Fair Shares
a guide to NHS allocations

Infographics (updated and expanded for CCG allocations 2019/20 onwards)

NHS England and NHS Improvement
# Fair Shares - a guide to NHS allocations

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NHS England and NHS Improvement are currently merging, but this is beyond the scope of this document. As CCG allocations are an NHS England commissioning function, this name persists in these slides.

NHS England leads the National Health Service (NHS) in England. We set the priorities and direction of the NHS and encourage and inform the national debate to improve health and care. We want everyone to have greater control of their health and their wellbeing, and to be supported to live longer, healthier lives by high quality health and care services that are compassionate, inclusive and constantly improving.

NHS England shares out more than £100 billion in funds and holds organisations to account for spending this money effectively for patients and efficiently for the taxpayer. A lot of the work we do involves the commissioning of health care services in England. We commission the contracts for GPs, pharmacists, and dentists and we support local health services that are led by groups of GPs called Clinical Commissioning Groups (CCGs). CCGs plan and pay for local services such as hospitals and ambulance services. We strongly believe in health and high quality care for all, now and for future generations.

We use a statistical formula to make distribution of financial resources fair and objective, so that it more clearly reflects local healthcare needs and hopefully reduces any health inequalities.

This updated and expanded summary of our Allocations Technical Documentation details the recent updates in the 2019/20 allocations model. We have used infographics and metaphors to help make some complex ideas easier to digest. We hope you find these slides useful in explaining some of the methods used. The annex includes more complex slides, where we describe some of the ideas in a bit more detail.
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<thead>
<tr>
<th><strong>Document Title</strong></th>
<th>Fair Shares – a guide to NHS allocations</th>
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<tr>
<td><strong>Written and illustrated by</strong></td>
<td>Roman Tatarek-Gintowt, Analysis and Insight for Finance</td>
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<td>NHS England and NHS Improvement</td>
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<td>Allocations Team, Quarry House 8E25, Quarry Hill, Leeds LS2 7UE</td>
</tr>
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<td><a href="http://www.england.nhs.uk/allocations/">www.england.nhs.uk/allocations/</a> page where latest version is published</td>
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</table>

We are continually developing both the allocations process and related documentation. We welcome your comments and feedback to help us improve them.

✉ Email  england.revenue-allocations@nhs.net (Subject: Allocations Infographics)

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Printing  These slides are designed for viewing on screen, rather than printed. Please consider if you really need to print them out. We suggest printing 2 slides per A4 sheet, double sided = total 11 pages.

NHS England and NHS Improvement
The NHS in England has a budget of £130 billion. Total UK health spending is £151 billion, around 18% of the budget (7% of GDP).

Devolved parliaments in Scotland, Wales and Northern Ireland receive a public services budget (including health), to spend according to local priorities.

Source: Office for Budget Responsibility (OBR) – UK Government Revenue & Spending Forecast 2019/20 (figures rounded)
Where does the money go?

Healthcare Services

- **Directly Commissioned**
  - Public Health (screening programmes, child health info, immunisation, sexual assault, prison healthcare, armed forces families, some specialised services)
  - Mental Health reported figures vary depending on the definition used, total spending on MH across all settings was estimated to be £10.8bn (9.5%) in 2015/16.

- **Other Primary Care**
  - Community pharmacy, dental services, ophthalmic (eye tests, glasses)
  - Public Health Grants are under review as part of local government financial reform. PH spending may be higher under OECD definition (could also include dental services / GP disease prevention – smoking, obesity)

- **Specialised Services**
  - Care for some uncommon conditions, for which there are few providers or costs are very high.

- **General Practice**
  - Primary care – GP surgeries, GPs and practice teams
  - Cost of medicines prescribed by GPs for their patients

- **Community Health**
  - Community nursing/ other support
  - Continuing Healthcare

- **Better Care Fund (BCF)** - programme to join up health and social care services

- **Acute Care**
  - Accident and Emergency (A&E), maternity, outpatient, acute hospital care, elective/ day case, non-elective, ambulances

- **Mental Health**
  - Treatment in dedicated facilities and other care settings, Improving Access to Psychological Therapies (IAPT)

NHS Commissioning

- **CCGs**
  - Clinical Commissioning Groups
  -Running costs cap

- **LAs**
  - 152 Local Authorities

NHS Support Activity

- **Public Health England**
  - Health improvement and evidence based interventions to tackle substance misuse, smoking & tobacco, children's health, sexual health, obesity, physical activity, and preventing infectious disease.
  - Also pandemic flu vaccines (0.35%).
  - Public Health Grants to LAs distributed by PHE. Section 7a budgets direct from DH to NHS England.

- **Social Care**
  - including care homes, drop-in centres, voluntary sector
  - Central funding + council tax

Simplified funding flows – % of total NHS budget (calculated from expenditure in 2016/17 or earlier) are indicative to give a sense of scale and may not reconcile back to accounts (numbers rounded)

- Due to the nature of funding flows some Local Authority/ Better Care Fund (BCF) expenditure may be double counted in other areas of CCG expenditure.
- Public Health grants are under review as part of local government financial reform. PH spending may be higher under OECD definition (could also include dental services / GP disease prevention – smoking, obesity)
- We hope to update this slide soon, early indications are that percentages have remained fairly stable.
What are CCGs?

Led by GPs and nurses, Clinical Commissioning Groups (CCGs) work together with patients, communities and GP practices within their area to ensure that the right NHS services are in place to support people and help improve their health and wellbeing.

CCGs fund health services for their population: Hospitals, community care etc. Annual allocations to CCGs are not ring fenced. It is for CCGs to decide their priorities for spending, balancing local priorities and planning guidance, to commission (process of planning, agreeing and monitoring) services from a range of providers.

Providers

- 135 acute non-specialist trusts (84 foundation)
- 17 acute specialist trusts (16 foundation)
- 56 mental health trusts (42 foundation)
- 7,454 GP practices
- 35 community providers - 11 NHS trusts, 6 foundation trusts and 17 social enterprises and 1 limited company
- 853 for-profit and not-for-profit independent sector organisations, providing care to NHS patients from 7,331 locations

Patients

- 59.7 million patients (2019) registered with a GP practice in England (NHS Digital)
- 56.0 million people (2018) estimated in England (ONS)

Purchasers

- 211 CCGs (2013)
- 209 CCGs (2015)
- 207 CCGs (2017)
- 195 CCGs (2018)
- 191 CCGs (2019)*

NHS England
Direct commissioning
Co-commissioning

Resident and GP populations are different due to a variety of factors, including cross-border flows, temporary migration and list inflation. See slide Issues with GP populations

*The allocations model described was based on 192 CCGs, as the CCG merger in Devon had not been confirmed in time to include it.

Source - NHS Confederation: Key statistics on the NHS
Some age groups require more healthcare than others. For example, spending on over 65s is typically higher than for 20-30 year olds. Also people with long term illness may have greater need for healthcare than those in generally good health. This is compared using supply-based costs of treatment.

Would it be fair to simply allocate the same amount for each person?

Each year NHS England shares resources over £100 billion between 191 CCG areas, representing around 7500 GP practices and almost 60 million patients.

Fair slices?
To support equal opportunity of access to health services by those with equal needs, and to contribute to a reduction in avoidable health inequalities.

**Aims of the formula**

To support equal opportunity of access to health services by those with equal needs, and to contribute to a reduction in avoidable health inequalities.

**Ways of sharing**

There are lots of ways to divide resources – equal slice per person? Or who shouts the loudest? Politically influenced? Historical spend? Or maybe there is a better way…

**Develop impartial objective formula**

To support decisions around allocations, a statistical formula, or ‘model’ (a complex set of formulas) has been developed, which calculates a target fair share of the national budgets for local areas.

**‘Weighted Capitation’ Formula**

This type of model has proved adaptable over many years and has been used effectively since the 1970s to distribute NHS resources between health care organisations. These models take information on a local population and advise what share of funding they should get.

Using this method, more resources are directed to areas estimated to have higher health needs, or where health inequalities can be reduced by providing health services - larger populations, more older people, worse health and higher levels of deprivation.

Additional funds also support services delivered in high cost areas, due to the going rate of staff and buildings, or unavoidable costs – for example, due to remoteness.
This familiar map is great for travel or measuring distance, but not so good for comparing population data, as cities look tiny and the countryside huge.

This cartogram maps each CCG to one cell. Although it is a bit distorted, it maintains relative positions, to keep groups (STP, DCO, Regions) together.

Using cartograms for clearer data visualisation

Maps below show GP registered populations (thousands of patients by CCG)
What evidence is used to show variation in need?

**Individual data**

The statistical allocations formula is built up from data, which the NHS holds on individuals and their use of hospital services. This person-based approach helps ensure accuracy and takes account of local variation in health needs.

**Patient spending**

Data for patients in GP practices are linked to their treatment records, to calculate overall cost of care.

The costs of health services for millions of real patients over a number of years are reviewed.

Statistical analysis identifies factors, which can be used to predict future spending, for a given sex-age group in any GP practice in England (all data used is non-identifiable).

**Testing predicted spending**

These predictions are then re-tested on further patient data where costs are already known, allowing the model to be refined, then retested.

The measure of need derived from the person-based research is effectively the relative cost of specified healthcare services by age and sex in a GP practice.
**Examples of need variation in England**

**Ageing population**

Average annual registrations (Nov 17-Oct 18)

<table>
<thead>
<tr>
<th>CCG Populations - % Aged 65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borders Region STP CCG</td>
</tr>
<tr>
<td>Low Med High</td>
</tr>
<tr>
<td>5.51 18.2 39</td>
</tr>
</tbody>
</table>

The biggest adjustment is based on age, due to evidence that the elderly and very young have a higher need for healthcare.

**Deprivation**

<table>
<thead>
<tr>
<th>Index of Multiple Deprivation 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average IMD Score by CCG</td>
</tr>
<tr>
<td>Borders Region STP CCG</td>
</tr>
<tr>
<td>Low Med High</td>
</tr>
<tr>
<td>7.85 21.6 54.8</td>
</tr>
</tbody>
</table>

Poverty also seems to make a big difference to healthcare need, so we use this to make an adjustment.

**Mortality**

<table>
<thead>
<tr>
<th>Standardised Mortality Ratio, age &lt;75</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMR need weight (mortality)</td>
</tr>
<tr>
<td>Borders Region STP STP CCG</td>
</tr>
<tr>
<td>1.49 2.27 6.7</td>
</tr>
</tbody>
</table>

Patterns of excess death rates in persons aged under 75 appear to closely reflect deprivation. We use this to estimate health inequalities adjustment across different areas.

darker colour = more elderly people
darker colour = more deprived
darker colour = more deaths
### Components of target allocations

The model for CCG allocations is made up of three separate formulas:

- **CCG core services**
- **Primary care**
- **Specialised services**

Each formula is made up of a number of segments.

The CCG core services model features the following segments:

<table>
<thead>
<tr>
<th>Segment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>General and acute</td>
<td>includes hospital inpatient, outpatient and A&amp;E</td>
</tr>
<tr>
<td>Maternity</td>
<td>focuses on services relating to births</td>
</tr>
<tr>
<td>Mental health</td>
<td>includes acute and community MH and LD services plus IAPT services</td>
</tr>
<tr>
<td>Community services</td>
<td>includes district nursing and intermediate care</td>
</tr>
<tr>
<td>Prescribing</td>
<td>focuses on primary care prescribing of medicines</td>
</tr>
<tr>
<td>Remoteness, MFF</td>
<td>identifies unavoidable costs of delivering services, including <strong>MFF</strong></td>
</tr>
<tr>
<td>Health inequalities</td>
<td>an adjustment based on rates of premature mortality</td>
</tr>
</tbody>
</table>

Finally each segment of the model may be affected by the **local population’s attributes**

For example - sex, age, morbidity (number and severity of physical and mental health conditions), rates of disability, excess deaths and deprivation, plus wider factors associated with health needs including housing status and unemployment.

For the health inequalities adjustment, analysis overseen by **ACRA (Advisory Committee on Resource Allocation)** is used to define the metric, but the weighting of that adjustment within overall target allocations is judgement-based and determined by **NHS England**.
How a CCG’s share is adjusted

These rotating dials are a way to represent the level of need for one CCG compared with all the others.

Statistical evidence of variation in healthcare need determines the direction & level for each dial.

Evidence of need can adjust a CCG share up or down

Statistical analysis on data regarding utilisation of services at patient level identifies factors which can be used to predict future costs.

CCGs are ranked for each factor, with CCG share increased where need is highest (dials to the right) and decreased where lowest (left).

Examples of need values

All the individual adjustments are combined with populations in the model to calculate an overall CCG target share.

‘Sunnyside’ CCG

This is a imaginary CCG including coastal resorts, popular for retirement.

- Higher age need
- More elderly population
- Lower poverty
- Slightly lower deprivation score
- Higher disease
- Slightly less healthy population
- Higher supply costs
- Above average staffing costs
As a result of adjustments, weighted populations may be larger or smaller than the registered population. The allocations formula is continually being improved. The waterfall chart details the changes created by the revised allocations model.

In Sunnyside, increased need (mostly from age) results in a ‘weighted population’ or ‘target share’ which is 3% higher than the value calculated using the 2016/17 allocations model. These adjustments are combined with each other and the population to get an overall ‘target share’.

<table>
<thead>
<tr>
<th>Start</th>
<th>Age</th>
<th>Poverty</th>
<th>Disease</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>higher</td>
<td>lower</td>
<td>higher</td>
<td>higher</td>
</tr>
</tbody>
</table>

- Age is higher
- Poverty is lower
- Disease is higher
- Costs are higher

Sunnyside CCG need values

As a result of adjustments, weighted populations may be larger or smaller than the registered population. The allocations formula is continually being improved. The waterfall chart details the changes created by the revised allocations model.
### Summary of adjustments included

Each formula within the model represents a national budget stream. Each segment may include evidence of variation in either ‘need’ or ‘cost’. The relative weight of unmet need is determined by the NHS England board. Weighted populations are calculated for each formula/component/segment. The impact of each segment is determined by relative spend.

#### Need adjustments

<table>
<thead>
<tr>
<th>CCG core services</th>
<th>Primary care</th>
<th>Specialised services</th>
</tr>
</thead>
<tbody>
<tr>
<td>£78.5 billion</td>
<td>£8.3 billion</td>
<td>£17.5 billion</td>
</tr>
</tbody>
</table>

- 59.8% Acute services
- 13.2% Mental Health
- 12.1% Prescribing
- 11.3% Community
- 3.7% Maternity

#### Cost adjustments

- **Utilisation models**
  - 90% Health inequalities and Unmet need
  - 85% Health inequalities and Unmet need
  - 95% Health inequalities and Unmet need

- **Staff and buildings**
  - Market forces factor (MFF)
  - Market forces factor (MFF)
  - Market forces factor (MFF)

- **Transport in rural areas**
  - Emergency ambulance cost adjustment (EACA)

- **Inefficiency and small hospitals**
  - Unavoidable remoteness

- **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.

- **59.8% Acute services**
  - 49% Formula* Historic spend

- **13.2% Mental Health**
  - 51% Historic spend

- **12.1% Prescribing**

- **11.3% Community**

- **3.7% Maternity**

- **100% Formula** No other adjustments

- **49% Formula* Specialised services** formula is a shadow allocation used for purposes of calculating place based pace of change, but not for actual commissioning budgets at the moment

#### 2019/20 allocations

- % overall spend shown but across the country needs may vary for different service.

- Utilisation models
  - 90%
  - 85%
  - 95%

- Staff and buildings
  - Market forces factor (MFF)
  - Market forces factor (MFF)
  - Market forces factor (MFF)

- Transport in rural areas
  - Emergency ambulance cost adjustment (EACA)

- Inefficiently small hospitals
  - Unavoidable remoteness

*Specialised services formula is a shadow allocation used for purposes of calculating place based pace of change, but not for actual commissioning budgets at the moment.
From target shares to allocations

CCG baselines £
The latest CCG budgets available in the autumn when the model is calculated are ‘month 6 baselines’, which should include any local adjustments agreed after the last formal allocations round.

From the point of view of stability for a CCG, the biggest determinant of this year’s budget is historic allocation (what they currently get).

Pace of change
‘Pace of change’ policy determines how quickly CCGs are moved from their baselines towards target, without creating instability which could damage local health economies.

Pace of change policy seeks to move CCGs towards target over time, ensuring that each CCG is no more than 5% below target.

Target shares %
The allocations model calculates weighted populations (target share %)
Target shares are calculated for each funding stream and also overall for combined ‘place-based’ allocations.
This ensures that a CCG gets at least the minimum growth for each stream.

Final £ allocations

Target allocations £
NHS England is allocated an overall budget. It then sets national budgets across various funding streams - CCG ‘core’ allocations, Specialised Services, Primary Care and Direct Commissioning - depending on need and current priorities.
Target shares (%) are applied to national budgets to calculate individual CCG target allocations (£).
Pace of change policy – core ideas

**Distance from Target (DfT)**
The gap between a CCG’s baseline and target allocation. Baseline below target suggests that CCG has higher need than current budget, so growth is required.

**Change in DfT**
Each revised model produces new target allocations, which may have changed. Updated populations and other data, along with improvements and revisions in the formula, cause target allocations to move (higher need in diagram). With reference to the same baselines, updated models lead to new targets and therefore new % distances from target.

**Pace of change (POC) policy**
Targets can change dramatically and unexpectedly due to improvements in the formula or changes in underlying data, so using them directly could give sharp shocks to budgets.

To dampen this effect, actual allocations are based on applying growth to the baseline to move towards the target, rather than immediately changing to the target figure. The level of growth is set according to a “pace of change” policy. This is done for each component of the model, to calculate minimum allocations within each stream, then again for overall ‘place based allocations’.

---

The gap between a CCG’s baseline and target allocation. Baseline below target suggests that CCG has higher need than current budget, so growth is required.

Each revised model produces new target allocations, which may have changed. Updated populations and other data, along with improvements and revisions in the formula, cause target allocations to move (higher need in diagram). With reference to the same baselines, updated models lead to new targets and therefore new % distances from target.

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To dampen this effect, actual allocations are based on applying growth to the baseline to move towards the target, rather than immediately changing to the target figure. The level of growth is set according to a “pace of change” policy. This is done for each component of the model, to calculate minimum allocations within each stream, then again for overall ‘place based allocations’.
Pace of change calculation

Pace of change flowchart - Distance from target is used to calculate minimum growth for each formula. The overall distance from target then determines distribution of any remaining funds.

Key considerations

The minimum growth we can expect an area to manage, without de-stabilizing the short-term provision of services.

The maximum growth that a CCG can invest in a given year, ensuring that value for money is maintained.

Reducing variation in growth rates, while allowing differences which help to bring CCGs closer to target.

Processing sequence

Variation in distance from target tends to be larger for primary medical care than for core CCG services.

Pace of change policy is applied to each of the funding streams individually then overall, giving additional resources to those CCGs requiring the most growth.
Examples of targets and final allocations

**Need Index**

This map shows the effect of the combined ‘need weights’ in the formula.

**Target Allocation**

Once the budget is applied we can calculate target share for each CCG (£ thousands per head).

**After Pace of Change**

Final allocations are subject to pace of change policy, to prevent sudden destabilising changes.
Methods in the allocations formula are continuously reviewed and improved

This runs alongside changes in NHS policy and best practice. Additionally, populations can grow or change differently to expected projections. For example a new town or industry might attract younger people to work in the area, affecting the age mix of the population, which may change relative need.

Modelling produces the best possible estimate, but is never perfect, so we actually use a cushion of + or – 5%, above which lower rates of growth may be applied.
## Key steps in the allocations process

The calculation of target allocations follows this sequence:

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Population basis</td>
</tr>
<tr>
<td>2</td>
<td>Adjust for age</td>
</tr>
<tr>
<td>3</td>
<td>Adjust for additional need over and above that due to age</td>
</tr>
<tr>
<td>4</td>
<td>Adjust for unavoidable differences in cost</td>
</tr>
<tr>
<td>5</td>
<td>Combine modelled adjustments with the health inequalities / unmet need adjustment</td>
</tr>
<tr>
<td>6</td>
<td>Apply shares (weighed populations) to available money</td>
</tr>
<tr>
<td>7</td>
<td>Apply ‘pace of change’ policy</td>
</tr>
</tbody>
</table>
Changes to 2019/20 allocations

1. Population basis
2. Adjust for age
   - evidence that the elderly and the very young have a higher need for health care services
3. Adjust for additional need over and above that due to age
   - evidence of higher need due to health status, morbidity, deprivation
4. Adjust for unavoidable differences in cost
   - neutralise unavoidable costs of providing services due to geographical location using the MFF and sparsity adjustments
5. Combine modelled adjustments with the health inequalities/unmet need adjustment
   - bring together all the above adjustments with the combined health inequalities/unmet need adjustments to get overall weighted population or target shares
6. Apply shares (weighted populations) to available money
   - weighted population shares determine target allocations – compare with current budgets to get ‘distance from target’
7. Apply ‘pace of change’ policy
   - New pace of change parameters

New community services formula
- Refreshed mental health and learning disabilities formula
- Off-formula adjustments to address identified issues

Latest GP registration data
- Revised methodology for the population basis and population projections

Update to the MFF
- Update to the health inequality weightings

New pace of change
- New community services formula
- Refreshed mental health and learning disabilities formula
- Off-formula adjustments to address identified issues

Updates
- Latest GP registration data
- Revised methodology for the population basis and population projections
- New community services formula
- Refreshed mental health and learning disabilities formula
- Off-formula adjustments to address identified issues

Changes to 2019/20 allocations

The calculation of each segment within the model follows this sequence:

- New pace of change parameters
- Update to the MFF
- Update to the health inequality weightings
- New community services formula
- Refreshed mental health and learning disabilities formula
- Off-formula adjustments to address identified issues

Latest GP registration data
- Revised methodology for the population basis and population projections

New pace of change
- New community services formula
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Updates
- Latest GP registration data
- Revised methodology for the population basis and population projections
- New community services formula
- Refreshed mental health and learning disabilities formula
- Off-formula adjustments to address identified issues

Changes to 2019/20 allocations
Annex

Slightly more technical background information

NHS England and NHS Improvement
## Glossary of terms used in NHS allocations

<table>
<thead>
<tr>
<th>Term used</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACRA</td>
<td>Advisory Committee on Resource Allocation – expert advisory group</td>
</tr>
<tr>
<td>Allocations</td>
<td>Recurrent funding allocated to a CCG to commission services</td>
</tr>
<tr>
<td>Allocations model</td>
<td>Complex set of formulas which calculate target shares</td>
</tr>
<tr>
<td>Baselines (month 6)</td>
<td>Updated CCG budgets in September (including in-year adjustments)</td>
</tr>
<tr>
<td>CCGs</td>
<td>Clinical Commissioning Groups (local area commissioners)</td>
</tr>
<tr>
<td>Commissioners</td>
<td>Organisations which plan, fund &amp; monitor healthcare for their population</td>
</tr>
<tr>
<td>Distance from target</td>
<td>Difference between calculated target allocation and baseline (or final allocation)</td>
</tr>
<tr>
<td>Healthcare need</td>
<td>Measure of variation in cost of healthcare</td>
</tr>
<tr>
<td>Market Forces Factor (MFF)</td>
<td>Estimate of unavoidable cost differences between providers, based on location</td>
</tr>
<tr>
<td>Normalised</td>
<td>Populations adjusted to add up to original total, maintaining % share</td>
</tr>
<tr>
<td>Pace of change policy</td>
<td>Process of gradually moving budgets towards calculated target allocations</td>
</tr>
<tr>
<td>Place based</td>
<td>Combined allocations for CCG core, Primary Care and Specialised</td>
</tr>
<tr>
<td>Providers</td>
<td>Organisations providing healthcare services to the NHS</td>
</tr>
<tr>
<td>Target allocation</td>
<td>Target share applied to national budget – nominal ‘ideal’ share of budget (£)</td>
</tr>
<tr>
<td>Target share</td>
<td>% share of overall budget, expressed as weighted population</td>
</tr>
<tr>
<td>Weighted population</td>
<td>Population x need (usually normalised to total population)</td>
</tr>
<tr>
<td>Unmet need</td>
<td>Need not easily captured by healthcare use formula, for example persons unaware they have a health issue or cannot see a doctor</td>
</tr>
</tbody>
</table>
Issues with GP populations

Cross-boundary flows

When using CCG populations, it is important to know whether we are referring to residents of a geographical area or GP practice membership.

These two groups overlap. Counts of GP patients can be mapped to either, as they include LSOA (small area) of patient residence. Comparing these can indicate the amount of cross-boundary flows between CCGs or across the borders with Wales and Scotland.

Migration and GP list inflation

Nationally the number of registered patients exceeds the ONS residence estimate (based on 2011 census) by 5%.

Differences may be due to data issues, short term migration or GP list inflation (so called ‘ghost patients’ not removed from GP practice lists when they move away or die).

However, these extra patients have no effect on the total amount allocated, which is set first by NHS England and then shared across all CCGs (rather than setting a specific budget per patient, which could result in uncontrolled totals).

Effects of list inflation are uneven across the country and historically very high in some parts of London. GP practices and CCGs are actively encouraged to monitor their lists, to ensure they reflect an accurate picture.
Projecting GP populations for future years

In order to project allocations for future years, we need to estimate how GP practice populations are likely to change.

Registered populations

Populations used in the allocations model are ‘Patients registered with a GP Practice’, published quarterly by NHS Digital. These are used because CCGs are responsible for the patients registered in their member GP practices, rather than geographic area of residence.

Future projection estimates

We apply the most recent percentage annual growth by CCG (ONS) to the latest available GP registrations, to estimate how these populations will change over the next couple of years. This allows us to project allocations forward for 2-3 years.

Resident populations

The Office for National Statistics (ONS) publish population projections for resident population estimates at CCG level, from which we calculate projected percent annual growth, on a consistent basis across England

2011 Census populations roll forward each year by adding births and net migration and subtracting deaths (small area).

Trends for fertility rates, death rates and net migration are then used (every 2 years) to project forward into the future.

Source: ONS
Update to population baselines and projections

Annual average populations
We now take an average of 12 months of registrations, instead of the last available month, which takes account of populations in areas with high numbers of students or temporary workers.

Age-Sex Projections
Using age-sex specific population projections at CCG level from ONS to take account of different projected growth rates in populations of different ages.
This means we can better project levels of need in different CCGs in future years.

Proportion of 15-24 year old registered GP population over time in a selection of CCGs Oct 2015 to Oct 2017

- University CCG – Midlands
- University CCG- South
- University CCG – North
- East London CCG
- Rural CCG

Using age-sex specific population projections at CCG level from ONS to take account of different projected growth rates in populations of different ages.
This means we can better project levels of need in different CCGs in future years.
Case study – Sunderland CCG

Hospital activity recording is used to predict patient need, so data quality has a direct effect on CCG resources. Low quality data could mean less money.

G&A need estimates for Sunderland were falling compared to their peers, despite having an older and more deprived population. With the CCG we tested various theories, comparing local with national data.

An unusually sharp drop in need was observed around a local hospital, which had installed a new computer system, briefly affecting its submitted Hospital Episode Statistics.

This led to missing data on hospital activity which affected the estimates produced by the statistical model, resulting in artificially low need weights for Sunderland. We checked to see if this effect was observed elsewhere.

Compelling evidence that this was a clear outlier has led to an exceptional off-formula adjustment, which corrected the need index for Sunderland, bringing it in line with similar neighbours.
We continue to use premature mortality SMR<75 as an indicator of inequalities between small areas, but with continuous weighting that is much more sensitive to the very high SMR<75 level in some small areas. Significant impact on the target of just a handful of CCGs. More than +0.5% for nine CCGs. Blackpool and Bradford City see a significant boost.
The formula suggests that the need for community services is highest in those areas with higher proportions of people aged over 85, particularly rural and coastal CCGs, and areas with deprived older populations in the Midlands and North. Overall London and the urban North have seen a decrease in their target shares as a result of the community services model, while the more rural South West, South East and Midlands and East have seen an increase. This change is because the previous formula did not take full account of the additional need for community services due to age.
The highest relative need remains in large urban centres with younger, deprived populations. The refreshed PRAMH2 model has resulted in higher need indices for some coastal areas and areas with older populations, due in part to improved diagnosis, treatment and recording of dementia.

Overall London, the South East and Midlands and East have seen a decrease in their target shares as a result of the new mental health formula, while parts of London, the South West and North increase.

BJPsych 2019.185 Estimating local need for mental health care to inform fair resource allocation within the NHS in England: cross-sectional analysis of national administrative data linked at person-level - Dr Laura Anselmi et al
Market forces factor (MFF) is an estimate of unavoidable cost differences between healthcare providers, based on their geographical location. It is used to adjust resource allocations in the NHS in proportion to these cost differences, so that patients are neither advantaged nor disadvantaged by the relative level of unavoidable costs in different parts of the country.

The revised MFF in the 2019/20 tariff reflects the latest data and methodology (to be introduced gradually over 5 years). For allocations, it is applied to everything except prescribing costs. Primary medical care allocation is unaffected as it still uses the older MFF from the Carr-Hill formula.
### Understanding the formula

At the heart of the CCG allocations model is a mathematical formula, which includes plenty of mathematical symbols and Greek letters, so on first sight can seem a bit intimidating.

\[
\hat{C}_p = \hat{\alpha} + \frac{\sum_{i \in p} (\sum_j \hat{\beta}_j N_{ipj})}{L_p} + \frac{\sum_{i \in p} (\sum_k \hat{\gamma}_k S_{ipk})}{L_p}
\]

To understand what’s going on, let’s look at each part and build up the formula gradually...

---

**The formula is based on lists**

Subscripts (in maths called ‘indices’, plural of ‘index’) denote the position in a list (index is like an ID or Key in a database).

**List of practices (indexed by p)**

<table>
<thead>
<tr>
<th>Index (p)</th>
<th>GP practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>practice 1</td>
</tr>
<tr>
<td>2</td>
<td>practice 2</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>p</td>
<td>practice p</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>

**List of patients registered at practice p (indexed by i)**

<table>
<thead>
<tr>
<th>Index (i)</th>
<th>patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>patient 1</td>
</tr>
<tr>
<td>2</td>
<td>patient 2</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>i</td>
<td>patient i</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>L_p</td>
<td>patient L_p</td>
</tr>
</tbody>
</table>

**List of variables for patient i at practice p (indexed by j)**

<table>
<thead>
<tr>
<th>Index (j)</th>
<th>Needs variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N_{ip1}</td>
</tr>
<tr>
<td>2</td>
<td>N_{ip2}</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>j</td>
<td>N_{ipj}</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>

**List of variables for patient i at practice p (indexed by k)**

<table>
<thead>
<tr>
<th>Index (k)</th>
<th>Supply variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S_{ip1}</td>
</tr>
<tr>
<td>2</td>
<td>S_{ip2}</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>j</td>
<td>S_{ipj}</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>k</td>
<td>S_{ipk}</td>
</tr>
<tr>
<td>.</td>
<td>.</td>
</tr>
</tbody>
</table>
Constructing the formula

**Building blocks required**

- $\Sigma$ is a mathematical symbol meaning sum
- $\bar{C}_p$ is what we want to know – cost per head at GP practice $p$
- $\beta_j$ and $\gamma_k$ are the predicted coefficients associated with each needs and supply variable respectively – these are the results of the regression modelling
- $\hat{\alpha}$ is a predicted constant term – could consider this as a fixed cost per patient (if all needs and supply variables were zero, then $\bar{C}_p = \hat{\alpha}$)

**Cost per head at practice $p$**

$$\bar{C}_p \approx \hat{\alpha}$$

*Fixed cost per patient*

$(if\ all\ needs\ and\ supply\ variables\ were\ zero)$

**Total needs based cost for patient $i$ at practice $p$**

$$\frac{\sum_{i \in p} (\sum_j \beta_j N_{ipj})}{L_p}$$

*Averaging (add up cost for all patients and divide by number of patients)*

**Total supply based cost for patient $i$ at practice $p$**

$$\frac{\sum_{i \in p} (\sum_k \gamma_k S_{ipk})}{L_p}$$

*Averaging (add up cost for all patients and divide by number of patients)*

**Final formula**

$$\bar{C}_p = \hat{\alpha} + \frac{\sum_{i \in p} (\sum_j \beta_j N_{ipj})}{L_p} + \frac{\sum_{i \in p} (\sum_k \gamma_k S_{ipk})}{L_p}$$

Showing the effect of updating the model

Waterfall Chart

When the baseline budget is applied to old and new models, the effect of changes on various parts of the formula can be seen in this waterfall chart.

Each change in the formula stacks up on the previous change, to produce the final target allocation and new distance from target.

This graph is an example of how this might look for a CCG.

### Change to CCG core services target allocation
Changes from 2018/19 model to 2019/20 model

<table>
<thead>
<tr>
<th>Key</th>
<th>Impact of...</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP</td>
<td>G&amp;A, Maternity &amp; Prescribing Weighted population updates</td>
</tr>
<tr>
<td>MFF</td>
<td>Revised MFF index (year 2019/20 based on glidepath)</td>
</tr>
<tr>
<td>MHLD</td>
<td>Revised Mental Health and Learning Disability model</td>
</tr>
<tr>
<td>Spend</td>
<td>Revised expenditure weights</td>
</tr>
<tr>
<td>CHS</td>
<td>New Community Services model</td>
</tr>
<tr>
<td>SMR</td>
<td>Revised approach to health inequalities (SMR&lt;75)</td>
</tr>
<tr>
<td>Total</td>
<td>Total impact of all changes</td>
</tr>
</tbody>
</table>

Link to waterfall charts for all CCGs
Comparison with other CCGs

These graphs show the waterfall chart distribution of changes across CCGs for each component of the model. Selected CCG shown in red, with grey lines showing values of the similar 10 CCG grouping (NHS RightCare). On the right graph, vertical lines indicate min/max values, grey box contains 50% of CCGs nearest the average.

Change to CCG core services target allocation 2018/19 to 2019/20

compared to RightCare 'similar 10' CCGs
compared to distribution for all CCGs

Link to waterfall charts for all CCGs

<table>
<thead>
<tr>
<th>Key</th>
<th>Impact of...</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP</td>
<td>G&amp;A, Maternity &amp; Prescribing Weighted population updates</td>
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</tr>
<tr>
<td>Total</td>
<td>Total impact of all changes</td>
</tr>
</tbody>
</table>
Waterfall chart - age vs deprivation

The graphs below show the impact of the 2019/20 model on 4 example population groups (defined by age and deprivation), compared to the 2018/19 model.
There will always be some variation in health needs that is inherently unpredictable. For example, a small number of high-cost cases could mean that an area with a smaller population sees their actual costs vary a great deal from their target allocation.

That’s one benefit of pooling resources to the level of CCGs rather than at GP practice level. And it’s why much high-cost (and unpredictable) care is commissioned by NHS England regional hubs.

Further work on the allocations formula for specialised services is also on our existing work programme.
Independent advice and support

Expert Advisory Group

The Advisory Committee on Resource Allocation (ACRA) provides recommendations and advice on the relative geographical target distribution of funding for health services in England. It is supported by a Technical Advisory Group (TAG) and a team of analysts in NHS England.

ACRA is an independent, expert committee, comprising academics including health economists, public health experts, NHS managers and clinicians.

This group makes recommendations to both NHS England (on CCG allocations) and the Department of Health and Social Care (on public health allocations).

Other guidance

Internally, the allocations work programme is overseen by the Allocations Steering Group, made up of senior managers within NHS England and external stakeholders.

Source: ACRA Terms of Reference
Further Reading

www.england.nhs.uk/allocations - find us online

**CCG financial resource allocations**
Recent and historic published allocations are now available at the link above. The latest version covers years 2019/20 to 2023/24

**Technical guidance documentation**
These pages also include technical documents, which explain the allocations formula, along with supporting documents, research reports and calculations (including this infographic guide)

**Other background reading**
Suggested materials listed below (links may not represent the views of NHS England)

- Public health formula for local authorities from April 2016 (Consultation Oct 2015)
- Unmet need literature review (University of York) – research paper (Jan 2017)
- Person-based Resource Allocation (PBRA) - (Nuffield Trust - Dec 2011)
- Weighted Capitation Formula 7th Edition (Department of Health – March 2011)
- NHS Allocations 2012/13 (Department of Health)
## Changelog

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Slide</th>
<th>Description</th>
</tr>
</thead>
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<tr>
<td>1.0</td>
<td>July 2017</td>
<td>1-32</td>
<td>Original version published on NHS England website</td>
</tr>
<tr>
<td>1.1</td>
<td>Sept 2017</td>
<td>6</td>
<td>Worked with PHE to improve clarity on Public Health</td>
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<tr>
<td>1.2</td>
<td>Sept 2018</td>
<td>4</td>
<td>Updated contact email - <a href="mailto:england.finance@nhs.net">england.finance@nhs.net</a></td>
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<tr>
<td></td>
<td></td>
<td>24</td>
<td>Improved wording, additional comments on list inflation</td>
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<tr>
<td></td>
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<td>33</td>
<td>Addition of changelog to track amendments</td>
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<tr>
<td>2.0</td>
<td>Feb 2020</td>
<td>All</td>
<td>Figures updated to show most recent available data (except slide 6)</td>
</tr>
<tr>
<td></td>
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<td>Slides now reflect formula for allocations 2019/20 to 2023/24</td>
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<tr>
<td></td>
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<td></td>
<td>Some full revisions, some partial updates to slides.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Additional slides added to expand explanations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>New contact email <a href="mailto:england.revenue-allocations@nhs.net">england.revenue-allocations@nhs.net</a></td>
</tr>
</tbody>
</table>
Contact us

england.revenue-allocations@nhs.net

NHS England and NHS Improvement