMR as it is recognised that the need for prescribing resource is not linked directly to mortality but rather illness and related conditions.
- 7.11 This is very encouraging from a NTSN perspective as it shows that the ordering of electoral wards in terms of their relative deprivation/affluence is validated by other commonly used indicators. We would not expect too high a correlation as the 'additional needs' index is concerned with measuring need for prescribing resources arising from deprivation rather than deprivation per se. It is also important to note that the attribution of the formula SEW indices to electoral wards will reduce the observed correlations with those deprivation/morbidity indicators which have had their electoral ward values calculated precisely with no attribution involved.
- 7.12 The issue of unmet need is very important from a resource allocation and hence NTSN perspective. Under-utilisation of services may not just be confined to deprived areas but may also exist in, for example rural areas and can be due to a variety of reasons. It is now recognised that it is essential for any resource allocation formula to address the issue of unmet need and therefore help to reduce inequalities in health and social care. The Capitation Formula Review Group (CFRG) has currently advertised a tender for a piece of research into inequalities in health and social care in Northern Ireland. Pending the outcome of CFRG's research, the Prescribing Formula Sub-Group will be guided in their approach to tackling the unmet need issue.

8. Characteristics of an Effective Formula

Introduction

8.1 The Northern Ireland Prescribing Formula Working Group produced a list of mandatory and desirable requirements which should be met by the resource allocation formula. This chapter evaluates the formula against the characteristics and criteria of an effective formula.

Mandatory Requirements

8.2 *Be based on a sound methodology*; the formula is primarily based on relevant population sizes, age/gender relationships and additional needs weightings which have been derived from Northern Ireland-specific research. In addition, the York methodology used to develop the additional needs index has been used in the development of resource allocation formulae in England, Scotland and further afield and has been subjected to extensive scrutiny including a House of Commons Select Committee.

8.3 *Be a fair and equitable method of allocating resources*; the Working Group believes that the overall approach to the development of the formula has ensured that fairness and equity follow. Initial consideration of equality issues (see chapter 10) has concluded that there is no adverse impact on any of the nine equality groups. This characteristic will be reviewed pending an equality assessment by an independent consultant.

8.4 *Be based primarily on the requirement to take account of differing levels of need for health and personal social services between resident HSS Board populations*; the formula calculates HSS Board shares as a product of crude relevant population, age/gender relationships and additional needs factors appropriate to this expenditure programme, thus taking into account the major service needs drivers and satisfying this characteristic. A significant factor of the formula is that the age/gender and additional needs weightings are derived from local data. Another factor to consider

under this characteristic is the ability to update the formula as, the more updateable, the more sensitive the formula is to changes in the relative needs of HSS Boards. The formula does allow for annual population estimates, age/gender weights to be updated as often as considered necessary.

- 8.5 *Be sensitive to New Targeting Social Need*; this issue is discussed in chapter 7 and concludes that the formula is sensitive to areas of high social need. This is particularly illustrated by the high correlation at electoral ward level between the overall 'additional needs' index and other indicators of deprivation such as the Noble, Robson and Jarman indices.
- 8.6 *Be capable of amendment and further refinement as improvements take place in information sources and the knowledge base on resource allocation*; the formula meets this characteristic and does so particularly due to the fact that the weightings are derived from local data.
- 8.7 *Be based on factors and/or weights which have a basis in evidence*; the formula is based on age/gender relationships and additional needs weightings which have been derived from Northern Ireland data and therefore satisfies this characteristic.
- 8.8 *Address the inescapable cost differentials for urban/rural areas*; capitation formulae can include a rurality adjustment for the costs of providing services in remote or rural areas. The Working Group felt that remoteness did not influence the need for prescribing resources as it does for other services.
- 8.9 *As far as possible, take account of the impact of cross-border migration and other population movements unless this is addressed by some other mechanism*; the formula incorporates a population adjustment for cross-border workers and therefore meets this characteristic.

Desirable Requirements

- 8.10 *Be sufficiently robust to permit its use in resource allocation below the level of HSS Boards, for example, at locality, practice level, etc;* this issue is discussed in detail in chapter 9 and concludes that the formula could be applied down to population sizes of approximately 125,000 (resulting in a maximum acceptable margin of error of 5%) with due regard being paid to risk management issues below population sizes of around 125,000. A rigid approach to the formula should not be applied to population sizes below 30,000 without a robust risk management process.
- 8.11 *Have inherent stability in its application, such that HSS Boards should not expect major shifts in allocation from year to year;* where data used to construct variables appear to vary from year to year a number of years data are amalgamated to smooth out fluctuations which could make the formula unstable. This is carried out prior to the modelling of the additional needs index.
- 8.12 *Should contain no perverse incentives;* none have been identified.
- 8.13 *Be easily understood and be as uncomplicated as possible;* the basic principles of any resource allocation formula based on weighted capitation are relatively straightforward, however, the method to develop the additional needs weightings are necessarily complex in order to ensure the formula is sensitive to need. However, in defining the additional needs index, the modelling work aimed not only for good statistical specification, statistical stability and high explanatory power but also transparency, parsimony and plausibility. Derivation of the age/gender weightings is uncomplicated and application of both the age/gender and additional needs weightings are easily understood.
- 8.14 *Support strategic changes in health and social care delivery;* as the formula weightings are derived from Northern Ireland data this allows the age/gender weights to be updated as often as considered necessary in response to service changes.

9. Application of the Prescribing Formula at Sub-HSS Board Level

Introduction

9.1 The main remit of the Northern Ireland Regional Prescribing Formula Working Group was to develop an equitable weighted capitation formula to be used to set appropriate Board level Indicative Prescribing Allocations (IPAs). To assist Boards with the weighted capitation process, the DHSSPS calculates IPAs at practice level using the weighted capitation formula, however, HSS Boards are encouraged to use these IPAs simply as guidelines in conjunction with local knowledge when making their final allocations. This section of the report outlines the application of the formula at practice level, highlights relevant issues and examines formula stability at this sub-Board level.

Population Source

9.2 The general practice population data used in the indicative practice allocations are obtained from the Central Health Index (CHI). The CHI, maintained by the Central Services Agency, is the only data source, which holds a record of all patients registered with GPs in Northern Ireland. We have already discussed the issue of 'list discrepancy' (see paragraph 3.3) and the method of controlling for list discrepancy (that is, the difference between the CHI population and the official mid-year estimate produced by the Registrar General for NI) when allocating to HSS Boards. Such an adjustment would not be possible at practice level without knowledge of the level of list discrepancy of each individual practice. Also, as these budgets are intended to cover costs incurred by GPs in prescribing drugs to all their patients, it is important that each practice receives an allocation for the proportion of patients on their registered lists as constrained to their respective Board's official mid-year estimate of population. This relies on practices cleaning their lists to ensure list discrepancy is kept to a minimum. The population source for indicative practice allocations also includes the count of temporary residents by practice.

Age/Gender Weightings

9.3 The construction of Northern Ireland age/gender cost weightings using individual patient prescribing data consisting of age, gender and spend data, has already been discussed in section 4 of this report. These Northern Ireland level weights are applied as opposed to HSS Board-specific weights. Although Board-specific weights would be more responsive to the particular needs of each HSS Board population, at present Boards do not have robust prescribing activity data to calculate local age/gender weightings (consider the process necessary for derivation of Northern Ireland-specific weights). An adjustment is also made for temporary residents - this again is derived at a Northern Ireland level.

Additional Needs Weighting

9.4 The construction of needs indices is not straightforward for individual practices where both the population and population need, will be defined in terms of patient lists. Needs indicators are not collected in this way, however, being available on an area basis only, and have to be attributed to practice populations. This attribution process is described in paragraph 5.5 and Annex C.

9.5 The main principle behind attribution is that each person on a practice list is given the value of the 'need score' of the electoral ward in which they reside. This is an approximation and raises the issue of 'ecological fallacy', that is, service users may not be typical members of the communities in which they live. The extent to which they are not typical is known as attribution error.

9.6 Attribution has been researched quite extensively in England where a key finding has been that the accuracy of attribution increases with practice size. Recent analysis shows that attribution error falls markedly as we move from average practice list size (circa 10,000 in England) to practice groupings with a combined list size of 60,000. It is reasonable to assume

that this finding is applicable in Northern Ireland and should be considered if allocations are to be based on practice lists.

- 9.7 It is not statistically correct to update individual needs variables which form part of statistically derived formulae without first re-estimating the coefficients of those other variables which are not updateable (eg. because Census data were used in their construction). As the Prescribing needs weighting is not composed entirely of updateable variables, it may have some limitation in terms of responsiveness to changing needs. Although it is recognised that it would have been possible to produce updateable models and models with slightly better statistical characteristics, it is important to note that there was an emphasis on transparency and plausibility in the choice of model.

Calculation of Practice Shares

- 9.8 It is accepted that HSS Boards should normally receive their own overall 'pot' and then allocate to practices using their discretion, allowing them to take account of local knowledge and Board policy. For example, Boards would then be able to top-slice their Board IPA for expensive drugs prior to setting practice budgets. HSS Boards are also free to set their own implementation level of capitation (as this may differ from the level of capitation to be implemented at Board level).
- 9.9 In order to calculate practice IPAs, an age/gender index and additional needs index is calculated for each practice. Application of these weightings then gives a weighted population for each practice. Practices are allocated their relative share of their own Board's 'pot' (which has already been allocated using the formula at the agreed regional NI level of capitation). This relative allocation share is their weighted population percentage share of the corresponding Board total weighted population (as opposed to their allocation share of the NI 'pot' which would be their weighted population percentage share of the total NI weighted population).

Formula Stability

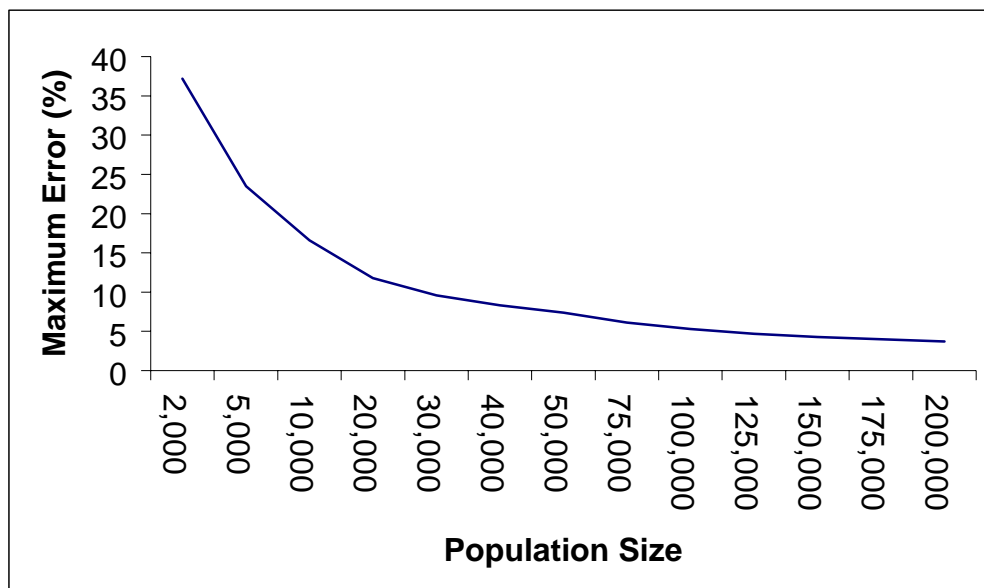
9.10 There is a major question over how robust the 'additional needs' weightings, which are derived from statistical formulae, are at small area level, in this case, practice level. The needs weightings are derived by modelling the relationship between utilisation data and a range of potential needs indicators at practice level (adjusting for supply). However, because the relationships are not perfect there will always be a degree of error associated with the needs weighting. This error will increase as the population to which the weighting is applied decreases because of the increased relative impact of random fluctuations in small populations. Random fluctuations in small populations tend to balance out over a larger population such as those served by HSS Boards. The decreasing accuracy of statistically derived formulae with population size does not, therefore necessarily prevent budgets for small areas being calculated but a risk management strategy would be necessary to deal with fluctuations in need.

Confidence Intervals Around Additional Needs Index at Sub-Board Level

9.11 An analysis of the error associated with the NI Prescribing needs weighting shows that allocation shares, adjusted for need, could vary from the correct share by as much as 24% for populations of around 5,000 (average NI GP practice size is 4,961) compared to 3.7% at a population size of 200,000. The relationship between the errors associated with the Prescribing needs weighting and population size is illustrated in Figure 9.1. To achieve a maximum acceptable error below 5%, a minimum population size of around 125,000 would be needed (the error will be in the range of +/- 4.7% at this population size). Risk management issues should be considered when applying the formula to population sizes of less than 125,000. If we take an error of 10% as being the maximum acceptable margin of error for resource allocation purposes, and even this would be difficult to manage in a single year, then this would suggest a minimum population size of 30,000 (the error will be in the range of +/- 9.6% at this population size). In terms of confidence intervals, it would therefore be advisable not to calculate budgets for population sizes of less than 30,000. However, application thresholds should be considered not

only in terms of confidence intervals but also take account of attribution error. Paragraphs 5.6 and 9.6 refer to the English evidence of a marked fall in attribution error when moving from practice list sizes of 10,000 to 60,000. It is reasonable to assume that this finding is applicable in Northern Ireland and should also be taken into account in sub-Board allocations.

Figure 9.1 Estimated Maximum Error Associated with Prescribing Additional Needs Index at varying Population Sizes



9.12 The results presented in paragraph 9.11 and Figure 9.1 represent an upper bound on the confidence interval in the vast majority of cases (that is, 95% of the time). Therefore, in most cases the true confidence interval on the needs index will be a good deal smaller than the confidence intervals shown here.

9.13 The effect of the confidence interval on the needs index at varying population sizes can be demonstrated by an example. First remember that the need for prescribing resources is based on the costs of all drugs prescribed by a GP practice having adjusted for age/gender structure and number of temporary residents. The dependent variable (that is, need for prescribing resources) is termed the Cost per Prescribing Unit (PU). Prescribing Units refer to the list adjusted for age/gender and temporary residents. If we consider the Northern Ireland average Cost per PU to be £34, then for a practice with a listsize of 5,000, the predicted value of

Cost/PU could be £34±23.5% (that is, in the range £25.84 to £42.16). For a group of practices with a total population of 30,000, the true value of Cost/PU could lie between £30.74 and £37.26 (£34±9.6%). However, consider the possible variation in the predicted value of Cost/PU for a population of 125,000. The true Cost/PU would lie only between £32.40 and £35.60 (£34±4.7%). It is worth noting that the prediction of Cost per PU using the needs index gradient is based on additional need only and additional need accounts for only 3% of the variation in prescribing costs (93% of the variation in prescribing spend is explained by population, age/gender and need but 90% is already explained by population and age/gender alone).

- 9.14 The confidence intervals related to the additional needs index also have an effect on the percentage share of an area. Taking a Board whose share of the Northern Ireland total is 25% and whose population is 400,000 the confidence intervals would lie 2.6% either side of the 25%. This means that the true share for this HSS Board could lie between 24.35% and 25.65%. Looking at a hypothetical Local Health and Social Care Group with a share of 5% and a population of 60,000, the confidence intervals would be 6.9% either side of 5% resulting in the true share lying between 4.65% and 5.35%. Finally, a hypothetical GP practice with a share of 0.5% and a population of 5,000 would have confidence intervals 23.5% either side of the 0.5% which would result in the actual share lying somewhere between 0.38% and 0.62%. This further demonstrates that the accuracy of the formula increases with the size of the population it is being applied to.
- 9.15 The reason the accuracy of the formula estimate improves with increasing population size is because as populations are aggregated, assuming needs are normally distributed, incidences of over and under-estimation of needs are more likely to cancel each other out than for smaller populations. This same effect is also evident if budgets are set for more than one year because unexpectedly high expenditure in one year is likely to be cancelled by lower expenditure in the following year. The risks associated with statistical variability can therefore be reduced if budgets

are aggregated over a number of years and over-spends in one year are offset by under-spends in the next year. The error associated with using the Prescribing formula for example, to allocate budgets to a population grouping of 50,000 could be reduced from 7.4% to 3.7% by setting the budget over 4 years as this is equivalent to increasing the population size to 200,000.

- 9.16 The decreasing accuracy of statistically derived formulae with population size does not, therefore necessarily prevent budgets for small areas being calculated but a risk management strategy would be necessary to deal with fluctuations in need. In conclusion, risk management issues should be considered when using the formula to allocate resources to population sizes of up to 125,000. In addition, due to attribution error, a rigid formula approach should not be applied to population units below 50,000-60,000 in size without a robust risk management process. [Please note the Third Report from the Capitation Formula Review Group states the following with regard to the main Board capitation formula: a rigid formula approach to allocating resources should not be applied to population units below 50,000-60,000 in size without a robust risk management process. Risk management issues should be considered when using the formula to allocate resources to population sizes of up to 250,000.] Guidance on setting prescribing budgets should have due regard to the issues highlighted and recommendations regarding application of the formula at small area level.

10. Equality

Background To Equality Obligations

10.1 Section 75 of the Northern Ireland Act 1998 obligates all public authorities to have due regard to the promotion of equality when carrying out their duties. Schedule 9 of the same Act also requests that authorities prepare equality schemes and carry out assessments on policies, whether existing or proposed, in relation to the promotion of equality. Authorities are obliged to report and rectify any aspects of policies that may not fulfil this requirement.

10.2 The aim of this is to ensure equality of access to services provided by public authorities for nine equality groups:

- Persons of different religious belief, political opinion, racial group, age, marital status, and sexual orientation
- Men and women generally
- Persons with a disability and persons without
- Persons with dependants and persons without.

An additional objective is to promote relations between people of different religious belief, political opinion and racial background.

10.3 If after investigation and consideration of the information any part of the policy is found to present a potential differential impact on any of the equality groups or affect one group's access to the service in question over another's, appropriate action needs to be taken. Policy makers need to consider what changes are necessary to rectify any diverse impacts.

Introduction of the Weighted Capitation Formula

10.4 As explained in Chapter 1 the allocation of prescribing resources was previously based wholly on historic spend which had the potential to perpetuate any already existing inequalities in allocation. In 1998/99 a

weighted capitation formula was partially introduced for HSS Board level allocations. This was initially carried out using both resource allocation formulae, which were in use in Scotland at that time and historic spend. However, as this was only considered an interim arrangement, work has continued and a Northern Ireland specific formula is currently used with historic spend to allocate prescribing resources to the HSS Boards at a level of 62.5% and 37.5% respectively.

10.5 The formula consists of three elements:

- The relative size of the population
- The age/gender structure of the population and their associated costs
- The relative level of deprivation/additional needs

These elements combine to ensure equity of allocations (Chapter 2).

10.6 The aim of this Equality Impact Assessment is therefore to examine if the use of a weighted capitation formula would result in a differential impact on or within any of the nine equality groups.

Methodology

10.7 Although resources for primary care prescribing are allocated at Board level, it was felt that analysis at a smaller area level would be more suitable in detecting any differential impacts.

10.8 In order to examine what impact introducing a weighted capitation formula for allocating prescribing resources would have on the equality groups it was first necessary to calculate what percentage share each ward receives of the “pot” based on historic spend only. This involved taking the percentage shares for each practice, calculated using the spend from April to November 2000 and projecting forward before calculating the shares, and attributing them to electoral wards. Available spend was tested, and no discernable difference occurred if spend during the winter months was included.

10.9 Ward percentage shares based on historic spend would then be compared with ward percentage shares based on the capitation formula at 100% implementation level. The percentage share of the “pot” based on 100% capitation was calculated by adjusting the ward populations using the age/gender and the needs indices and then calculating each ward’s relative share of the total.

Equality Group Data

10.10 Numerical data was obtained at ward level in respect of six of the nine equality groups (or suitable proxies for the groups). LGD level data was available on racial group (qualitative) and political preference (quantitative). The only available data source for five of the equality groups was the 1991 census. More up to date data sources were available for the other equality groups. No data was available for the sexual orientation group.

10.11 In instances where a direct count of the numbers in a specific group was not available, a suitable proxy was used. For example, the aggregate of attendance allowance and disability living allowance claimants was used as a proxy for those with/without a disability. However, as there may be issues surrounding take-up of social security benefits, an alternative disability proxy was created based on numbers self-reporting a limiting long-term illness at the 1991 Census.

10.12 More detail on the source of data for each equality group and the geographical level at which it was available is given in Appendix F.

10.13 Once the datasets were assembled at ward level then it was possible to map the equality group data to the ward shares based on historic spend and capitation. This then allowed each equality group to be separately analysed in terms of their improvement in ward shares when moving from historic spend to 100% capitation. The same principle was used for political group, which was being analysed at LGD level. Only qualitative comments could be made on the racial background equality group.

Results

10.14 The percentage gained/lost on the introduction of capitation was calculated for each ward and two categories created:

- Those wards whose percentage share increased or did not change with a move to 100% capitation
- Those wards whose percentage share decreased with a move to 100% capitation

The make-up of these wards with regards to the equality groups were then examined by looking at the percentage of each equality group which lives in each category of ward. (See Appendix G for a breakdown of the results at NI level.) (Appendix H contains results at HSS Board level.)

Persons of Different Gender

Fig 10.1 Impact of 'Total Need' Index

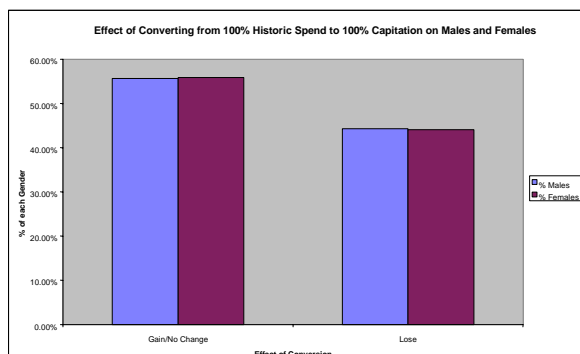
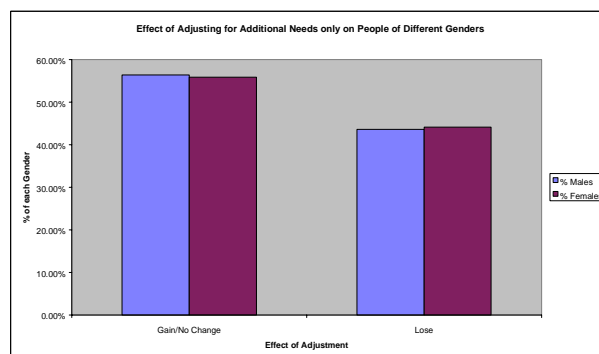


Fig 10.2 Impact of 'Additional Need' Index



10.15 Figures 10.1 and 10.2 show that there is minimal difference between the percentage of males and the percentage of females that live in wards that would experience either an increase or no change in their percentage share of the overall Northern Ireland “pot” (55.69% of males and 55.91% of females). The graphs above also demonstrate that when the population is adjusted for age, gender and need as opposed to just additional need the differential effect on gender is reduced from 0.5% to just over 0.2%. This would suggest that the implementation of the full weighted capitation formula at 100% would have no adverse impact on the gender equality group. Analysis at individual Board level produced the same results for each of the Health and Social Services Boards when the total needs index was applied (see Annex H, Charts 1-4a, Tables 1-4a).

Persons of Different Age

Fig 10.3 No Adjustments

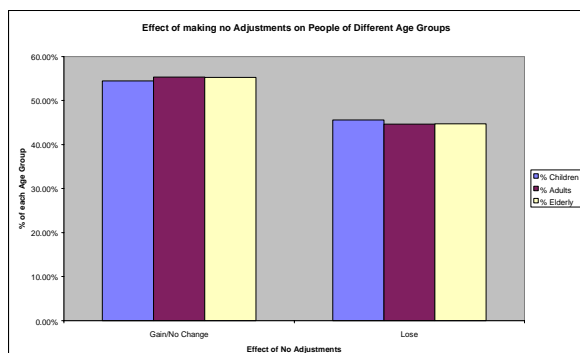


Fig 10.4 Impact of 'Age Index'

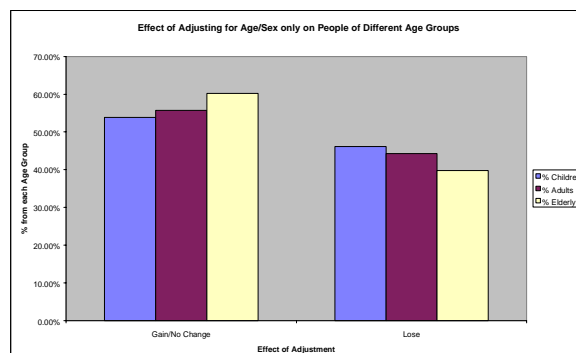


Fig 10.5 Impact of 'Additional Needs Index'

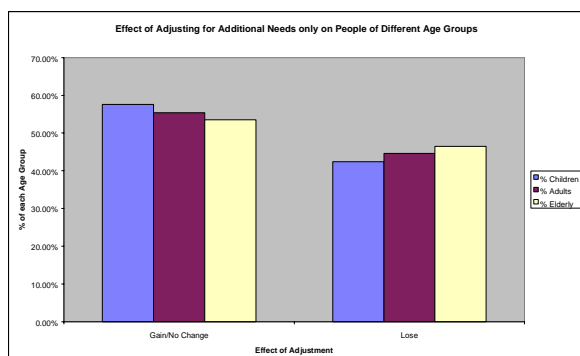
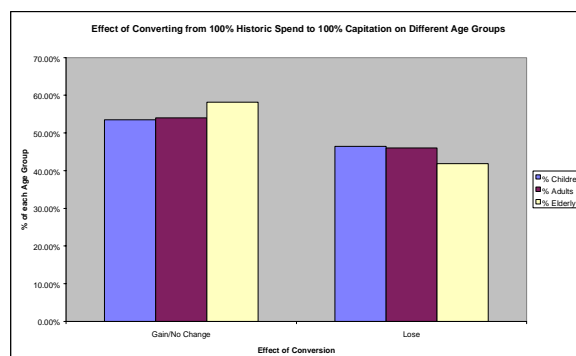


Fig 10.6 Impact of 'Total Needs Index'



10.16 Figure 10.6, which shows the effect of converting to 100% implementation of the capitation formula, demonstrates there to be a higher proportion of elderly people living in wards whose percentage share would either increase or stay the same (58.14% of elderly compared with 53.53% and 53.99% of children and adults respectively). This, however, is actually what would be hoped for, as it would be expected that a larger number of elderly people would require prescribing resources. The series of charts above show that adjusting for age skews resources to areas with older populations, whereas adjusting for additional need would target areas with younger populations. Younger people generally live in more deprived areas and, therefore, needy areas whereas the older age groups live in more affluent areas (Annex I, Table 1). Figure 10.6 shows that capturing both types of additional need, that is, arising from age/gender and additional need, ensures equity between adults and children and a lesser skew towards the elderly. It would therefore appear that there would be no adverse impact on different age groups with the introduction of 100% capitation. Again analysis at Board level produced the same results (Annex H, Charts 1-4a,

Tables 1-4a) and the same justification for these results was evident (Annex I, Tables 10-13).

Persons of Different Marital Status

Fig 10.7 No Adjustments

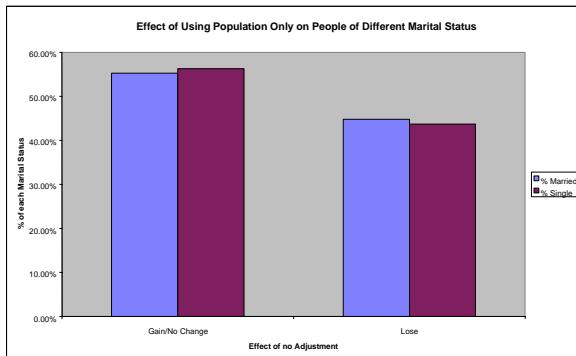


Fig 10.8 Impact of 'Age Index'

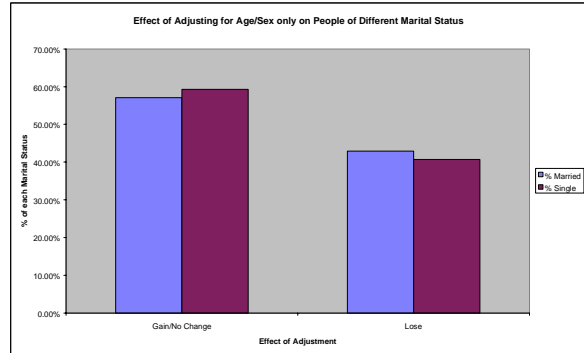


Fig 10.9 Impact of 'Additional Needs Index'

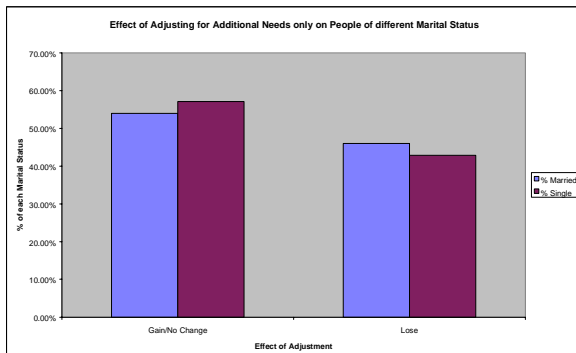
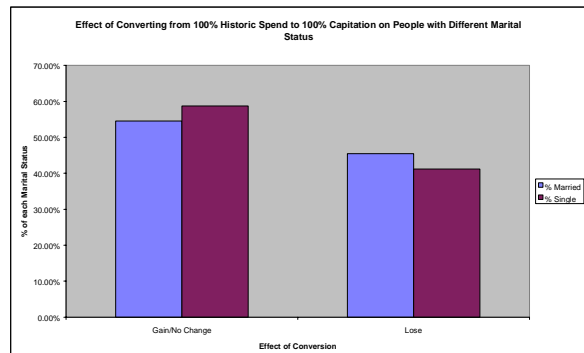


Fig 10.10 Impact of 'Total Needs Index'



10.17 The move to 100% capitation (Fig 10.10) shows a higher proportion of people who are single, widowed or divorced live in wards whose share increases or does not change. 58.76% of single/widowed/divorced people live in wards where there is either an increase in share or no change, compared with 54.52% of married people. The charts above demonstrate that when adjusting for additional need, age and gender or overall total need the skew is in the favour of those who are single, widowed or divorced. The charts above demonstrate that while both categories of marital status gain with the adjustment for age and gender (the “single” category is distorted as it includes people who are divorced and widowed who are more likely to be older), the “married” category actually loses when adjustments are made for additional need (Annex G, Chart 1a).

These charts show that there could be a differential impact on people with different marital status. The relationship between the two categories for Marital Status remained the same when the analysis was repeated for each of the four Boards (Annex H, Charts 1-4a, Tables 1-4a).

10.18 Further analysis was carried out to identify if this differential impact would be adverse and whether it would be due to single/widowed/divorced people having an older age profile or if the number of people in this group live in areas of higher deprivation. It was discovered that both these assumptions were confirmed (as shown in tables 10.1 to 10.3 below).

Table 10.1: Proportion of Married and Single People Living in Areas of High and Low Need According to the Noble Measure of Multiple Deprivation

Top 50 Wards with:	Proportions of:	
	Married	Single
High Need	43.37%	57.79%

Table 10.2: Proportion of Married and Single People Living in Areas of High and Low Need According to the Additional Needs Index

Top 50 Wards with:	Proportions of:	
	Married	Single
High Need	43.16%	52.20%
Low Need	56.84%	47.80%

Table 10.3: Proportion of Married and Single People according to Age Group

	Proportion of	
	Married	Single
Adults	79.10%	74.13%
Elderly	20.90%	25.87%

10.19 Tables 10.1-10.3 suggest that people who fall into the single category should gain from both indices as they seem to have a higher proportion of people in the “elderly” age band and a higher proportion live in more deprived areas (when using either the additional needs index or the Noble measure of multiple deprivation). The previous conclusion that single people gain more from both the age/gender and the additional needs element of the formula has been justified by this additional analysis and should actually be expected. Any possible future differential impact in the favour of the “single” group may therefore not be viewed as an adverse

one. This justification holds for each of the Board’s analysis of marital status (Annex I, Tables 23-26).

Persons with/without a Disability

10.20 As there are no direct data available on the number of people with a disability broken down by geographical location, two alternative proxies were used, namely the number of people in each ward with a limiting long-term illness and the number of people in each ward claiming Disability Living Allowance (DLA) or Attendance Allowance (AA). Analyses are presented for both.

Fig 10.11 Impact of ‘Total Needs Index’

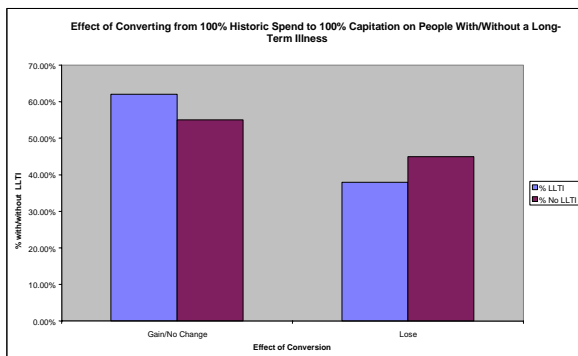


Fig 10.12 Impact of ‘Additional Needs Index’

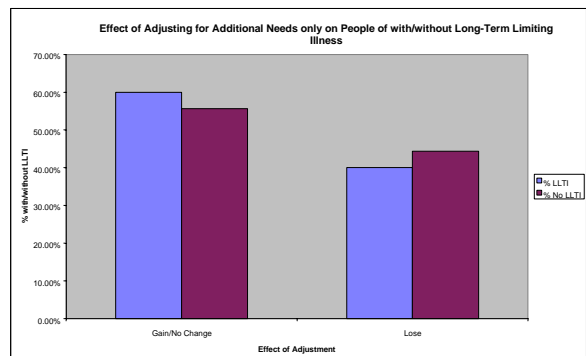


Fig 10.13 Impact of ‘Total Needs Index’

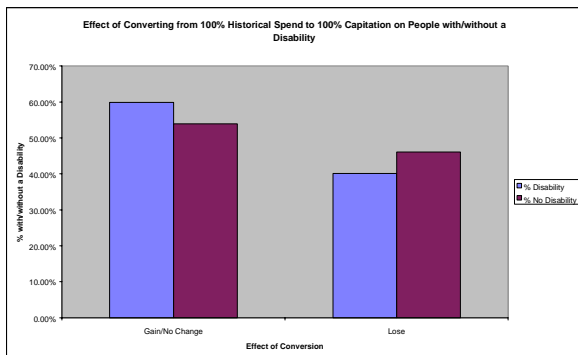
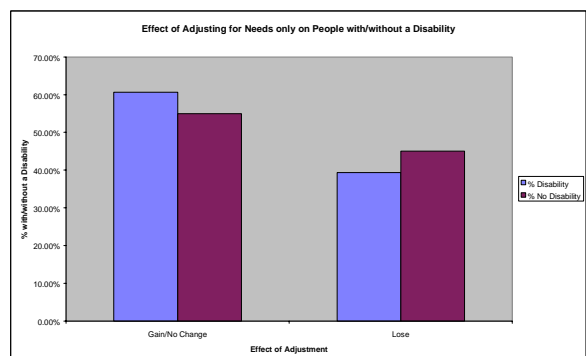


Fig 10.14 Impact of ‘Additional Needs Index’



10.21 Both proxy measures of disability show that there are a higher proportion of both people with and without a disability living in wards that would experience an increase or no change with the introduction of 100% capitation. However, there are a much higher proportion of people with a disability (looking at both proxies) in wards whose percentage share would

increase (60.03% people with a long-term limiting illness compared with 55.04% without a limiting illness along with 59.86% of people claiming disability allowances compared with 53.89% of people not claiming. As people with a disability would use the health service more a differential impact in favour of those with a disability would be anticipated after the application of the needs index. The charts above show that when adjusted for additional need only the skew is towards those with a disability for both proxies. However those with a long-term illness actually gain more when the full formula is applied as opposed to those claiming DLA/AA. This suggests that those with a long-term illness gain through the application of the age/sex index and must have an older age/sex profile whereas claimants of disability allowance must have a younger age/sex profile. This suggests that there would be no adverse impact on this equality group if 100% capitation were introduced and that people with a long-term illness live in wards that would benefit more.

10.22 Under further analysis it was found that there was a lower proportion of elderly in the 50 wards with the highest level of Disability Living Allowance and Attendance Allowance claimants than in the wards where there were high levels of long-term limiting illness. This is demonstrated in table 10.4.

Table 10.4: Proportion of each age group in wards with high levels of Long-Term Limiting Illness or Claimants of Disability Living Allowance and Attendance Allowance

Top 50 Wards with:	Proportions of:		
	Children	Adults	Elderly
LLTI	21.97%	55.17%	22.85%
DLA+AA	25.81%	56.30%	17.89%

This backs up the suggestion that people with long-term limiting illness live in wards with an older age profile which means that they would gain more from the age/sex component of the formula as has been illustrated in fig 10.14 above.

10.23 The results were replicated in the Board level analysis for three of the four Boards (see Annex H, Charts 1-4a, Tables 1-4a). However, the analysis on the Western Health and Social Services Board showed that while more people with long-term limiting illness, than without, lived in wards that would benefit from the introduction of capitation, this was not the case for claimants of DLA or AA. More people not claiming benefits actually lived in wards that would benefit from the formula. However, further analysis showed that when historic spend effects are removed from the Western Board analysis, the differential impact in favour of those claiming DLA/AA re-emerges (see Annex H, Chart 4b, Table 4b).

Persons with Different Religious Beliefs

Fig 10.15 Impact of 'Age Index'

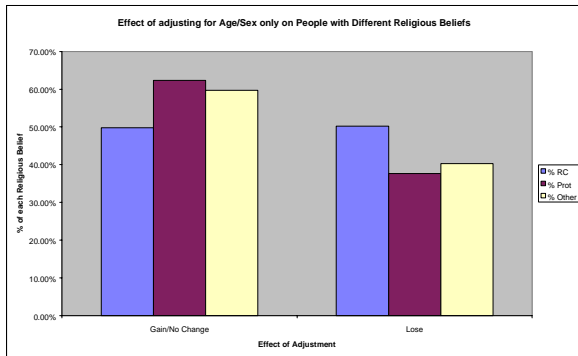


Fig10.16 Impact of 'Additional Needs Index'

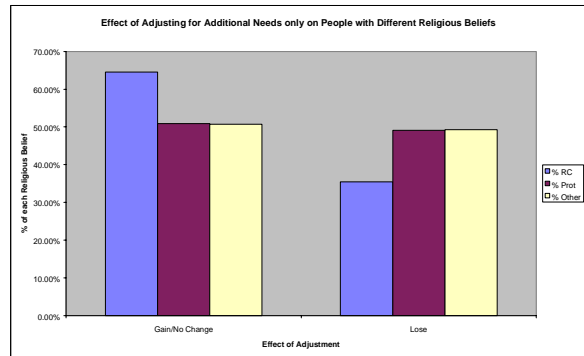
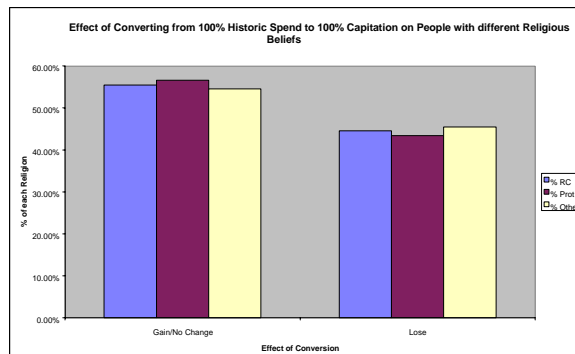


Fig 10.17 Impact of 'Total Needs Index'



10.24 There is little difference in the percentage of people with different religious beliefs living in wards where the percentage share of the Northern Ireland “pot” would increase or remain the same with 100% implementation of the weighted capitation formula. The largest difference is between ‘Protestants’ and ‘Others’ which is slightly over 2%. The charts above

show that Roman Catholics gain the most from the implementation of the additional needs index suggesting that they live in more deprived areas (Annex I, Tables 7-8 and 19-22). However, Protestants gain more from the age/sex index suggesting that the age profile of Protestants is older (Annex I, Table 6 and 15-18). Therefore application of the full weighted capitation formula results in increased equity between the different religious groups. The results suggest that this equality group would experience no adverse impact with the introduction of 100% capitation.

- 10.25 Analysis at Board level produced much the same results with the exception of the Northern Health and Social Services Board (see Annex H, Charts 1-4a, Tables 1-4a). More Catholics in the Northern Board live in wards that would gain with the implementation of the weighted capitation formula as opposed to Protestants gaining the most, as is the case in the other HSS Boards and at Northern Ireland level. Again further analysis showed that when historic spend effects are removed the differential re-emerges with a higher proportion of Protestants living in wards that gain from introduction of the formula (see Annex H, Chart 2b, Table 2b). Although the Western Board analysis produced results skewed as expected, the differential was larger than the case in NI or other Boards. Again the removal of historic spend effects brought more equity between the religious groups (see Annex H, Chart 4b, Table 4b).

Role of Social Security Benefits

- 10.26 Disability Living Allowance (DLA) was found to play an influential role in predicting prescribing expenditure. However, the variable was subsequently excluded on the recommendation of the academic researcher developing the index, due to concerns over its measurement, uptake rate and the possibility that its use may create perverse incentives for general practitioners to miss-record or influence future take-up rates. Removing DLA rate from the modelling and re-estimating the model adopting the preferred selection procedure by Dr Rice (see Dr Rice's Report), resulted in an alternative model specification which included standardised limiting long-term illness ratio under 75 years (Ltilt75)

instead of DLA. However, a peer reviewer (Matt Sutton’s peer review is available from PSAB on request) expressed concern over the use of a variable which, performed less well (that is, Ltilt75) than the DLA variable which was excluded.

10.27 Further work was carried out to investigate the role of DLA in more detail. Since the DLA variable has not been standardised for age there was a potential problem in that the variable may be picking up an age effect and having the effect of biasing the estimated co-efficient. The modelling was repeated using age standardised DLA rates, however, no significant relationship with prescribing costs was observed. Dr Rice concluded that the originally observed relationship was due to the lack of standardisation for age. However, to ensure that this issue has been addressed from an equality perspective, analysis has been carried out on the alternative model, that is, using DLA rather than standardised limiting long-term illness ratio under 75 years.

Fig 10.18 Impact of “Age/Sex Index “

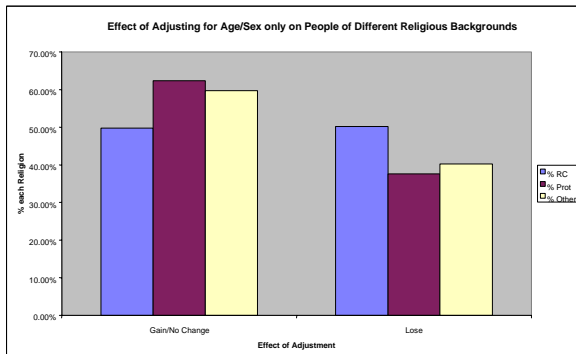


Fig 10.19 Impact of “Additional Needs Index” (DLA)

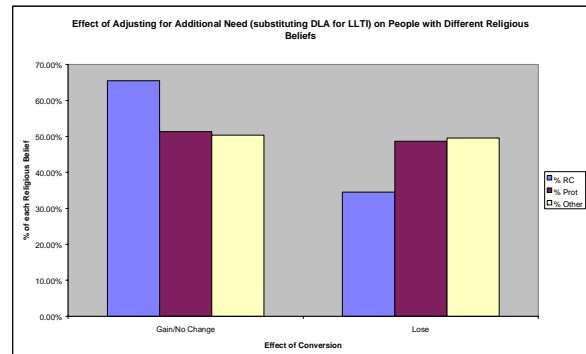
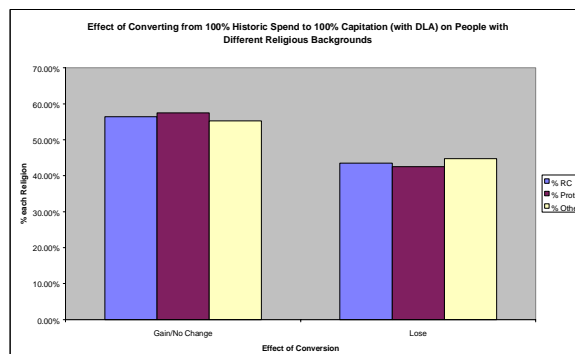


Fig 10.20 Impact of “Total Needs Index” (DLA)



10.28 Using the model with Disability Living Allowance (DLA) instead of Limiting Long-Term Illness (Ltilt75) shows the same profile when the needs index is applied (Fig 10.18), that is, Roman Catholics gain the most from implementation of the additional needs index. The substitution of DLA for Ltilt75 does not affect the age/sex index and therefore the results are as before, in that Protestants gain more from the age/gender index. The total needs index using DLA produces the same result as the LLTI model, resulting again in increased equity between the different religious groups. In terms of equality impact, there is no difference between the preferred 'Rice' model and the alternative 'DLA' model. Both results suggest that this equality group would experience no adverse impact with the introduction capitation at 100% level of implementation.

Persons with/without Dependants

Fig 10.21 Impact of 'Age Index'

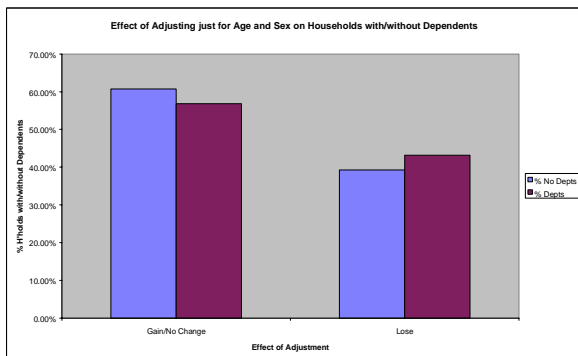


Fig 10.22 Impact of 'Additional Needs Index'

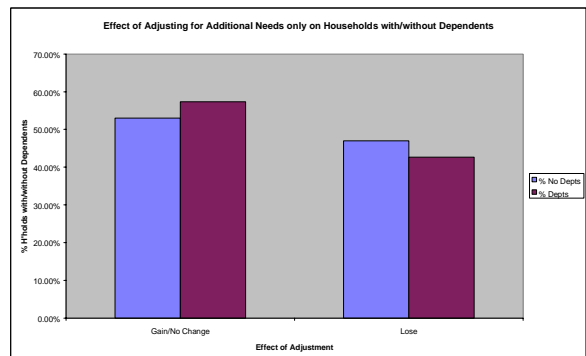
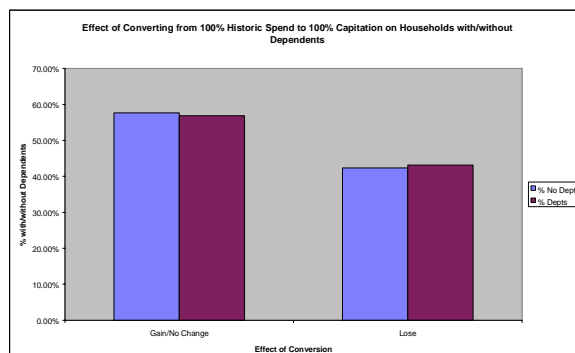


Fig 10.23 Impact of 'Total Needs Index'



10.29 In terms of those with or without dependants there is little difference. 57.69% of households without dependants and 56.82% of those with dependants live in wards where there would be an increase or no change in the percentage share of the Northern Ireland “pot” with the introduction of capitation. However charts 10.21-10.23 above show that this slight skew towards households without dependants could be due to the age/sex structure of the wards that they are situated in. While households with dependants gain with the application of the additional needs index, households without gain a lot more with the application of the age/sex index suggesting that households without dependants are situated in areas with an older age structure. Again the application of the full weighted capitation formula increases equity within this equality group suggesting that there would be no equality implications with this group if capitation were to be introduced at 100%. Analysis at Board level produced the same relationships as at NI level (see Annex H, Charts 1-4a, Tables 1-4a).

Persons with Different Political Beliefs

Fig 10.24 Impact of ‘Age Index’

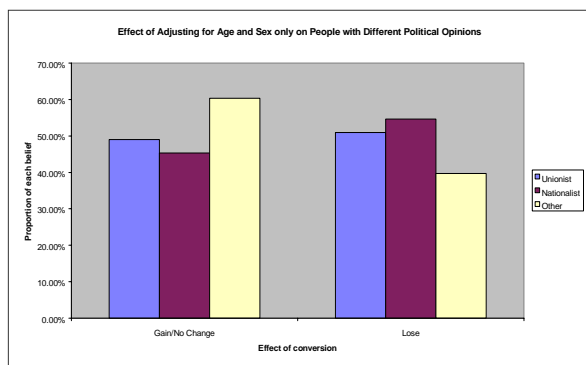


Fig 10.25 Impact of ‘Additional Needs Index’

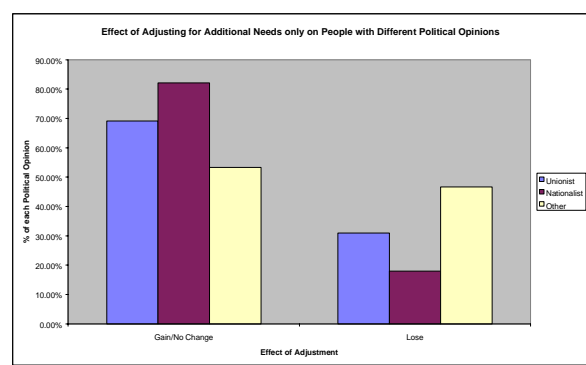
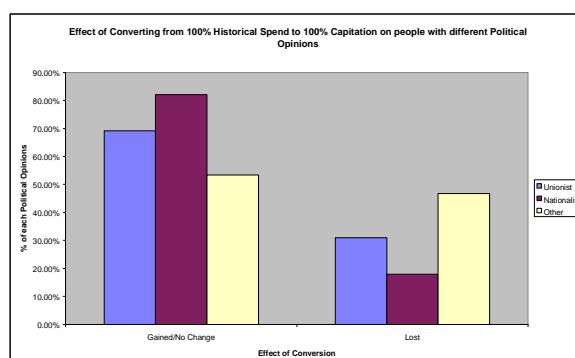


Fig 10.26 Impact of ‘Total Needs Index’



10.30 Charts 10.24-10.26 above show a swing towards the Nationalist Political belief (82.07% living in LGDs that would either gain or have no change compared with 69.11% and 53.30% of Unionists and “others” respectively), although the majority of all categories of political belief are in LGDs that gain. When looking at the application of the indices individually the very same Local Government Districts are shown to gain and lose following application of the additional needs index but the Age/Sex index does seem to equalise the categories somewhat (reflecting the results of the religious beliefs category). As this group can only be examined at a very high level, any subtle differences due to the application of the individual indices are not obvious. Although figs 10.25 and 10.26 show the same profile as the same LGDs gain and lose in both instances there are differences in the amounts gained and lost. What is not apparent is the how much is gained or lost as some LGDs may gain for both but to different extents. For example, Antrim loses from the application of the age/sex index but it gains from the additional needs index (-0.32% and 0.19% respectively), which could be due to a younger age structure of the LGD. However, it also gains when the total formula is applied (0.35%). Although the gains for Antrim are different from the application of the additional needs index and the overall total needs index, it is still included in the group of LGDs that gain with the application of each one and still makes up part of the profile of those that gain and any differences taking place at a lower level are masked. Therefore, without the availability of data at a lower level it is impossible to predict what the full effect of the implementation of the weighted capitation formula would be. Further masking of any differences would occur if analysis was conducted at Board level.

People with Different Racial Backgrounds

10.31 Whilst it was not possible to obtain specific client data on the geographical location of different racial groups, the Centre for Racial Equality did provide some guidance in this respect. In Belfast they estimate large numbers from each of the racial groups, a high proportion of Chinese, Travelling and Pakistani communities are found in Craigavon and in

Londonderry there are relatively large numbers of people from Chinese, Indian and Travelling communities. There are also sizeable numbers of people from different racial backgrounds found in Down, Lisburn, Ballymena, Newry and North Down. From the analysis it is known that the majority of these LGDs would gain with conversion to 100% implementation of the weighted capitation formula with the exception of Londonderry, North Down and Lisburn (who each lose -2.17%, -3.40%, and -0.67% respectively).

Analysis of Effect of Indices on a Base Population

- 10.32 The same analysis was carried out looking at the effect each of the indices had on a base population (see Annex G, Chart 1b) as opposed to the effect on the percentage shares converting from 100% historic spend to 100% capitation has. This was a validation exercise, assessing whether the indices skew resources in the right direction (e.g. towards the elderly).
- 10.33 Overall the analysis produced the same results and demonstrated that when the historic spend factor was removed, leaving only the effect of the indices, the skew for each of the groups, if a skew was expected at all, remained in the right direction. The difference was that any skew found in the previous analysis was exaggerated when only examining the indices (ie. having removed any effect historic spend may have had). For example, in religious background more Protestants were in wards where the percentage share either increased or remained the same with the application of the age/sex index (13% more than Roman Catholics when percentage shares were analysed and 23% more than Roman Catholics when the indices were analysed). Also, more Roman Catholics were in wards where the percentage share increased or remained the same with the application of the needs index (10% more than Protestants when looking at effect on percentage shares and 23% more than Protestants when looking at the effect of the indices). The overall relationship remained the same between each of the religious groups when the total needs index was applied.

10.34 The only difference that is apparent in terms of categories within a group that gain is females gain slightly more over males whereas in the previous analysis males and females were shown to gain equally. However, when the historic spend factor is removed the age/sex and total needs indices skew towards females which would actually be expected as there are more older females than males. Aside from this difference the skews within each of the groups remain the same as in the previous analysis with any swings just more pronounced.

Overall Conclusions

10.35 The age and disability groups experience differential impact in favour of elderly and those with a disability. This impact would actually prove beneficial and would be expected with the introduction of capitation as older people are generally found to use the service more and therefore cost more as do people with a disability. As capitation accounts for age/gender structure of the population and the relative needs (people with a long-term illness being one of the components of the index), it is hoped that areas with a higher proportion of these people would have an increase in their percentage shares. However, the marital status equality group also shows a differential impact in the favour of those who are not married. However, after further investigation it was found that people falling in the single category live in areas with an older age profile and married people may live in less deprived areas meaning that single, divorced and widowed people may benefit slightly more from the conversion to 100% implementation of the weighted capitation formula.

10.36 In terms of Religious beliefs, the application of the overall formula skew very slightly in the favour of Protestants. Under further analysis it became apparent that Protestants gain more from the age/sex component of the formula (suggesting they live in areas with an older profile) and Roman Catholics gain more from the additional needs element (suggesting they live in more deprived areas). However the interaction of these components leads to a more equalised result.

- 10.37 The same is true for the household with/without dependants equality group with the result showing that the full formula, as it takes account of age, gender and need, leads to more equality within and between groups. The results show that the majority of all equality groups are in wards that do not lose out with the introduction of 100% capitation.
- 10.38 The quality assurance analysis on the indices indicates that they act as they should and will skew resources in the right direction in terms of each of the equality groups examined quantitatively which included persons of different gender, age, religious beliefs, marital status, persons with or without a disability and persons with or without dependants. This supports the conclusion that there will be no adverse impact on any of the equality groups with the introduction of the weighted capitation formula.
- 10.39 In principle, the exclusion of historic spend highlights the real difference of moving a crude population to its need weighted prescribing entitlement (see Annex G, Chart 1b). The overall conclusions for each HSS Board are very similar to the NI results and any differential impacts were again justified in terms of the nature of any capitation formula, which is to skew resources to ensure equal resource for equal need. Any differentials not explained in terms of need, proved to be emerging due to the pattern of historic spend within HSS Boards. Removal of historic spend allowed the justified differentials to re-emerge or equity between groups to be re-established (see Annex H, Charts 1-4b, Tables 1-4b).
- 10.40 The next stage in the equality impact assessment will be a pre-consultation exercise during which the main stakeholders representing the equality groups will be consulted in order to develop a full public consultation. Views will be sought on who should be consulted, how this consultation should be carried out and suitable consultation materials.
- 10.41 The final stage in the equality impact assessment will be the undertaking of full public consultation during which active participation of representatives of equality groups will be sought, to test further the conclusions drawn to date.

11. Conclusions & Recommendations

11.1 This Report describes a wide range of research and analyses which the Prescribing Formula Working Group (PFWG) have commissioned from researchers or the analytical support team in order to develop a Weighted Capitation Formula for the allocation of primary care prescribing resources. Population issues are to be examined separately and be subject to a Ministerial decision. The need for resources by the different age/gender groups in the population has been developed via a very innovative method. The limitations of this approach to examine the impact of age/gender are recognised but further work has been identified which will improve this method. Needs research based on NI data has made it possible to examine the impact of additional need. The proposed formula aims to equitably share out resources to meet, as far as possible, the need for prescribing resources. In order to keep the needs index up-to-date, it is recommended that further modelling work occur when new information becomes available, for example, after publication of the results of the NI Census 2001. It is the view of the PFWG that the need for further work should not delay the implementation of its proposals. The PFWG are confident that the proposed formula represents a substantial improvement over the historic allocation of resources.

11.2 The PFWG therefore recommends that:

- A full public consultation on the PFWG proposals should take place to provide for proactive engagement with all interested parties.
- Pending the further testing of conclusions, implementation of the proposed formula should not be delayed.
- A future work programme for the PFWG should include improvement to the methodology for examining the impact of age/gender and review the impact of additional need when new data becomes available.