How the NRAC Formula works in practice

NHS Board target shares are calculated by adjusting the population of each NHS Board area for three factors that are known to influence healthcare utilisation:

1. the age-sex profile of the population (age-sex cost weights),
2. the additional needs of the population due to morbidity and life circumstances (MLC weights), and
3. the unavoidable excess costs of supplying services in different geographical areas (excess cost weights).

The four main components within the formula (population, age-sex costs weights, MLC weights and excess cost weights) are generated for datazones (which are key small-area statistical geographies in Scotland introduced by the Scottish Government for use in Scottish Neighbourhood Statistics), intermediate datazone (IDZ) and GP practice level as appropriate.

1. Population

Population is the primary component of the formula.

1.1 Hospital and Community Health Services (HCHS)

The population figures used within the previous formula runs are re-based General Register Office for Scotland (GROS) population projections. Re-based population projections are a simple adjustment made to the GROS population projections, by updating them using the latest mid-year population estimates (MYEs) that have been published since the Health Board level projections were published. For example, to re-base the 2004-based projection of 2008 using 2006 MYE the calculation is:


This calculation takes account of any over or under-estimation of the projection in the years to 2006, and this adjustment is applied to the projection of 2008.

For 2014/15 NRAC formula run the 2010-based projections of 2014 are not used in the 2014/15 NRAC formula run for the target shares. Instead, the 2012 Mid Year Population Estimates (for health board, council areas and data zones by single year of age and sex) are used, as this is the most up-to-date population data available which incorporates the 2011 Census information.

1.2. GP Prescribing

The population figures used are based on the Community Health Index (CHI) population. The CHI population count is deflated at GP Practice level to match the re-based Scotland population projection used for HCHS. (for more information see Technical Addendum B - Population - 15 August 2007 document on the NHS Scotland Resource Allocation Committee “NRAC” web site).

For 2014/15 NRAC GP Prescribing part of the formula the CHI population is deflated to match the 2012 Mid Year Population Estimates.

2. Age-sex

The formula adjusts for the age-sex profile of the population to take account of the effect of age differences on the cost of delivering different NHS services. On the whole, older people tend to consume greater resources and the costs can rise steeply with age.

Calculation of the age-sex cost weight starts with the age-sex breakdown for the population of each datazone. This gives a population structure for each area to which the national average cost per head of population (by age group) can be applied. These costs are specific to each of the care programmes (acute, care of the elderly, mental health & learning difficulties, maternity and community) analysed in the formula. The total “cost” associated with each care group within each age-sex band is obtained by multiplying the number of individuals by the national average cost per head appropriate for that age-sex group.

These “costs” are then totalled across all age-sex bands for each care programme. This total is then divided by the population of the datazone to get a datazone cost per head for the care
programme across all ages and sexes. This is then compared to the Scottish average cost per head for the care programme to produce a care programme index (by datazone). This shows the amount by which the expected costs for the datazone are above or below the national average for each care programme.

All theses indices are combined using care programme weightings (obtained from the Scottish Health Service Costs Book – see table 1) to produce the final age-sex index (for more information see Technical Addendum C - age sex - 19th September 2007 document on the NHS Scotland Resource Allocation Committee “NRAC” web site).

Table 1 Care programme weights (year ended 31st March 2012)

<table>
<thead>
<tr>
<th>Care Programme</th>
<th>Acute</th>
<th>Care of the Elderly</th>
<th>Mental Health &amp; Learning Difficulties</th>
<th>Maternity</th>
<th>Community Travel-based</th>
<th>Community Clinic-based</th>
<th>Overall HCHS</th>
<th>GP Prescribing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>50.9%</td>
<td>3.2%</td>
<td>10.9%</td>
<td>3.8%</td>
<td>12.4%</td>
<td>8.2%</td>
<td>67.0%</td>
<td>13.0%</td>
</tr>
</tbody>
</table>

3. Additional needs (MLC) - due to morbidity, life circumstances and other factors

In general, people who are less healthy and/or more deprived have a greater need for healthcare so this index directs relatively greater resources towards Boards with higher premature death rates and greater health needs.

The factors that best explained the variation in need for each care programme were identified using statistical regression. For example, for the acute care programme the variables were identified as the mortality rate for under 75s and the limiting long-term illness rate. Combinations of these two variables were used to calculate the MLC index for each IDZ. This represents the needs over and above those explained by the age-sex structure (for more information see Technical Addendum D - Morbidity and Life Circumstances - 19th September 2007 document on the NHS Scotland Resource Allocation Committee “NRAC” web site).

In April 2011, TAGRA established a technical subgroup to undertake an update of the MLC adjustment for Mental Health and Learning Difficulties (MHLD) care programme. At the 15th meeting of TAGRA in December 2012, the following recommendations for improving the MLC model for MHLD proposed by the subgroup were accepted:

Recommendation 1: The MLC adjustment should be undertaken separately for the under 65 and the 65 and over age cohorts.

Recommendation 2: The dependent variable for the estimation of the MLC coefficients should be age/sex standardised cost ratios for short-stay (less than half a year) inpatients and outpatients MHLD hospital activity (for the relevant age cohort).

Recommendation 3: The MLC coefficients should be estimated using cost utilisation ratios calculated as an average of the latest 3 years of data.

Recommendation 4: The MLC coefficients should be estimated using Intermediate Geography as the geographical unit.

Recommendation 5: The MLC coefficients should be estimated using linear functional form without transformations.

Recommendation 6: Needs indicators for the under 65 age cohort should be:
  • SIMD employment domain
  • SIMD crime domain
  • Hospital stays (continuous inpatient stays) due to alcohol misuse
  • Standardised mortality ratio for ages under 65 with mental health as cause of death

Recommendation 7: The needs indicators for the 65 and over age cohort should be:
  • Standardised mortality ratio for 65+ years; all causes of death
  • Hospital stays (continuous inpatient stays) due to alcohol misuse

Recommendation 8: The MLC adjustment updating schedule should take account of the timing of the release of updated data for the independent variables (e.g. SIMD)
All these recommendations were all accepted by TAGRA and incorporated in 2014/15 formula run.

4. Unavoidable Excess costs of supply

This index takes account of the excess costs of supplying health services in different urban–rural areas and gives greater weights to areas where there is evidence of unavoidable excess costs of supplying healthcare services. There are four components of the unavoidable excess cost factor: hospital services, community clinic based services, community travel based services and GP prescribing.

The unavoidable excess cost index for hospital services is developed at datazone level based on the ratio of local to national average costs for the 10 Scottish Executive Urban-Rural Categories (SEURC) in which the datazone lies. The GP prescribing index is set to one for all areas as prescriptions are reimbursed at national fixed prices. The community care programme index has two elements; clinic based services and travel based services. Both community indices are calculated at datazone level and represent the excess costs of providing these services to residents of the datazone.

The overall unavoidable excess cost index for each datazone is obtained by combining all the hospital and community excess costs indices using care programmes weightings (table 1). (for more information see Technical Addendum E1, E2 & E3 on NHSScotland Resource Allocation Committee “NRAC” web site).

In spring 2011, the Remote & Rural sub-group was established to consider issues identified by the report of the Technical Advisory Group on Resource Allocation: The Impact of the NHSScotland Resource Allocation Committee (NRAC) Formula on Remote and Rural Areas of Scotland.

In December 2012, the Remote & Rural Subgroup presented 3 recommendations to TAGRA:

Recommendation 1: There should be an adjustment, based on the Scottish Allocation Formula, which explicitly recognises Out of Hours Services.

Recommendation 2: With regards to the Scottish Distant Islands Allowance (SDIA) costs:
- There should be an adjustment to the urban rural categories used within the Unavoidable Excess Cost Adjustment element of the NRAC formula.
- There should be NHS Board specific adjustments included to reflect the different rates of SDIA in place in the different boards.
- SDIA costs should be compensated through the NRAC formula.

Recommendation 3: TAGRA should include a review of the community element of the excess cost adjustment in its work programme, when a reliable national dataset for community services activity and costs becomes available.

All these recommendations were all accepted by TAGRA and incorporated in 2014/15 formula run.

5. Overall indices

The indices for HCHS and GP Prescribing parts of the formula are calculated separately. These indices are then aggregated up to Health Board level for each care programme and each element of the formula. For example, the acute age-sex indices for every datazone in a Health Board are averaged (weighted by population) to give an acute age-sex index for that Health Board. Similarly, the additional needs indices are averaged using populations adjusted for age and sex as weights, and the calculations of the Health Board level excess costs indices use populations adjusted for age-sex and additional needs as weights.

With these small area ‘building blocks’ the figures can be split in any number of ways e.g. to give Health Board level indices for individual factors (e.g. an additional needs index for Greater Glasgow & Clyde); an index for a particular care programme (e.g. distributions for maternity); or an index for a different geography e.g. CHP.

6. Health Board shares

The small areas indices are amalgamated to Health Board level, and applied to the population share to give a final value that is used to inform the target share of funding for each Health
Board. (for more information see NRAC - Final Report on NHSScotland Resource Allocation Committee “NRAC” web site).