**TAGRA ACUTE MLC SUBGROUP By email**

**INDICATOR SELECTION RESULTS – PART 5**

**1. Background and Summary**

At the 14th meeting of the Subgroup in May 2016, paper TAMLC49 was discussed. Two further decisions were made:

* To eliminate index options containing Unpaid Care, for the reasons discussed in the paper.
* To exclude the Ethnicity variable representing populations with average to poor health, for face validity reasons concerning the inclusion of White Scottish (the vast majority of the population) in the count.

It was pointed out that the candidate variable list contained another ethnicity variable, representing the populations with poorer than average health, which had been eliminated in the near-duplicates analysis but could now be reconsidered following the exclusion of the above variable. This ‘Ethnic populations with poorer than average health’ variable comprised Pakistani and Gypsy/Traveller population counts, as a fraction of the population, and was based on intermediate zones (to avoid large numbers of zero counts at data zone level). Although its performance was likely to be inferior to that of the Ethnicity variable used in paper TAMLC49, its benefits in terms of face validity and equity may outweigh a small difference in terms of statistical performance.

The analysts were therefore asked to compute results for an alternative model, consisting of LLTI, All-cause SMR <75, and Ethnic populations with poorer than average health. In addition, the fraction of the population belonging to Pakistani and Gypsy/Traveller groups could each be used separately; models including each of these two further variables along with LLTI and All-cause SMR <75 were also to be considered.

In this paper the following options for the needs index are compared in terms of explanatory and predictive power:

* [LLTI, All-cause SMR <75]
* [LLTI, All-cause SMR <75, Ethnic populations with poorer than average health]
* [LLTI, All-cause SMR <75, Pakistani populations]
* [LLTI, All-cause SMR <75, Gypsy/Traveller populations]

The Subgroup is asked to decide on the index to be adopted.

**2. Comparison of needs index options**

In this section the performance of the different index options is examined. Section 2.1 looks at how well the different options explain variation in the 3-year cost ratios, and section 2.2 looks at how well the different options predict the future costs.

**2.1 Explanatory power: adjusted R2**

Table 1 shows the adjusted R2 values from the regressions using each of the index options. The final column of the table shows an average R2, using the spend within the diagnostic groups to weight the average.

*Table 1: Adjusted R2 for various index options. The highest value for each diagnostic group is highlighted in bold and italics. The highest value out of the three models including ethnicity variables is indicated in green.*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Cancer** | **Heart** | **Digestive** | **Injury** | **Other** | **Respiratory** | **Outpatients** | **Weighted**  **average** |
| [LLTI, All-cause SMR <75] | ***10.9%*** | ***21.0%*** | ***38.6%*** | ***26.0%*** | ***45.1%*** | ***38.2%*** | ***49.3%*** | ***36.9%*** |
| [LLTI, All-cause SMR <75, Pakistani populations] | 10.0% | 17.7% | 34.1% | 22.8% | 39.4% | 33.4% | 46.4% | 32.9% |
| [LLTI, All-cause SMR <75, Gypsy/Traveller populations] | 9.9% | 17.5% | 33.3% | 21.2% | 39.1% | 33.2% | 46.9% | 32.6% |
| [LLTI, All-cause SMR <75, Ethnic populations with poorer than average health] | 9.9% | 17.5% | 33.3% | 21.0% | 39.1% | 33.1% | 47.0% | 32.6% |

The 2-variable model, [LLTI, All-cause SMR <75], produces the highest R2 for all diagnostic groups, and the highest weighted average. Of the models including an ethnicity variable, the best-performing (by only a very small margin) is the one in which the fraction of population that belongs to the Pakistani ethnic group is used. Its weighted average R2 is 4 percentage points lower than that of the 2-variable model.

**2.2 Predictive power: RSS**

*Predictive* power is arguably more important than *explanatory* power, since the MLC adjustment is used to predict cost ratios in the year of allocation. To evaluate the models in predictive mode, predicted cost ratios are generated. These predictions are then compared with a 1-year cost ratio based on 2014/15 data. The 2014/15 cost ratio represents the ‘future’ observation which the model would be trying to predict.

Predicted cost ratios are calculated in the same way as in the NRAC formula: the coefficient of the needs index is obtained through a regression including the supply model, but the supply variables are not used in the prediction. In the case of Outpatients, the prison dummy variable (introduced in paper TAMLC43) is included in both the regression and the prediction.

As before, comparison of predictions with observations is done using the residual sum of squares (RSS): this is the sum of the squared differences between the predictions and the observations. Low RSS values indicate that the observations are relatively close to the predictions.

The RSS values are given in Table 2.

*Table 2: RSS obtained from comparing predictions derived from the index options with the 2014/15 cost ratios. Lower values indicate the predictions are closer to the observed value; the lowest value(s) for each diagnostic group are highlighted in bold and italics. The lowest value out of the three models including ethnicity variables is indicated in green.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Model** | **Cancer** | **Heart** | **Digestive** | **Injury** | **Other** | **Respiratory** | **Outpatients** |
| [LLTI, All-cause SMR <75] | ***3264*** | ***3618*** | ***2200*** | ***2852*** | ***828*** | ***3569*** | ***396*** |
| [LLTI, All-cause SMR <75, Pakistani populations] | 3292 | 3632 | 2333 | 2911 | 913 | 3793 | 407 |
| [LLTI, All-cause SMR <75, Gypsy/Traveller populations] | 3272 | 3657 | 2283 | 2936 | 882 | 3648 | ***396*** |
| [LLTI, All-cause SMR <75, Ethnic populations with poorer than average health] | 3272 | 3661 | 2279 | 2937 | 881 | 3646 | ***396*** |

The 2-variable model, [LLTI, All-cause SMR <75], produces the lowest RSS for all diagnostic groups. Of the models including an ethnicity variable, the best-performing overall (by only a very small margin) is the one in which the fraction of population that belongs to ethnic groups with poorer than average health – i.e. Pakistani and Gypsy/Traveller populations together – is used.

Since the diagnostic groups are not equally weighted, it is also useful to aggregate the predictions of the diagnostic groups, as will be done when the adjustment is implemented in the Formula, and compare those Acute-level predictions with an overall Acute-level cost ratio. Table 3 shows the results of doing this. In this analysis, the performance of all models is very similar. The drop in explanatory power seen in Table 2 when adding an ethnicity variable into the index is not seen in Table 3; however, this is likely to be a result of residuals frequently having (by chance) opposite sign in different diagnostic groups, such that the combined residual is lower.

*Table 3: RSS obtained from comparing predictions derived from the index options – aggregated to Acute level – with the 2014/15 overall Acute cost ratios.*

|  |  |
| --- | --- |
| **Model** | **Aggregated diagnostic groups** |
| [LLTI, All-cause SMR <75] | 461 |
| [LLTI, All-cause SMR <75, Pakistani populations] | 461 |
| [LLTI, All-cause SMR <75, Gypsy/Traveller populations] | 459 |
| [LLTI, All-cause SMR <75, Ethnic populations with poorer than average health] | 459 |

**3. TAGRA Core Criteria**

Table 4 provides comments on the inclusion or not of an ethnicity variable in relation to the TAGRA Core Criteria. Positive comments are highlighted in green, negative in red (and neutral comments in black). The positive and negative points have been tallied to provide a summary evaluation in the final row.

On balance, the inclusion of an ethnicity variable in the Acute MLC needs index does not appear to be borne out by either the statistics or the other aspects of the core criteria. Objectively, its inclusion would be difficult to justify: including in the needs index the fraction of the population belonging to Pakistani and Gypsy/Traveller ethnic groups – groups independently identified as having poorer than average health – does not improve predictions of healthcare resource use for small areas, but rather, results in *poorer* explanatory and predictive power overall. This may possibly indicate under-utilisation of healthcare services by these populations, relative to their need, which will be tested for in the unmet need analysis.

In terms of responsiveness, there are concerns about changes over time in both the ethnic composition of small areas and in the relative levels of need of the different ethnic populations in Scotland. It would seem risky to assume that not only would the proportion of a data zone’s population belonging to Pakistani or Gypsy/Traveller communities not change much over the 10 years between census updates, but that these groups would still have the highest need.

**The Subgroup is asked to endorse the proposal to retain [LLTI, All-cause SMR <75] as the needs index, and instead use the ethnicity information to look for unmet need.**

*Table 4: TAGRA core criteria evaluation for the decision on adding ethnicity into the existing Acute MLC model.*

|  |  |  |
| --- | --- | --- |
|  | **Retain existing model** | **Add ethnicity to existing model** |
| **Equity** |  | Equity would arguably favour the inclusion of a variable accounting for ethnicity. However, the statistical results indicate that it does not achieve this in practice, perhaps because of under-utilisation by the populations with poorest health on average. Ethnicity will in any case be used to look for unmet need, which may be a more appropriate use of the data. |
| **Practicality** | Similar level of work involved in updating each index option | Similar level of work involved in updating each index option |
| **Transparency** |  |  |
| **Objectivity** |  | - Statistical performance is poorer: R2 is around 4 percentage points lower in the regressions, and RSS results indicate predictions are further away from the 14/15 observations. |
| **Avoiding Perverse Incentives** | + The elements of this model are all demand side variables and are therefore not susceptible to variations in supply provision. | + The elements of this model are all demand side variables and are therefore not susceptible to variations in supply provision. |
| **Relevance** | + All variables have a strong theoretical / intuitive link to healthcare need | + All variables have a strong theoretical / intuitive link to healthcare need |
| **Stability** | + Keeping the current index would result in minimal changes to the target shares. |  |
| **Responsiveness** |  | - Ethnic group demographics may change more rapidly than can be captured adequately by a 10-yearly census; for example, in relation to possible political change such as changes in policy on immigration and asylum, or exit from the EU.  - The relative healthcare need of the different ethnic groups may change over time, due to (for example) education, programmes to reduce inequity, and generational cultural change. |
| **Face Validity** | + Since this is the current index, it has already been accepted and explained | + The processes through which these variables influence healthcare needs are well evidenced and understood |
| ***Overall evaluation*** | + + + + | + + + - - - |