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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 tax payer. 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 document is a brief summary of our Allocations Technical Documentation. 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.
Contact details

NHS Allocations Infographics

Document Title  Fair Shares – A guide to NHS Allocations
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We are continually developing both the allocations process and related documentation. We welcome your comments and feedback to help us improve them.

Email  england.finance@nhs.net  Subject  Allocations Infographics

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Printing  These slides are primarily designed for viewing on-screen.

Please consider if you really need to print them out.
If yes, we suggest setting your printer to
2 slides per A4 sheet, double sided = total 8 pages.
How much do we spend on patient healthcare?

UK budget

The chancellor balances a public spending plan, against money raised in taxes, reflecting government values & priorities.

UK budget 2016/17
- Borrowing: £68 bn
- Overall debt: £1,775 bn (81% of GDP)
- Debt Interest: £36 bn

Taxes

- Borrowing (deficit): £68 bn
- Income tax
- VAT
- Corporation Tax
- Council Tax
- Business Rates
- Fuel Duty
- Capital Taxes
- Other Taxes
- Other receipts

Spending

- Health (England): £116 bn
  - Education: £60 bn
  - Defence: £27 bn
  - Other public services: £111 bn
  - State pensions: £94 bn
  - Other welfare: £97 bn
  - Investment: £37 bn
  - Debt interest: £36 bn
  - Tax credits (personal): £28 bn
  - Other spending: £169 bn

Total UK health spending is around £145 billion, 19% of the budget (6.5% of GDP).

The NHS in England has a budget of £116.1 billion.

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) – figures rounded - UK Government Revenue & Spending Forecast 2016/17
Where does the money go?

NHS Commissioning

CCGs
Clinical Commissioning Groups

LAs
152 Local Authorities

Social Care
including care homes, drop-in centres, voluntary sector

Public Health

NHS Support Activity
including Data Collection / IT Services
Quality Monitoring and Regulation
Support and Improvement
Education and Workforce Training
Business Services, Litigation

Public Health Grants

Public Health

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.

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

‘Place-based’ CCG allocations for 2016/17 include Core CCG services (£70.5 bn), GP Practice (£7.3bn) and Specialised Services (£14.5 bn) - total £92.4 bn

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. Mental Health reported figures vary depending on the definition used, total spending on MH across all settings is estimated to be £10.8bn (9.5%) in 2015/16.

Public Health grants are under review as part of local government financial reform. PH spending may be higher under OECD definition (could include dental services / GP disease prevention – smoking, obesity)

Healthcare Services

Directly Commissioned
Public Health (screening programmes, child health info, immunisation, sexual assault) prison healthcare, armed forces families, some specialised services

Other Primary Care
Community pharmacy, dental services, ophthalmic (eye tests, glasses)

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)
What are CCGs anyway?

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

- 137 acute non-specialist trusts
- 17 acute specialist trusts
- 56 mental health trusts
- 7,674 GP practices
- 34 community providers - 11 NHS trusts, 6 foundation trusts and 17 social enterprises
- 853 for-profit and not-for-profit independent sector organisations, providing care to NHS patients from 7,331 locations

Patients

- 57.7 million patients registered with a GP practice in England (NHS Digital 2014)*
- 54.3 million people estimated in England (ONS 2014)*

Commissioners

- 211 CCGs (2013)
- 209 CCGs (2015)
- 207 CCGs (2017)

NHS England
Direct commissioning
Co-commissioning

* The allocations model described is based on populations from 2014. Newer GP/CCG populations are published monthly by NHS Digital.

Note: Differences between resident and GP populations possibly due to temporary migration and some GP 'list inflation' (plus cross-border flows with Wales and Scotland). See slide ‘Issues with GP populations’

Source - NHS Confederation: Key statistics on the NHS (March 2017)
Some age groups require more healthcare than others. For example GPs spend on over 65s is typically higher than for 20-30 year olds.

Also people with long term illness may have greater need for health care than those in generally good health.

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

Each year NHS England shares over £100 billion between 200 plus CCGs, representing almost 8000 GP practices and nearly 58 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 head? Or who shouts the loudest? Politically influenced? Historical spend? Or maybe there is a better way…

**Develop an impartial objective formula**

To support decisions around allocations, a statistical formula, or ‘model’ (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.
What data is used as evidence of need variation?

**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.
What is included in the formula?

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

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

Each formula is made up of a number of segments. For example, services covered by CCG core allocations feature these segments:

- **General and acute** - includes hospital inpatient, outpatient and A&E services.
- **Maternity** - includes pregnancy care, before and after birth.
- **Mental health** - includes psychiatric and psychological services.
- **Prescribing** - includes community pharmacists processing prescriptions.
- **Supply needs** - identifies unavoidable costs of delivering services.

Finally each segment 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.

**Statistical evidence of variation in need**

CCGs are ranked (for each factor), with CCG share increased where need is highest and decreased where need is lowest. These ‘need adjustments’ are combined within each segment, then within each formula for an overall need adjustment.
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.

Average need

more need

less need

Evidence of need can adjust a CCG share up or down

If CCGs were listed (ranked) in order of need, dials turned to the right represent those at the top (with highest need) and those turned to the left at the bottom (with lowest need).

‘Sunnyside’ CCG

This is a fictional CCG which includes coastal resorts, popular for retirement.

Evidence of variation in healthcare need controls direction & adjustment level for each dial.

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

Examples of need values

All the individual adjustments are combined in the model to calculate an overall CCG share.
A ‘cartogram’ schematic map shows data more clearly, for example by using equally sized shapes for CCGs (darker=higher, graph shows range of values).

This type of map is good for travel or measuring distance, but may not be good at displaying data, as cities look too small and countryside too large.

How can we improve data visualisation for CCGs?

Both maps below show populations (thousands of patients by CCG)
Examples of need variation in England

Ageing population

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

Deprivation

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

Mortality

Patterns of excess death rates in persons aged under 75 appear to closely reflect deprivation.
In Sunnyside CCG, overall higher need results in a ‘weighted population’ or ‘target share’, which is bigger than the actual population.

Example need values

- age
- poverty
- disease
- costs

These adjustments are combined with population to get an overall ‘target share’ or ‘weighted population’.

Combine adjustments to get target share

Waterfall chart

registered population 300,000

weighted population 350,000

Example need values

- age
- poverty
- disease
- costs

These adjustments are combined with population to get an overall ‘target share’ or ‘weighted population’.

Combine adjustments to get target share

Waterfall chart

registered population 300,000

weighted population 350,000

Example need values

- age
- poverty
- disease
- costs

These adjustments are combined with population to get an overall ‘target share’ or ‘weighted population’.

Combine adjustments to get target share

Waterfall chart

registered population 300,000

weighted population 350,000
Examples of targets and final allocations

**Need Index**

CIGN Allocations 2016-17 - weighted populations

*Need Index (weighted pop/ pop)*

<table>
<thead>
<tr>
<th>Low Med High</th>
<th>0.82</th>
<th>1.00</th>
<th>1.60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borders</td>
<td>1.11</td>
<td>1.19</td>
<td>1.10</td>
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<tr>
<td>Region</td>
<td>1.09</td>
<td>1.19</td>
<td>1.10</td>
</tr>
<tr>
<td>Hub</td>
<td>1.08</td>
<td>1.19</td>
<td>1.05</td>
</tr>
<tr>
<td>CCG</td>
<td>1.05</td>
<td>1.11</td>
<td>1.11</td>
</tr>
<tr>
<td><strong>0.97</strong></td>
<td>1.03</td>
<td>1.11</td>
<td>0.99</td>
</tr>
</tbody>
</table>

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

**Target Allocation**

CIGN Allocations 2016-17 - sensitivity testing

<table>
<thead>
<tr>
<th>Low Med High</th>
<th>0.96</th>
<th>1.17</th>
<th>1.32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borders</td>
<td>1.31</td>
<td>1.31</td>
<td>1.30</td>
</tr>
<tr>
<td>Region</td>
<td>1.28</td>
<td>1.40</td>
<td>1.30</td>
</tr>
<tr>
<td>Hub</td>
<td>1.23</td>
<td>1.40</td>
<td>1.24</td>
</tr>
<tr>
<td>CCG</td>
<td>1.20</td>
<td>1.40</td>
<td>1.27</td>
</tr>
<tr>
<td><strong>1.21</strong></td>
<td>1.31</td>
<td>1.31</td>
<td>1.26</td>
</tr>
</tbody>
</table>

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

**After Pace of Change**

CIGN Allocations 2016-17 (Jan 2016)

<table>
<thead>
<tr>
<th>Low Med High</th>
<th>0.96</th>
<th>1.22</th>
<th>1.60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borders</td>
<td>1.39</td>
<td>1.47</td>
<td>1.37</td>
</tr>
<tr>
<td>Region</td>
<td>1.37</td>
<td>1.67</td>
<td>1.38</td>
</tr>
<tr>
<td>Hub</td>
<td>1.36</td>
<td>1.51</td>
<td>1.30</td>
</tr>
<tr>
<td>CCG</td>
<td>1.32</td>
<td>1.35</td>
<td>1.41</td>
</tr>
<tr>
<td><strong>1.25</strong></td>
<td>1.41</td>
<td>1.17</td>
<td>1.26</td>
</tr>
</tbody>
</table>

*Final allocations are subject to Pace of Change process, to prevent destabilising sudden changes.*
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 later local ‘in-year’ adjustments.

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 defines the rate of growth of baselines towards target allocations, without creating instability which could damage local health economies.

This process is applied to each of the funding streams individually then overall, giving additional resources to those CCGS requiring the most growth, ensuring that no CCG is more than 5% below its target.

**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 directly could give sharp shocks to budgets.

To dampen this effect, distance from target is reduced, by applying growth to baseline, moving it towards the target.

This is done for each component of the model, to calculate minimum allocations within each stream. Pace of change is also applied to the combined ‘place based allocations’.
Moving targets

Target allocations are constantly moving

As soon as allocations are published, component parts within the model may have already changed and targets moved. Our aim therefore is to ensure that no CCG is more than 5% under their target allocation.

Target movement
relative to baseline.
This can be affected by population changes, data updates, formula improvements, and NHS policy 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 - hence the cushion of + or – 5%, above which lower rates of growth may be applied.
### Just to review, how does the model work?

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

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Based on population</strong></td>
<td>GP registered patients</td>
</tr>
<tr>
<td>2</td>
<td><strong>Adjust for age</strong></td>
<td>Evidence that the elderly and the very young have a higher need for health care services</td>
</tr>
<tr>
<td>3</td>
<td><strong>Adjust for additional need over and above that due to age</strong></td>
<td>Evidence of higher need due to health status, morbidity, deprivation</td>
</tr>
<tr>
<td>4</td>
<td><strong>Adjust for unavoidable differences in cost</strong></td>
<td>Neutralise cost of providing services due to geographical location</td>
</tr>
<tr>
<td>5</td>
<td><strong>Combine adjustments</strong></td>
<td>Bring together all adjustments within a segment, formula or model to get weighted population or target shares</td>
</tr>
<tr>
<td>6</td>
<td><strong>Apply shares (weighed populations) to available money</strong></td>
<td>Weighted population shares determine target allocations – compare with current budgets to get ‘distance from target’</td>
</tr>
<tr>
<td>7</td>
<td><strong>Apply ‘pace of change’ policy</strong></td>
<td>Pace of change aims to maintain budget stability, while giving additional resources to those CCGs requiring the most growth</td>
</tr>
</tbody>
</table>
# Glossary of terms used in NHS allocations

<table>
<thead>
<tr>
<th>Term used</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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 CCG allocation 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 target allocation and baseline (final allocation)</td>
</tr>
<tr>
<td>Healthcare need</td>
<td>Measure of variation in cost of healthcare</td>
</tr>
<tr>
<td>Normalised</td>
<td>Populations adjusted to add up to original total, maintaining % share</td>
</tr>
<tr>
<td>Pace of change</td>
<td>Process of moving budgets towards target allocations, keeping stability</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’ £ 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>
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.

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.
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 spent, which is set first by NHS England and then shared across all CCGs (rather than setting a specific cost per patient, which could result in uncontrolled budgets)

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.
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.

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

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)

<table>
<thead>
<tr>
<th>List of practices (indexed by p)</th>
<th>Each GP practice has an associated list of patients</th>
<th>There are also needs variables N (indexed by j), which have 3 indices</th>
<th>The same applies for any supply variables S, (indexed by k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subscripts (in maths called ‘indices’, plural of ‘index’) denote the position in a list (index is like an ID or Key in a database)</td>
<td>The number ( L_p ) tells us how many patients are registered at practice ( p )</td>
<td>( N_{ipj} ) is the needs variable for the ( i )th patient at practice ( p ) and the ( j )th needs variable</td>
<td>Again ( S_k ) has a different value for each patient ( i ) at practice ( p ), hence ( S_{ipk} )</td>
</tr>
</tbody>
</table>

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>( \text{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>( L_p )</td>
<td>( \text{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>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Index ((j))</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>
</tbody>
</table>

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.
Constructing the formula

**Building blocks required**

\[ \sum \text{ is a mathematical symbol meaning sum} \]

\[ \widehat{C}_p \text{ is what we want to know – cost per head at GP practice } p \]

\[ \widehat{\beta}_j \text{ and } \widehat{\gamma}_k \text{ are the predicted coefficients associated with each needs and supply variable respectively – these are the results of the regression modelling} \]

\[ \hat{\alpha} \text{ is a predicted constant term – could consider this as a fixed cost per patient (if all needs and supply variables were zero, then } \widehat{C}_p = \hat{\alpha} ) \]

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

- **Cost per head at practice** \( p \)
  - fixed cost per patient
  - \( \widehat{C}_p = \hat{\alpha} \)
  - (if all needs and supply variables were zero)

- **Total needs based cost for patient** \( i \) at practice \( p \)
  - Averaging (add up cost for all patients and divide by number of patients)
  - \[ \sum_{i \in p} (\sum_j \widehat{\beta}_j N_{ipj}) \]

- **Total supply based cost for patient** \( i \) at practice \( p \)
  - Averaging (add up cost for all patients and divide by number of patients)
  - \[ \sum_{i \in p} (\sum_k \widehat{\gamma}_k S_{ipk}) \]

**Final formula**

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

See CCG allocations Technical Guide (April 2016) PDF Document 3, p72
What is the impact of each segment?

**Adjustments to weighted population (overall place-based allocations)**

Each formula within the model represents a national budget stream. Within each formula, the segments may include evidence of variation in ‘need’ or ‘cost’. The relative weight of unmet need is determined by the NHS England board.

<table>
<thead>
<tr>
<th>CCG Core</th>
<th>Primary Care</th>
<th>Specialised</th>
</tr>
</thead>
<tbody>
<tr>
<td>£70.54bn</td>
<td>£7.34bn</td>
<td>£14.51bn</td>
</tr>
</tbody>
</table>

**Need**

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

- **72.3%** Acute services
- **13.1%** Prescribing
- **11.0%** Mental health
- **03.7%** Maternity

**Utilisation models**

- **90%**
- **85%**
- **95%**

Unmet need

<table>
<thead>
<tr>
<th>CCG Core</th>
<th>Primary Care</th>
<th>Specialised</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>15%</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Cost**

Estimate of effects on healthcare spend of unavoidable cost differences between health care providers, based on geographical location.

<table>
<thead>
<tr>
<th>CCG Core</th>
<th>Primary Care</th>
<th>Specialised</th>
</tr>
</thead>
<tbody>
<tr>
<td>staff and buildings</td>
<td>staff and buildings</td>
<td>staff and buildings</td>
</tr>
<tr>
<td>Market forces factor (MFF)</td>
<td>Market forces factor (MFF)</td>
<td>Market forces factor (MFF)</td>
</tr>
<tr>
<td>transport in rural areas</td>
<td>Supply factors</td>
<td></td>
</tr>
<tr>
<td>Emergency ambulance cost adjustment (EACA)</td>
<td>- 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.</td>
<td></td>
</tr>
<tr>
<td>inefficiently small hospitals</td>
<td>Unavoidable remoteness</td>
<td></td>
</tr>
</tbody>
</table>
How can we show the effect of updating the model?

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 the waterfall chart below. Each change in the formula stacks up to produce the final target allocation and distance from target. The graph below is an example of how this might look for a CCG.

This type of analysis could be helpful for CCGs to understand changes in their allocations.

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 the waterfall chart below. Each change in the formula stacks up to produce the final target allocation and distance from target. The graph below is an example of how this might look for a CCG.

This type of analysis could be helpful for CCGs to understand changes in their allocations.
限于模型，需要进一步的工作

难以精确衡量‘需要’

医疗服务

即使需求得到满足，仍然存在许多形式的健康需求，这些需求并没有以结果医院入院的形式记录。这些需求可能通过社区医疗服务等方式来处理，例如。我们现在缺乏稳健的全国水平数据来构建一个具体的公式，这是我们在当前工作计划中的优先事项。

难以测量‘未满足需求’

模型通常评估现有的需求，因此可能没有捕捉到未满足需求或不恰当满足的需求。

NHS England也有一项减少健康不平等的职责。因此有对未满足/不恰当地满足需求和健康不平等的调整，根据人口健康状况衡量。然而，现在没有足够的证据来判断未满足需求的存在和它分布在国家的分布。

这是一个正在进展的过程，作为我们工作计划的一部分。

The modelling isn’t perfect

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 centrally by NHS England.

Further work on the allocations formula for specialised services is also on our existing work programme.

Difficult to measure ‘unmet need’ for healthcare

The models typically assess need as it is currently met by NHS services and therefore may not capture unmet need or inappropriately met need.

NHS England also has a duty to reduce health inequalities.

There is therefore an adjustment for unmet/ inappropriately met need and health inequalities, based on a measure of population health. However, there isn’t as much evidence available as we would want on how much unmet need there is and how it’s distributed across the country.

This is in progress, as part of our work programme.
Independent advice and support

Expert Advisory Group

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

ACRA is an independent, expert committee, comprising mainly of GPs, public health experts, NHS managers and academics.

This group makes recommendations for changes to the weighted capitation formula (the preferred, relative, geographical distribution of resources for health services), for both NHS England (CCGs) and the Department of Health (LAs).

Other guidance

In drawing up recommendations for final CCG allocations to the board, the Chief Financial Officer also draws on other expertise from senior managers within NHS England and external stakeholders.

Source: ACRA Terms of Reference
Note: Codes and boundaries shown for 209 CCGs, which were included in 2016/17 allocations. Cartograms show CCGs (not hospital Trusts, which may have more familiar local names).
Further Reading

Financial Allocations

Current and previous published allocations being available at the links below. The latest round included allocations for 2016/17 (indicative for 2017/18 and 2018/19)

- Allocation adjustments for 2017/18 and 2018/19
- Allocation of resources 2016/17 – 2020/21
- Allocation of resources 2015/16
- Clinical Commissioning Group allocations 2014/15 and 2015/16 and here
- CCG Allocations 2013/14 and here
- NHS Allocations 2012/13 (Department of Health)

Technical Details

These technical documents explain how the allocations formula works, along with supporting documents, research reports and spreadsheets (including full details of calculations)

- Technical Guide to determination of revenue allocations to CCGs for 2016-17 to 2020-21
- Technical Guide to Clinical Commissioning Group and Area Team allocations 2014-15 and 2015-16

Further Reading

The allocations formula has recently had a fundamental review and the PBRA research has been updated. Some links below 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)
# Changelog

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Slide</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>
</tr>
<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>
</tr>
<tr>
<td></td>
<td></td>
<td>24</td>
<td>Improved wording, additional comments on list inflation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33</td>
<td>Addition of changelog to track amendments</td>
</tr>
</tbody>
</table>