Technical Guide to Allocation Formulae and Pace of Change

For 2019/20 to 2023/24 revenue allocations

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Promoting equality and addressing health inequalities are at the heart of NHS England's values. Throughout the development of the policies and processes cited in this document, we have:

Given due regards to the need to eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant protected characteristic (as cited under the Equality Act 2010) and those who do not share it;

Given regard to the need to reduce inequalities between patients in access to, and outcomes from, healthcare services and in securing that services are provided in an integrated way where this might reduce health inequalities.

Contents

1 Executive summary

1.1 Overview

The allocation of funding to Clinical Commissioning Groups (CCGs) to support them in commissioning services for their local population is one of the key duties of NHS England.[1] The approach we must take in setting allocations is outlined in the mandate from the Department of Health and Social Care[2] which says:

> *The Government expects the principle of ensuring equal access for equal need to be at the heart of NHS England's approach to allocating budgets.*

The approach is also informed by NHS England's duty to have regard to the need to reduce inequalities between patients with respect to their ability to access services and with respect to the outcomes they achieve.[3]

These two aims are reflected in the target formula, which produces a target allocation or 'fair share' for each area, based on a complex assessment of factors such as demography, morbidity, deprivation, and the unavoidable cost of providing services in different areas.

The formula is based on independent academic research and is overseen by an independent external group, the Advisory Committee on Resource Allocation, which provides advice to the Secretary of State for Health and Social Care and the Chief Executive of NHS England.

Allocations will therefore differ depending on the exact combinations of these factors in each area, as well as how quickly an area can be moved towards its target allocation each year, determined by our 'pace of change' rules. These rules are also informed by the mandate, which states:

> *This [allocations] process must be transparent, and must ensure that changes in allocations do not result in the destabilising of local health economies.*

This document describes how CCG allocations are calculated. The allocations process has been in existence in broadly this form since 1976, and has been continually improved and updated as clinical services have changed, the NHS has been re-structured, and more and better data and analytical techniques become available.

A summary document setting out the changes made to CCG allocations for 2019/20, the pace of change rules, and the assumptions used to set the overall CCG allocations growth rate is available on the NHS England website.[4]

We welcome comments and feedback on our approach. In particular, the Advisory Committee on Resource Allocation are currently developing their research and

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[1] Section 223G NHS Act 2006, as amended by the Health and Social Care Act 2012.

[2] See https://www.gov.uk/government/publications/nhs-mandate-2018-to-2019 for the 2018/19 mandate.

[3] Section 13G Health and Social Care Act 2012.

[4] NHS England » Note on CCG allocations 2019/20 to 2023/24

development programme for the next round of allocations. Suggestions for work that might be included there can be sent to england.acra-secretariat@nhs.net. Comments about the wider process, such as the pace-of-change policy, should be sent to the NHS England allocations team at england.revenue-allocations@nhs.net.

1.2 Main changes to the allocation formula

The main changes to the formula compared with those used for 2016/17 allocations are set out below.

These changes are described in more detail within this technical guide and the supporting documents.

1) We have made two changes to the way in which population data are used:

   (a) We now use the annual average GP registered list size for the most recent 12 months, rather than the size of the list at the time of allocations.

   (b) We now use age and gender specific CCG population growth rates based on projections of residential populations produced by the Office for National Statistics (ONS).

2) A separate component for community services has been developed for the first time.

3) The component for mental health services has been refreshed by running new statistical models using new data sources.

4) The unmet need and health inequalities adjustment continues to be based on the standardised mortality ratio for those aged under 75 years (SMR<75). The latest data have been used and there are technical changes to the way SMR<75 are weighted for small areas.

5) The updated market forces factors (MFF) for providers have been accounted for in allocations through the purchaser-provider matrix. The purchaser-provider matrix is the estimated spend on tariff services by each CCG on each provider, and is used for the weights to calculate the MFF for CCGs from the average of the MFFs of the providers their patients use. The MFF changes will be phased in over five years, consistent with MFF changes for providers in the National Tariff.

6) Other than data updates the following areas of the model have not had any methodological changes:

   - The general and acute model

   - The prescribing model

   - The maternity model

   - The emergency ambulance cost adjustment (EACA)

   - The adjustment for unavoidably small hospital provision in remote areas

   - The primary medical care model

   - The specialised services model

2 Introduction

2.1 How allocations were set

2.1.1 NHS England Board

Draft allocations were published on 10 January 2019 and final approval provided by the NHS Board on 31 January 2019 for:

- core CCG allocations;
- specialised services allocations;
- primary medical care allocations; and
- total place-based allocations (the sum of the core, specialised and primary medical care).

The NHS England Board meeting on 31 January 2019 agreed the principles and parameters for funding allocations for the years 2019/20 to 2023/24. The first three years, 2019/20 to 2021/22, are firm allocations and the final two years, 2022/23 and 2023/24 are indicative allocations.

This guide should be read in conjunction with the following policy documents relating to allocations for 2019/20 to 2023/24:

1. NHS England Board paper: *Allocation of resources to NHS England and the commissioning sector for 2019/20 to 2023/24;*[5]
2. *NHS Operational Planning and Contracting Guidance 2019/20;*[6] and
3. *Note on Clinical Commissioning Group (CCG) Allocations 2019/20 - 2023/24.*[7]

2.1.2 Advisory Committee on Resource Allocation (ACRA)

ACRA is an independent, expert, technical committee that makes recommendations to NHS England on the target formula for NHS allocations and to the Department of Health on the target formula for public health allocations. ACRA's remit does not include pace of change policy, which is set by NHS England for NHS allocations. ACRA's membership includes academics, GPs, NHS managers and public health experts.[8]

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[5] See https://www.england.nhs.uk/wp-content/uploads/2019/01/04-pb-31-01-2019-ccg-allocations-board-paper.pdf

[6] See https://www.england.nhs.uk/wp-content/uploads/2018/12/nhs-operational-planning-and-contracting-guidance.pdf

[7] See https://www.england.nhs.uk/wp-content/uploads/2019/01/note-on-ccg-allocations-2019-20-2023-24.pdf

[8] ACRA terms of reference; NHS England » Advisory Committee on Resource Allocation (ACRA) terms of reference

The latest recommendations by ACRA for the formula for NHS allocations are published alongside this technical guide and were accepted in full by the NHS England Board. The formulae recommended by ACRA are based on research, and references to the research and other relevant publications are provided in Annexes 2 and 3.

ACRA was established in 1997 as a successor to the different committees that over time have provided advice on NHS allocations formulae, starting with the Resource Allocation Working Party of 1976.

2.1.3 Steps in setting allocations

Once the national budgets are known, there are four steps in the calculation of actual allocations:

- determine target allocations based on relative need and relative unavoidable costs;

- establish baselines (the previous year's allocations plus any adjustments);

- calculate opening distances from target (baseline minus target); and

- determine each CCG's allocation growth based on their opening distance from target and the pace of change model.

The approach for calculating CCG running cost allowances is necessarily different.

2.2 Scope of the Technical Guide

2.2.1 Funding streams covered

This guide provides an overview of the calculation of the allocations announced on 10 January 2019 for the years 2019/20 to 2023/24. It covers:

- the calculation of the formulae for core CCG, specialised and primary medical care target allocations;

- pace of change policy;

- CCG running cost allowances.

2.2.2 Allocations spreadsheets

The Technical Guide includes this document and a set of workbooks which show the calculation of target and actual allocations for each of core CCG responsibilities, specialised services and primary medical care. This document also provides a brief guide to the workbooks. The workbooks include detailed notes on data sources and the calculations.

Due to the large size of many of the workbooks, many values have been hard coded for publication rather than driven by Excel formulae. Where this is the case, the notes in the files explain the relationship between the columns in the workbooks. The calculations have also been set out over a number of separate files rather than two or three files, again for reasons of size. A list of the accompanying workbooks is at Annex 3.

2.2.3 Weighted capitation formulae

The formulae for target allocations estimate the relative need and relative unavoidable costs between CCGs for healthcare services. Target allocations are based on the weighted capitation formulae recommended by ACRA. There are separate formulae for CCGs' core responsibilities, specialised services and primary medical care. For each of these, weighted populations are calculated for each CCG, and each CCG's target allocation is the CCG's share of the total weighted population for England multiplied by the national budget for the relevant funding stream.

Weighted populations are calculated for each CCG for the baseline year of 2018/19 and each of the allocations years 2019/20 to 2023/24, based on the projected registered population for each area for each year.

An overview of the weighted capitation formulae is set out below. The subsequent sections provide more detail on the formulae and pace of change policy.

For further information, references to the research and modelling are provided in Annexes 2 and 3.

2.3 Overview of methodology for the weighted capitation formula

2.3.1 Methodology

An overview of the approach for calculating weighted populations is set out below. The detailed differences in the calculations for CCG core responsibilities, specialised services and primary medical care are set out in the subsequent sections and the accompanying workbooks.

2.3.2 Weighted populations

The weighted population for each CCG is based on:

- the size of each CCG's registered population;

- a weight, or adjustment, per head for need for health care services related to age and sex (all else being equal, areas with older populations typically have a higher need per head) and for need over and above that due to age (all else being equal, areas with poorer health have a higher need per head);

- a weight, or adjustment, per head for unmet need and health inequalities;

- a weight, or adjustment, per head for unavoidably higher costs of delivering health care due to location alone, known as the Market Forces Factor (this reflects that unit staff, land and building input costs are higher in some parts of the country, for example London, than in others); and

- an adjustment in the core CCG formula for the higher costs of providing emergency ambulance services in sparsely populated areas, and an adjustment for the higher costs of unavoidably small hospitals with 24-hour accident and emergency services in remote areas.

As the need for different types of health services varies across the country, there are separate formulae for each of CCG core responsibilities, specialised services and primary medical care. Within each of these, there are separate components and

adjustments – for example the distribution of need for CCG core responsibilities is different between general and acute, mental health, community and maternity services.

The different components and adjustments for unavoidable costs are summarised in Figure 2.1 and more details on each are provided in the relevant sections of this document.

Figure 2.1: Summary of CCG formula and adjustments[9]

Each formula within the overall place-based model represents a national budget stream
Within each formula, segments may include evidence of variation in 'need' or 'cost'
The relative weight of unmet need is determined by the NHS England board
Weighted populations are calculated for each component/segment
Impact of each segment is determined by relative spend

2019/20 allocations	CCG Core Services £78.5 billion	Primary Care £8.3 billion	Specialised Services £17.5 billion
Need adjustments % overall spend shown but across the country needs may vary for different service.	59.8% Acute services 13.2% Mental Health 12.1% Prescribing 11.3% Community 3.7% Maternity **Utilisation models 90%** — Health inequalities and Unmet need 10%	100% Formula No other adjustments **Utilisation models 85%** — Health inequalities and Unmet need 15%	49% Formula 51% Historic spend **Utilisation models 95%** — Health inequalities and Unmet need 5%
Cost adjustments Estimate of effects on healthcare spend of unavoidable cost differences between health care providers, based on location.	**staff and buildings** Market forces factor (MFF) **transport in rural areas** Emergency ambulance cost adjustment (EACA) **inefficiently small hospitals** Unavoidable remoteness	**staff and buildings** Market forces factor (MFF) **Supply factors -** In calculating the target allocation, only the health needs of the population are taken into account. 'Supply factors' such as the number of hospital facilities available, shouldn't influence that estimation of the level of need - even though they might affect how much healthcare people receive - so we measure those factors and then neutralise them in an area's allocation calculation. This helps balance funding between urban and rural areas.	**staff and buildings** Market forces factor (MFF)

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[9] These are different from the high-level allocations in the January Board paper for two reasons. First, only part of the specialised services and general practice allocations are allocated to CCG geographies, the balance being managed nationally to commission, for instance, highly specialised services or distributed in-year on a different basis. Second, the complex set of pace of change rules make it impossible to exactly match the distribution of resources at CCG geographies back to the totals set in the high-level allocations.

2.3.3 Fair shares formula

The weighted capitation formula estimates the need per head of each CCG's population relative to other CCGs and is also known as the fair shares formula. It does not seek to calculate an absolute level of need for each area, but to assess relative need (and relative unavoidable costs) between areas.

2.3.4 Population base

The populations used in the formula for each CCG are the annual average registered lists of all their GP practice members between November 2017 and October 2018. These are then projected forward at CCG level for each year 2019/20 to 2023/24, based on Office for National Statistics' age-sex specific residential population projections.[10] Adjustments are made for practice changes that occurred mid-year:

- Where a practice has closed mid-year the average registrations are attributed to the last recorded CCG;
- If a closed practice has merged with an existing practice, the registrations are added to the existing practice and the average registrations will reflect this; and
- If a new practice has opened during the year, the average registrations are attributed to the CCG in which it opens.

2.3.5 Variation in need

People do not have identical needs for health care services. A key difference is that need varies according to age and sex, and in particular the very young and elderly, whose populations are not evenly distributed across the country, have a higher need for health services than the rest of the population. The weighted capitation formula therefore takes into account the relative need per head of different age-sex groups and the different age-sex profiles of local populations.

Even when differences due to age and sex are accounted for, populations with the same age-sex profiles display different levels of need. An additional adjustment to reflect the relative need for health services over and above that due to age and sex is therefore necessary.

2.3.6 Utilisation approach

Statistical modelling has been used to examine the relationship between the utilisation of health services on the one hand, and the characteristics of individual patients and the areas where they live on the other hand. These models have been used to decide which factors to include in the formula to predict future need per head and the relative weight on each of the factors.

Typically, the models estimate need related to age and sex and additional need over and above that due to age and sex as a single set of weights rather than separate weights for age and additional need. This is because additional need varies by age group.

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[10] ONS 2016 based Subnational Population Projections (SNPP) for CCGs

2.3.7 Supply side variables

The statistical models also include 'supply' variables to take account of the greater availability of health care services generally leading to higher use. As utilisation driven by available capacity is not a reflection of need, while the supply variables are included in the models, they are sterilised and set to the national average when calculating weighted populations. This means areas are not penalised in the formula for lower utilisation due to relatively lower capacity.

2.3.8 Market Forces Factor (MFF)

The costs of providing health care unavoidably vary across the country due to different unit input costs, in particular staff costs and the costs of land and buildings. The weighted capitation formula includes an adjustment for these unavoidable costs, known as the Market Forces Factor (MFF). These costs are due to location alone, not need.

2.3.9 Emergency ambulance cost adjustment

The emergency ambulance cost adjustment (EACA) adjusts for unavoidable differences in the costs of providing these services across the country, particularly in sparsely populated areas due to for example the longer distances to incidents and conveying patients to hospitals. The EACA is only included in the formula for CCG core allocations.

2.3.10 Costs of unavoidable smallness

In the formula for CCG core allocations there is an adjustment for the higher costs of running unavoidably small hospitals with 24-hour A&E departments in remote areas. These hospitals are typically unable to achieve the same economies of scale as other hospitals.

The adjustment is based on modelling the costs at site level for all hospitals to give a 'cost-curve', showing the estimated relationship between the size of hospitals and costs. Criteria were developed to identify the hospitals that were unavoidably small due to remoteness. These were based on the size of the population served being relatively small, and travel times to other hospitals being relatively long. The 'cost-curve' gave the estimated higher costs for the remote hospital sites.

The EACA and the adjustment for the costs of unavoidable smallness due to remoteness capture higher costs over and above those covered by the MFF.

2.3.11 Unmet need and health inequalities adjustment

NHS England has a strong commitment and legal duty to have regard to the need to reduce health inequalities. We look to meet some of this legal duty in part by reducing avoidable inequalities in healthcare provision through our approach to allocations. Further, we recognise that our utilisation-based approach to measuring healthcare needs will not necessarily fully capture needs that are not being met.

In order to take account of health inequalities and unmet need in the allocations formula, ACRA have recommended that the standardised mortality ratio for those aged under 75 (SMR<75) is the best available indicator on which to base the adjustment. The adjustment is calculated for the population of each small area and then aggregated to CCG level. Applying the measure at the small area level takes into account unmet need/health inequalities within as well as between CCGs.

ACRA considered a range of measures of population health for the adjustment for unmet need and health inequalities. These were found to be highly correlated with each other. The SMR<75 has the advantage that it can be updated regularly at small area level, while other measures can typically only be updated at small area level using data from the ten-yearly Census. The SMR<75 was recommended as an indicator of the health of the whole population of areas, including morbidity and all age groups. However, ACRA wishes to undertake further work in the area of unmet need. As part of NHS England's commitment in the Long Term Plan to further reduce health inequalities, ACRA has been commissioned to conduct and publish a review of the inequalities adjustment in the allocation formulae.

ACRA have not been able to make an evidence based recommendation on how much funding should be redistributed through the unmet need adjustment. The NHS England Board meeting of 31 January 2019 determined the share should remain at 10% for the core CCG formula, 15% for primary medical care, and 5% for specialised services. The differential reflects our assessment of the relative importance of these streams in addressing unmet need and health inequalities.

3   Population base

3.1   Calculating CCG estimated registrations

3.1.1   GP registered lists

The starting point for the weighted capitation formula is each CCG's population. The populations used are the registered lists of all member GP practices of the CCG as published by NHS Digital.

Previously a single monthly snapshot of GP registrations has been used as the baseline population. Based on a recommendation from ACRA, this has changed for 2019/20 allocations and a 12-month average of GP registrations has been used. This better reflects seasonal patterns in some areas, such as areas with high numbers of students or seasonal workers. The estimated baseline population for 2018/19 is based on an average of GP registrations, by quinary age-sex group, over the period November 2017 to October 2018.

GP registered lists are used irrespective of the patients' place of residence or where they use NHS services. This follows the guidance '*Who pays? Determining responsibility for payments for providers'* (NHS England 2013)[11].

3.1.2   Projected registered lists

The 12-month average GP registrations to October 2018, aggregated to CCG level, are projected forward to give estimated GP and CCG registered lists for each year from 2019/20 to 2023/24. In previous allocations rounds this has been done using the overall projected population changes for a CCG, keeping the age and gender distribution fixed for each CCG. For the 2019/20 to 2023/24 allocations they are projected forward using the ONS projections for resident populations in CCGs by quinary age-sex group. If population growth in an area is disproportionately in a younger or older population – which will affect relative levels of need – this is reflected in the changes in need-weighted populations over time. The percentage growth in CCGs' age-sex registrations is assumed to be the same as its projected percentage growth in its age-sex resident population.

The ONS projected populations are the 2016 based Sub-National Population Projections[12] (SNPPs) published at CCG age-sex level. These projections start with the 2011 Census populations, which are rolled forward to 2016 by adding the number of births and net migration and subtracting the number of deaths. Trends for the fertility rates, death rates and net migration are used by the ONS to project forward from 2016.

The sizes of CCGs' registered lists differ from the sizes of the ONS resident populations. This is for several reasons, the largest of which is cross-boundary flows: people who are registered with one CCG but reside in a different CCG. Other reasons include people who are entitled to register with a GP practice but are excluded from ONS populations because they have not yet been resident in the UK for 12 months, unregistered patients who are included in ONS populations, and

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[11] NHS England, *Who pays? Determining responsibility for payments to providers*, August 2013
[12] ONS 2016 based Subnational Population Projections (SNPP) for CCGs

patients for whom there is a delay in removal from registered lists, for example following a move abroad.

3.1.3 Projected weighted populations

Weighted populations are calculated for 2018/19 based on the average registered population to October 2018 and for each year 2019/20 to 2023/24 using the projected CCG registered populations for each year.

Each CCG's share of England weighted population will change over the period from 2018/19 to 2023/24 to reflect the differences in age-sex population projections across the country over that time.

3.1.4 Unregistered populations

Using registered lists does not take account of people who are not registered with a GP practice. ACRA considered whether an adjustment should be made to the formula for unregistered populations, but the absence of reliable data on the size of the unregistered population by area and their healthcare needs, means for the present they could not.

A - Registrations by GP practice and CCG – 2018/19 (Excel file)

This gives the average number of registrations for the 12 months to October 2018 by GP practice and CCG, broken down by age-sex group.

B – Calculation of CCG estimated registrations 2019/20-2023/24 (Excel file)

This shows the projected registered populations from 2019/20 to 2023/24 by CCG and their population growth rates.

4 Clinical Commissioning Group core allocations

4.1 Introduction

There are three steps in calculating weighted populations for target allocations for CCG core responsibilities. The first is to weight, or adjust, registered populations for relative need, the second is to weight for unmet need/health inequalities, and the third is to weight for unavoidable differences in cost due to location.

This section covers the first and second, the weights per head for need and the unmet need adjustment. There are separate weights per head for need for general and acute, mental health, community and maternity services, as well as prescribing as the distribution of each need component is different across the country.

Section 3 has described the population base, section 5 describes the adjustments for unavoidable costs, and section 6 describes how the need-weighted populations for general and acute, community mental health, maternity, and prescribing are combined into a single need-weighted population. Section 6 also describes how the need-weighted populations are combined with the unmet need adjustment and the adjustments for unavoidable costs to give a single unified weighted population for each CCG for its core allocations.

The basic approach in calculating need-weighted populations for CCGs is to multiply the population for each age-sex group for each GP practice by the relative need per head estimated from research. The products for each age-sex group are summed to give the relative need-weighted population for each GP practice. The weighted populations for GP practices are summed to give the relative need-weighted populations for each CCG.

4.2 General and acute

4.2.1 The development of the model

The relative need per head for general and acute for 2014/15 and 2015/16 allocations was estimated by the Nuffield Trust[13] using a person-based approach, building on the research for the former practice based commissioning toolkit. The person-based approach uses data at the individual level (anonymised) to provide accurate estimates of need for small and atypical populations. The Nuffield Trust research estimated both need related to age and additional need over and above that due to age.

For the 2016/17 allocations, NHS England refreshed the Nuffield research using more recent data and re-estimated the models to produce updated weights for different drivers of need. The same approach and methodology as the Nuffield Trust were followed.

For the 2019/20 allocations round the model is unchanged and the need weights derived for 2016/17 allocations were applied to updated population estimates.

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[13] See Person-based Resource Allocation: New approaches to estimating commissioning budgets for GP practices | The Nuffield Trust

4.2.2 Services covered

The general and acute model covers inpatient spells in hospital and community settings, outpatient attendances, accident and emergency attendances and critical care. Mental health, community (non-inpatient) and maternity services were excluded as they are covered by separate components. Specialised services were also excluded as they are not commissioned by CCGs.

4.2.3 Need estimated from past healthcare use

Relative need was estimated from past patterns of utilisation of health services. Costs per head in 2013/14 were calculated for each individual by applying a cost to each inpatient spell, outpatient attendance, A&E attendance and critical care day. The costs used were National Tariff prices where available, and otherwise reference costs. In a small minority of cases, the specialty average was used in the absence of tariff prices and reference costs.

Statistical modelling was used to select the 'best fit' drivers of relative costs at the person level and the relative weights for each driver. The quantified relationships found were taken to be predictors of relative future, cost-weighted need for health care services, with the exception of the supply variables.

The modelling tested a wide range of potential variables to select those that were the best in statistical terms, and also plausible indicators of need, to be included in the final model. Morbidity (previous diagnoses) and age were the most important variables in the model.

4.2.4 Explanatory variables

A range of data were collected to test as possible explanatory variables in the modelling.

The model included anonymised data on the diagnoses for each patient admitted to hospital in 2011/12 and 2012/13 as indicators of morbidity, their age and sex.

Other data tested for inclusion in the model were from the ONS Census of Population and 'attributed' to individuals based on their place of residence - these data are only available for small geographical areas (lower super output areas - LSOAs) rather than for individuals, so individuals are attributed with the value for their small area. They include data such as the proportion of people from black and minority ethnic groups, and the proportion of people aged 16-74 who have never worked.

The numbers of registrations (anonymised) by age-sex group were also obtained for each GP practice to provide information on the proportions of each practice's list using, and not using, health care in 2011/12 to 2013/14.

4.2.5 Supply variables

The utilisation of health care may also be affected by the relative availability of health care services. Variables were tested in the modelling to adjust for this, known as supply variables. These variables included for example waiting times and distances to hospitals. While these variables were included in the models as they affected utilisation, they were not included in the formula to calculate weighted populations; instead their value for each area was set to the national average. This means if an area has lower use of health care services because of lower capacity or longer distance, this is corrected for in the formula.

4.2.6 Implementing the model

The refresh modelled cost weighted need in 2013/14 for those registered with a GP practice in April 2013 using values of the explanatory variables in 2011/12 and 2012/13.

In implementing the model, the coefficients were applied to values of the explanatory variables in 2012/13 and 2013/14 for those registered with a GP practice in April 2014.

For GP practices that have opened or been newly formed since the modelling was undertaken, the average need per head by age-sex group for the relevant CCG was used.

The data used for the modelling excluded treatments received in hospitals in Wales by those registered with an England GP practice. NHS Wales Information Services provided counts of activity data for those registered with a GP practice in each of NHS Shropshire CCG, NHS Herefordshire CCG, NHS West Cheshire CCG and NHS Gloucestershire CCG. The need index is adjusted for these CCGs to account for patients treated in Wales.

> **C1 – General and Acute need per head 2019/20 to 2023/24** (Excel file)
>
> This shows the need per head for each age-sex group for each GP practice. It also shows where the CCG average need per head by age-sex group was used for new practices.
>
> The file shows also each GP practice and CCG's registrations weighted for need (general and acute), and the variables included in the model and their coefficients.

4.3 Community Services

4.3.1 Background

Until now there has been no specific formula that estimates need for community services, mainly due to a lack of reliable data; in the past we have assumed that need for community services is in line with need for General & Acute services. This was a limitation in our approach given that community services form around 17% of CCG spend on core services.

A new national dataset on community services, the community services dataset, has now started flowing but we need at least two years' of data before building a formula. In the meantime, we have been able access, or commission analysis of, local datasets from a diverse group of CCGs. This has allowed us to develop a community services component, which is significantly different from the general & acute component. It is also a stepping stone towards a full analysis of the community services dataset.

For the purposes of CCG allocations, community services are CCG funded health services which take place outside of a hospital setting, and are not part of the primary medical care portfolio. Community mental health services are excluded here as they are included in the mental health formula. Community services funded by local authorities, such as health visiting and school nursing, are also out of scope.

Community services cover a wide range of service types and different CCGs will offer different sets of services depending on the make-up of their populations and on historical factors affecting service provision in their area. The most common forms of service are district nursing or long-term condition management, intermediate care, podiatry and children's services. Other services include physiotherapy and speech and language therapy.

We have focused our analysis on contact with district nursing, because:

- it represents a large part of the spend on community health services (18%);
- it is applied universally across England; and
- it has an age profile which rises steeply with age for recipients in their 70s and 80s which is significantly different to the profile for general and acute services.

4.3.2 Approach

The development of the model for the community services component is based on analysis of district nursing data for five CCGs in Kent for 2016/17 and three CCGs in the West Midlands each with part-year activity in at least one of three years (2015/16 to 2017/18). The model was validated using data from Leeds. Further details can be found within the Community Services research paper.

Programme budgeting shows that the two sets of CCGs are a reasonable sample of middle-ranking CCGs for district nursing spend, so would produce a reliable starting point for the equitable distribution of district nursing funding.

Utilisation of district nursing rises as recipients get into their 70s and 80s and suggests a quite different age-cost curve to the one for General & Acute services as shown in Figure 4.1, justifying the requirement for a separate component for community services to reflect this.

Figure 4.1: Comparison of age-cost curves for General Acute and Community Services
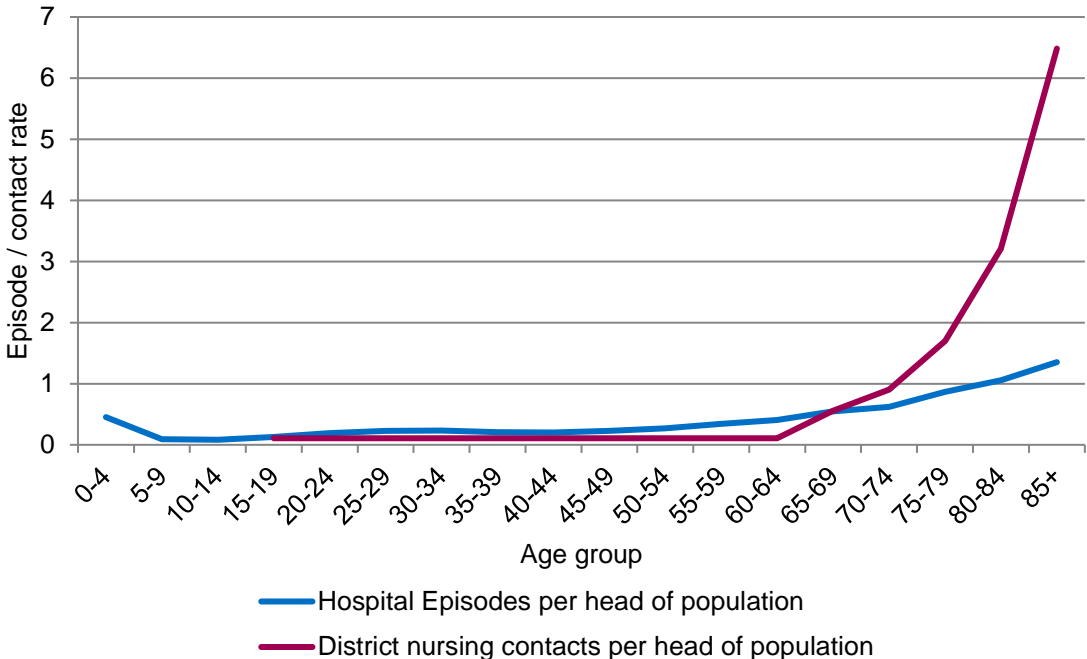
Our analysis suggests that half of all community service activity (weighted by expenditure) varies in a similar way to district nursing. The community services component of the core CCG formula will therefore be used to distribute 50% of the community services budget with the remaining 50% continuing to be distributed in-line with the General & Acute component of the formula.

4.3.3 Model

Analysis was undertaken to attempt to estimate a workload model for district nursing, details of which can be found in the Community Services research paper. Due to restrictions in the data available it was concluded that estimating a workload model would add little value and greater uncertainty over and above an activity model, thus we developed an activity model using contact rate, based on a combination of the Kent and West Midlands data.

Analysis showed that age was the most important factor in determining need for community health services, but within each age band there was also a notable deprivation slope that means that, controlling for age, patients in more deprived areas receive more district nursing contacts than those in less deprived areas. Our approach is therefore based on a regression model taking account of age, sex and deprivation.

4.3.4 Implementing the model

Contact rates by age and sex are calculated for GP practices and CCGs based on applying the contact rates from the model to the registered populations by age, sex and deprivation decile. These contact rates are then applied to the registered populations for those cohorts to produce a weighted population.

C2 – Community Services 2019/20 to 2023/24 (Excel file)

This shows contact rate by age and sex for GP practices and CCGs.

The file shows also each GP practice and CCG's registrations weighted for need.

4.4 Mental health

4.4.1 Approach

The adult mental health component has been newly refreshed for this allocations round by NHS England, with the development of the model overseen by ACRA. The refreshed model used person-level data on the use of mental health services, learning disability services, Improving Access to Psychological Therapies (IAPT) services, and general and acute hospital services, as well as demographic characteristics and area level socio-economic characteristics. Specialised mental health services, which are commissioned by NHS England, were excluded from the model whenever data would allow.

The refreshed model was based on more up-to-date data than the previous model and it also includes IAPT services and updated categories for unit cost breakdowns.

Over sixty different formulations of the statistical model were analysed to test different variables for inclusion and to assess which model had the best performance

in terms of predicting the cost of care at GP practice level while being as parsimonious as possible. Only variables derived from data that are consistently reported across the country were used, to avoid differences in reporting affecting need predictions.

4.4.2 Data

The model is based on national datasets for 2015/16 that capture person-level service usage in a consistent and comparable way. The two main datasets used were the Mental Health Services Data Set (MHSDS[14]) and the IAPT dataset. Information on inpatient and outpatient care was complemented with Secondary Uses Survey (SUS) data when not reported in the MHSDS. Individual cost-weighted activity estimates were calculated by aggregating the cost for inpatient bed days (split by the cost per general bed day and cost per intensive bed day) and unit costs for community care contacts (split by the pay band of the care professional overseeing the care) and IAPT contacts.

These data were merged with other person and area level information relative to 2013-14 and 2014-15 derived from other routinely collected data available within NHS England for all individuals registered with a GP practice in England at 1st of April 2015.

4.4.3 Explanatory Need and Supply Variables

The model included a set of explanatory variables that were found to be associated with the future use of mental health care, including both need and supply variables.

Key indicators of need that were included are:

- **Individual level indicators** of age, gender and ethnicity, and of physical health diagnostic flags (from inpatient diagnoses, relating to issues such as substance misuse and conditions such as diabetes[15]);

- **Household level indicators** on household composition to inform key drivers discussed in the literature such as living alone[16];

- **Small area level indicators** where individual and household level data are not available, in particular the proportion of people in receipt of benefits, indicating levels of worklessness; and

- **General Practice (GP) indicators** on the proportion of students on the GP list and the Quality and Outcomes Framework measures covering the prevalence of severe mental illness.

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[14] Formerly the Mental Health and Learning Disabilities Services Data Set and the Mental Health Minimum Dataset

[15] As identified in recently published work by Public Health England on links between physical health and severe mental illness https://www.gov.uk/government/publications/severe-mental-illness-smi-physical-health-inequalities

[16] The mental health costs for individuals living alone were found to be higher than individuals who did not, further details are outlined in the Technical report for the Mental Health Allocation Formula.

A set of supply variables have also been included to account for differences in supply side issues. The variables included are:

- A set of variables indicating the CCG of the GP practice where the individual is registered, to account for differing levels of access and commissioning approaches to mental health services;

- A variable indicating the degree of service use for each GP practice at each mental health trust, to control for the supply of mental health services by taking account of the effect that differing provider approaches to provision, classification, coding and reporting of treatment, may have on individual cost; and
- Average driving distance between the LSOA centroid (of patient residence) and the closest provider (mental health trust headquarter), as living closer to a provider is associated with higher access to and utilisation of services. Sterilising this variable in the formula is important so that rural areas are not under-allocated resources.

4.4.4 Need Estimates

Individual need estimates were derived by taking predictions from the model but sterilising the effect of supply variables and variables which were counterintuitive. Variables were sterilised by fixing values to reflect England averages, to predict need.

For example, being from some minority ethnic groups, including Indian, Pakistani, Bangladeshi and Chinese classifications, was associated with a lower utilisation of mental health services. As this is potentially reflecting unmet need within these population groups, rather than lower need, the impact of variables for these minority ethnic groups is sterilised. Where ethnic groups were seen to be associated with higher levels of need this was taken account of in the model.

Individual need estimates were aggregated to the patient age and gender levels and used to weight GP registered populations. GP registered populations were based on the average across the year from November 17 to October 18, and then uplifted by ONS 2016 based projections to estimate overall need at practice level for 2019/20 and subsequent years.

4.4.5 Data Quality Testing

Sensitivity analyses were performed to confirm that the model specification is robust to data quality issues and stable to the inclusion/exclusion of the selected variables. Analysis of resulting need indices by CCGs have been carried out to verify if providers with known data quality issues, as reported by NHS Digital and as revealed in our interrogation of the dataset, were particularly affected. To account for under reporting for some providers, non-overlapping records from SUS were added to the MHSDS records.

Individual level mental health diagnoses, clusters and risk flags were not used in the model due to concerns around data completeness, which could unfairly affect some CCGs. Thus, only acute physical health diagnoses are included, as these are more consistently reported by General and Acute providers.

Further details can be found within the research report for the Mental Health Allocation Formula[17].

4.4.6 Children's and Young People's (CYP) Mental Health Adjustment

The refresh of the adult model concentrated on those aged 20 and over, so an alternative method was used by NHS England to estimate mental health need per head for the four quinary age bands under 20. The adult model is person-based but person-based CYP data has not yet been available for long enough in the MHSDS to extend the model to this age group. The adjustment for CYP therefore followed a similar approach to that taken in previous allocations rounds.

The method used all mental health activity captured as inpatient bed days and outpatient appointments within the Mental Health Services Data Set (MHSDS) for 2017/18.

Cost-weighted activity estimates were calculated by quinary age groups and across these age groups by gender. The unit costs used for bed days and appointments were taken as estimated for the adult model. 9% of all the cost-weighted activity within the MHSDS was for CYP and the remaining 91% captured services delivered to adults, however, it should be noted that this activity excludes adult IAPT contacts.

The CYP cost-weighted activity estimates were then expressed as a percentage of cost-weighted activity for the 20-24 age groups, split by gender.

The percentage of cost-weighted activity by gender and for the four children and young person's age groups were then applied to the need per head from the refreshed adult mental health model by gender for those aged 20-24. These ratios were validated against data extracts from Hospital Episode Statistics (HES).

> **D – Mental Health need per head 2019/20 to 2023/24** (Excel file)
>
> This shows the need per head for each age-sex group for each GP practice and CCG calculated using the refreshed mental health model and estimates for those aged under 20 as described above.
>
> The file also shows the weighted populations for mental health and mental health relative need index for each GP practice and CCG.

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[17] https://www.england.nhs.uk/allocations/

4.5 Maternity

4.5.1 Approach

The maternity model was refreshed for 2016/17 allocations by NHS England. The model used person-based data to estimate cost per birth by GP practice in 2013/14. For the 2019/20 allocations round, the model is unchanged and the need weights derived for 2016/17 allocations were applied to updated birth estimates.

4.5.2 Model

The same data set was used as for the refresh of the general and acute model. This included diagnoses in previous years and a wide range of data including for example from the ONS Census of Population.

A number of new variables were created for the refresh of the maternity component, including the proportion of births that were low birth weight births and the number of births by the mother in the period 2010/11 to 2013/14.

A smaller set of variables were tested for inclusion in the model than for general and acute, based on the plausibility of relevance for maternity services. For example, the proportion of those aged over 65 in the small area claiming state benefits was not tested.

Age and some morbidity markers (previous diagnoses) were found to be important determinants of predicted costs per birth. Supply variables were included in the model but set to the national average in the calculation of weighted populations.

4.5.3 Implementing the model

For the 2019/20 allocations round, ONS 2016 statistics on 'live births by age of mother and father, 2000 to 2016'[18] were used to weight female registered patients aged 15 to 44 by quinary age bands within LSOAs, to distribute live births in England by GP practices. The costs per birth were applied to the average annual number of live births between 2013 and 2017.

For practices that had opened since the end of 2013/14 (and for which there is not a cost per birth available from the model), the average cost per birth for the relevant CCG was used.

> **E – Maternity need 2019/20 to 2023/24** (Excel file)
>
> This shows the number of new registrations for births, the estimated cost per birth, and the variables in the maternity model and their coefficients
>
> The file also shows each GP practice and CCG's registrations weighted for maternity need.

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[18] ONS Births by parents' characteristics

4.6 Prescribing

4.6.1 Approach

The prescribing component covers the costs of medicines prescribed in primary care and actually dispensed. It does not cover the costs of dispensing the prescriptions as these are not funded by CCGs.

The model has two stages; the first weights for need related to age and sex, and the second stage weights for additional need over and above that related to age and sex. The unit for analysis in the models is GP practices.

The model was refreshed by NHS England for 2016/17 allocations and is based on the cost of prescriptions by GP practice in 2013/14. For the 2019/20 allocations round the model is unchanged and the need weights derived for 2016/17 allocations were applied to updated population estimates.

4.6.2 Weights for age and sex

The adjustment for age and sex applies the weights that were developed by NHS Digital known as ASTRO(13)-PUs.[19] This is an index of the national average costs of prescriptions by age-sex group.

4.6.3 Weights for additional need

The model for additional need includes both need and supply variables as for the other components. The set of variables in the model were determined by statistical goodness of fit and plausibility as indicators of need. The need variables in the final model include for example the Index of Multiple Deprivation and the proportion of those aged 70 years and over claiming disability living allowance (DLA).

4.6.4 Implementing the model

ASTRO(13)-PUs and additional need estimates were applied to each GP practice and the GP practice weighted populations summed to give the CCG weighted populations. Supply variables were included in the model but set to the national average in the calculation of weighted populations.

Where a GP practice has been newly opened or formed, the average additional need values for the relevant CCG for these GP practices has been applied.

> **F – Prescribing need 2019/20 to 2023/24** (Excel file)
>
> This shows the calculation of registrations weighted for age, sex and additional need for each GP practice and CCG. It shows also where the additional need variables were not available from the model for new practices, and the average CCG value was used.
>
> The file also lists the coefficients and variables in the model.

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[19]https://webarchive.nationalarchives.gov.uk/20180307182940/http://content.digital.nhs.uk/prescribing/measures

4.7 Unmet need and health inequalities adjustment: SMR<75

4.7.1 Approach

Given the use of utilisation-based formulae in our allocations approach, ACRA recognises the importance of attempting to account for health needs which are not visible in the utilisation statistics. We also have a duty to use an approach which tries to help reduce avoidable health inequalities. As such, a significant proportion of target allocations is devoted to a combined unmet need/health inequalities adjustment.

In order to take account of health inequalities and unmet need in the allocations formula, ACRA have recommended that the standardised mortality ratio for those aged under 75 (SMR<75) is the best available indicator on which to base the adjustment.

ACRA has considered a range of measures of population health for the adjustment for unmet need and health inequalities. These were found to be highly correlated with each other. The SMR<75 has the advantage that it can be updated regularly at small area level, while other measures can typically only be updated at small area level using data from the 10-yearly Census. The SMR<75 was recommended as an indicator of the health of the whole population of areas, including morbidity and all age groups.

ACRA have not been able to make an evidence based recommendation on how much funding should be redistributed through the unmet need adjustment. For 2019/20 to 2023/24 the share for CCG core allocations will remain at 10%.

4.7.2 Standardised Mortality Ratio

The unmet need/health inequalities adjustment is based on the standardised mortality ratio for those under 75 years of age (SMR<75) applied at small area level to take account of inequality in health outcomes within as well as between CCGs.

The SMR<75 is a measure of how many more or fewer deaths there are in a local area than the national average, having adjusted for the differences between the age profiles of local areas compared with the national average. It is applied at small area level (middle layer super output area (MSOA[20])) and then aggregated to CCGs.

4.7.3 Weights per head

The adjustment has been updated to use the latest available data for the SMR<75 (2011-15).

We have, on the recommendation of ACRA, revised our approach to the weighting we apply to each MSOA. Previously each MSOA was assigned to one of sixteen groups based on its SMR<75 value. Those with the lowest SMR<75 values were in group one, and those with the highest SMR<75 values are assigned to group sixteen.

Each of the sixteen groups was given a weight per head, with all the MSOAs in group 16 having a weight ten times higher than the MSOAs in group 1. The weight for the

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[20] MSOAs are small geographical areas designed by ONS for statistical reporting and analysis and MSOAs have similar population sizes.

intermediate groups increased exponentially, so that group one had a weight of 1.00, group two a weight of 1.17, through to group fifteen with a weight of 8.58 and group sixteen with a weight of 10.00.

Now instead we apply a continuous exponential distribution based on SMR<75 values. This is calibrated to the previous approach by setting the weights for the two MSOAs at the mid-points within groups 2 and 15 to the weights they would have been assigned previously, i.e. 1.17 and 8.58 respectively. We apply the continuous exponential across all other MSOAs using their SMR<75 values.

This ensures that weighting is a function of SMR<75 values rather than simply the rank of the MSOA. This better reflects the wide variation in SMR<75 values seen in the group with the highest mortality ratios allowing weights for some MSOAs to rise above the previous upper limit of 10.

4.7.4 Implementation

Each MSOA's population is given a weight based on this methodology and the MSOA weighted populations are then summed to CCG level using the number of the CCG's registrations resident in each MSOA.

> **G – SMR weighted populations** (Excel file)
>
> This shows the weights per head for each of the 6,791 MSOAs in England, and the calculation of SMR<75 based weighted populations for CCGs.

5 Unavoidable costs

5.1 Introduction

There are adjustments for three types of unavoidable costs: the market forces factor (MFF); the emergency ambulance cost adjustment (EACA); and remoteness.

The adjustments are included in the weighted capitation formula to take account of the higher costs of commissioning services as a result of these unavoidable factors.

5.2 Market Forces Factor (MFF)

5.2.1 Approach

The MFF adjusts for the unavoidable differences in unit input costs between areas due to their geographical location alone. For example, it typically costs more to run a hospital in a city centre than in other areas due to higher staff, buildings and land costs. This adjustment is for higher, unavoidable input costs alone.

The provider MFF for 2019/20 has been updated, incorporating more up to date data and a revised methodology to improve the accuracy of the estimates of unavoidable cost difference between providers. The previous MFF values were produced in 2010.

Following the update, the provider MFF consists of 6 components, which are; non-medical and dental staff; medical and dental staff; land; buildings; business rates; and other.

Full details of the changes to the provider MFF and the methodology for creating the MFF are set out in *A guide to the market forces factor*, published as part of the S118 consultation for the National Tariff. [21]

To smooth the impact of change to the new MFF, the transition to the updated MFF values will take place over a five-year period in equal steps. This phased approach has been replicated in CCG target allocations.

5.2.2 MFF index for CCGs

The MFF for each provider is the starting point for the calculation of MFFs for CCGs. The MFF for each CCG is calculated from the MFFs of providers where each member GP practice's patients received inpatient, outpatient and A&E treatment.

The CCG's MFF is the weighted average of providers' MFFs, where the weights are the spend by the CCG with each provider. The weights are often known as the purchaser-provider matrix, which has been updated for 2019/20 allocations.

The updated purchaser-provider matrix uses activity in 2017/18 (as recorded in the Secondary Uses Service Payment by Results (SUS PbR) data).

The CCGs' MFFs are expressed as an index, with the England average set to the value of 1.0.

The MFF index value is applied to the combined weighted populations for general and acute, community, mental health, community and maternity services.

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[21] See https://improvement.nhs.uk/resources/201920-payment-reform-proposals/

The prescribing component is not adjusted by the MFF as the costs of prescribed medicines are the same throughout the country.

There are slightly different MFFs for CCG areas applied to the specialised services formula as the balance of providers used is different from that for general and acute services.

H – Market Forces Factor (Excel file)

This shows the percentage of each CCG's costed inpatient, outpatient and A&E activity with each provider, along with the 2019/20 to 2023/24 MFFs, plus the scaling to rebase CCGs' MFFs so that the England average equals 1.0

5.3 Emergency ambulance cost adjustment

5.3.1 Approach

The Emergency Ambulance Cost Adjustment (EACA) adjusts for unavoidable variations in the costs of providing emergency ambulance services in different geographical areas, and in particular sparsely populated areas. The EACA was refreshed by NHS England for the 2016/17 allocations round. The model for 2019/20 allocations is unchanged.

5.3.2 Model

Data on times to incidents, times at incidents, times to convey to hospitals, and turnaround times at hospitals from four ambulance trusts (North East, South West, London and East Midlands) were used to develop separate models for times to 'see & treat' and 'see & convey'. See & convey is where the patient is taken to a hospital in the emergency vehicle, and see & treat is where the patient is treated at the scene (such as in the patient's home) and is not transported to hospital.

Data was provided at MSOA (middle super output area) level to maintain patient confidentiality. Data from other sources on the characteristics of MSOAs were collected by NHS England, including population density, distance to A&E departments, and age profiles.

Distance to A&E departments and population density were found to be important in the models.

The two models for see & treat and see & convey were combined to give average predicted times in minutes using the proportions of see & treat and see & convey cases in the dataset.

5.3.3 Implementation

The modelled times in minutes for MSOAs were summed to CCG level. The modelled times for CCGs were converted into an index, with the England average set to the value of 1.0.

The index from the previous step was applied to the proportion of national Hospital and Community Health Services (HCHS) expenditure on ambulance services, to give the final overall EACA index. The same EACA index value is applied to the combined weighted populations for general and acute, mental health, community and maternity services.

> **I – Emergency Ambulance Cost Adjustment** (Excel file)
>
> This shows the calculation of the EACA index from the coefficients from the models.

5.4 Unavoidable costs of remoteness

5.4.1 Approach

The purpose of this adjustment is to provide funding to CCGs to meet the unavoidably higher costs of remote hospital sites, where the costs are higher because the level of activity is too low for the hospital to operate at an efficient scale.

There are two steps in calculating the adjustment. The first is to define remote hospital sites, and the second is to estimate by how much their costs are unavoidably higher. This adjustment was introduced in 2016/17 allocations, the same model has been used in 2019/20.

5.4.2 Identifying remote hospitals

The remoteness adjustment applies to hospitals providing Tier 1 A&E services. The criteria used to define remote hospitals are as follows:

i) There is a population of under 200,000 within a one-hour travel time of the site. A population served of 200,000 is the scale at which a hospital is taken as being able to achieve close to national efficiency levels. This is to avoid an adjustment being applied to larger remote hospitals for which costs should not be unavoidably high.

ii) The next nearest provider (with tier 1 A&E services) is one hour or more away by normal road travel times (including ferry times where relevant), for at least 10% of the population served. One hour is taken to be the maximum travel time to hospitals for clinical safety reasons for emergency care. The proportion of the population served who are more than 60 minutes away from the next nearest hospital provides an indication of whether the hospital is serving a population of under 200,000 for reasons of remoteness or for other reasons. An adjustment to target allocations is only made when this percentage is 10% or higher. This avoids giving very small (immaterial) adjustments to a large number of providers.

Travel times were used rather than road distances or straight-line distances. Travel time to the next nearest hospital is an indicator of whether or not consolidation of services onto fewer sites is feasible.

The criteria identified eight hospital sites as unavoidably small due to remoteness.

5.4.3 Higher costs due to smallness

A cost curve was estimated for all hospitals, which gave the estimated cost of sites by activity levels. The estimated relative costs were adjusted to remove the impact of differences in case mix and in costs that are already compensated through the market forces factor (that is unavoidable differences in unit input costs across the country).

Estimated costs for predicted activity for a hospital serving a population of 250,000 people, around the national average, were used as the reference point for deriving the size of estimated higher costs of remote sites. The cost curve gives the estimated higher costs above the reference point for each of the hospitals with predicted activity levels that correspond to the size of their population catchment area.

The adjustment reflects the expected higher costs based on the cost-curve, rather than the actual costs of the hospital, which may be affected by a number of factors

unrelated to its scale. Predicted activity for a given population catchment area was used for the remote hospitals instead of actual activity, as the latter may be affected by other factors such as patient choice.

5.4.4 Implementation

The total adjustment was £34 million covering seven CCGs for eight hospital sites. The adjustment for the baseline year of 2018/19 was calculated by adjusting the 2015 figure for 2018/19 by uplifting by an amount equivalent to the growth of the CCG core allocation budget over that time period. These are shown in Table 5.1. How the adjustments for higher costs due to unavoidable smallness were included in weighted populations for CCGs is described in section 6.

Table 5.1 Adjustment for unavoidable smallness: adjustment by site

Hospital	Adjustment 2018/19 £000s	Clinical Commissioning Group
Furness (University Hospitals of Morecambe Bay)	£6,281	NHS Morecambe Bay CCG
West Cumberland (North Cumbria)	£5,591	NHS North Cumbria CCG
St Mary's (Isle of Wight)	£5,312	NHS Isle of Wight CCG
North Devon (Northern Devon)	£3,985	NHS North, East, West Devon CCG
Cumberland	£3,598	NHS North Cumbria CCG
Hereford (Wye Valley)	£3,415	NHS Herefordshire CCG
Pilgrim (United Lincolnshire)	£3,019	NHS Lincolnshire East CCG
Scarborough (York Teaching)	£2,864	NHS Scarborough and Ryedale CCG

6 Total weighted populations for core CCG allocations

6.1 Combining the formula components

6.1.1 Unified weighted populations for the average of registrations between November 2017 and October 2018

As described earlier, there are separate weighted populations for need for general and acute services, mental health services, community services, maternity services and prescribing, and additionally there are adjustments for unmet need and unavoidable costs.

These are combined into unified weighted populations for each CCG for core allocations in the following steps.

1. Combine the weighted populations for need for general and acute, mental health, community and maternity services, by using the 2017/18 national outturn expenditure on each for their relative shares in the overall hospital and community services (HCHS) need-weighted population.

2. Apply the indices for the MFF and EACA.

3. Combine the weighted populations for HCHS from steps 1 and 2 with the weighted populations for prescribing, by using 2017/18 national outturn expenditure on HCHS and prescribing for their relative shares. There is no adjustment for the MFF and EACA for prescribing.

4. Combine the outcome from step 3 with the unmet need/health inequalities adjustment. The latter is given a weight of 10% and the outcome from step 3 a weight of 90%.

5. Apply the adjustment for the costs of unavoidable smallness due to remoteness.

6.1.2 Unified weighted populations for 2019/20 to 2023/24

Unified weighted populations for 2019/20 to 2023/24 are calculated by applying the same percentage growth to the annual average registered populations as the projected growth in each quinary age/sex group of the CCG's resident population as projected by ONS, and using these as inputs into the separate component models for general and acute services.

J – Overall weighted populations for CCGs 2019/20 to 2023/24 and GP practices 2018/19 (Excel file)

This shows the overall weighted population for each CCG for core allocations for 2018/19 based on November 2017 to October 2018 average registrations, and the weighted populations for general and acute, community, mental health, maternity, prescribing and the SMR<75.

The file also shows the core CCG weighted populations for 2019/20 to 2023/24. It shows also the overall weighted population for each GP practice for 2018/19.

Finally, a breakdown is provided of the change in the distance from target for each CCG for 2019/20 between those published in February 2018 and those following the refresh of the CCG formula.

7 Primary medical care allocations

7.1 Introduction

The formula for primary medical care (GP services) allocations was updated in 2016/17. This update moved away from using the Carr-Hill contractual formula that is at the heart of the General Medical Services (GMS) contract, to a formula based on new estimates of workload per patient by age-sex group, which were used as the relative weights per head for allocations.

ACRA endorsed the new formula, ACRA's recommendations on the workload formula are for allocations purposes only. ACRA's remit does not extend to recommendations on how GP practices are remunerated through the GMS contract.

Only primary medical care is included in the place-based commissioning allocations by CCG, as other areas of primary care (mainly community pharmacy, dentistry and optical services) are not currently within the scope of collaborative commissioning, and the allocation formulae are not sufficiently robust to use for individual CCG geographies.

The formula for 2019/20 allocations is unchanged.

7.2 Methodology

7.2.1 Data

The requirement was to measure general practice workload and consider how the attributes of practices and their patients influenced that workload. The dataset used was the Clinical Practice Research Datalink (CPRD), which is an ongoing primary care database of anonymised medical records for a large number of general practitioners. It is broadly representative of the UK general population in terms of age, sex and ethnicity. For this work there were usable records from around 210 practices covering about two million patients.

Workload was measured by the number of minutes electronic files for patients were open, weighted by staff group.

7.2.2 Modelling approach

A linear fixed effects model was fitted to the CPRD data to estimate the effect of patient and practice characteristics on GP workload. The model is at the person level, and of the form:

$$\text{Total file opening times (weighted by staff group)} = \text{Constant} + \text{Age-sex group} + \text{New registration} + \text{IMD decile} + \text{Practice ID}$$

Age and sex are well known to affect workload; typically more elderly patients have more minutes of GP practice time than younger age groups.

Index of Multiple Deprivation (IMD) is a proxy for higher need in more deprived areas. IMD 2010 data were used as these data were in the CPRD dataset at the time of data extraction, even though IMD 2015 has since been released. IMD values were imputed for the individual patients who did not have associated IMD deciles in the dataset provided.

Being newly registered with the practice was found to be associated with higher workload.

The intercept (constant) represents the estimated average number of additional weighted contact minutes per year that a patient on the registration list at the start of the year with baseline characteristics has with their GP surgery. In the model that is a male patient, aged 0-5, in IMD decile 1.

The practice ID was treated as a supply variable, and not included in the weighted populations. This removes the impact on workload of differences between individual GP practices in their working practices.

ACRA considered whether rurality should be included as a factor in determining workload but advised that it should be excluded from the model. This was because of the uncertainty over whether it was reflective of additional workload or systematic behaviour in rural practice not arising from workload.

More information on the model can be found in the paper *Primary medical care – new workload formula for allocations to CCG areas.*[22]

7.3 Implementation

The model's coefficients and constant term were applied to the average GP practice registered lists between November 2017 and October 2018 for 2018/19 and to projected practice populations for 2019/20 to 2023/24. The GP practice MFF from the Carr-Hill formula was also applied. This gave GP practice weighted populations which were then aggregated to CCGs.

An adjustment accounting for 15% of the overall primary medical care weighted population is applied to adjust for unmet need and health inequalities (see Section 4.7). An adjustment was also applied to account for estimated dispensing doctors' fees in 2018/19. A final adjustment was made to reflect net effects of funding changes to the GP contract following the introduction of a new centrally funded Clinical Negligence Scheme for General Practice in April 2019.

CCG weighted populations for 2019/20 to 2023/24 were derived using the projected GP registered population profiles as described in section 3.

K1 – Primary Care (medical) (Excel file)

This shows the coefficients from the new primary medical services model and data at GP practice level.

The file also shows the calculation of weighted populations for primary medical services and how these are combined with the SMR<75 weighted populations to give overall weighted populations.

K2 – Primary Care adjustment for new GP contract (Excel file)

This shows the net effect on final allocations following the changes to the GP contract.

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[22] See https://www.england.nhs.uk/wp-content/uploads/2016/04/5-primary-care-allctins-16-17.pdf

7.4 Other primary care

Other (non-medical) primary care services mainly comprise community pharmacy, dental and ophthalmic services but are not included in the place-based allocation as the separate formula for these services is not currently robust enough to use to for individual CCGs. We have not produced weighted populations for these services.

8 Specialised services

8.1 Introduction

Weighted populations and target allocations for specialised services were developed for the first time for CCG areas for the 2016/17 allocations round. The same model has been used for 2019/20 allocations. The responsibility for commissioning specialised services, however, has not transferred to CCGs. These allocations are produced to enable an understanding of total place-based expenditure for a CCG.

A formula was developed for specialised services that followed the same approach and was based on the same dataset as that for the formula for general and acute services.

The data set used for the modelling, however, had poor coverage of some specialised services. Therefore, the new formula was used for 46% of the overall weighted populations for specialised services - for those services where the coverage in the dataset was good. The other 54%, for those where coverage in the dataset was poor, were set in line with the historic pattern of spending as the best estimate of need for these other services. These services have a very "lumpy" geographical distribution and so a per capita approach would not have been suitable.

Using outturn spend for 2017/18 the scope of the formula component has changed from 46% to 49% for 2019/20 allocations.

Expenditure of around £1 billion on very rare, high cost specialised services was not broken down by CCG areas and excluded from the weighted populations.

8.2 New formula

8.2.1 Services covered

The specialised services formula covers inpatient spells, outpatient attendances, accident and emergency attendances and critical care. Specialised mental health and maternity services are included.

The Prescribed Specialised Services (PSS) 2014/15 Identification Tool was used to identify specialised services in the wider dataset used for the modelling. The services poorly covered in the dataset, as defined below, were omitted from the models.

8.2.2 Need estimated from past healthcare use

Relative need is estimated from past patterns of utilisation of health services. Costs per head in 2013/14 were calculated for each individual by applying a cost to each inpatient spell, outpatient attendance, A&E attendance and critical care day. The costs used were National Tariff prices where available, and otherwise reference costs. In a small minority of cases, the specialty average was used in the absence of tariff prices and reference costs.

Statistical models were used to select the 'best fit' drivers of relative costs at the person level and the relative weights for each driver. The quantified relationships found are taken to be predictors of relative future, cost weighted need for health care services, with the exception of the supply variables.

The modelling tested from a wide range of potential variables to select those which were the best in statistical terms, and were also plausible indicators of need, to be included in the final model. It was found that morbidity (previous diagnoses) and age were the most important variables in the model.

The numbers of registrations (anonymised) by age-sex group were also obtained for each GP practice to provide information on the proportions of a GP practice's list using, and not using, specialised services in 2011/12 to 2013/14.

8.2.3 Supply variables

A wide range of supply variables were tested for inclusion in the formula, but none were statistically significant, and they are not therefore included in the formula.

8.2.4 Unavoidable costs

The market forces factor was applied to the weighted populations from the formula. This adjusts for differences in unavoidable employment, land and building costs due to location alone.

The MFFs used in the specialised formula are slightly different than for core CCG allocations as specialised services are commissioned from a different mix of hospital trusts.

8.2.5 Unmet need and health inequalities adjustment

NHS England determined that the unmet need and health inequalities adjustment should have a weight of 5%, and the utilisation formula should have a weight of 95% in the formula based weighted populations. The unmet need and health inequalities adjustment is described in section 4.7.

8.3 Historic spend

Weighted populations were based on 2017/18 spend, rather than the utilisation based formula, for clinical reference groups (CRGs) where the SUS PbR data covered under 40% of total spend in 2014/15, and in addition the whole of National Programme of Care (NPOC) E (Paediatrics, neo-natal, obstetrics and gynaecology).

The choice of a 40% threshold was felt to strike a balance between maximising the range of the formula and avoiding those areas where the representativeness was in greatest doubt.

8.4 Implementation

The weights from the formula were applied to average registrations for November 2017 to October 2018 for 2018/19, and to the next five years of projected registered populations for 2019/20 to 2023/24. These were combined with those based on historic spend to give overall weighted populations for specialised services. The formula has a share of 49% and historic spend a share of 51% in the overall weighted populations.

The calculation of the unified populations is shown in Excel file L – Specialised Services.

L – Specialised services (Excel file)

This shows the overall weighted population for each CCG area for specialised services based on average registrations from November 2017 to October 2018.

The file also shows the specialised services weighted populations based on projected registered populations for 2019/20 to 2023/24.

9 Pace of change

9.1 Principles of pace of change

Actual allocations have been derived from target allocations through pace of change policy. This sets a minimum growth in allocations for core CCG allocations and higher growth in allocations for the CCGs furthest under target. Pace of change for primary medical care allocations also sets a minimum rate of growth and higher growth for those furthest under target. For specialised services, all CCG areas received the same per head uplift.

It has long been the case that the move from the baseline towards target allocations is moderated through a pace of change policy. While ensuring the fastest growth is focused on those furthest below target, the moderation of the speed of movement towards target has a number of benefits:

- the maximum growth for the furthest below target is set at a level that balances achieving an acceptable distance from target with setting growth at a level that can be effectively deployed;

- the minimum growth for the furthest over target is set at a level that allows stability of services and creates confidence for medium term planning; and

- it avoids year-on-year volatility in allocations for those CCGs close to their target allocation.

Figure 9.1: Outline of pace of change policy
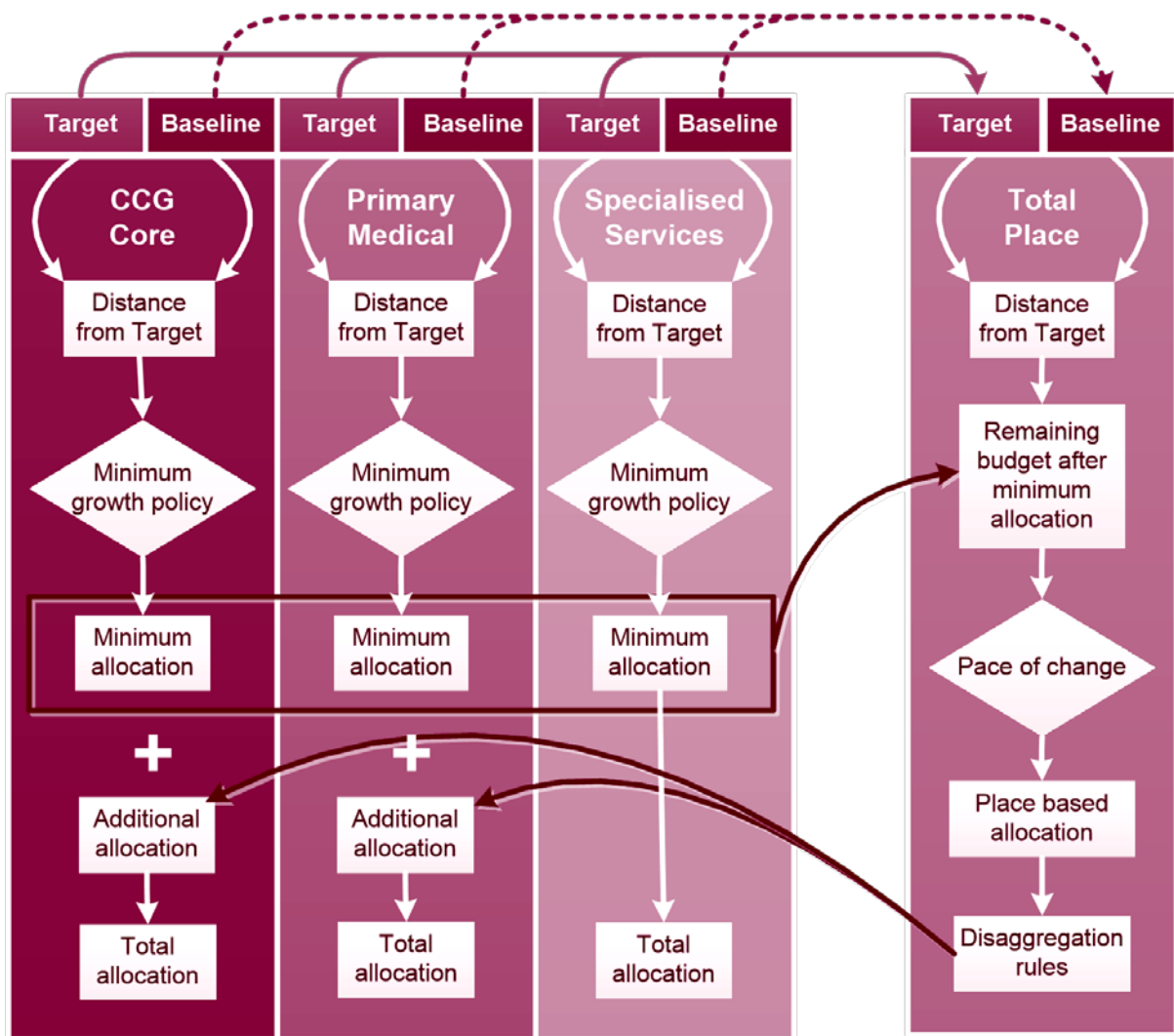
9.1.1 Extending to place based budgets

One of the key aims for the allocations package is to support a place based approach. This acknowledges that a CCG area can better cope with being below target if some of the other streams are funded above target. It also helps mitigate the impact of changes in the way services are commissioned, such as changes in identification rules.

To allow this interdependency a pace of change approach was developed with three separate steps.

i.   For each group of services (primary medical care, CCG core services or specialised services) a minimum allocation was set that meets NHS England's policies, but does not necessarily fully commit the resources identified for that stream;

ii.   A pace of change policy is then applied to the total resources available to the CCG population, based on the sum of the three service groups. This includes a requirement that the total resources available to each population at least meets the sum of the minimum allocations set in step i.; and

iii. Where the total allocation exceeds the minimum allocation, the excess is disaggregated across the groups of services. This leads to the final allocation for each group of services and for each CCG population.

9.2 Setting the minimum allocation

9.2.1 CCG core services

The CCG core services minimum allocation is based on the following rules.

i. Growth is applied to all areas on a per capita basis. Higher per capita growth is applied to those areas most below target, with an aim that no area is more than 5% below target in 2019/20;

ii. Areas close to target receive equal per capita growth. We aim to give this group of CCGs as close to average growth as possible given this reflects our overall assessment of the pressures facing CCGs. This applies to all CCGs between -2.5% and +5% from target in 2019/20, and CCGs between 0% and +5% from target in all later years;

iii. Areas more than 5% above target receive lower per capita growth, tapering down to floor per capita growth for those more than 10% above. Per capita growth for CCGs more than 10% above target will be set at a floor equal to the average growth per head of population less 1.5 percentage points; and

iv. An absolute floor of GDP deflator on overall funding (i.e. not per head of population) also applies to ensure that every area gets real terms growth

9.2.2 Primary medical care services

The rules for the primary medical services are similar to those for core CCG services, except that the floor for areas more than 10% above target will be set at 1.25 percentage points below average growth. This reflects the fact that flexibility in this commissioning stream is more limited by the structures of the primary care contract.

As with CCG core services, 0.1% of funding for primary medical care services is reserved to be distributed on a place-based basis.

9.2.3 Specialised services

The rules for specialised services are different to those for core CCG services and primary medical care services. We have continued to set the minimum allocation for specialised services by applying a uniform per capita uplift for all CCG populations, so that the quantum set for these services is fully depleted.

9.3 Setting the total allocation

The pace of change rules for the total place-based allocation are the same as those used in setting the minimum allocation for CCG core services. The quantum equals the sum of the quanta for the three commissioning streams and as with specialised services, it is fully depleted.

9.4 Disaggregation

If as a result of the place based pace of change an area is allocated more than the sum of the minima there is then the question of how the excess is distributed back to the individual groups of services.

Because of the caution in the use of the specialised services formula, the actual allocation for specialised services is set at the minimum value, set as described in section 9.2.3. This leaves any additional resources to be disaggregated between primary medical services and core CCG services.

If the minimum allocation for primary care services is below target, while that for core CCG services is above target, primary care services receives any additional allocation, or is taken to target, whichever is the lower shift. If core CCG services are below target while primary medical services are above the opposite applies.

If after this step some money remains, or if CCG core services and primary medical services minimum allocations are both above or below target then resources are distributed such that the two services move the same amount towards or further above target.

9.5 Per capita growth rates

The average growth per capita for total place-based allocations resulting from the implementation of pace of change are shown in table 9.1.

Table 9.1 Average per capita growth rates

Opening distance from target	2019/20	2020/21	2021/22	2022/23	2023/24
More than -2.5% below target	6.50%				
Between -2.5% and +5%	5.43%				
Between -5% and 0%		4.16%	4.20%	4.07%	3.98%
Between 0% and +5%		3.89%	3.93%	3.77%	3.67%
Between +5% and +10%	5.01%	3.59%	3.65%	3.59%	3.51%
More than 10% above target	4.27%	2.87%	2.89%	2.97%	3.07%
All CCGs	5.48%	3.99%	4.03%	3.89%	3.80%

> **M – Supporting information for pace-of-change** (Excel file)
>
> **N – Min growth primary medical care** (Excel file)
>
> **O – Min growth CCG core** (Excel file)
>
> **P – Min growth specialised** (Excel file)
>
> **Q – Total place based pace of change** (Excel file)

10 Running cost allowances

10.1 Overall envelope

The overall envelope for 2018/19 is £1,210,954. For 2020/21 CCG running costs allowances (RAC) have been set in line with the expectation that CCGs deliver a real terms reduction of 20% from their 2017/18 running cost allowances by 2020/21.

10.2 Calculation of running cost allowances

10.2.1 Approach

Shares of the running cost allowance for 2019/20 and 2020/21 are based on the same relative share of running costs as was used in 2018/19, after taking into account market rents adjustments and locally agreed adjustments for boundary changes.

The RCA distribution was set on the basis of unweighted 2015 ONS populations adjusted for cross-boundary flows. There is unlikely to be a relationship between the items of expenditure covered by the allowance (i.e. the CCG's management costs and the costs of commissioning support) and the traditional determinants of population need (for example age, sex, deprivation) that form the basis of weighted populations.

S – Running cost allowances (Excel file)

This shows the calculation of running cost allowances for 2019/20 to 2020/21.

Annex 1: Age-cost curves

Age-cost curves show the relative cost per head of providing NHS services to different age and sex groups, and are derived from the research to develop the formulae used to allocate resources to NHS organisations.

The age-cost curves are not used in the funding formula directly, but age and gender are taken into account in the formula in the modelling of the need for health care services at the person level or small area level.

The age-cost curves are included here as they are sometimes helpful for other analyses.

The age-cost curves are given below. Note that:

- they are for different years for different components, reflecting the data used for the underpinning modelling.
- they show total costs for each age-sex group or age-sex weights (the latter where additional need weights cannot be broken down by age-sex group).
- some are actual costs from the data used for the modelling and some are predicted costs from the modelling, dependent on the availability of cost data.

General and Acute

Table A1 shows the modelled cost per head for 2013/14 from the refresh of the general and acute formula as outlined in section 4.2. They include inpatient, outpatient and A&E attendances.

They exclude mental health, maternity and specialised services.

Table A1: General and acute age-cost curve

Age group	Males	Females
1-4	259	198
5-9	183	149
10-14	186	169
15-19	188	227
20-24	190	252
25-29	185	281
30-34	196	315
35-39	223	345
40-44	281	395
45-49	357	470
50-54	446	545
55-59	589	620
60-64	776	745
65-69	962	886
70-74	1,260	1,134
75-79	1,603	1,397
80-84	1,950	1,703
85+	2,350	2,008

Figure A1: General and acute age-cost curve
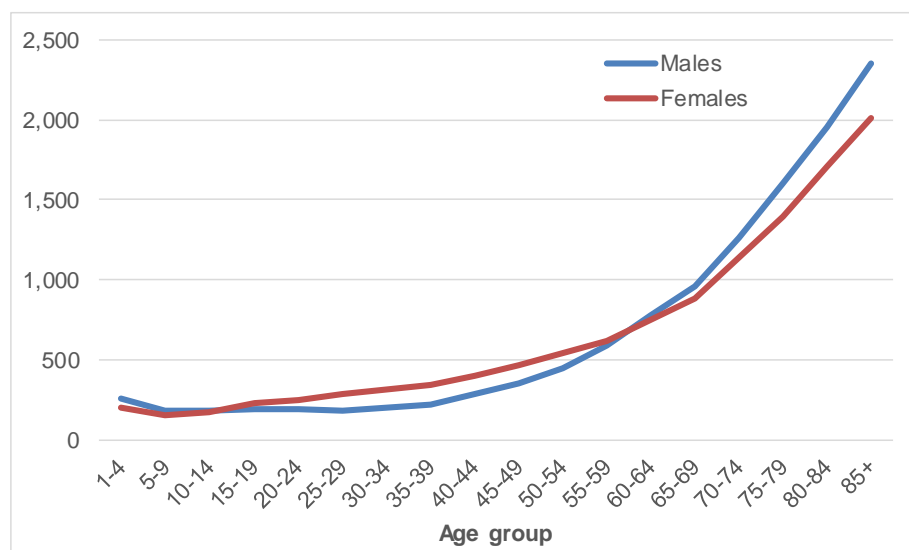

Community services

Table A2 shows the modelled cost per head derived from the newly developed community services formula as outlined in section 4.3. This is the full community services model, based on district nursing contacts, which is applied to 50% of community services spend in the CCG allocations formula.

The data for the modelling did not include those aged under 15, so the general and acute (G&A) model age-cost curve was used as a proxy. The ratios of the G&A age-cost curve for the age groups 0-4, 5-9 and 10-14 (as a proportion of the G&A age-cost curve for those aged 15-19) were calculated and applied to the community services age-cost curve for those aged 15-19.

Table A2: Community services age-cost curve

Age group	Males	Females
0-4	5.7	3.6
5-9	4.0	2.7
10-14	4.1	3.0
15-19	4.1	4.1
20-24	4.1	4.1
25-29	4.1	4.1
30-34	4.1	4.1
35-39	4.1	4.1
40-44	4.1	4.1
45-49	4.1	4.1
50-54	4.1	4.1
55-59	4.1	4.1
60-64	4.1	4.1
65-69	21.7	16.3
70-74	32.9	32.6
75-79	61.5	64.5
80-84	109.0	127.0
85+	226.4	276.2

Figure A2: Community services age-cost curve
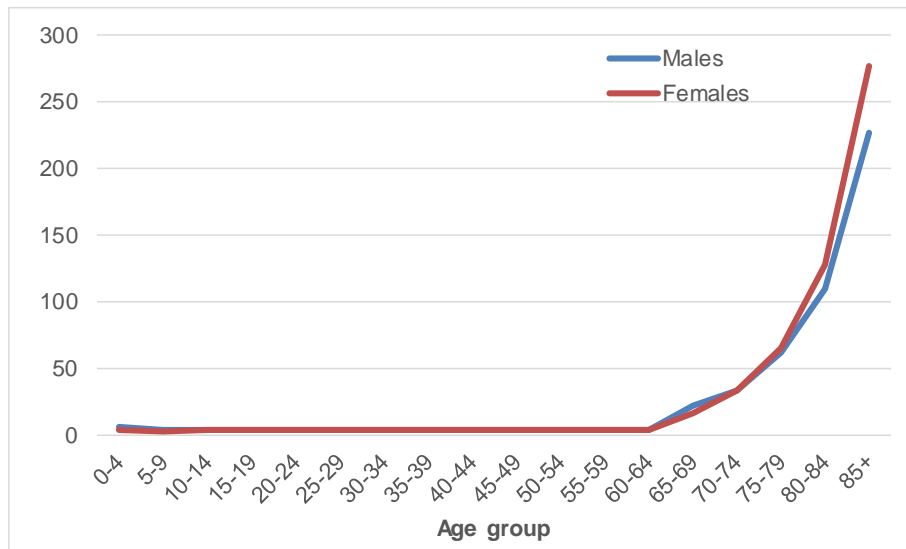
Mental health

Table A3 shows the modelled cost per head for 2015/16 derived from the 2018 refresh of the mental health formula as outlined in section 4.4.

The individual cost of mental health services in 2015/16 was estimated as a function of individual and area level need and supply predictor variables in 2013/14 and 2014/15. Activity data were from the Mental Health and Learning Disabilities Dataset (MHLDD) and the Improving Access to Psychological Therapies (IAPT) dataset for 2015/16, and were costed using Reference Costs for 2015/16.

The data for the modelling did not cover those aged under 20 so inpatient and outpatient activity data from the 2017/18 Mental Health Services Data Set (which contains data for children and young people) were used. Weights for each age-sex group 0-4, 5-9, 10-14 and 15-19 were calculated from the estimated service cost of each age-sex group expressed as a proportion of costs for those aged 20-24. These weights were then applied to the need per head for those aged 20-24 from the adult model to estimate need per head for the under 20 age-sex groups.

The age-cost curve excludes the MFF and specialised mental health services.

Table A3: Mental health age-cost curve

Age group	Males	Females
0-4	2.0	1.6
5-9	11.9	7.0
10-14	17.9	38.9
15-19	48.2	100.1
20-24	86.0	81.1
25-29	90.4	78.8
30-34	87.0	78.4
35-39	82.1	78.8
40-44	80.7	82.2
45-49	73.2	80.4
50-54	68.7	79.3
55-59	63.0	71.3
60-64	58.0	57.9
65-69	60.5	66.3
70-74	71.9	83.9
75-79	88.4	103.7
80-84	117.6	124.7
85+	100.1	104.7

Figure A3: Mental health age-cost curve
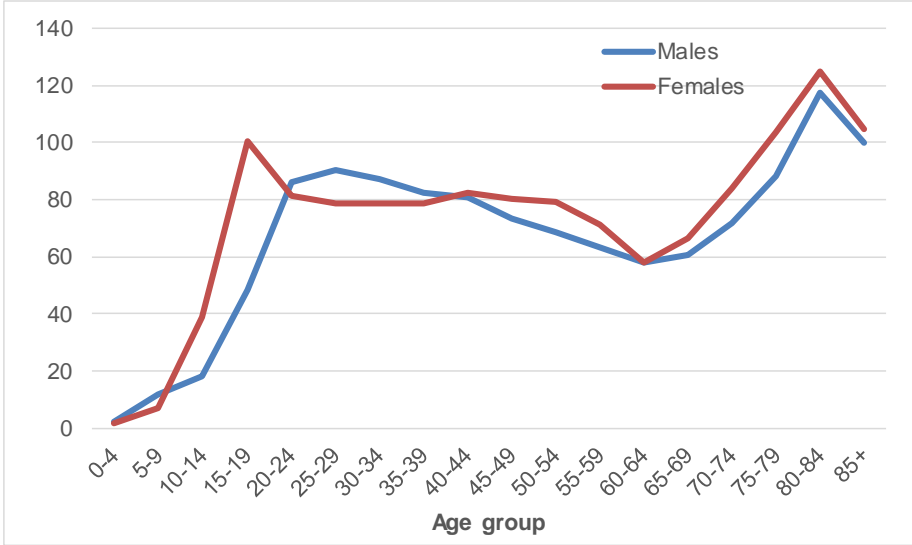
Prescribing

Table A4 shows the prescribing age-cost curve, better known as Age, Sex and Temporary Resident Originated Prescribing Units (ASTRO-PUs) developed by NHS Digital. The latest available are for 2013. These are based on actual costs rather than modelled costs.

This weighting is designed to weight individual GP practice populations for age and sex to allow for better comparison of prescribing patterns. The number of temporary residents attending practices is no longer captured or included in funding allocations. The weightings are standardised (based on a male child under 4 years being 1.0) and are used in the prescribing resource allocation model to calculate the expected cost of drugs prescribed for each GP practice

Table A4: ASTRO(13)-PUs

| Age group	Males	Females
0-4	1.0	0.9
5-14	0.9	0.7
15-24	1.2	1.4
25-34	1.3	1.8
35-44	1.8	2.6
45-54	3.1	3.7
55-64	5.3	5.4
65-74	8.7	7.6
75+	11.3	9.9

Figure A4: ASTRO(13)-PUs
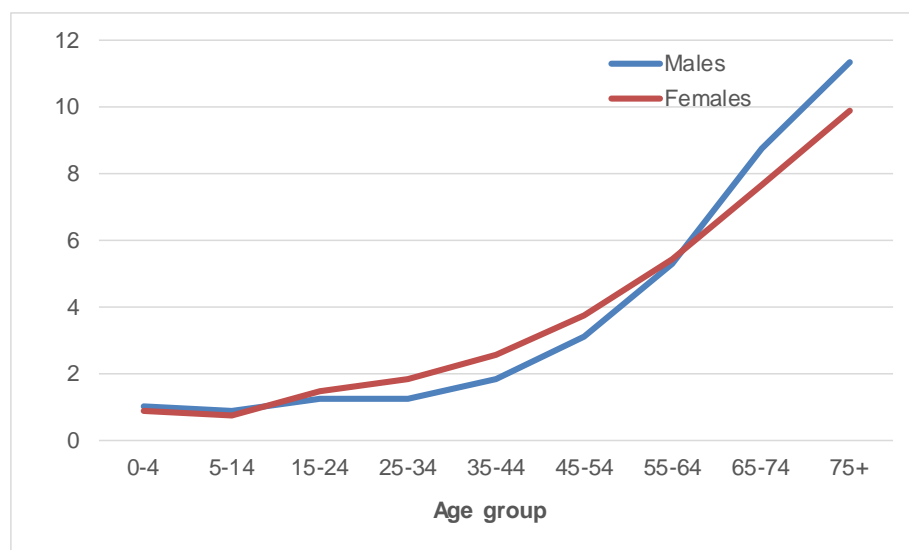
Primary Medical Care

Table A5 shows the Primary Medical Care (PMC) age-cost curve derived from the 2015 refresh of the PMC allocation formula. The model estimated the effects of patient and practice characteristics on GP practice workload (see section 7). The modelling produced age-sex coefficients that represent the estimated average number of additional weighted contact minutes that a patient in each age-sex group has with their GP surgery compared to the baseline, that is a male patient aged 0-4.

The primary medical care age-cost curve is for modelled weights per head by age-sex group, not modelled or actual costs. The age-cost curve excludes need over and above that related to age and sex, and also differences in costs, such as the MFF, which cannot be broken down by age-sex group.

Table A5: Primary Medical Care age-gender workload coefficients

Age group	Males	Females
0-4	0.0	-3.2
5-14	-22.4	-20.9
15-44	-17.2	9.1
45-64	6.7	25.7
65-74	41.1	48.1
75-84	80.5	89.4
85+	116.7	123.5

Figure A5: Primary Medical Care age-gender workload coefficients
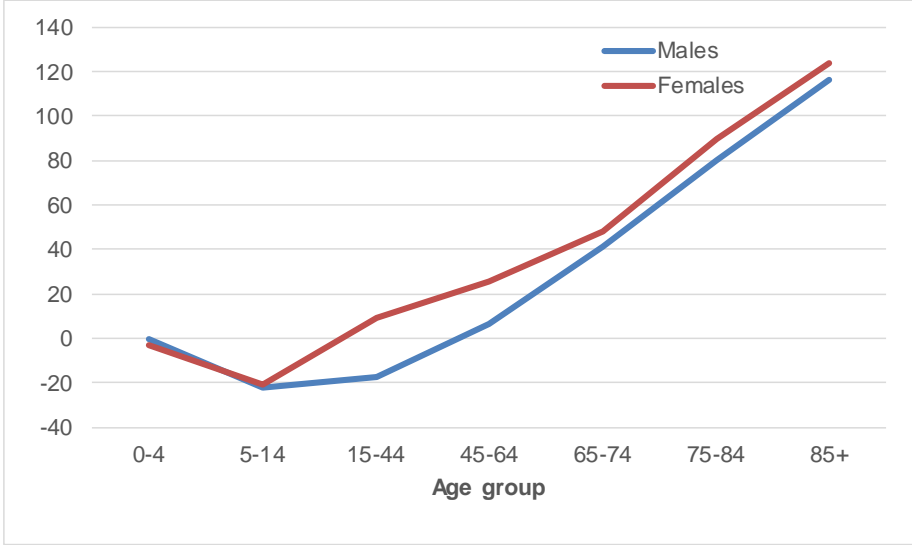
Annex 2: References

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Annex 3: List of documents published alongside the technical guide

A set of ACRA papers and research reports will be published shortly.

This guide will be updated once these are published.

ACRA papers

Research reports

Developing a community services component for the CCG allocations formula

Refresh of the mental health component of the CCG allocations formula

Spreadsheet files

A Registrations by GP practice and CCG – November 2017 to October 2018

B Calculation of CCG estimated registrations 2019/20 to 2023/24

C1 General and Acute need per head 2019/20 to 2023/24

C2 Community Services need per head 2019/20 to 2023/24

D Mental Health need per head 2019/20 to 2023/24

E Maternity need 2019/20 to 2023/24

F Prescribing need 2019/20 to 2023/24

G SMR weighted populations

H Market Forces Factor

I Emergency Ambulance Cost Adjustment

J Overall weighted populations CCGs and GP practices 2019/20 to 2023/24

K1 Primary care (medical)

K2 Primary care adjustment for new GP contract

L Specialised services

M Supporting information for pace of change

N Min growth primary medical care

O Min growth CCG core

P Min growth specialised

Q Total place based pace of change

R Better Care Fund

S Running cost allowances

Equality Analysis

Equality Analysis for 2019/20 to 2023/24 revenue allocations to Clinical Commissioning Groups and commissioning areas is available at the following link: NHS England » NHS England Board meeting papers – 31 January 2019