
CHAPTER 9: Summary Results at Board Level

The results of the research at Board level are outlined in this chapter. The results are presented for Theoretical Service Configurations and Current Service Configurations. Only the current hospitals have been included in this last category. Although the modelling of the emergency ambulance service has been based closely on the current configuration of services it has been included with the theoretical configurations of community services. This choice has been made for two reasons (i) the work has been based on a strategic plan for the service that has not yet been implemented and (ii) community services have been combined to give the overall results presented here.

Results have been derived from a suite of models – access models, service models, scale cost models and cross-boundary flow models – and all these models offer the user choices of input parameters. Hence, a very wide range of different results is available dependent on the choices made. In presenting the results in the individual chapters illustrative scenarios have been used reflecting the judgements of the researchers but in this chapter results are presented for a number of scenarios.

In selecting these scenarios the aim has been to reflect the range of possibilities rather than attempt a comprehensive coverage, which would be likely to overwhelm the reader.

The scenarios chosen for hospitals are:

- ◆ Scenario A: Critical Care Included, Excess Day Costs Adjusted, At Full Cost
- ◆ Scenario B: As A, but at NHS Costs per Excess Day
- ◆ Scenario C: As A, but no adjustment for Excess Days
- ◆ Scenario D: As C, but Critical Care Excluded

For community services, the critical input is the degree of unpredictable variability in daily workload. Three scenarios have been chosen based on the overall average proportional variability as follows:

- ◆ Scenario A: 10% greater variability than that suggested by the survey
- ◆ Scenario B: Variability as suggested by the Survey
- ◆ Scenario C: 10% less variability than that suggested by the survey

The results for community services include the 'extrapolated' services that have not been modelled in detail.

For both hospitals and community services results are presented for configurations resulting from SMOSS default journey times and congestion-weighted journey times.

Each Table shows the total estimated scale budget for each Board and its percentage share of the total budget.

Theoretical Scenarios

Hospitals

Scenario A: SMOSS

Service Type	Eastern	Northern	Southern	Western
Hospitals	£5,609,938	£5,004,985	£3,658,991	£4,377,450
Shares	30.08%	26.83%	19.62%	23.47%
Total	£18,651,364			

Scenario A: Congestion

Service Type	Eastern	Northern	Southern	Western
Hospitals	£5,967,521	£4,320,716	£4,065,358	£4,842,937
Shares	31.09%	22.51%	21.18%	25.23%
Total	£19,196,807			

Scenario B: SMOSS

Service Type	Eastern	Northern	Southern	Western
Hospitals	£5,762,414	£5,117,107	£3,740,160	£4,469,923
Shares	30.19%	26.81%	19.59%	23.42%
Total	£19,089,604			

Scenario B: Congestion

Service Type	Eastern	Northern	Southern	Western
Hospitals	£6,195,823	£4,508,536	£4,239,497	£5,059,539
Shares	30.97%	22.54%	21.19%	25.29%
Total	£20,003,395			

Scenario C: SMOSS

Service Type	Eastern	Northern	Southern	Western
Hospitals	£5,866,243	£5,206,741	£3,803,076	£4,551,104
Shares	30.2%	26.8%	19.58%	23.43%
Total	£19,427,163			

Scenario C: Congestion

Service Type	Eastern	Northern	Southern	Western
Hospitals	£6,129,341	£4,472,464	£4,203,040	£5,029,614
Shares	30.9%	22.55%	21.19%	25.36%

Total	£20,171,441
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Scenario D: SMOSS

Service Type	Eastern	Northern	Southern	Western
Hospitals	£4,991,366	£4,497,027	£3,159,895	£4,122,890
Shares	29.76%	26.81%	18.84%	24.58%
Total	£16,771,177			

Scenario D: Congestion

Service Type	Eastern	Northern	Southern	Western
Hospitals	£5,638,546	£3,981,449	£3,786,432	£4,534,790
Shares	31.43%	22.19%	21.1%	25.28%
Total	£17,941,217			

Across the set of scenarios:

- ◆ The Eastern Board varies from 29.76% to 31.43% share of the Scale budget
- ◆ The Northern Board varies from 22.19% to 26.83% share of the Scale Budget
- ◆ The Southern Board varies from 18.84% to 21.19% share of the Scale Budget
- ◆ The Western Board varies from 23.42% to 25.36% share of the Scale Budget

The budget quantum ranges from £16.77 to £20.17 million. Scenario B has been used in the detailed discussions in previous chapters and there are strong reasons for accepting this scenario as the most appropriate basis for costing. There is little obvious reason why critical care costs should be excluded (as in Scenario D) and there are well-argued reasons for making adjustments for excess days above those 'expected' since this 'excess' would be an indication of avoidable costs. The data from NHS sources strongly supports the costing of excess days at a level below the full costs per bed day.

In relation to choosing between the two travel time configurations it is difficult to make any objective judgements other than to say that the use of the so-called SMOSS journey times is more consistent with other analyses of 'access' previously carried out within N Ireland. Alternatively the two configurations can be regarded as samples from a set of configurations that meet the access requirements and that the use of the average values of the two scenarios might be sensible. This would give the result shown in Table 9.1 below.

Table 9.1: A 'Best' Estimate of the Scale Costs for Theoretical Hospital Configurations

Service Type	Eastern	Northern	Southern	Western
Hospitals	£5,979,119	£4,812,822	£3,989,829	£4,764,731
Shares	30.59%	24.62%	20.41%	24.38%
Total	£19,546,500			

Community Services

Scenario A: SMOSS

Service Type	Eastern	Northern	Southern	Western
Community	£4,253,395	£3,738,189	£2,549,384	£2,614,705
Shares	32.33%	28.42%	19.38%	19.88%
Total	£13,155,673			

Scenario A: Congestion

Service Type	Eastern	Northern	Southern	Western
Community	£4,486,448	£3,966,096	£2,663,407	£2,703,831
Shares	32.46%	28.7%	19.27%	19.56%
Total	£13,819,782			

Scenario B: SMOSS

Service Type	Eastern	Northern	Southern	Western
Community	£4,468,001	£3,926,919	£2,674,682	£2,745,010
Shares	32.34%	28.43%	19.36%	19.87%
Total	£13,814,613			

Scenario B: Congestion

Service Type	Eastern	Northern	Southern	Western
Community	£4,708,510	£4,161,013	£2,792,072	£2,835,374
Shares	32.48%	28.7%	19.26%	19.56%
Total	£14,496,969			

Scenario C: SMOSS

Service Type	Eastern	Northern	Southern	Western
Community	£4,672,119	£4,106,427	£2,793,857	£2,868,947
Shares	32.35%	28.44%	19.35%	19.87%
Total	£14,441,351			

Scenario C: Congestion

Service Type	Eastern	Northern	Southern	Western
Community	£4,919,721	£4,346,405	£2,914,450	£2,960,488
Shares	32.49%	28.71%	19.25%	19.55%
Total	£15,141,064			

There are no clear reasons for choosing scenarios that are different from the estimated variability inputs that emerged from the survey. Although this survey was of a very limited nature, it represents the best available information and, hence, Scenario B is to be preferred.

As for hospitals there are no obvious arguments for choosing between the two journey time assumptions and it is sensible to regard both configurations as samples from a notional set of locations capable of meeting the access standards required. Using the average values (for Scenario B) gives the result shown in Table 9.2.

Table 2: A 'Best' Estimate of the Scale Costs for Theoretical Community Configurations

Service Type	Eastern	Northern	Southern	Western
Community	£4,588,256	£4,043,966	£2,733,377	£2,790,192
Shares	32.41%	28.57%	19.31%	19.71%
Total	£14,155,791			

Current Configurations

The scale costing of the current configuration of the acute hospital service in Northern Ireland has been described in an earlier chapter. The final result is replicated in Table 9.3.

Table 9.3: Scale Cost Estimates for the Current Hospital Service

Service Type	Eastern	Northern	Southern	Western
Hospitals	£15,913,273	£10,209,306	£4,786,285	£4,779,145
Shares	44.59%	28.61%	13.41%	13.39%
Total	£35,688,009			

A comparison between Table 9.1 and Table 9.3 shows very clearly that the theoretical configurations together with the imposition of access and volume targets changes the whole pattern of hospital scale costs in the Province. The overwhelming reason for this is the large current 'diseconomies of scale' associated with one very large hospital in Belfast. This research has not been able to establish whether or not this is unavoidable.

It would be simplistic to argue that the hospital activity in Belfast should be more evenly spread between the current hospitals in order to reduce scale costs. The reasons for higher than expected costs are likely to be much more complex than this including such questions as:

- ◆ Do reference costs fail to capture adequately the extra case complexity found in a large teaching hospital?
- ◆ Do teaching and research activities, although not directly included in reference costing, result in unavoidable indirect cost effects?
- ◆ Can a grouping of hospitals (as is the case for the large hospital in Belfast) be appropriately regarded as a single hospital for scale costing purposes?

These and other questions remain to be addressed to obtain a fuller understanding of the distinct differences between scale costs that result from inability to exploit economies of scale and scale costs that result from diseconomies of scale.

Conclusions

This research has broken new ground both in developing and applying an appropriate methodology to cast light on scale in health and care delivery.

A modelling approach has been applied to theoretical configurations of service with the main aim of identifying scale effects that might inevitably result from applying consistent access requirements in areas with different geodemographic characteristics in Northern Ireland. In general the findings provide support (both theoretical and empirical) for the existence of such scale-cost effects.

On the hospital side of the work, the research has identified scale effects but of a complex nature. It does appear that small hospitals might well face unavoidable difficulties in achieving the cost efficiency levels that they would wish to achieve but, on the other hand, large hospitals might also face extra costs that are not adequately reflected by reference costing methods.

On the community side of the work the research has delivered findings that reflect the working through of plausible assumptions concerning staffing/manning level effects in teams of differing sizes under conditions of demand variability.

The research has reached the point where scale cost budgets can be considered and via top-slicing methods applied to funding mechanisms.

Recommended further research.

A number of issues arise where further research could usefully be undertaken to provide additional assurance and face validity to the results obtained at this time. These have been raised at appropriate points throughout the text.

There is a clear need to undertake more empirical work in relation to scale costs that might be experienced in facilities with differing workloads and in teams facing different levels of daily demand in the community services area. The work carried out to date has largely been based on theoretical analyses with only limited supporting data from projects carried out in England. Also, in this community area, the survey carried out of the levels of variability and unpredictability of daily demands on services (a key input to the models developed) was of limited scope and of small sample size.

Although the supporting data for the hospital analyses has been much more comprehensive than is the case for community services, there is considerable uncertainty concerning the actual relevant costs faced by some of the hospital groups – particularly the Royal Group of hospitals.

One of the major issues is the position of the Royal Group in the analysis – a position at present that has a defining influence on the observed functional form of the relationship between hospital size and unavoidable scale-related costs. It is not clear whether this hospital is less efficient than it 'ought' to be or whether the estimates of expected cost (based on reference costs) are, in some way, failing to adequately reflect the product costs.

There are a number of possible reasons that need to be explored including whether the case complexity within the specialty-specific HRG groups is systematically greater for this hospital than for other hospitals in Northern Ireland, whether teaching and research costs have spilt over into the costing, whether there are unavoidable extra overheads associated with the management of a 'group' of hospitals and so on.

One area of further work could usefully focus on a specific examination of the direct costs and indirect cost consequences of a hospital having a major teaching role in the health economy. Although adjustment has been made in this study using teaching related receipts identifiable in Trust accounts, a more thorough examination of this complex issue may lead to an improved ability to net off such costs and provide a better measure of patient-related costs in such settings. Such work may also lead to a separate compensation mechanism to support such activity on a more equitable basis than at present.

The research carried out to date has been predicated on the desire to derive scale budgets for the four Boards in Northern Ireland. It is clear that this division of the Province does not reflect the way in which many of the services are actually provided. The most obvious example is the way that the Belfast conurbation straddles the boundary between the Eastern Board and the Northern Board, giving rise to substantial (and inevitable) cross-boundary flows. This means that serious attention needs to be given to the methods of apportionment of scale costs between the administrative Authorities. Only a simplistic approximate approach has been employed in the work reported here and much more research on this aspect is needed.

APPENDIX 1

EoS Costs: Developing Better Services

Background

'Developing Better Services' (DBS) refers to recent document that outlines a way forward for the provision of hospital services in the Province. In part it specifies a configuration of hospital provision including the locations of hospitals and the types of service they would provide. This configuration is neither a 'theoretical' scenario, in the terms used in the research, nor does it directly reflect the current hospitals service. It is, in essence, a strategic plan for the provision of the Northern Ireland hospital service. However, the Steering Group for the project had requested that this plan be evaluated in a similar manner to the approach taken for the theoretical configurations.

The DBS Configuration differs from the theoretical ones in a number of important respects. Firstly the locations of the hospitals are pre-determined and not derived from any analysis of the access requirements specified in this project. Secondly, although there are similarities between the hierarchical hospital 'levels' used in the theoretical modelling, these levels do not fit precisely with the planned intentions lying behind the DBS plan. Finally, and most importantly, there is no information in the plan concerning the expected flows from districts to each of the hospitals.

Such flows might well be closer to the flows found in the current hospital service than they are to flows generated by the 'nearest appropriate hospital' routines used for the theoretical configurations. No flow modelling research as such has been attempted in this project but some preliminary analysis has been done in order to provide some guidance on both the possible levels of activity at each 'planned' hospital and the flows from districts to these hospitals.

The DBS Configuration – Theoretical Analysis

Activity Levels from the Access Model

Table 1 shows the activity levels predicted by the Access Model for the hospital locations proposed.

The locations are divided into the three levels proposed by the Steering Group. The location names are those associated with the 'population centres' in the access model. However within these centres the geographical coordinates of actual hospitals have been used. In Belfast there are three hospital sites but the activity has been grouped in this Table.

For comparative purposes the current activity at the locations is also shown.

Interpreting the data shown in Table 1 is far from straightforward. Some of the differences between the DBS access-model predictions and the current activity levels will be the result of the application of the 'nearest appropriate hospital' rule within the access model. However some differences will be due to changes in the nature of the work 'expected' at the hospitals. Thus, for example, it would appear that the high volume at Portadown compared with the current hospital might well be mainly a nearest hospital effect but the reduction in volume at Omagh under DBS is more likely to be the result of the downgrading to level 1 status of the hospital at this location.

It should be noted that the Level 1 hospital at Dungannon in the DBS configuration does 'exist' under the current arrangements but has been combined with the hospital at Craigavon.

Table 1: Predicted Activity and Actual for Current Service

DBS and Current Configurations		
Level 3	DBS	Current
Belfast	115816	134859
Dundonald	46251	48243
Antrim	41825	30944
Portadown	61473	35689
Londonderry	47431	37290
Level 2		
Coleraine	15376	14431
Newry	14847	15829
Enniskillen	11698	12682
Level 1		
Lisburn	4286	10596
Downpatrick	2949	6900
Newtownabbey	6444	8152
Magherafelt	2660	10478
Omagh	2919	10613
Dungannon	2730	
	376706	376706

Portadown = Craigavon

It is not likely that the predicted activity pattern for the DBS hospitals is realistic. Whatever the complex determinants of current flow happen to be, they are likely to be present, at least in part, under the planned arrangements.

Flow Patterns from the Access Model

Table 2 provides a summary of the overall flow patterns from Board areas to hospital locations estimated using the access modelling. The flow patterns to current hospitals are also shown for comparative purposes.

Table 2: Flow Patterns from Boards to Hospitals

Flows - DBS (Theoretical) versus Current								
Level 3	Eastern		Northern		Southern		Western	
	DBS(T)	Current	DBS(T)	Current	DBS(T)	Current	DBS(T)	Current
Belfast	82.20%	69.02%	16.74%	18.60%	1.07%	9.24%	0.00%	3.14%
Dundonald	100.00%	90.56%	0.00%	4.28%	0.00%	3.81%	0.00%	1.35%
Antrim	0.00%	0.98%	100.00%	98.71%	0.00%	0.19%	0.00%	0.13%
Portadown	3.50%	1.70%	7.34%	2.84%	82.87%	94.76%	6.29%	0.70%
Londonderry	0.00%	0.22%	9.59%	5.25%	0.00%	0.49%	90.41%	94.04%
Level 2								
Coleraine	0.00%	1.00%	77.83%	96.02%	0.00%	0.36%	22.17%	2.62%
Newry	10.34%	0.85%	0.00%	0.11%	89.66%	98.97%	0.00%	0.07%
Enniskillen	0.00%	0.46%	0.00%	0.35%	4.19%	4.19%	95.81%	95.00%
Level 1								
Lisburn	83.87%	83.63%	0.00%	2.03%	16.13%	14.20%	0.00%	0.13%
Downpatrick	94.63%	94.51%	0.00%	0.15%	5.37%	5.26%	0.00%	0.08%
Newtownabbey	6.88%	5.04%	93.12%	94.88%	0.00%	0.04%	0.00%	0.05%
Magherafelt	0.00%	0.17%	97.20%	98.26%	0.00%	0.70%	2.80%	0.87%
Omagh	0.00%	0.17%	0.00%	0.37%	5.49%	8.02%	94.51%	91.44%
Dungannon	0.00%		19.75%		79.46%		0.79%	

Portadown = Craigavon

As for Table 1, the data in Table 2 reveal significant differences between theory and practice that no doubt have complex explanations – the flows into Belfast are more wide ranging in the current situation than ‘in theory’, whereas flows into some hospitals (Craigavon, Londonderry) are less wide ranging, and so on.

Access Performance

The access model estimates that the DBS scenario is significantly less successful in meeting the agreed (for this study) access targets than the previous theoretical scenarios.

At level 1 this configuration fails to meet the criterion of 95% within 30 minutes in seven Districts under SMOSS journey-time assumptions and twelve Districts under Congestion assumptions.

At both levels 2 and 3, where the previous theoretical scenarios succeeded in all Districts, the DBS pattern fails in many Districts.

Thus, in the strict terms of this research, the DBS pattern is not really a member of the possible set of acceptable configurations from an access viewpoint.

The DBS Configuration – Scale Costing

The Approach Taken

It is clear from the analysis described above that the DBS configuration cannot sensibly be regarded as an access-driven theoretical scenario – access targets are not meetable with this configuration, flow patterns to hospitals are unlikely to change from current patterns to the degree predicted by the access modelling and volumes of activity are unlikely to have been accurately forecast. The configuration is better considered as a modification of the current arrangements.

The approach taken has been to examine the likely modifications to current arrangements and provide preliminary estimates of scale cost effects.

Possible Relevant Changes

The main changes that have scale-costing implications appear to be:

- ◆ Reducing the scope (and size) of some hospitals to become local community hospitals
- ◆ Increasing the importance (and size) of certain key 'Area' hospitals
- ◆ As a possible corollary to the previous change a reduced geographical 'coverage' of the Belfast hospitals for some current services

Associated with the above changes, the scale costing questions become:

- (i) What are the scale costs associated with small community hospitals?
- (ii) In relation to possible diseconomies of scale associated with large hospitals, are such likely to be experienced by some 'Area' hospitals?
- (iii) If a degree of de-centralisation from Belfast can be achieved, are diseconomies of scale likely to be reduced?

Only the most tentative steps towards answering these questions can be taken at this stage.

Analysis and Findings

Activity Volumes

The simplifying assumption has been made that at level 1 the hospital system operates in exactly the same way as in the modelling of the theoretical configurations. The 30-minute access time has been accepted and demand flows to the 'nearest' available hospital. This assumption is reasonably well supported by both 'policy' and the comparative analysis

presented above and allows scale costing to be applied to the six community hospitals.

At levels 2 and 3 a modification has been introduced to the methodology previously applied. The current patterns of flow have been examined in order to assess unavoidable flows into Belfast. Currently around 8% of the work from the relatively 'remote' Western Board is carried out in Belfast. If this is assumed to be a minimum irreducible proportion it can be 'top-sliced' from all Boards and the remainder allocated using the previously applied methodology.

Using this approach a number of locations attract more than the optimum levels of workload suggested by the scale costing regression analyses presented previously – Belfast, Dundonald and Portadown. In Belfast three hospital sites could 'share' this work but this option is not available at the other locations.

In order to share the workload in Belfast the assumption has been made that all the top-sliced demand is shared between City and the Royal (a 30% to 70% split has been used) and that Mater accepts only workload at levels 1 and 2.

Table 3 shows the activity volumes predicted for each hospital site.

Table 3 Estimated Activity Volumes at DBS Hospitals

DBS Activity Predictions	
Hospital	Activity
Erne	10449
Tyrone County	2597
Altnagelvin	45623
Causeway	13762
Mid Ulster	2860
Antrim	42934
Whiteabbey	6102
Royal	58576
City	46521
Mater	15474
Downe	2665
Lagan Valley	5012
Ulster	50206
Craigavon	52000
Daisy Hill	19350
South Tyrone	2577
Total	376706

Scale Costs at Board Level

As in the costing of the theoretical configurations scale costs are assumed not to increase at activity volumes below 5000 combined inpatient and day case episodes and the Scenario B assumptions have been used in the costing. Flows from Districts are assumed to be proportional to acute-weighted populations for the top-sliced flows into Belfast. No maximum activity volumes have been imposed. The overall results are shown in Table 4.

Table 4: Scale Costs for DBS Configuration – Scenario B Assumptions

Service Type	Eastern	Northern	Southern	Western
Hospitals	£8,968,974	£5,744,728	£4,058,778	£3,981,696
Shares	39.42%	25.25%	17.84%	17.5%
Total	£22,754,176			

Conclusions

A preliminary effort has been made to predict scale costs for the DBS configuration of hospitals. The main difficulty is associated with making realistic predictions of flows and activity levels associated with the hospitals in this configuration. Using a combination of information about current flows and predictions made using the access modelling, an attempt has been made to provide at least some guidelines on these quantities.

APPENDIX 2: Population Settlement Characteristics and Costs associated with Scale

Introduction

One of the central tenets in this research has been the hypothesis that opportunities to exploit scale economies might well depend on the geodemographic properties of the areas being served – population sizes, settlement patterns, rurality and so on. In more densely populated urban areas the populations to be served are likely to be relatively nearer to service delivery points than in more sparsely populated areas. Thus, for any given access requirements, more sparsely populated areas are likely to need more service delivery points per head of the population and operate at lower activity volumes.

The overall results obtained from the EoS modelling can be examined to assess the extent to which these are consistent or otherwise with this hypothesis.

The access-driven models for each service have generated scale costs by estimating the catchment areas for each service centre and from these, via appropriate indicators of demand rates, the activity volumes likely to be generated on the 'theoretical' centres of service delivery. However these catchment areas differ from one service to another and, furthermore are not (within the models) coterminous with current administrative areas – Local Government Districts, Local Social and Health Care Groups, Trusts or Health Boards. Hence it is not straightforward to answer the question whether, in overall terms, administrative areas having different levels of rurality are likely to show systematically different scale economies. The analysis presented in this chapter is an initial attempt to pursue this question.

In applying the scale costing models to service delivery centres the derived costs have been aggregated, within the models, across all the services at the Local Government District level, which is, therefore, the 'smallest' administrative unit that could be used to examine the effects on scale costs.

Population and area data for Districts are directly available from the 2001 Census information.

District Scale Costs

For all services that have been modelled two driving time scenarios have been used – so-called SMOSS default driving times and congestion-weighted times. The SMOSS times are based on expected travel speeds

under off-peak conditions on roads of different types. The congestion approach has modified these times using an algorithm that estimates the total population density along routes such that times are increased as population density increases. The two approaches yield different estimates of the EoS costs

Table 1 shows the combined relative scale costs per head of total population, attributed to demands made on service providers by district residents, for all services modelled including the extrapolated values for community services that have not been modelled in detail. These results are based on the particular set of input parameters that have been used in the analyses described in the earlier chapters.

The index shown is, by definition, equal to unity for Northern Ireland as a whole. Adding together for each District the annual EoS contribution for each service and dividing this total by the district population gives a cost per head. This cost is then expressed as a ratio to the Northern Ireland value.

The contribution of hospital service costs has been based on the theoretical configurations only.

Table 1: Estimated Relative Scale Cost per Head Shares for Districts

District Shares per Head	Population	SMOSS	Congestion
Antrim	48,366	0.81	0.49
Ards	73,244	1.16	0.65
Armagh	54,263	1.08	1.23
Ballymena	58,610	0.54	0.52
Ballymoney	26,894	1.43	1.42
Banbridge	41,392	0.78	1.10
Belfast	277,391	0.47	0.49
Carrickfergus	37,659	1.02	1.11
Castlereagh	66,488	0.67	0.59
Coleraine	56,315	1.40	1.39
Cookstown	32,581	1.65	1.60
Craigavon	80,671	1.04	0.81
Londonderry	105,066	0.44	0.46
Down	63,828	2.04	2.00
Dungannon	47,735	1.90	1.47
Fermanagh	57,527	1.81	1.83
Larne	30,832	1.08	1.18
Limavady	32,422	1.52	1.50
Lisburn	108,694	0.53	0.97
Magherafelt	39,780	1.11	1.08
Moyle	15,933	1.82	1.78
Newry	87,058	0.72	1.10
Newtownabbey	79,995	0.95	0.64
North Down	76,323	1.02	0.99
Omagh	47,952	2.20	2.40
Strabane	38,248	1.68	1.78
	1,685,267		

The indicator of shares is different for the two journey time scenarios but the correlation between them is high – above 90%.

It can be seen clearly that some of the more rural Districts show relatively high cost shares – including Moyle, Strabane, Omagh and Fermanagh and some of the more densely populated districts relatively lower shares – including Belfast and Londonderry.

However, it is important to recognise that many services provided to any given district’s residents involve significant cross-district-boundary flows and the districts taken individually might well be inadequate representations of ‘natural’ service operating areas. A more satisfactory test of the hypothesis requires that districts should be combined into reasonably coherent service areas. In this context a balance needs to be struck – the larger in area size the ‘regions’ become the less cross-boundary effects will bias the findings but the fewer the data points for analysis.

Scale Costs for Service Regions

Identifying Regions

Although there is no single ‘best’ answer to this question, nevertheless reasonably sensible judgements can be made. For example, the southwest comprising Fermanagh, Strabane and Omagh is likely to be a reasonably coherent ‘region’ in the sense implied here and, similarly the Greater Belfast area – Belfast, Castlereagh, Carrickfergus, Lisburn and Newtownabbey –could be regarded as reasonably self contained.

Following this judgemental process eight Regions have been identified, as shown in Table 2.

In no sense do these ‘Regions’ represent anything other than the researchers own judgements and others might prefer to combine the districts in other ways.

Table 2: A Possible Set of ‘Regions’

<i>Regions</i>	Name	Districts
A	North East	Antrim, Ballymena, Ballymoney, Larne, Moyle
B	Greater Belfast	Belfast, Carrickfergus, Castlereagh, Lisburn, Newtownabbey
C	Strangford	Ards, Down, North Down
D	Central South	Armagh, Dungannon
E	South East	Craigavon, Banbridge, Newry
F	Central North	Coleraine, Cookstown, Magherafelt
G	North West	Derry, Limavady
H	South West	Omagh, Strabane, Fermanagh

A MapPoint picture of these Regions is shown in Figure 1.

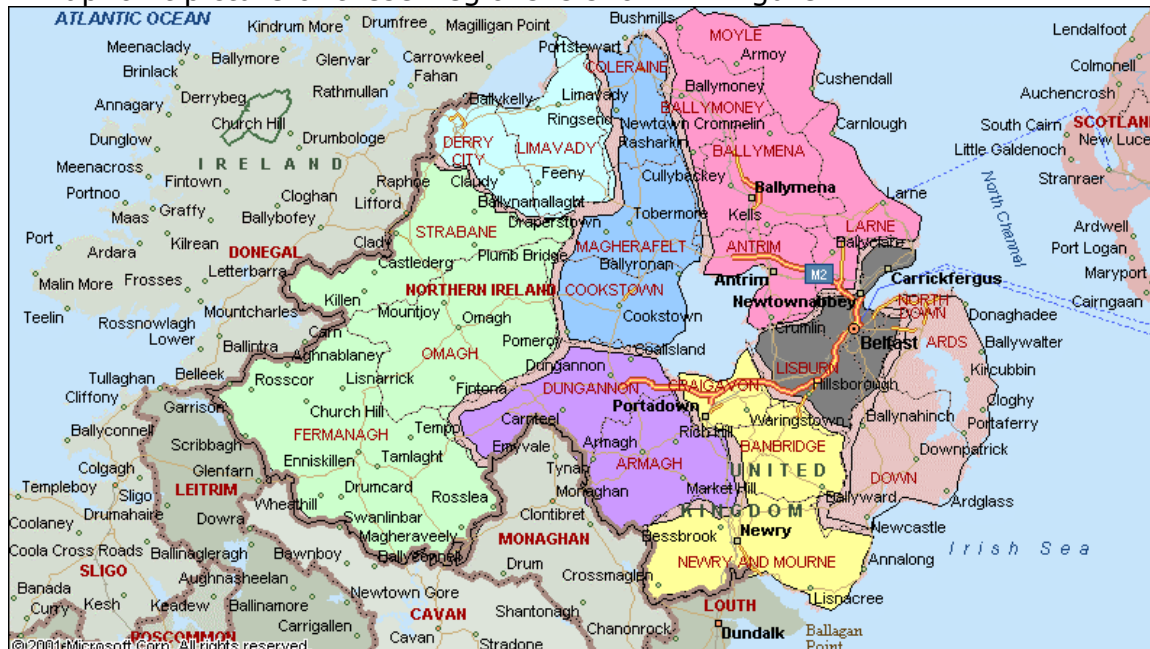


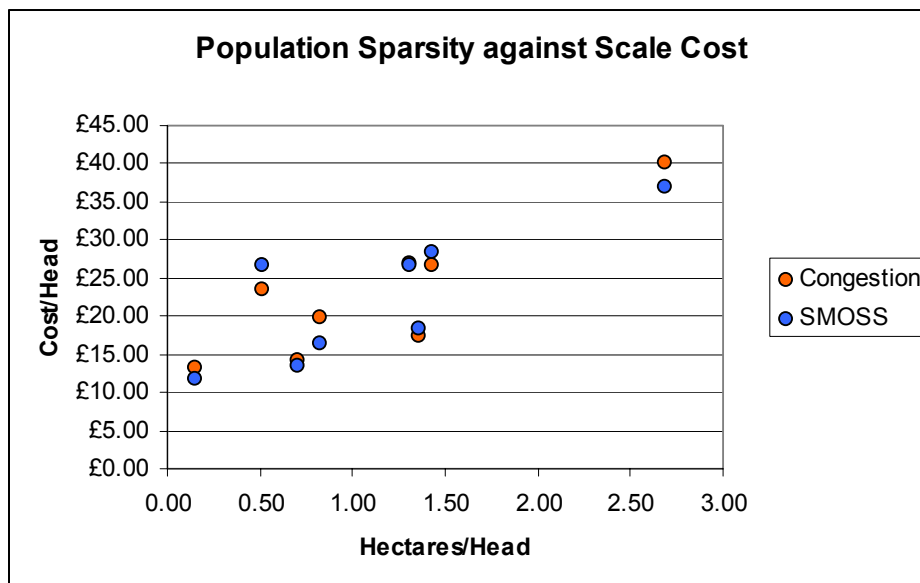
Figure 1: A Map of Eight Possible 'Regions'

Analysis of EoS Costs within Regions

Estimates of the geographical 'land' areas of each Region can easily be obtained from the areas of the constituent districts and similarly total population can be obtained from the district census data. Total EoS Cost per Head is obtained for each Region by summing the total EoS costs derived in this project for each service in each constituent district and dividing this result by the Region's population. Using a simplistic indicator of population distribution – the geographical area (hectares) divided by population – gives the chart shown in Figure 2.

Figure 2 shows the results of this analysis for the SMOSS default and Congestion-weighted configurations respectively.

Figure 2: Population Sparsity against Scale Cost per Head - Regions

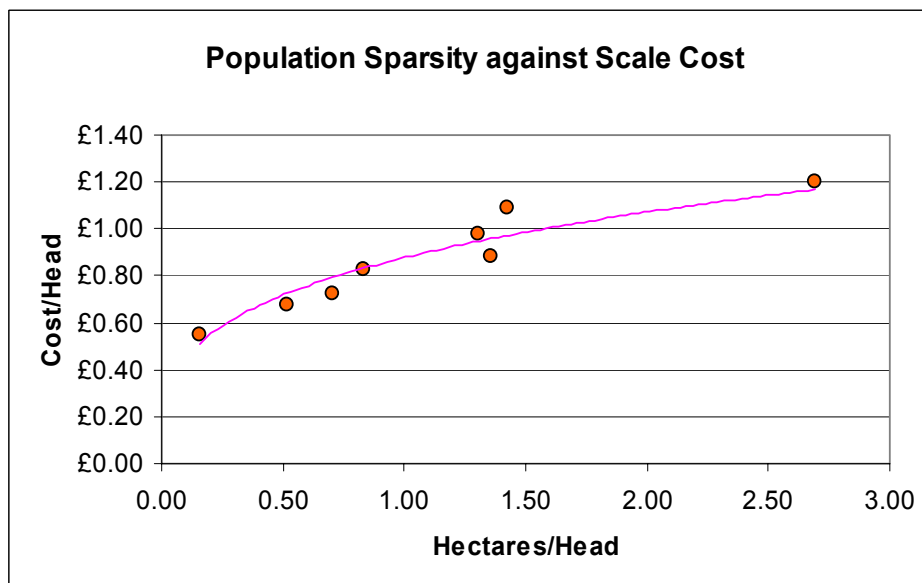


The data in Figure 2 suggests a possible relationship between sparsity and scale costs. However there is clearly a considerable amount of variability.

The results presented above have included all services that have been considered in this project. However this is not a necessary condition in that different Regions might well be appropriate for different service combinations. Thus, for example, a hospitals service might need to be considered in terms of larger, less numerous, Regions whereas a service such as home care could well be considered at lower levels of aggregation.

As an example of a closer relationship with hectares per head for the particular Regions selected, Figure 3 shows the result for day centres using the congestion-weighted configuration.

Figure 3: Day Centres with Congestion-Weighted Configurations



In the case of the example shown in Figure 3 it appears that the chosen indicator – hectares per head – is a useful one for predictive purposes. However, for other services, other indicators might be more successful. Thus, for example, recent research on geodemographic indicators in Wales has shown that indicators based on the degree of population concentration (proportions of enumeration districts with populations above threshold values) within defined areas is related to costliness for a number of Local Authority services.

Further work is needed to examine alternative indicators. Improved indicators could include measures of population concentration (as in the Welsh study) but also incorporate indicators of the extent of population clustering (e.g., the numbers of densely population towns) and indicators linked to area 'shape' – such as the ratios of perimeter distances to area sizes.

The main aim would be the identification of good predictors of relative costliness for costs such as scale costs but also travel-related costs associated with the spatial distribution of services within Regions.

Conclusion

The work presented in this chapter is at a preliminary stage and has not reached any final conclusions concerning the relationships between (unavoidable) scale costs and population distribution properties – in Northern Ireland or elsewhere.

The analysis presented does, however, open up a number of new possibilities relevant to improving funding mechanisms, especially in relation to scale and rurality costs. In particular, it gives rise to opportunities for what might be called 'meta-modelling' such that cost effects that result from settlement patterns and service dispersion might be estimated quickly and efficiently using readily available data on the services and the geodemographic properties of the areas served. This search for efficiency is important because of the needs in funding situations for parameters to be readily updateable on an annual basis in response to changes in populations, changes in the way services are organised and changes in administrative structures.

APPENDIX 3: **Acknowledgements**

The researchers would like to thank those who contributed valuable advice and assistance throughout the research.

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