Resource Allocation Formula: Options for publication of 2025/26 shares

# TAGRA meeting, June 2023

1. Introduction

This paper examines potential options for the timing and nature of the National Resource Allocation Formula (NRAC) publication by Public Health Scotland (PHS) containing 2025/26 target shares. TAGRA is asked to advise on their preferred option.

COVID-19 has impacted on the availability of up-to-date data from key national datasets that the Formula traditionally relies on for input data. Some datasets have not been updated since prior to when the pandemic began to impact Scotland. Equally, where more recent data are available, covering a period where the pandemic has severely impacted services, there is the challenge of whether to interpret any changes to trends or patterns of healthcare usage as a temporary phenomenon or an indication of a longer-term change that will continue into 2025/26.

Particular attention is focused on the key datasets that have the largest influence on the Formula and the updates to these that will occur in the next 15 months. The paper assesses the pros and cons of waiting for these updates as opposed to using what is currently available.

1. Options for 2025/26 run

Following discussion between PHS and the Scottish Government, three options are presented in table 1 for consideration by TAGRA in respect of timing of the next run of the Formula. All options are based on when updates to key datasets become available: option one shows what components of the formula could be updated now based on currently available data with options two and three highlighting what additional information will become available if the update were delayed. The longer the update can be delayed, the more up-to-date information can be incorporated. Each of these options and their advantages and disadvantages have been produced based on consideration of the information outlined in the remainder of this document.

NRAC incorporates data from approximately 50 individual datasets but the three sources that have the greatest influence on the Formula have been considered when assessing options for the publication date:

1. Population mid-year estimates and projections. The main driver of any weighted capitation formula is the population size of each area and so these data are crucial in calculating the target shares.
2. Scottish Financial Returns (SFRs). Cost is generally used by the Formula as a proxy for measuring 'need'. It is used in several components of the Formula including Age-Sex where national average healthcare costs are calculated for standard age-sex groupings and used to account for age and sex differences in the cost of delivering NHS services.
3. Scottish Morbidity Records (SMRs). Hospital activity information (for example inpatient and outpatient activity) that is generally used to examine patterns of activity and the associated cost of delivering care to different population groups.

Population estimates and projections are used in the calculation of the population share while the SFRs and SMRs are used in each of the remaining components of the Formula: Age-Sex, Morbidity and Life Circumstances (MLC), and Unavoidable Excess Cost. Given their extensive use compared to other data that the Formula uses, these three datasets are key when considering potential publication dates for 2025/26 target shares and are the primary focus of this paper.

Table 1: Options for publication of 2025/26 NRAC target shares

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| --- | --- | --- | --- | --- | --- |
| Option | Month/year of publication release | Formula components updated | Key datasets updated (and period information relates to) | Advantages | Disadvantages |
| 1 | September 2023 | Population share.  (Age-Sex, MLC and Excess Cost components will be updated using the latest re-based populations but no other data will be updated e.g. Age-Sex costs). | Population estimates (2021).  (Previous run for 2024/25 used 2020 population estimates.) | Allows target shares for 2025/26 to be produced as soon as possible to aid planning.  Provides stability to NRAC shares as will use only one updated data source (population estimates) compared to the 2024/25 run. | Population projections used (2018-based) would be seven years behind the target year (2025/26) which may affect accuracy of the target shares. There would normally be five or six years between projections and the target year.  Age-Sex, MLC and Excess Costs components would be based on the same data used for the 2024/25 run. Some of these data (i.e. hospital activity and expenditure) pre-date the pandemic and are six years behind the target year.  There is a risk that using pre-pandemic data to calculate 2025/26 shares will not reflect possible changes in trends caused by impact of COVID-19. |
| 2 | May 2024 | Population share, Age-Sex, MLC, Excess Costs | Population estimates (2021),  Scottish Financial Returns (2022/23),  Scottish Morbidity Records (2022/23) | Unlike option 1, significant data updates would be available for all formula components.  Any changes in trends caused by pandemic will be captured in expenditure and hospital activity. | Publication date closer to the target year and further away from the 3-year planning horizon.  As with option 1, population projections seven years behind the 2025/26 target year.  Risk that patterns of activity and costs seen in 2022/23 data will not be reflective of those that exist in 2025/26 because the health system is in recovery. |
| 3 | October 2024 at the earliest (approximate, depends on population projection release date) | Population share, Age-Sex, MLC, Excess Costs | Population estimates (2022),  Population projections (2021-based),  Scottish Financial Returns (2022/23),  Scottish Morbidity Records (2022/23) | Identical to option two except it will include more recent population estimates (2022 instead of 2021) and projections (2021-based instead of 2018-based).  Population estimates and projections will factor in 2022 census data. | Publication date likely to be too close to the target year for planning purposes. This may outweigh the advantage gained from waiting for population estimates and projections.  Population projection release date is uncertain and so NRAC publication could be delayed beyond October 2024. |

1. Discussion

The remaining sections examine the points raised above in more detail, such as: the impact of the COVID-19 pandemic on data that the NRAC model uses; descriptions of each component of the Formula including data requirements and data availability; and general discussion that led to the assessment of the advantages and disadvantages of each publication date, as summarised in section 2.

1. Impact of COVID-19

The COVID-19 pandemic had a huge impact on the provision of NHS services and subsequently on hospital activity trends and expenditure. Prior to COVID-19, year-to-year patterns of service use and expenditure were generally quite stable and without the significant changes experienced at a national level during the COVID-19 period (2020/21 and 2021/22). Since then, activity levels have increased but have not yet returned to pre-pandemic levels and, while total expenditure increased during the pandemic, 2022/23 expenditure will not be known until data becomes available in February 2024.

COVID-19 has impacted various national data collections. Some data required by the Formula could not be collected at the level of detail required for NRAC, including expenditure, while, due to significant changes in trends such as those described above, using other data relating to the COVID-19 period could produce skewed results for future target years. This latter point remains a potential issue with data collected for 2022/23 as it is unclear whether the period immediately following the pandemic will be reflective of patterns of need in 2025/26 or more reflective of a health system that is in recovery.

Some of these issues are discussed in more detail below but until more data is available for a full NRAC run then the potential impact on target shares will remain uncertain.

1. Population share
   1. Data required/available

The population share is calculated using re-based population projections which are derived from mid-year population estimates (MYEs) and projections. This involves adjusting the population projection for the target year using the latest mid-year estimate to account for any over- or under-estimation of the projection.

National Records of Scotland (NRS) normally produce MYEs annually and population projections every two years. The NRAC formula requires MYEs at data zone level and population projections at sub-national level. MYEs have continued to be published annually but the most recent projections (2020-based) were only released at national level. This was due to the period of uncertainty in the mid-2020 base year and in setting long-term demographic assumptions following the onset of the COVID-19 pandemic.

Target shares for 2024/25 were produced using 2020 MYEs and 2018-based projections. 2021 MYEs are now available but 2018-based projections remain the most up-to-date projections available at sub-national level.

NRS estimate that 2022 MYEs for data zones will be released in summer 2024 but this is still to be confirmed. This release date is later than normal because the estimates will incorporate the latest UK-wide census data at data zone level but their publication date is still to be announced.

2021-based projections at sub-national level may be available in August 2024 but this release date is very uncertain. Work to produce the projections is led by the Office for National Statistics (ONS) and has been delayed - an update is expected from ONS in June 2023. 2021-based projections will include the latest census data from England, Wales and Northern Ireland but not Scotland.

Currently, any NRAC publication prior to October 2024 will require the use of population projections based on 2018 data which are seven years behind the NRAC forecast year (2025/26).

* 1. Considerations for 2025/26 run

Population projections incorporate the best information available at the time but, given the nature of forecasts, they are prone to change (see chart 1 below). It is always preferable to use the most up-to-date population projections (and mid-year estimates) available to ensure the re-based populations are as accurate as possible.

Chart 1: Comparison of Scotland population projections and mid-year estimates.

Chart 1 shows a comparison of Scotland level population projections which were produced in years 2014, 2016, 2018 and 2020. This comparison highlights how projections with a different base year can vary for the same projection year from one release to the next. 2020 mid-year estimates are also presented.

1. Please note that only national level projections are available for 2020.

It was assumed that the 2018-based sub-national population projections currently available would not account for the possible impact of COVID-19 on future population trends but that any potential impact would be factored into 2021-based projections. For example, the impact of the higher number of excess deaths recorded during the COVID-19 period and any changes in migration, such as a potentially increasing number of people moving to more rural areas. This would have strengthened the argument to delay the formula run until 2021-based projections were available.

However, the projections are designed to focus on medium to long-term trends more than short-term trends, which the effect of COVID-19 on mortality rates is considered to be, and so COVID-19 is not likely to significantly impact 2021-based projections. The main benefit of using 2021-based sub-national projections would be to use the most up-to-date population information possible and incorporate any changes in patterns since the release of the 2018-based sub-national projections, such as the impact of falling fertility rates observed in the 2020-based national projections.

Analysis presented in chart 2 below indicates that, overall, COVID-19 does not look to have adversely affected the accuracy of population projections. 2018-based projections for 2019, 2020 and 2021 were subtracted from their corresponding MYEs to calculate the difference between the projection and the MYE for each year and each NHS Board. The difference was then calculated as a percentage with respect to the MYE to determine the percentage difference between the projection and the MYE. The same calculations were performed for 2014-based projections and MYEs in 2015, 2016 and 2017, and for 2016-based projections and MYEs in 2017, 2018 and 2019. The average percentage difference per NHS Board for each set of projections and MYEs is presented in chart 2. Please note all percentage differences are shown as positive values to allow comparison of how much the projection differs to the MYE.

Chart 2: Average percentage difference per NHS Board (projection versus mid-year estimate).

Chart 2 shows the average percentage difference per NHS Board when comparing population projections to mid-year estimates. Percentage differences have been calculated when comparing 2014-based projections for years 2015, 2016 and 2017 to mid-year estimates in those same years, and the same for 2016-based projections for years 2017, 2018 and 2019, and 2018-based projections for 2019, 2020 and 2021. 2018-based projections show the smallest change compared to the mid-year estimate aside from in year 1.

1. 2014-based projections: Year 1 = 2015, Year 2= 2016, Year 3 = 2017.

2. 2016-based projections: Year 1 = 2017, Year 2= 2018, Year 3 = 2019.

3. 2018-based projections: Year 1 = 2019, Year 2= 2020, Year 3 = 2021.

On average, the 2018-based projections are more in line with MYEs than previous years' projections and MYEs which provides a degree of confidence that, so far, the impact of COVID-19 has not caused a bigger divergence than normal between projections and MYEs. There is variation at individual NHS Board level but this has always been the case in previous NRAC runs.

However, MYEs are not yet available after 2021 to allow comparisons with projections in other years, and it is not certain that the above trend will continue up to 2025/26. Projections and MYEs will generally diverge further from each other the longer you project into the future. Running the NRAC formula based on 2021-based projections should therefore still provide more accurate target shares for 2025/26 but the formula could be run now using 2018-based projections with less concern than may have been expected regarding the impact of COVID-19. Please note this applies to the total population only and not the Age-Sex adjustment which is discussed in section 6.

1. Age-Sex adjustment
   1. Data required/available

The key datasets required for the calculation of the Age-Sex adjustment are the Scottish Financial Returns (SFRs) - which contain expenditure collected for the [Scottish Health Service Costs](https://publichealthscotland.scot/publications/scottish-health-service-costs/scottish-health-service-costs-high-level-costs-summary-2021-to-2022/) publication (Cost Book) - and data from Scottish Morbidity Records (SMRs). The Age-Sex component was last updated for the 2023/24 target shares using data from 2019/20 SFRs and SMRs.

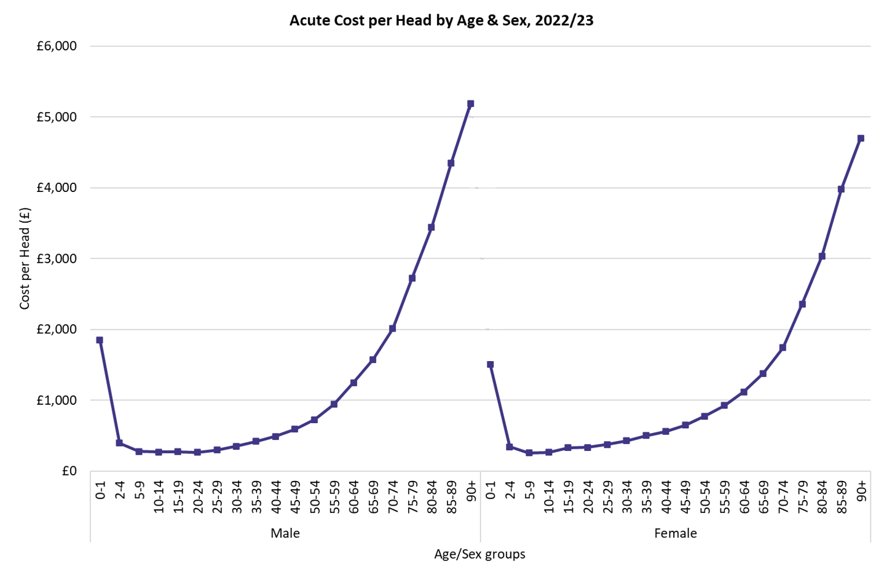
Due to the impact of the COVID-19 pandemic, most NHS Boards were unable to submit the full set of SFRs (essential for NRAC) for 2020/21 and 2021/22 but a full data collection will resume in 2022/23. This means 2019/20 data is the most recent expenditure currently available for use within the NRAC formula. Cost information from 2022/23 SFRs will be available by the end of February 2024.

SMRs are patient-level hospital activity records that are submitted by NHS Boards to PHS and include information for: acute inpatients and day cases; mental health, maternity and geriatric long stay inpatients; and outpatients. SMR data is currently available for 2021/22 and complete 2022/23 information will be available in summer 2023. However, the formula needs hospital activity and expenditure data from the same year and so, if running the formula before February 2024, the most recent year of SMR data that could be used is 2019/20, or 2022/23 data if running the formula after this date.

* 1. Considerations for 2025/26 run

The Age-Sex component of NRAC accounts for age and sex differences in the cost of delivering NHS services. National average age-sex costs are calculated by marrying expenditure from SFRs - such as inpatients (SFR 5.3) and day cases (SFR 5.5) - to activity data available in SMRs. They are applied to the projected population structure for the NRAC forecast year, aggregating up from data zone level and standard age-sex groupings to a total NHS Board share. Chart 3 below shows the national average cost per head for each age-sex grouping in the acute care programme for the 2022/23 target shares - prior to COVID-19 the distribution of activity and costs between these groupings remained stable from year-to-year.

Chart 3: Average cost per head for each age-sex group for the 2022/23 NRAC shares, acute care programme



Generally, it is more expensive to deliver services to older people and therefore NHS Boards with older populations will have a greater age-sex share.

The COVID-19 pandemic has clearly had a large impact on the delivery of NHS services. Both activity and expenditure changed during this period and continue to be different as we enter the recovery phase. Until we have access to more up-to-date cost information, it is not clear if the cost curves presented above have changed.

For example, anecdotal evidence suggests that older people have been disproportionately affected by the impact of COVID-19, with access to treatment delayed during the pandemic, and where they are now living with more complex needs. This could result in the average cost per head increasing at a faster rate in the older population compared to other age groups. Using 2022/23 expenditure rather than 2019/20 data could therefore help reflect any changes that may have occurred in patterns of expenditure following the pandemic but as mentioned previously, it is uncertain whether such trends will remain reflective of need in 2025/26. This is particularly important as the average age-sex costs are calculated using only the most recent year of available SFR and SMR data.

1. Morbidity and Life Circumstances adjustment
   1. Data required/available

As with the Age-Sex component, the main data needed for the calculation of the MLC adjustment are expenditure from SFRs and hospital activity from SMRs. Please see section 6 above for more information regarding current data availability for these two datasets. The MLC component was last updated for the 2022/23 target shares using data from 2018/19 SFRs and SMRs.

A range of other data are also used including: NRS deaths information; Scottish index of multiple deprivation (SIMD) crime and employment data; average house prices; and limiting long-term illness (LLTI) information. Current data availability varies from 2011 for LLTI (based on census, will be updated once 2022 census information becomes available) to 2022/23 (NRS deaths).

* 1. Considerations for 2025/26 run

The MLC component adjusts shares based on a set of factors ('indicators of need') which help explain variation in healthcare use over and above the age and sex profile of the population. Different indicators of need are used for different care programmes and among others include premature mortality, LLTI rates and hospital admissions due to alcohol.

Linear regression is used to establish a relationship between the indicators of need and the healthcare cost and predicts a cost ratio: the ratio of the actual cost to the cost that is expected based only on the age and sex structure of the population. A cost ratio greater than one indicates greater use of healthcare services than the age and sex of the population alone would predict, and vice versa for a cost ratio less than one.

Many of the indicators of need are based on SMR activity data that could soon be updated using more recent (2022/23) information. However, the MLC adjustment is dependent on the relationship between the indicators of need and associated costs and expenditure is currently only available until 2019/20. This means MLC cannot be updated with 2022/23 data until expenditure for that period become available in February 2024.

Using expenditure and hospital activity from this period may be important as it would help reflect any changes in levels of healthcare need in local populations that may have occurred following the pandemic. For example, one of the indicators of need for the mental health and learning difficulties care programme is hospital admissions due to alcohol. Alcohol consumption is reported to have increased among certain cohorts of people during the pandemic which, if continued, could disproportionately impact populations in particular parts of the country e.g. more deprived areas.

It is worth noting that the MLC component uses three years of SMR and expenditure data rather than a single year like the Age-Sex adjustment. As expenditure is not available at the required level for the COVID-19 period, the next MLC update will use a mixture of pre- and post-pandemic data (2018/19, 2019/20 and 2022/23).

1. Unavoidable excess costs adjustment
   1. Data required/available

As with the Age-Sex and MLC components, two of the main datasets needed for the calculation of the Unavoidable Excess Costs adjustment are expenditure from SFRs and hospital activity from SMRs. Please see section 6 above for more information regarding current data availability. The Excess Cost component was last updated for the 2022/23 target shares using data from 2018/19 SFRs and SMRs.

* 1. Considerations for 2025/26 run

The Excess Cost adjustment accounts for the cost of providing NHS services in different urban-rural areas, giving greater weight to areas where there is evidence of unavoidable excess costs in delivering services. This adjustment is calculated differently for hospital care programmes and the community care programme but the information below focuses on hospital care only as that programmes uses data from the SFRs and SMRs.

In a similar way to the MLC adjustment, a cost ratio is calculated for the hospital care programme: the ratio of the actual cost to the expected cost, based on national average unit costs. Cost ratios are calculated at data zone level and averaged across urban-rural categories so that only the additional cost associated with remoteness and rurality is considered.

Like the MLC adjustment, this calculation depends on the availability of expenditure from SFRs and hospital activity from SMRs and so cannot be updated with 2022/23 data until expenditure for that period become available in February 2024. It may be beneficial to include data from this period as it would help reflect any potential changes that may have occurred since 2019/20 in the cost of delivering health services in each urban-rural category.

Again, like MLC, the Excess Costs component uses three years of SMR and expenditure data. As expenditure is not available at the required level for the COVID-19 period, the next Excess Costs update will use a mixture of pre- and post-pandemic data (2018/19, 2019/20 and 2022/23).