



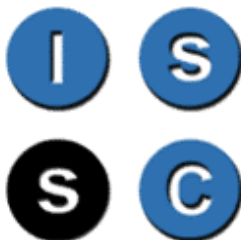
**Allocating Funding Across Health Boards – Is Equity Easy?\***

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## Allocating Funding Across Health Boards – Is Equity Easy?

### I INTRODUCTION

This paper reviews the UK's formula based system for the equitable allocation of health care funding across regions paying particular attention to the Northern Ireland experience. 'Equitable' here means equal 'treatment' for individuals with the same health needs irrespective of their geographical locations (or incomes). We have two main reasons for believing that such a review is well worthwhile. First, administrative theories and devices introduced in the UK often appear in the Republic after some time-lag, especially since equity attainment, or the aspiration to it, seems to be accorded the same primacy here to judge from health policy statements. But we need to take a critical look at the assumptions underlying formulae and assess how they have worked in practice. Even if we do follow the UK to formulae, there are lessons to be learned from the UK experience and we may need to do a lot better.. Second, equity – in spite of its primacy in many minds – turns out to be an elusive entity, very hard to measure, let alone achieve. We think realistic assessment of the degree of attainability of equity could have implications for the emphasis that should be placed on other objectives such as effectiveness and efficiency.

As regards the plausibility of a formula based allocation, a recent paper on capitation funding in the public sector, Smith, Rice and Carr-Hill (2001) lists four possible mechanisms for distributing funds across geographical regions as:

- (i) according to size of bids from regions
- (ii) on the basis of political patronage
- (iii) according to historical precedent
- (iv) on the basis of an independent measure of needs

Put as simply as that and assuming that attainment of equity has primacy, it would be hard for anyone to dispute that mechanism (iv) is preferable. It might seem a natural step then to say that allocation of health resources across regions should be based on populations, age/gender distributions, and morbidity and socio-economic measures. That indeed is what the formulae purport to do. However, as we will see, there are problems, conceptual as well as practical, just beneath the surface.

Although the notion of equity was implicit in the principles of the UK's National Health Service from its origin in 1948, actual annual allocations for its first 30 years were largely based on those of the previous year with (depending on the state of national finances) some increments for growth. However, in recent decades there have been ambitious attempts to actually attain equity by using statistical or econometric formulae that relate financial allocations to measures of need. The methodology behind the currently employed formulae dates to the mid-1990's and experience of the implementation of these formulae is more recent still.. We will return to the UK formulae in sections III and IV. But first, because of the centrality of the idea of equity attainment to the methodology, we should discuss the various interpretations of equity and its perceived primacy.

### II EQUITY

While there are several possible definitions of 'equity' in relation to health services, when it comes to measurement it is usually equality of expenditure (or a closely related measure) for equal need that is understood. That is, two individuals with the same health needs, but from different groups (defined by region, or income, or age, or whatever) are being treated equitably when there are equal expenditures on their health care<sup>2</sup>. It could be validly argued that unequal expenditures for equal need not imply inequity. Some people may *choose* to receive less treatment than is on offer and while they are perhaps unwise they cannot be subject to compulsion and are certainly not being treated inequitably. So 'access' to equal health care rather than equality of care may be a preferable definition, but the problem is that data records, particularly at aggregate level, usually cannot distinguish between a choice not to utilise health services and a lack of need for them. Again, it is true that equality of the quantity and quality of health services delivered to people of equal need is what is important and equal expenditures

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<sup>2</sup> We are focussing on this equal utilisation of health services for equal need (often called horizontal equity), but it needs to be said the term 'equity' is often understood as not only implying this, but also implying that higher income groups should contribute proportionately more to the funding of the health service irrespective of their utilisation of it (often called vertical equity).

do not guarantee these because efficiency could vary (by region, say). Although a certain amount can be done about this<sup>3</sup>, there are great problems to quantifying efficiency and quality.

If feasible, it would be equality of health and not of health care than would be the objective. But the quality of health an individual experiences through a lifetime depends on far more than on available health care. It is true that the rich enjoy better health than the poor (although increasingly ill-health can result from consequences of lifestyles associated with prosperity rather than poverty) and it may well be a valid welfare objective for the State to try to eliminate this inequity. But to do so would require extra resources devoted to many other areas that can affect health, such as nutrition, housing, education, etc. Health care expenditures on their own will not create equity in health and may indeed have relatively little impact, at least if past findings are still relevant. McKeown (1976) claimed the main determinants of health in the UK are behavioural, environmental and nutritional and the contribution of clinical medicine is relatively minor – a view that has been frequently re-expressed, for example, by Benzeval, Judge and Whitehead (1995). Indeed, for the UK, the Acheson Report (Department of Health, 1998) concluded that inequalities had not only not improved since the 1970's, but had worsened in some respects. These considerations have implications for both the choice of total health service expenditure and its distribution. Even on just an equity criterion, the health service budget ought not be disproportionate to the budgets for other (health influencing) services. Also, regional equity of health would demand much more than regional equity of the health service, so that even if the latter were achievable, it could only do so much.

However, these considerations have not weakened the priority accorded in the UK to seeking equity in health care expenditure and certainly the current UK capitation formulae are not only directed to this end, but are formulated without consideration of other objectives. The view is not limited to policymakers, but widely held by health policy analysts, nor is it restricted to the UK alone. Gillon (1986) maintained that the view of equity in healthcare that commanded greatest support among health professionals and the public at large is that of distribution according to need, coupled with payment according to ability to pay. Mooney (1986) claimed that throughout OECD countries the public attached greater importance to equity than to efficiency in health care and the claim has been frequently repeated. Wagstaff and Van Doorslaer et al (1992) believed there was broad agreement among policy makers in at least eight of nine Western European countries that health care ought to be financed according to ability to pay, but delivered according to need. A quotation from Wagstaff, Van Doorslaer and Paci, (1991) probably sums it up - "If there are two persons in equal need of medical care, it would be considered undesirable if the richer of the two were to receive treatment". Health services seem to be seen as somehow different to all other commodities<sup>4</sup>. Majority views in the US do not give the same primacy to equity. Health services are more likely to be thought and written about in the general context of consumer demand for commodities with a consequently greater trust in the role of markets to promote efficiency and less emphasis on equity. Enthoven (1988) could perhaps typify the majority viewpoint. However, there are American health economists, for example, Rice (1998), who disagree and take a 'European' line.

Views in Ireland fit into the European mould. Nolan (1993) saw the Irish perception of healthcare as "distinctive in terms of public attitudes as regards equity", with access to it "generally regarded as a basic right". Indeed, the importance of healthcare equity relative to equity in consumption of other (health influencing) commodities seems to be more highly rated in Ireland than elsewhere. This was certainly not a unanimous view in the past. Tussing (1982), who studied health and poverty, said little about equity of health service distribution. He stressed housing, the living and working environment, and health problems arising from hazards peculiar to poverty. He also favoured health care cost control including consideration of pricing and payment systems. But a succession of Government papers - *Health the Wider Dimensions* (1986), *Commission on Health Funding* (1989) and *Shaping a Healthier Future* (1994) have emphasised equity in healthcare expenditure. Indeed, in contributions to a recent book (Leahy and Wiley, 1998) officials of the Department of Health and Children (O'Dwyer, 1998 and Barrington, 1998) not only see their Department's objective as achieving healthcare equity "across the whole country and between groups with different needs", but of reducing inequality generally - "The biggest challenge for the health services . . . is . . . the reduction of inequality...", the logic being

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<sup>3</sup> By replacing actual expenditure by an aggregate of standardised components – for example, cost hospital bed nights not by the actual regional costs, but by the average national cost and try to do the same for other components of care.

<sup>4</sup> Some health policy analysts argue that the 'exceptional' characteristics of health services, make it extremely difficult to say any level of health expenditure is too high. Others (for example: Smith, Frankel and Ebrahim, 2000) deny such conventional economic views as that 'free' supply of a desirable commodity will increase consumption without limit unless strictly rationed.

that health care would enable people to better themselves in all ways. In line with this, Barrington (1998) claimed the Department had made a major contribution to the Irish economic boom of the 1990's. With these views, it is probably reasonable that these authors had no worries about choice between objectives (equity v efficiency, say) in health care provision, or total expenditure on health care v that on other commodities. The Irish health service was "perhaps one of the most cost-effective in any OECD country" and the very large increases in Irish health expenditure in the 1990's were treated as if exogenous<sup>5</sup>.

To summarise: in Ireland, the UK and Europe, equity is accorded primacy among objectives by policymakers, health administrators and many analysts. But the measure of equity is via expenditure on health care and the connection between that and health outcomes is quite tenuous. In the following sections we will show that in the UK, which has taken the formulaic determination of equitable expenditure allocation further than other developed countries, the resultant distribution of even this expenditure measure is of very dubious equity.

### III THE UK ALLOCATION FORMULAE

The financial resources required by a regional health authority will depend on the population of the region. So a first stab at equitable allocation would just allocate a fixed total in line with population proportions over regions. But people of different age and gender have different health care needs, so this allocation should be modified to reflect different demographic and gender patterns that may exist between regions. Again, even given age and gender, people can differ in health care needs due to various morbidity and socio-economic factors. So there should be further adjustment for these factors. All this is very reasonable. The difficulty lies in determining the magnitudes of the adjustments.

The essential problem can be understood by considering a hypothetical (grossly over-simplified) situation. Suppose we have only two age categories – old and young – and nothing else affects health care needs. Suppose we have only two regions, both with 1 million population – one with 75% old and 25% young and the other with 25% old and 75% young. Suppose that in a previous time period central authority had allocated £1 billion to each region, because they had the same populations, but no allowance was made for age distribution. Now central authority wishes to again allocate an unchanged total of £2 billion, but wants to adjust equitably for age distribution. The regional health authorities are able to give us the actual health care expenditures incurred by old and young in each region in the most recent time period prior to this allocation exercise. They were:

	Old	Young	Everyone
Region 1 Expenditure	£800 million	£200 million	£1 billion
Population	.75 million	.25 million	1 million
Region 2 Expenditure	£500 million	£500 million	£1 billion
Population	.25 million	.75 million	1 million
Whole State Expend.	£1300 million	£700 million	£2 billion
Population	1 million	1 million	2 million

The old incurred more health expenditure than the young in a per person ratio of 1.3 to .7 = 1.86. So Region 1 got 'too little' and region 2 got 'too much'. Assigning according to the national ratio gives:

	Everyone
Region 1 Expenditure	£1.15 billion
Population	1 million
Region 2 Expenditure	£.85 billion
Population	1 million
Whole State Expend.	£2 billion
Population	2 million

Real life situations are much more complicated with more regions, many age categories, plus gender and other factors, as well as various classifications of health care expenditure (acute hospital care, GP services, elderly care, etc.) being allocated separately, rather than as a single health care allocation. However, the essence of the procedure is the same.

<sup>5</sup> The very recent publication by Layte and Nolan (2001), while it restates the equity in healthcare aspiration, recognises the limitations of healthcare alone to achieve equity in health outcomes.

The problem is that national, or overall, expenditures on old and young are being taken as providing ‘true’ measures of age related need. This assumes that even though regions differed originally in relative expenditures on old and young, they did so in a ‘random’ fashion so that the overall is a fair estimate. There are other possibilities. Suppose we believe that some of the old can be relatively easily fobbed off from seeking some of their health entitlements and that this is more likely to happen in a more financially pressured region. Then we would feel use of region 1 in estimating relative need would be biased against the old and region 2 would give a fairer picture. The expenditure on each old person was £2000 and on each young person £667 (as compared with the overall of £1300 to £799) or 3 to 1. Allocating the £2000 on this basis would lead to the allocation:

	Everyone
Region 1 Expenditure	£1.25 billion
Population	1 million
Region 2 Expenditure	£.75 billion
Population	1 million
Whole State Expend.	£2 billion
Population	2 million

This gives a larger proportion of total funding to region 1. This example, is *not* merely hypothetical, although a vast simplification of its real life counterpart. In Scotland, there has been opposition to using national average expenditures as estimators of need. Sutton and Lock (2000) argue that high need groups can under-use health care (for example, Tudor-Hart, 1971), so regions with substantial numbers of high need groups will, if quite constrained in resources, ‘underspend’ in relation to these needs. So Scottish estimates of need use averages from the regions judged to be less financially pressured. Subjective judgement may be involved, but ideas like that of Blundell and Windmeijer (2000) to assess pressure by hospital waiting lists, may overcome this.

Of course, someone could argue that regional health care professionals and administrators might react to tight financial constraints by concentrating care on the most needy, the old in our example, and (relatively) neglecting the young. Then national figures would over-estimate the needs of the old relative to the young. We are not trying to disagree with Sutton and Lock, but to emphasise that there is a basic circularity in trying to measure the needs of a category of people by the observed expenditure on them. The circularity can be broken if strong assumptions are made. Taking national averages as proportional to need and readjusting the regional allocations to them assumes the original regional differences were unrelated to needs (‘random’), so that the original allocation was unbiased, if imprecise. The ‘Scottish’ approach is different and ‘better’ if original regional differences were related to needs in the manner they describe, that is if their assumptions are true.

With a regression framework we could write a model (say for acute hospital care)

$$y = a + b_1 x_1 + b_2 x_2 + \dots + b_n x_n + e, \quad (1)$$

where  $y$  is expenditure, the  $x$ ’s are needs (dummy, perhaps) variables, the  $b$ ’s are the adjustment coefficients to be determined and  $e$  is the ‘random’ deviation from ‘correct’ expenditure. But the circularity is *not* evaded by the more sophisticated representation<sup>6</sup>. However we will subsequently be considering the possibility that adding extra (‘supply’) variables to equation (1) can break circularity. First it is necessary to explain estimation. A model can involve a lot of needs variables and as there are a limited number of health board regions, more observations are required. This is achieved by relating expenditure to needs variables at electoral ward level. The statistical task is gigantic. Hospital records corresponding to a chosen base period are comprehensively examined to determine the electoral wards patients originated from, the treatments they received, the bed nights involved, etc. So a dependent variable can be constructed for each electoral ward and from small area census data and other sources, demographic, morbidity and socio-economic variables can be ascertained to give the explanatory, or needs, variable values for each ward.

Actually, the estimation of coefficients in the current UK approach is done in two stages. First, age and gender adjustment coefficients are derived from national totals as described earlier and these are used for an initial adjustment to allocations based on ‘raw’ populations. The second stage is for morbidity and socio-economic variables, but since age and gender effects are already presumed provided for, the dependent variable needs purging of these effects. So national average treatment and

<sup>6</sup> The familiar econometric condition for validity of regression is that the  $x$ ’s are independent of  $e$ . In this case that means regional deviations must not depend on needs.

bed night costs are ascertained for each age band and gender combination. These ‘standard’ costs are then applied appropriately to produce the dependent variable values. It is called ‘utilisation’ and is an expenditure type measure, but presumed free of age and gender effects. Although these needs coefficients are estimated at ward level, they are of course employed for allocation at health board regional level. This introduces complications in itself.<sup>7</sup> We will see later that a key issue is complicated by the ward level estimation.

Probably the most contentious issue in the current methodology relate to the use made of ‘supply’ variables and the easiest way to appreciate the current situation is to look at how the NHS allocation formulae evolved. Initially they were fairly simple adjusting for age, gender and standardised mortality rate under 75 years of age (SMR75) as a proxy for all other influences on health. But since the circularity difficulty was inherent in the exercises. Cooper and Lybrand (1988) employed supply variables to try to break the circularity problem. For example, for each electoral ward they devised measures of GP availability in the ward and ease of access (via a distance gravity model) to hospital beds from the ward. Then, rather than estimating (1), they estimated

$$y = a + b_1 x_1 + b_2 x_2 + \dots + b_n x_n + c_1 s_1 + c_2 s_2 + \dots + c_k s_k + e, \quad (2)$$

where the  $s$ 's are the supply variables. The needs coefficients (the  $b$ 's) are now being estimated controlling for the supply variables, that is, as if the supply variables were everywhere equal. They then interpreted the  $b$ 's as having been adjusted for previous resource imbalances between regions and appropriate for use in regional allocation formulae. Clearly, a lot is assumed here about how well the supply variables perform as measures of resources, but there are deeper issues.

Criticisms of the Cooper and Lybrand report and continued dissatisfaction with the actual operation of the allocation formulae led to the NHS commissioning another study, this time by staff of the University of York. The model described in the report by Carr-Hill et al (1994) became the basis for the current NHS allocation formulae. Now needs coefficients were estimated from a regression of the dependent variable (utilisation) on need variables *alone*, that is, an equation of the form (1). Their argument is that if a region got greater than average resources in the past (represented by supply variables), this was probably for the good reason that its needs were greater, so they did not want to control for supply in estimating current needs coefficients. So they are returning to the original assumption that the national, or overall, distribution of resources to needs is OK. Remember that the first stage age/gender adjustment implicitly involved the same assumption. At the Royal Statistical Society meeting on the topic of York methodology, various people disagreed with the procedure and underlying assumption, including Leyland, Bevan, Chisholm and Sanderson, all (2001). Subjective judgements on how well the NHS allocation system has been working could matter a lot to what assumptions are found plausible.

But whatever about the appropriate assumptions about past *regional* resource allocation, the York procedure is wrong for the following reason. The regression analyses were at ward level and within a health board region, wards will differ as regards supply variables (as is obvious from their very nature - distance to hospital beds, access to GPs etc.) depending on their location, rural or urban nature and the decisions of the board as regards siting of facilities. These differences would occur even if all regions had received exactly the same resources. Unless the needs coefficients are estimated with supply variables in the regression, they will be ‘biased’ because they contain supply effects, whose magnitude will depend on the patterns of need and supply at ward level. But these supply patterns are hardly likely to relate to historical cross-regional allocations, so it cannot be argued that these biases be retained. The reply from Smith et al (2001) to this point, when made by Conniffe (2001) was that “this issue is not yet completely resolved” and is “an interesting area for future research”.

Supply variables do play a role in the York approach, but only in choosing which set of needs variables from the very large number of candidate variables (type of housing, tenure of same, amenities in same, density of occupation, employment status, social class, car ownership, ethnic origin, welfare recipients, etc) are included in the final regression. Simplifying somewhat, the York approach puts needs variables and supply variables in a huge initial regression and proceeds to eliminate non statistically significant needs variables (but not supply variables) using the mechanical, approach of stepwise regression. The argument is that if a needs variable is found non-significant and is excluded, this is because it was taken account of in past allocation of resources and so its effect operates through the supply variables. So it should not play a role in current allocation. On the other hand, a needs variable that is significant, in spite of the inclusion of supply variables, represents something not allowed for in previous resource allocations and so should play a part in the current one. They label included and excluded variables with the emotive titles of “legitimate needs drivers” and “illegitimate

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<sup>7</sup> Some, including the ‘ecological fallacy’ and aggregation problem, are described in the NIRSA paper.

needs drivers". Having finally identified a small group of "legitimate needs drivers" they drop out the supply variables and derive the formula coefficients as already described.

The first point to be made is that, once again, the difference between regional level and ward level distributions of resources is being missed. Even if past regional resource allocations had been made fully equitably given perceived needs, there is no reason why the postulated process should operate at ward level within regions. But anyway, there are other reasons why needs variables might or might not be statistically significant. A group of needs could be individually important, but statistically highly correlated, so that when inserted simultaneously in an equation they do not register as significant. This is not because the supply variables are picking up their effects, but because they act as proxies for each other. We believe the York approach is actually highly arbitrary as regards the final set of variables.

Note that age and gender related needs are not subject to this selection procedure. The two stage allocation process ensures that age and gender are always adjusted for, although the strong assumption previously discussed underlies the adjustment. Since age and gender are such obvious variables, it is understandable that anyone would be uneasy about omitting them from an allocation formula. On the other hand their invariable inclusion seems inconsistent with the key notion of the York approach – that past allocations to regions will have (equitably) taken account of perceived past needs. Of course, age distributions will change somewhat over time, but that could also be said of any other variable.

We have simplified our account of the York variable selection procedure, to bring out the essential features and assumptions. Actually their method is technically much more complex, because they argue that supply is *endogenous* and that introduces complications<sup>8</sup>. For reasons given in the NIRSA paper, we believe this is unnecessary, serving only to obfuscate what is going on. Nor were equations (1) and (2) actually taken linear. The York approach choose a multiplicative (double-log) model. This assumes the dependent variable zero if any needs variable is zero, which is plausible for the output of a firm, where nothing can be produced without some labour, some capital, some raw materials etc. We do not think this is plausible for the consumption of health services. We could say more about appropriate models, but the topic is again technical. For now, the point is that they could have chosen differently.

#### IV THE NORTHERN IRELAND EXPERIENCE

English formulae were not applied to Northern Ireland because it was felt there were sufficient differences in circumstances to warrant separate estimation. Taking the acute hospital services case, the York methodology was applied to the nearly 500 wards in Northern Ireland, with the modelling (HHCRU, 1997) performed by staff of the Health and Health Care Research Unit (HHCRU), QUB in conjunction with the Centre for Health Economics, University of York. As in England, the objective, having gone through the stepwise selection process (from nearly 50 candidate needs variables and five supply variables) was to have a final model with good fit in the sense of high  $R^2$  and also parsimonious (which they took to mean 4 or 5) in needs variables. In the chosen HHCRU model these variables were: SMRALL – standardised mortality rate at all ages, ISTOTAL - the proportion of people on income support, FAMCRED – a similar measure of receipt of family credit, ELDER61 – the proportion of people (over 75) living alone, PCLBW – a measure of low birth weight frequency.

The coefficients were used in a second stage modification of the allocations to the four Northern Ireland Health Boards. (A first stage had already adjusted for age/gender patterns.) Health Boards, or at least two of them, did not consider the resulting allocations in the least equitable and this is how we got involved. We were each approached by (different) Health Boards seeking help in understanding the econometric model that was producing the allocations and making a case against the reduction in its former share. We found that Board officers not only did not understand the econometric methodology, but disagreed with the underlying assumptions, once they understood what these were. Implementation of formulae was contested for a considerable time and eventually accepted only after revision. In a zero-sum game situation, Boards can be expected to fight their own corners, but we learned a lot about the practical performance of the allocation procedure.

In the previous section we have outlined some major problems with the York methodology. But suppose we choose to accept it all – the final re-estimation without supply variables, the concept of legitimate and illegitimate needs drivers, the two stage least squares and the multiplicative functional form. One of us (Conniffe) was given (via the DHSS and a Health Board) the original data used by HHCRU, so it was possible to repeat their exercise a considerable number of times just making some

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<sup>8</sup> They replace regressions with two stage least squares and their stepwise procedure involves sequential identification of instrumental variables as well as selection of needs variables.

quite arbitrary and no less plausible choices about variable deletions at various stages<sup>9</sup>. Many of the resulting models were superior in terms of statistical fit to the HHCRU model, although they usually involved more variables. Although we do not agree with the primacy of parsimony, we will limit ourselves to those models that had as few variables. We will describe four of these models – three of which fit (in terms of HHCRU’s own criteria of adjusted  $R^2$ , statistical significance of coefficients and passing their specification test) as well or better than their model and have the same number of variables, while the other fits very marginally less well, but scores on parsimony through fewer variables. For practical purposes, it would not matter that several equally tenable models exist provided they lead to the same inter-regional allocations, so we show the allocations. For confidentiality, the Boards are just labelled A, B, C, D and the allocations are given in percentage terms. The HHCRU model is given first for ease of comparison.

MODEL	$R^2$ (adj.)	Allocation			
		A	B	C	D
SMRALL ISTOTAL FAMCRED ELDER61 PCLBW	.52	41.51	24.17	18.00	16.31
SMRALL ISLT65 ISGT65 ELDER61 FAMCRED	.53	41.11	24.15	18.22	16.52
SMRALL ISLT65 ISGT65 PCLBW FAMCRED	.52	41.17	24.10	18.12	16.61
SMRALL ISLT65 ISGT65 AMENIT21 FAMCRED	.53	41.54	23.85	18.08	16.52
SMRALL ISLT65 ISGT65 FAMCRED	.51	40.96	24.10	18.19	16.75

The variable AMENIT21 measures lack of some basic household amenities, while ISLT65 and ISGT65 are more refined measures of categories of income support.

Now the allocations given by the 4 new models may not look very different from the HHCRU model, which is unsurprising given that we are making only relatively minor variations on the York/HHCRU approach. A major change in line with the criticisms of the previous section would no doubt produce much greater deviations from the HHCRU allocation. But even so, every .1% is a very large sum and for at least one Board the differences in allocations shown would (they claimed) have made the difference between comfortable operation and very harsh service reductions. It is possible that expecting regression equations with substantial residual variation to allocate with great precision is expecting too much. The  $R^2$  values just shown for the acute care programme in Northern Ireland, are by no means the lowest found for any UK models. In the discussion on Smith et al (2001), Derbyshire (2001) remarked on an equation with an  $R^2$  of .13, while Goldstein (2001) also expressed concern about the magnitude of unexplained variation. Wright (2001), though commenting on education (where funding is also formula allocated), worried about consequent fluctuations in expenditures, saying “although fairness is said to be the most important thing, stability is what makes life bearable”. Barrow (2001) made a related point about the importance of stability. Chisholm (2001), for the same reason of large unexplained variation, as well as basic doubts about methodology, felt that the pursuit of equity, while laudable in principle, seriously conflicted with other objectives. In replying, Smith et al maintained their  $R^2$  values were quite good by the standards of equations estimated from large cross-sectional data sets in the social sciences. This is true, but an equation that is good enough to confirm a social scientist’s hypothesis about the effect of some factor, in spite of great variability in the data, is not necessarily good enough to allocate budgets between competing regions.

Still less does it support the idea of within region geographical equity. 50% of the original variation in utilisation is still present after controlling for variation in need. If equity existed there should be no

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<sup>9</sup> Statistical packages usually provide a range of stepwise variable selection procedures. They differ in strategies of omission of some variables, reassessment, possible readmission, choice of probability levels for exit and entry, etc. There is *no* accepted optimum procedure.



(significant) variation having controlled adequately for needs. Of course, there may not have been adequate control for needs due to faulty York/HHCRU methodology, fundamentally because of the issues described in the previous section and perhaps also because of excessive parameter parsimony by HHCRU and to some possible problems with the Northern Ireland data.<sup>10</sup> But we do not believe better modelling will reduce the unexplained variation to an insubstantial level. We do not believe there is equity between wards within regions – if by that we mean equal utilisation for equal need. And if there is inequity between ward averages within regions, even greater inequity could be expected between individuals within regions.

Before concluding this section it is worth considering the extent to which consideration of private medical services provision complicates the allocation and estimation issues and to what extent it has been taken into account in the Northern Ireland modelling. The reason is because it would certainly arise in attempting corresponding modelling for the Republic. In a context of the State meeting full expenditures, a regional Board could either provide medical services or purchase them from a private provider (or from another region). There have been moves in the UK in recent years to separate the purchase and provision of health services at regional level. This should not alter the principles of allocation of funding to regions since needs would be unaltered, although if there were efficiency differences between types of care providers there could be short term pressures. The estimation could be more complicated, however, not only because of the need to get proper data representation from public and private, but also because there could well be more supply variables if, say, access to private hospitals is considered different in kind from access to public hospitals. Private payment for services introduces still more complications. Equity in regional allocation will presumably require adjustments for the proportions of regional populations opting for private payment, but re-examination of what is meant by equity would be implied also. Would regional equity in allocation now mean equal ‘utilisation’ for equal need for those availing of the public service or should it mean equality of utilisation between public and private<sup>11</sup>? And what would be the implications for the modelling procedure? As was shown in Section III, assumptions can easily get incorporated into modelling, but be disguised by the technicalities of the procedure.

These matters received little emphasis in the UK studies. This is not another criticism, however, as these allocation models originated in the context of a comprehensive NHS. The HHCRU (1997) report (p. 33) justified a cursory treatment on the grounds that private bed availability and utilisation in Northern Ireland was very small, while the York (1994) work was conducted prior to the acceleration in the 1990’s of UK demand for private health care (analysed by such as Propper, 2000). However, some reservations about the implications for modelling have appeared, for example, Barrow (2001), Chisholm (2001) and Glennerster (2001). If allocation models are to be developed for the Republic, the topics will require far more consideration.

## V SUMMARY AND CONCLUDING REMARKS

We think that the preceding sections will have made clear that formula based regional allocation of health care finances as currently practised in the UK, is not the panacea it has sometimes been claimed to be. Although the objective is focussed on equity, this is interpreted as equity in expenditure, which, as we discussed in section II, is a far from ideal measure. Even then, as we showed in section III, the theory and methodology behind the derivation of formulae are replete with strong assumptions that lack consensus support and in some respects are, we think, quite wrong. In section IV we turned to the practical implementation of estimation and allocation as exemplified by application in Northern Ireland, where it was certainly not seen, by at least some Health Boards, as an improvement on previous approaches. We pointed out various worrying features such as inadequate stability of allocation over equivalent models and the substantial unexplained variation. Overall, there is little support for the argument that formulae lead to equitable allocation between regions, which is one, but only one, necessary condition for equitable allocation between individuals.

At this point it is only fair to say that there are those who believe the allocation formulae do deliver equity, or are at least better in that regard than the sort of alternatives described in section I. The Government commissioning agencies and those distributing funding to Health Boards (the DHSS in Northern Ireland) believe in them. But they would have little hope of having them implemented if they

<sup>10</sup> Lack of space prevents discussion here, but the NIRSA working paper gives details.

<sup>11</sup> This is not, of course, to suggest that there are not already various views on this. Nolan (1993), for example, took equity as relating not just to publicly funded health services, but to “the overall use of health services, whether publicly or privately financed or delivered”.

did not display confidence in them. The, often eminent, researchers who developed theory and methodology believe in them also, although perhaps sometimes less dogmatically than do the agencies that commissioned them. Although we earlier cited many critical comments made at the RSS discussion of Smith et al (2001), not all contributors were critical. Also, as described in section II, equity was an objective of the NHS long before the current formula methodology and indeed a key objective of European health policies whatever the allocation mechanisms employed in the various countries, and there are papers in the health and economics literature that assert or assume that equity has been more or less achieved. It would take much too long to explain why we disagree with all these papers, so a couple of examples must suffice.

Propper (2001), in an important review of UK health care policy, saw regions approaching equity. But her measure of this was the extent to which actual regional health expenditures were converging on the formulae determinations (when formulae were first introduced it was appreciated it could be operationally impossible for some Boards to adjust instantly to restrictions on expenditure and scope was provided for phasing and temporary funding). So she was defining equity as compliance with the formulae, that is, implicitly assuming they were well founded. She also reviewed the international literature on equity attainment and while quite sceptical about the quality of a lot of it, quoted the multi-country findings of Van Doorslaer et al (2000 and earlier) in support of equity attainment elsewhere. These multi-country studies used data from household surveys in the various countries to perform huge regression analyses of health expenditures on income and other socio-economic variables, and on needs variables like age, gender and self assessed health status. They concluded that in all countries lower income groups were more intensive users of the State funded health care systems, but that taking their greater needs into account, equity seemed achieved in most respects. While the first conclusion is probably unassailable, the second is very doubtful, because assessing need through regression of expenditure on a collection of needs variables runs straight into the circularity problem discussed in section III. Without 'supply' variables, or any other device to try to break circularity, the implicit assumption to begin with is that the availability of health services is equitable between households apart from purely random variation.

Of course, it may be possible to overcome some of the issues we have reviewed in this paper. The notion of commencing from regional populations must be sound and the next and key step is to find unbiased ways of adjusting for differences in the (average) health service requirements of individuals in the different regions. The major problems seem to arise through trying to use existing health expenditures to deduce the adjustments. Given suitable data, it is certainly possible to form estimates of a person's likelihood of various health problems and, presumably, consequent treatment needs<sup>12</sup>, from knowledge of their personal circumstances and characteristics. The potential value of such studies based on data on individuals is often mentioned by authors, including indeed, Smith et al (2001). Clinical, epidemiological and observational studies (perhaps even from other countries), as well as hospital record data, might all have a role. Presumably both York (1994) and HHCRU (1997) felt that data gaps precluded this approach and, of course, they believed their theoretical formulation permitted them to proceed using expenditure/utilisation and supply variables.

So if the Republic should aspire to a formula based regional allocation strategy, some hard thinking about the objectives and their likely attainment would be called for. We must not slavishly imitate the UK approach, but we can learn from their experience and especially from debates such as that following Smith et al (2001). Econometric theory and equations can disguise, even if unintentionally, assumptions and value judgements with which many might be uneasy. We need to recognise that equity is an elusive entity, hard to measure, let alone achieve. If we decide to pursue equity, via formulae, we should try to produce a database that will enable us avoid the circularity and other problems that have dogged the UK approach.

The existence of substantial regional inequity and geographic inequity within regions, must have implications for that viewpoint on equity that is heavily focussed on income. The sort of comment quoted earlier "If there are two persons in equal need of medical care, it would be considered undesirable if the richer of the two were to receive treatment", not only assumes a supreme primacy for equity, but even in that context, must hang on a supposition that regional or geographical inequity is either non-existent or else that region is a perfect proxy for income. If in a less favoured region the rich choose to pay private providers to obtain the same measures of health care as are publicly provided in a well favoured region, they are improving equity, partly by raising their own level of care and also by saving resources for the others in their less favoured region. For example, the less favoured region may have long waiting lists, leading those who can afford it to opt for private provision rather

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<sup>12</sup> Although some authors (e.g. Bevan, 2001) have argued that discretionary choices by physicians can be a considerable source of variation.

than queue, which they might not do if in a favoured region. (Perhaps some authors, holding the viewpoint summed up in the quote, may believe there is total ‘crowding out’ of public by private provision - that is, anyone getting private care is depriving someone else of public care.)

Perhaps more importantly, the effects on equity of policies to promote efficiency can be similarly debated. Propper (2001) reviewed the literature assessing some recent innovations in the UK health service. At regional level these included permitting Boards to purchase health service provision from other regions or from private providers and conversely to allow a region’s public providers to bid to service other regions. Within regions, some GP practices were grouped into GP Fundholders – who not only provided GP services, but purchased hospital treatment etc. as they deemed fit, so that they had considerable discretion over the spending of the total funds allocated to them and could retain funds in their practices. Propper reported that competition and market type forces do seem to improve efficiency in the sense of reducing costs and (in the case of GPF’s) reducing hospital referrals<sup>13</sup>. Now, for example, had there been equity in geographic areas before formation of GPF’s, it could be argued that the reduced hospital utilisations on GPF patients compared to normal GP practice patients was increasing inequity (at least as measured by expenditure). But if areas were inequitable to begin with, it could be argued that the incentive for doctors to form GPF’s and their subsequent reductions in hospital referrals would be greatest in resource favoured areas. This would reduce, not increase, inequity. Of course, quality of service is not being taken into account here.

Although these policy related themes could be developed much further, we have probably taken them as far as we should. We are econometricians, not health economists, and our involvement with UK/ NI healthcare funding disputes arose from requests for help on technical issues. But health services are important and fascinating topics and it is difficult not to stray beyond the technical issues.

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<sup>13</sup> Complementing US findings which mostly support the effectiveness of markets (for example, for example, Manning et al, 1987, employing the famous Rand Health Experiment).

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