The Strategy Unit.

Recommendations for advancing the analytical capability of the NHS and its ICS partners

Strategy Unit Report: October 2021

NHS
Midlands and Lancashire
Commissioning Support Unit

Preface: supporting the entire analyst community*

All analysis is done to inform decisions. These can be strategic decisions or operational/clinical decisions. In this sense, the umbrella term is Decision Making Analysis which comprises two, interrelated parts : Strategic Analysis and Operational Analysis.†

In this report we have focussed our attention on how to develop a **high functioning strategic analytics team** (and an analytical community that can sustain these), to support each ICS. **These teams will undertake high impact strategic analysis, addressing the most significant questions facing their system.**

In doing this we recognise that a typical ICS might have between 100-150 self-identified analysts‡ working across a range of functions and organisations (including key partner organisations working as part of ICSs) and that only a minority of these will be involved in the strategic analytics team.

We have done this because we see such strategic analytics teams, networked as we have proposed, as being the most powerful vehicle for advancing the use of analytics in NHS decision making. Thus we have focussed on how to support those teams and those analysts.

We recognise, however, that the entire analytical community also deserves developmental support and opportunity. Given the fundamental need for integrated working and focus on place, plus the fact that we see analysts moving between sectors in their careers, we see these recommendations as also being relevant to colleagues in social care, public health and local government.

To address this within the framework of our recommendations we would additionally recommend:

- **Each regional network should support an analyst professional network which is for any individual analyst who wants to join.** This network should offer regular connection, development and learning. In the Midlands, for example, the Decision Support Network (DSN) already maintains a network for over 200 analysts with fortnightly 'huddles' and provides a number of larger scale learning events that are open to all. Thus any 'analyst' in the NHS, as well as analysts from partner organisations working as part of an ICS e.g. social care, Public Health and wider local government, would have a regional community to connect to and learn with. These regional networks will also support national communities such as NHS-R and AnalystX.
- **Each regional network should help the wider BI community in its area to identify training requirements and offers and enable coordination of that as required.** As an example of this, in the Midlands one of the AHSNs runs a well-regarded introductory programme that we would say all analytical/BI staff should consider. The DSN education arrangements then address the additional elements required for those involved in each ICS's strategic analytics teams.
- **Each ICS strategic analytics team should be tasked to support advancing 'analytical capability' across their ICS systems.**

* This report has been commissioned by NHSE/I and focuses its recommendations on the NHS. There is an absolute recognition, however, that advancing analytics for ICSs is a joint endeavour for health and local government and our recommendations are intended to address partners in an ICS and the whole analytical community that supports each ICS.

†We describe the distinction between these two terms on slides 14/15.

‡ A PHE audit of analytical capacity and capability found a typical ICS/STP having c. 100-150 professional analysts.

Executive summary

Our report addresses the vital question of how analytical capability (and capacity) can be advanced across the NHS (and the NHS working with key partners in ICSs) in order to support the best possible decisions to be made. To do this we describe what analysis is for; what a high functioning analytical team looks like and the kind of questions they should be addressing; we unpack the skills needed to do that and what that means for analysts in developing their careers; and we make recommendations for how the best climate can be created for advancing analysis and its use by decision makers.

We see all analysis as informing decisions, be they operational/clinical or strategic decisions, and recognise the term Decision Making Analysis as an overarching terminology for these different types of analysis. In this report, however, we have focused on strategic analysis whilst recognising that the boundaries between this and operational analysis are porous. To help the reader we have set out a distinction of these types on slides 14/15.

Whilst our report makes a number of detailed recommendations* for action at each level of the service, at a headline level our essential recommendations are these:

- Adopt a vision for strategic analysis that places it as the heart of strategic decision making in health and care and is based on a clear **national description of what strategic analysis covers, what a high functioning strategic analytics team should look like and the skills that are associated with that.**
- Each system should establish a **strategic analytics team, separate from BI delivery** - they require different skills and different working practices – and these **analytical teams, drawn from across the system, should be led by skilled analysts.**
- These **teams should be actively networked at a regional level.** The **network should be supported/coordinated by an expert team** that can offer analytical leadership, structured education and systematic knowledge exchange focussed on advancing the capability of the ICS teams. The **network members should 'own' the network** and resource this development function. The network learning programme should embrace (and help analysts to navigate) the training offers already available from 'the market' but supplement that with **network delivered, context-specific learning focussed on the craft of analysis** in pursuit of advancing 'decision quality'. The **regional networks should be recognised as the lead for coordinating and providing analytical development** in their areas, working collaboratively as necessary. **Any national resources to support analytical development should have a direct impact on ICSs** with an expectation that they are deployed through the regional networks, where there is such a desire and capability exists, with governance secured through the proposed membership model.
- We would advocate the promulgation of national communities of practice. Existing examples that may be drawn upon include the NHS-R Community; AnalystX, and the NHS Python Community.
- **All training offers should be accredited by a credible national body** (we suggest AphA), but this needs to be done on a phased basis to avoid disruption.
- A **national competency framework for analysts should be agreed before the end of 2021/2,** one that introduces much-needed consistency in role descriptions and grading. **By April 2023, all NHS recruitment and promotion to analyst roles will be dependent on applicants meeting the required standard.**
- **Protected learning time for all analysts** should be built into job descriptions and a national minimum expectation should be set of at least 10 per cent of analysts' time per week protected for learning. Additionally, 1 week per annum should be identified nationally as a dedicated learning week. Regional networks should coordinate activity in this week.
- The principles and practical implications (e.g. for tools needed) of **open-source analysis and replicability should be actively promoted** and widely understood across NHS leadership.
- Set an expectation that ICS leaders should be analytically confident/capable and should be actively engaged in analytical development. **Analytical competencies should feature in person specifications for key NHS leadership positions**. Position regional networks as the prime support for this aspect of leadership development.

* The recommendations in this report are currently under consideration by the National NHSE/I team.

Structure of this report

- Background & the asks
- About the Strategy Unit
- Methodology for this report
- Report outputs & our recommendations

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Background & the asks

There is widespread recognition that the current use of data analysis to support decision making in the NHS is variable and often poor. A number of barriers and enablers have been identified and NHSE/I have commissioned the Strategy Unit– an exemplar NHS-based analytics unit - to provide insights on how best to secure advancing analytics at a national scale. The objectives of this multifaceted commission are as follows:

Objective 1: Suggest ways of advancing analytical capability.

This should include recommendations for how best to advance the training and development of healthcare analysts and to create the most effective environment for that nationally.

Objective 2: Describe what high-quality analytics look like.

In support of the recommendations, this should include a description of what a high functioning analytical team does/looks like and an associated typology of questions that healthcare analysts* need to help answer.

Objective 3: What are the implications for skills, career paths and training.

This should identify how high functioning analytics translates into the kind of skills needed, how they might develop across a career and what training is currently on offer in support of that.

* For the purposes of this report, healthcare analyst is used to describe the full range of analytical posts including data analysts and data scientists although our focus is on strategic analysis.

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About the Strategy Unit

About Us

Our vision & theory of change for strategic analysis

How we aim to realise this vision via a network of Decision Support Units in the Midlands region

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About us

The **Strategy Unit**, hosted by Midlands and Lancashire CSU, is widely recognised as being an example of a high functioning NHS analytical team*, for both quantitative and qualitative analysis. Our vision is for strategic analysis to be at the heart of strategic decision making in health and care.

In addition to undertaking a wide range of significant analytical projects locally, regionally and nationally, and producing a range of peer-reviewed and other publications, the Strategy Unit also has a formal role in developing analytical capability across its home region (MDSN – see below) and nationally (leading the NHS-R Community funded by the Health Foundation). The team has been in existence for over a decade, operating exclusively on a 'pay for project' basis and with a high degree of managerial autonomy. During that time, by embracing the challenging discipline of having to secure a paying client for every piece of work it does, the team has grown four-fold and now employs nearly 50 specialist NHS staff. The Unit has in recent years designed and run its own graduate entry programme for junior analysts. As a matter of philosophy, the Strategy Unit seeks to share its work openly and to contribute actively to building NHS capability. A substantial range of the analytical work we do is accessible on our website, www.strategyunitwm.nhs.uk.

* The term is described in more detail on slide 22

About the Strategy Unit

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How we aim to realise this vision via a network of Decision Support Units in the Midlands region

Our vision & theory of change for strategic analysis

For us the primary purpose of analysis is to enable high quality decisions to be made. This may not be sufficiently appreciated or recognised in the NHS, especially for non-clinical strategic decision making. This culture shift requires a change in behaviour on the part of decision makers and analysts along with a new way (system) for making strategic decisions which focuses on decision quality (DQ)* as its primary aim. To achieve this change:

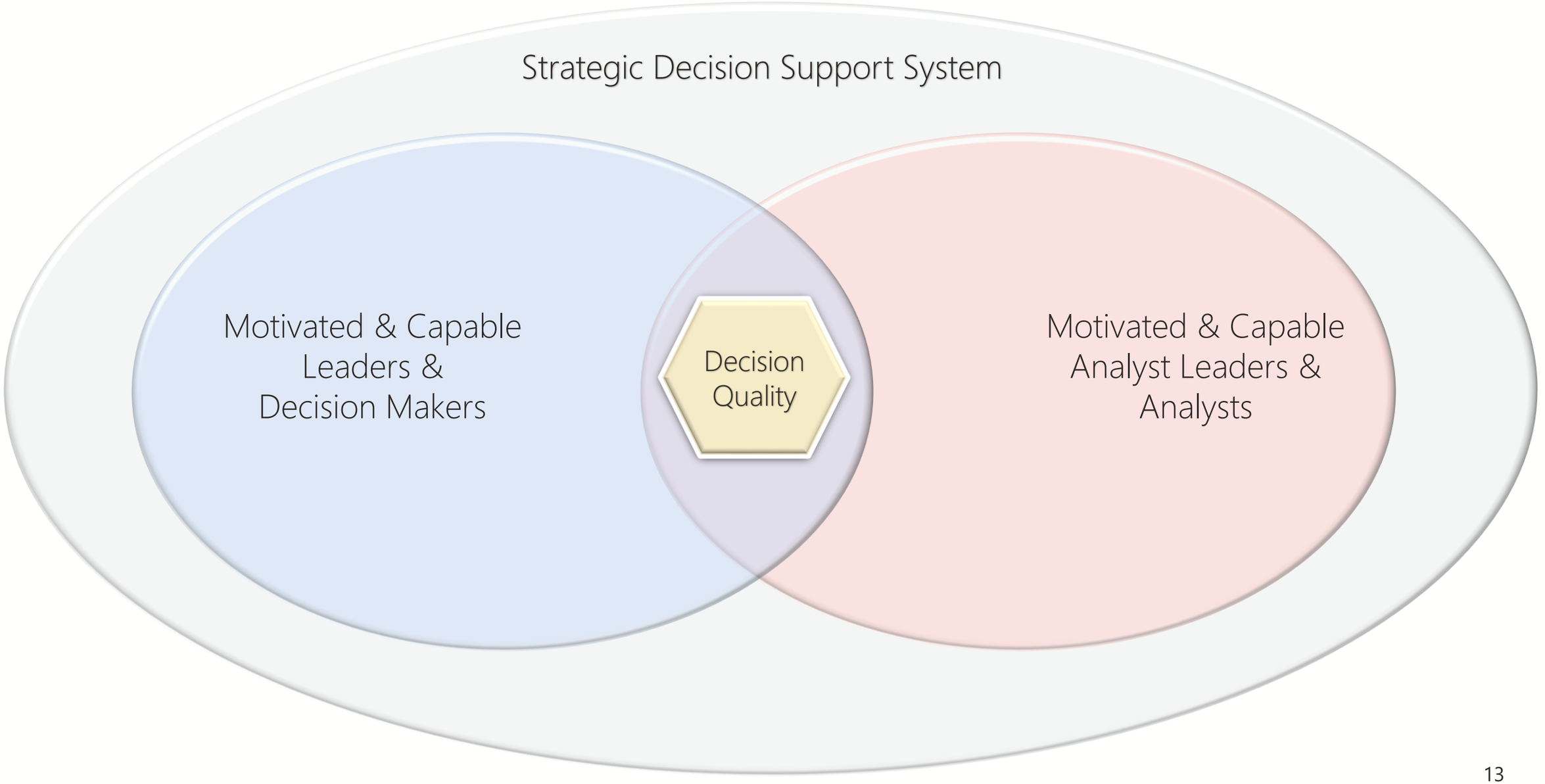
- **Decision makers need to be…**
  - Capable of appreciating, commissioning and understanding the role of analysis to enhance DQ
  - Motivated to avoid poor quality decisions and have an appetite for analysis recognising it needs adequate time and space
  - Supported in developing opportunities to achieving DQ by designing decision support systems (or teams) that are capable of achieving DQ

- **Analysts need to be…**
  - Capable of supporting decision makers with the expertise and high quality application of their craft in support of DQ
  - Motivated to continual learning, development and sharing and to see themselves as champions of DQ
  - Supported with opportunities to co-design and participate in decision support systems that achieve DQ

- **Since the NHS has a common aim and faces common challenges, there is a need to…**
  - Pool and network the analytical resource locally into well-organised decision support teams led by skilled and experienced analysts with a "do-once and share-many" philosophy using open source tools across the NHS

* The six dimensions of decision quality are here

Our vision & theory of change for strategic analysis



What do we mean by 'strategic analysis'?

In this report we have used the term **'strategic analysis'**. This is by no means a precisely defined term. What we mean by it is the structured application of analytical methods to a range of data in response to a strategic question. Strategic questions are ones which impact on important strategic decisions. We have defined how we think strategic analysis differs from operational analytics below, **although we recognise that all analysis is done to inform decisions, and so both types of analysis should be considered under the umbrella of 'Decision Making Analysis':**

Strategic Analysis is characterised by:
- Seeking to identify the "right things to do" or the best way ahead
- Focusing more on medium to longer term vision & policy
- Aiming to support leaders & strategic decision makers
- Greater involvement of external stakeholder perspectives
- Synthesising a wide range of sources of evidence

Operational Analysis is characterised by:
- Seeking to identify ways of "doing things right" & trouble shooting
- Focusing more on short to medium term goals & issues
- Aiming to support managers & operational decision makers
- Greater involvement of internal stakeholder perspectives
- Synthesising mostly internal sources of evidence

One way 'strategic analysis' works can be that a question becomes important to decision makers . Those decision makers believe that analysis can help them address this question, either by answering it or reducing the uncertainty they currently face in reaching a high quality decision. They therefore work with their strategic analysts to **define the problem**. The analysts then **consider options for addressing the question**, drawing on their expertise, the literature, their expert networks, and the ideas of others. They work with decision makers to decide **which option best meets the needs** (adopting a 'value of information' perspective) and then **deliver what is selected as a self-contained, fully documented analytical report, complete with recommendations**. The analysts then support the decision makers in **understanding the report** (including its limitations) and facilitate them in **reaching decisions based on it**. The work is then shared to add to the knowledge base.

What do we mean by 'strategic analysis'? (cont.)

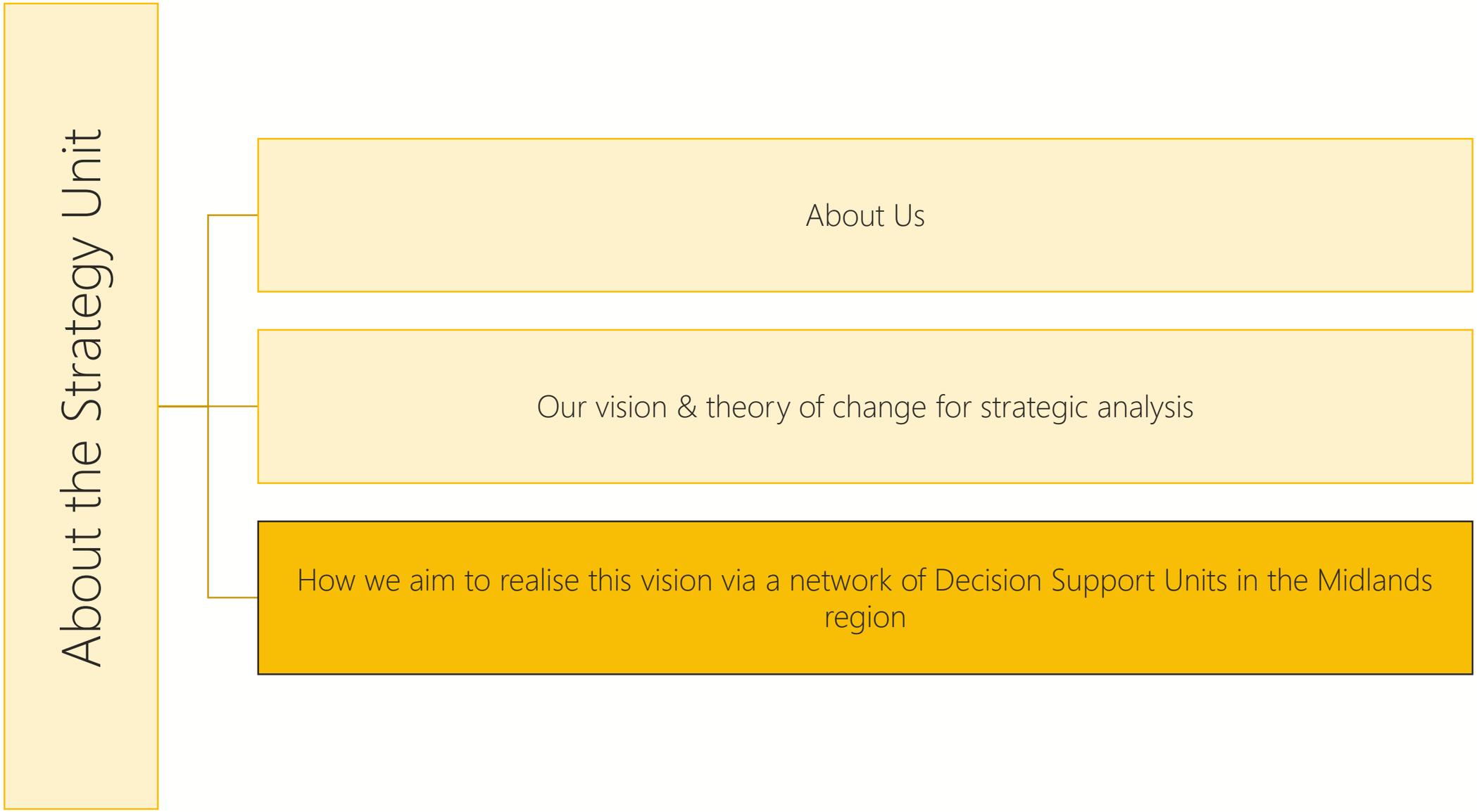
The other way 'strategic analysis' works is **where the strategic analytics team itself explores questions**, based on its own understanding of key health/care issues, discussions with its own networks of clinicians, think tanks, researchers etc., or emerging themes in policy or the literature, and **brings ideas and proposals to leaders about opportunities for improvement at a strategic level.**

In our experience, a high functioning strategic analytics team will **suggest as many important questions to be addressed as it will receive from its decision makers**. This is a critical point and a sign of success.

What sort of questions might be 'strategic analytical questions'?

Here are a few examples, by way of illustration, though our typology of analytical questions developed for this report approaches this more systematically (see slides 43 & 44). Key features include: the openness of the (big) question; the lack of a road map for "how to do it" (and the need for expert consideration of methodological options); as well as the need to bring order to complexity.

- Can you help us to develop a coherent, transparent unifying method to prioritise our efforts on reducing inequalities – one which combines a perspective on extent; scale; and impact on years of life lost?
- How might we optimise the capacity we have for service **x** across our system/network?
- We want to understand at which points on the pathway inequalities are occurring and why?
- Which upstream interventions are likely to give us our greatest return on investment in our local context?
- What might be the mental health demand implications of the COVID-19 pandemic in our system?
- Is our plan to shift more work into the community having the effect we intended and if not, why not?
- Where across our system might we be experiencing the most 'low value' activity and what might be the implications for redistribution if this was addressed?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How we aim to realise this vision via a network of Decision Support Units in the Midlands region

A network of Decision Support Units

The Midlands Decision Support Network sees each ICS in the Midlands committing to establishing a local Decision Support Unit (DSU) team as a focal point for strategic analysis, evaluation (to be a learning system), knowledge exchange and application of evidence-based methods for advancing DQ and effective implementation.

These local DSUs are actively networked to support their own development, to promote collaboration and to achieve the benefits of scale. The Strategy Unit acts as the development centre for the DSU Network, funded by member subscription, and as part of that remit:

- Provides a learning programme designed to complement and bolster the range of analytical training that is routinely available by focussing on analytical craft skills (e.g. leadership for analysts) and application of critical methods in real world settings (e.g. systems dynamics modelling; advanced PHM; quasi experimental methods etc). The learning programme also addresses a non-analytical leadership audience (e.g. critical thinking and DQ for leaders)
- Develops design principles and toolkits for the Network members to use (e,g. interactive evaluation guide, described as 'definitive' by the Health Foundation)
- Undertakes a number of large scale analytical projects chosen by the members (e.g. socio-economic inequalities in access to planned hospital care: causes and consequences) and supports them in taking insight into action for these
- Is creating an active knowledge exchange and library for the Network

A network of Decision Support Units (cont.)

The Midlands Decision Support Network is bold in its ambition

It is a self-owned collaborative venture across Midlands ICSs that is squarely aimed at advancing analytical capability and securing genuine scale benefit in order to advance decision quality. It has included from the outset colleagues from other sectors and already sees NHS and social care analysts learning together for example. In asking the Strategy Unit to act as the nerve centre for the Network, the members are looking beyond casual networking and are seeking “thought leadership” in how the Network progresses analytical advancement.

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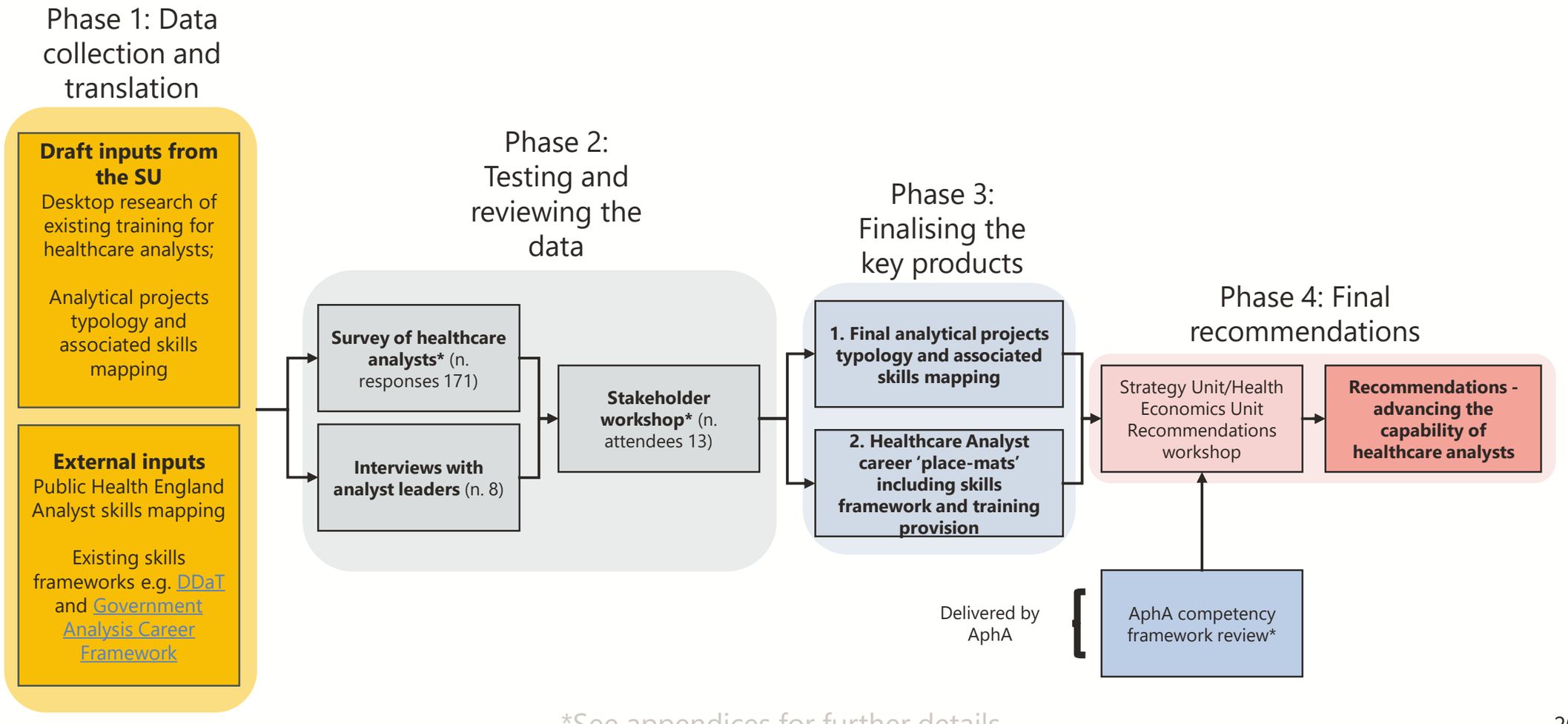
Our Methodology

We approached this commission using a mixed-methods, multi-phase approach which blended insights from our own experience and that of our new sister team, the Health Economics Unit; a survey of NHS analysts; interviews with analytical leaders; desktop research of training provision; and stakeholder workshops.



*See appendices for further details

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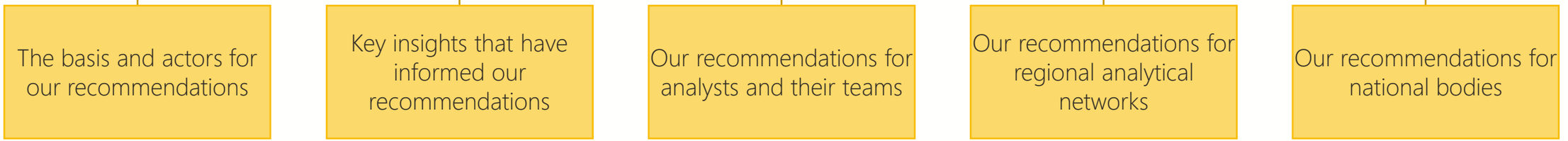

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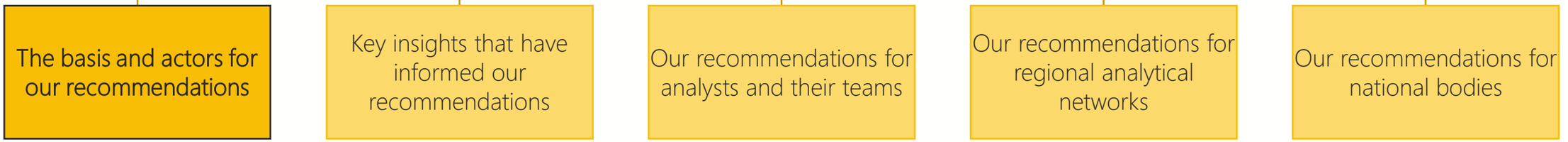
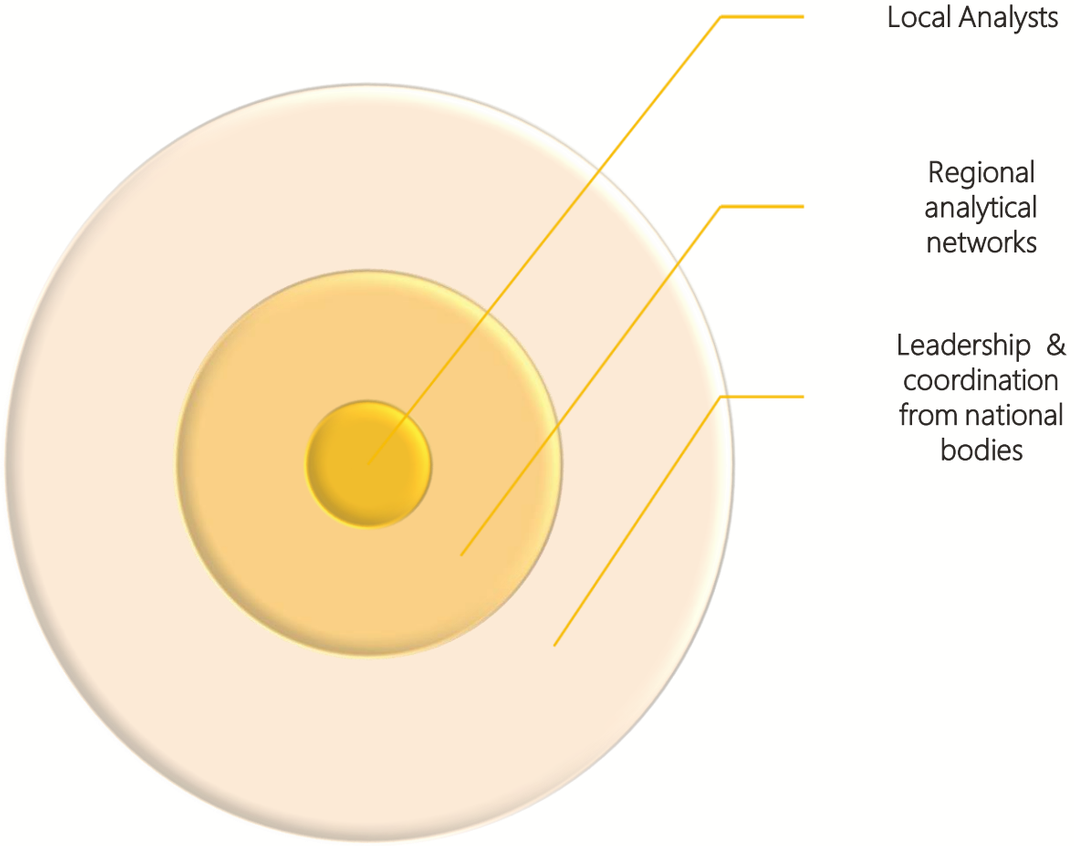


The basis and actors for our recommendations

Our vision is for strategic analysis to be placed at the heart of strategic decision making in health and care.

To achieve this vision **nationally**, we posit that a **paradigm shift** is required that recognises:

- Individual component parts to realise this vision already exist
- A few working models based on this vision already exist
- The need for a systematic approach with recommendations across local, regional and national actors in the health and care system to realise this vision, with the regional network as the prime locus for analytical development
- The need to be resource efficient



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- **Key insights that have informed our recommendations**
- Our recommendations for analysts and their teams
- Our recommendations for regional analytical networks
- Our recommendations for national bodies

Key insights that have informed our recommendations

- Improving analytical effectiveness requires a focus on ‘decision quality’ as the end point and needs change for decision makers; analysts; environment and processes
- Doing something about training offers for analysts in isolation will achieve little hence some of our recommendations that are about the ‘demand side’ and about environment/system
- We draw a working distinction between ‘ strategic analysis’ (structured application of analytical methods to a range of data in response to a strategic question) versus BI/reporting/dashboards because they are different disciplines and need different skills and context. This insight is born from our observations across the NHS, that where analytical teams are distinctly set up for strategic analysis, then analytical excellence follows
- High functioning analytical teams and analysts are evident now but are not widespread. We are not starting from zero, and these well-led, well-coordinated teams and networks can deliver the skills required now from existing offers. This should be built upon through a devolved network model with strong network analytical leadership.
- Whilst the “market” provides plenty of specialist training valued by analysts, there is less attention paid to the essential craft skills needed for analytical teams be effective and to ensuring that learning about application of a range of powerful methods is context specific. In addition, as the survey perhaps illustrates, when left unguided analysts focus on elements of training that play to the demands currently put upon them which, as we can see, are but a small part of what analytics overall is about/can address
- We must also acknowledge that a common failure of learning programmes can be the recipient returns to a context that makes no use of what they’ve learned
- Our experience shows that our new recruits have high technical/software skills but the art of application and judgement about what to apply when, is one that has to be learned through structured experience. Some of that can be addressed in training; much of it requires effective coaching within an already highly capable team with high quality analytical leadership

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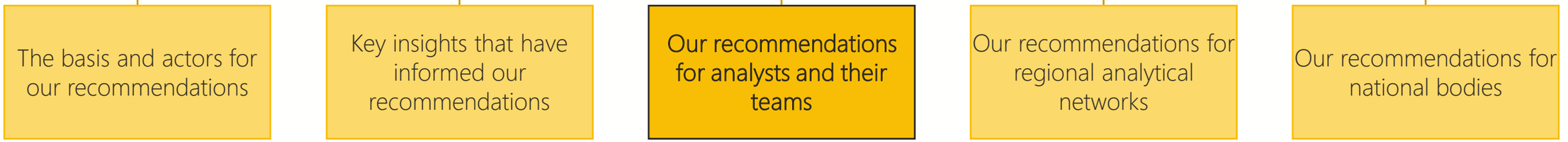

Our recommendations for analysts and their teams

1. Organise for strategic analysis
2. Use learning & career progression maps
3. Set aside protected development time
4. Undertake strategic projects
5. Connect with regional & national networks

Recommendations for individual analysts and their teams

1. **Organise for strategic analysis**
    - Analytical teams should be separate to BI/data teams, though with extensive interactions and matrix working where possible (that could include cross-team working between individual analysts)
    - Analytical teams should be led by skilled analysts who are supported to be effective leaders with accredited (as proposed) leadership and technical development programmes
    - Each ICS should establish a team that acts as its focal point for strategic analysis (the Midlands has, by way of example, established DSUs to fulfil this function). These teams should have a designated 'Chief Analyst'. How this team fits within the ICS intelligence architecture is for local determination.
2. **Use learning and career progression maps**
    - To use the descriptions of high performing, strategic analytics teams, the typology of strategic analytics and career pathways to identify their learning needs and meet these needs via available learning opportunities which includes the "art and craft" of strategic analysis
    - Analytical teams should develop a team learning strategy in conjunction with their regional network (as proposed) which maps out a coherent plan that combines individual development with team development
3. **Set aside protected development time**
    - All analysts working in the NHS should have a right to protected learning time and resource to support self-development as part of local, regional and national learning networks. This learning time should be built into job descriptions and a national minimum expectation should be set of at least 10 per cent of analysts' time per week protected for learning. Additionally, 1 week per annum should be identified nationally as a dedicated learning week. Regional networks should coordinate activity in this week.

Recommendations for individual analysts and their teams

4. **Undertake strategic analytical projects**

    - Strategic analytics teams should work on a project basis focussed on clear questions set in an environment which commits to embracing the outputs in planned decision-making processes

5. **Connect with regional and national analysts and decision support networks**

    There are many examples of existing networks that should be engaged. These include:

    - Regional analytical networks where present e.g. the Midlands DSN Analysts Network
    - The NHS-R Community: this community aims to support the learning, application and exploitation of R in the NHS through workshops, video tutorials and providing a platform for discussion and sharing of developing best practice solutions to NHS problems.
    - AnalystX: AnalystX is a data and analytics community hosted on the FutureNHS collaboration platform.
    - NHS Python Community: this is an open community of practice that champions the use of the Python programming language and open code in the NHS and healthcare sector

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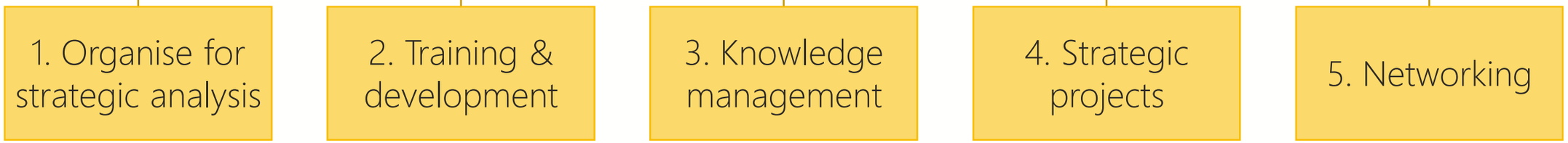
- **Our recommendations for regional analytical networks**
- Our recommendations for national bodies

Our recommendation for Regional Analytics Networks



Recommendations for regional analytical networks

1. **Organise for strategic analysis**
    - There should be a comprehensive coverage nationally of 'regional analytical networks'. These should be developed based on the Midlands DSN model or similar. These networks should be designed to support local/ICS strategic analytical teams to develop; to collaborate; to achieve scale benefits. They should be 'owned' by the constituent ICSs. They should take the lead in analytical advancement for their constituent strategic analytics teams and systems and be seen as the fundamental building blocks for a national analytical advancement strategy
    - Each regional network should establish and resource a network development function which can, at a minimum, deliver a structured education programme; supported professional networks; an R&D and knowledge management capability; undertake scale activities on behalf of the membership. The team that delivers this function should be selected by the network based on its demonstration of an appropriate analytical track record and credentials
2. **Training & Development**
    - Each regional network should, at a minimum, deliver a structured (accredited) education programme based on a learning strategy for each ICS analytical team
    - Any national resources to support analytical development should be devolved to ICSs with an expectation that they are deployed through the regional networks, with governance secured through the proposed membership model
3. **Knowledge management**
    - Each regional network should have knowledge management and mobilisation capability to maximise learning, sharing and avoid unnecessary duplication
4. **Strategic Analytics Projects**
    - A series of regional strategic projects should be prioritised with system leaders and undertaken on behalf of members
5. **Networking**
    - Local systems should identify existing communities of practice to support their networks. Examples that may be drawn upon include the NHS-R Community; AnalystX, the NHS Python Community and the Midlands DSN Analyst Network
    - The regional network works to connect developing analysts with opportunities to apply their skills
    - Regional networks link with each other to identify opportunities to share /collaborate
    - Regional Network (and Regional Networks in collaboration) support ICS Boards to be trained in and supported to adopt methods around Decision Quality and using high-quality analytics
    - Regional networks take a specific responsibility for designing shared approaches which advance the use of analytical apprenticeships/careers as an 'anchor institution' opportunity
    - Each regional network should nominate a 'Chief Network Analyst' to represent it nationally and interact with the proposed 'Head of Profession'

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- Our recommendations for analysts and their teams
- Our recommendations for regional analytical networks
- **Our recommendations for national bodies**

Our recommendations for National Bodies

1. Sponsorship
2. Coordination & Leadership
3. Accreditation
4. Professionalisation

Recommendations for national bodies

1. Sponsorship

- NHSE/I and stakeholders (eg ApHA, NHSX) to agree and promulgate widely a vision for strategic analysis that places it as the heart of strategic decision-making in health and care. This should be based on a clear description of a high performing analytical team; the question-led analytical typology; the career and skills framework (all provided as part of this report), both across the analytical profession but also across the ICS/national etc leadership community

- NHSE/I to promote the development of regional analytical networks (e.g. the Midlands DSU arrangements) and to place an expectation on ICSs that they develop such and participate actively. NHSE/I to provide a roadmap that ICSs in regions could draw upon

- NHSE/I to actively promote the principles of open-source analysis and replicability and to ensure that this is widely understood across NHS leadership given its importance for the development needs and tools available to analytical teams and for developing a learning culture across the NHS. This may form part of an analytics charter that organisations agree to

2. Coordination and leadership

- NHSE/I and stakeholders promote understanding across the analytical and leadership community of available training, mapped against the skills framework, and work with regional networks in addressing gaps/keeping the resource up to date

- As vital intelligence, NHSE/I to consider the case for maintaining a register of all external (non-NHS provided) analytical commissions (locally and nationally) and to require such commissions to be documented in terms of whether they were for capacity or for specialist skill gaps (and if so what). The costs of these commissions should also be recorded. This information should be collated in order to help NHSE/I and regional networks identify gaps in skills that they can address and to help make the business case for further investment in the NHS analytical workforce as appropriate.

Recommendations for national bodies (cont.)

3. Accreditation

- Existing and new training provision should be audited and accredited by a credible national body (we suggest AphA ,if appropriately resourced to do so). This should be phased to avoid disruption.
- A national competency framework for analysts should be agreed before the end of 2021/2, one that introduces much-needed consistency in role descriptions and grading. By April 2023, all NHS recruitment and promotion to analyst roles will be dependant on applicants meeting the required standard
- Expectations are set that ICS leaders of the future will need to be analytically confident/capable and actively engaged in analytical development. Analytical competencies should feature in person specifications for key NHS leadership positions. Regional networks should be a coordinating point for developing a training/education offer for leaders that draws off their own bespoke and a range of external offerings – e.g. Data Masterclass for Leaders in Government; Midlands DSU Network Decision Quality and Critical Thinking for leaders etc. This does not prevent national communities of practice organising training or providing education as long as they do not duplicate regional offers
- In partnership with NHSX, to produce a regularly updated list of tools, software application etc that all analysts in the NHS should be able to access as of right (in agreement with regional networks) and mandate that to all NHS organisations

4. Professionalisation

- A 'Head of Profession' is identified who has recognised analytical credentials, akin to a Chief Medical Officer post. The Head of Profession should work with Chief Network Analysts from each regional network plus senior analysts from NHSE/I and other national bodies (e.g. the NHSX Analytics Unit and the Office of the Chief Data and Analytics Officer NHSE/I) as a national analytical leadership team which sets and supports national analytical standards and ensures that skills and capacity are available to deliver them. We need to develop the career path towards these Chief data and analytics roles and would welcome the creation of a national learning infrastructure to develop the senior cadre of such individuals

Objective 2: Describe what high-quality analytics look like.

In support of the recommendations, this should include a description of what a high functioning analytical team does/looks like and an associated typology of questions that healthcare analysts need to help answer.

- We describe the characteristics of a high functioning analytical team
- We describe a typology for strategic analysis
- We Illustrate the use of the typology

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We describe the characteristics of a high functioning analytical team

We describe a typology for strategic analysis

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What are the characteristics of a high functioning analytical team?

From our discussions with analytical leaders across the NHS, the following description of a high functioning analytical team was agreed at the analytical leaders' workshop.

A high-functioning analytical team…

- Is clear that their key role is to enhance the quality of the decision-making process
- Has critical problem formulation skills – to help them engage with decision makers to ensure the right questions are being addressed
- Is technically proficient across the range of analytical project ‘types’ and able to apply these to the questions at hand
- Is aware of its own limitations and establishes collaborative partnerships to supplement this
- Is able to influence the decision-making processes by providing reliable, relevant, well communicated analyses to decision makers to ensure decision quality
- Is dedicated to research and sharing knowledge; producing replicable work and evidencing new ways of working
- Is well-versed in the healthcare context in which it operates

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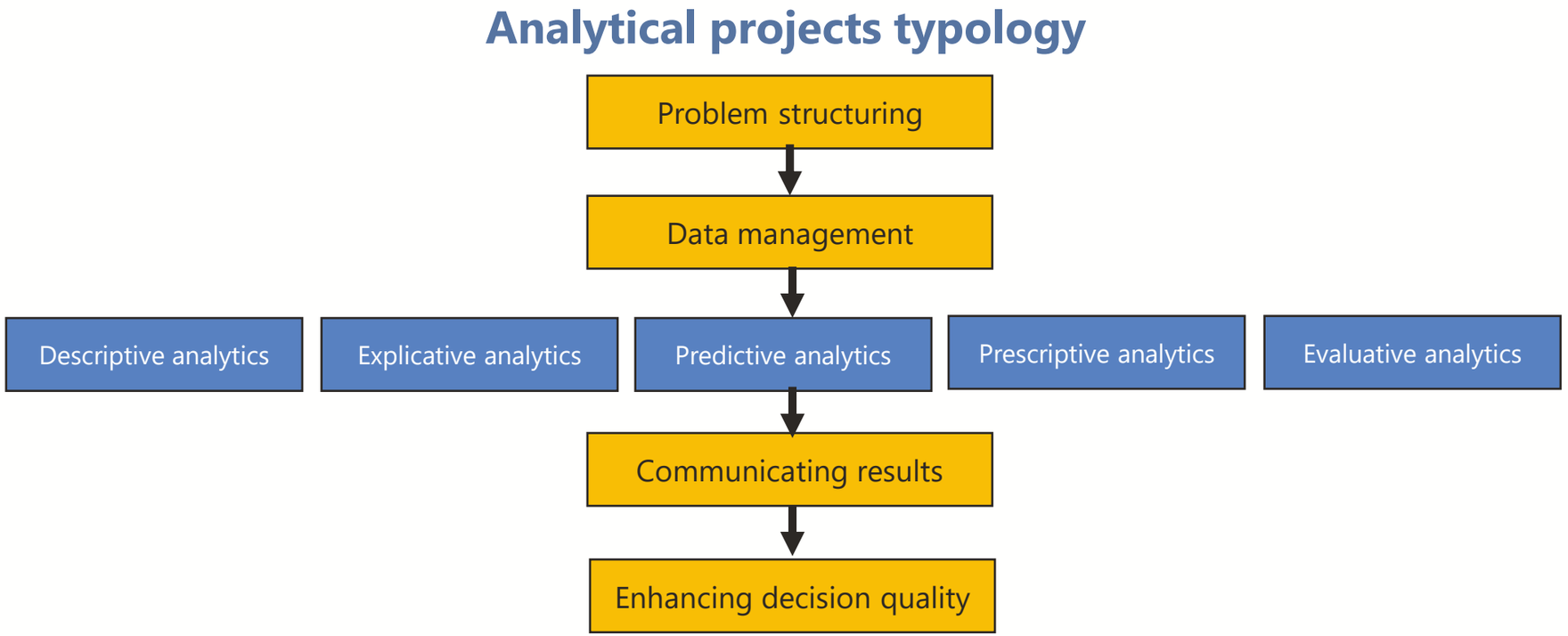
Typology for analytical projects

In support of the analytical career paths (objective 3), a typology of analytical question types has been developed and tested with stakeholders. This describes the types of analytical work that may take place within a high functioning team and the types of analytical methods that are required to address them. The purpose of this typology is to support meaningful conversations between analysts and their leaders about the types of analytical projects they deliver; the skills and skills development trajectory needed to be able to accommodate the whole spectrum; and the art of the possible. **We recommend the adoption of this typology nationally.**



Typology for analytical projects (cont.)

Five ‘types’ of analysis have been defined according to the nature and context of the problem to be addressed. We acknowledge that some projects include multiple phases, and that different phases require different ‘types’ of analysis. Some commonly used methods are listed for each ‘type’, but these are neither exclusive nor exhaustive. In addition, four foundational analytical tasks are identified which will feature in most analyses, irrespective of ‘type’.

Problem Structuring - deriving a problem definition and analytical plan from a presenting management, clinical or operational context.	**Data Management -** information governance, data ethics, data processing, wrangling, and linkage	**Descriptive Analytics-** What is the world like now and in the past? Using multiple data sources to provide a coherent overview of activity, resource use, performance, quality, efficiency, experience and outcomes. *Commonly used methods: Summary statistics, data visualisation, geospatial mapping, metric development and derivation, prevalence studies, experience surveys.*	**Explicative Analytics -** Why is the world the way it is? Exploring and explaining observed patterns of activity, performance and outcomes and the variation in these between groups and over time. *Commonly used methods: Explanatory regression modelling, inferential statistics and hypothesis testing, data-mining, observational (risk) studies, choice experiments.*	**Predictive Analytics -** What might the future hold for patients, services and populations? Estimating how activity levels, performance and outcomes change in the future under different assumptions and scenarios. *Commonly used methods: Time series forecasting, risk prediction, machine learning, scenario planning, simulation, ex-ante modelling, epidemiological and demand modelling.*	**Prescriptive Analytics -** What should we do? Providing specific advice for decision makers in order to make best use of available resources to maximise health outcomes *Commonly used methods: Opportunity assessments, options appraisals, resource allocation, resource planning, scheduling, optimisation, statistical process control, decision aids and decision analysis.*	**Evaluative Analytics -** Did it make a difference and was it worth it? Estimating the impact and costs of changes that are or have been made to the health system to inform decisions about implementation and whether to continue / roll-out. *Commonly used methods: Causal inference, logic modelling, experimental and quasi-experimental studies, directed acyclic graphs, contribution, mediation and moderation analysis, cost effectiveness, cost benefit and return on investment analysis.*	**Communicating results -** constructing narratives, report writing, data visualisation, verbal presentation, conveying risk and uncertainty, describing concepts and methods to non-technical audiences.	**Enhancing decision quality -** supporting decision makers and the decision-making process with problem formulation, relevant & reliable data, evidence and analyses to evaluate alternatives, sound & insightful reasoning and effective communication

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We Illustrate the use of the typology

Example projects by ‘type’

To support understanding of these project types, some examples of each that have been conducted by the Strategy Unit and BNSSG CCG are included below. These are for information and we are not suggesting that such work is unique to these organisations or that our examples are necessarily exemplary. The list is iterative and further contribution from other teams should be invited.

Project Type	Project 1	Project 2	Project 3
Descriptive	Exploring mental health inpatient capacity	Health service use in the last two years of life	Population Health Management to identify and characterise ongoing health need for high-risk individuals shielded from COVID-19: a cross-sectional cohort study
Explicative	Waiting times and attendance durations at English A&E Departments		
Predictive	Modelling the impact of COVID on waiting lists for planned care	Nowcasting for improved management of COVID-19 acute bed capacity	
Prescriptive	Opensource model for planning vaccine centre capacity	Improving COVID-19 vaccination centre operation through computer modelling and simulation	
Evaluative	Evaluation of an Integrated Mental Health Liaison Service (Rapid Assessment Interface and Discharge Service) in Northern Ireland	The Value of Triage during Periods of Intense COVID-19 Demand: Simulation Modelling Study	

Objective 3: What are the implications for skills, career paths and training.

This should identify how high functioning analytics translates into the kind of skills needed, how they might develop across a career and what training is currently on offer in support of that.

We describe career ‘place-mats’ for analysts from entry level to leader

We describe a skills map for analysts from entry level to senior

We describe the current provision of training courses on offer for analysts

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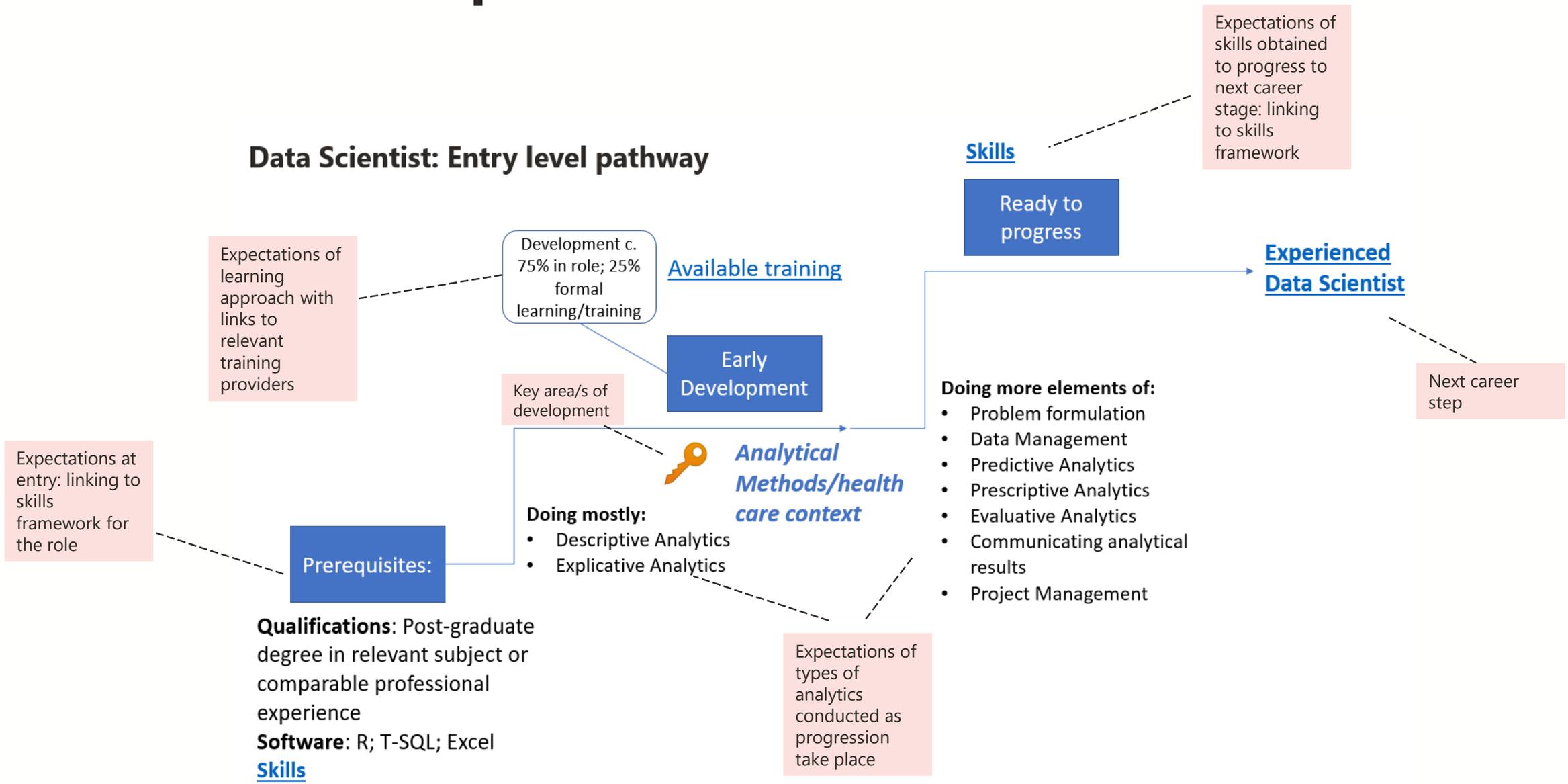
Healthcare analyst career ‘place-mats’

We have developed ‘place-mats’ for the career development of Data Analysts and Data Scientists in the health and care sector. We have focused on these two roles as our survey found that 85 per cent of healthcare analysts self-identify as such.

The ‘place-mats’ chart the pathway from career entry to leader/advanced specialist, describing the prerequisites to progression in terms of qualifications, familiarity with coding/software, skills/methods employed in the role, and areas of development to focus on as they gain experience.

Although the pathways should not be considered an all-encompassing competency framework for Data Analysts and Scientists, we believe they can be used to frame the recommendation from AphA’s recent report that a standardised framework for healthcare analysts should be established and adopted across the health and care system. We strongly recommend maintaining this high level view as the first line of sight for healthcare analysts and those that employ them and manage them with any further detail, as necessary, appended.

How to use the ‘place-mats’



Note - what's the difference between a Data Scientist and a Data Analyst?

The differences between these two roles in what we have set out have been informed by existing professional frameworks including the Digital, Data and Technology Profession Capability Framework (DDaT) and Government Analysis Career Framework. The survey responses have also suggested some differences in role and responsibility that are reflected here.

The significant divergences are that:

- Data Scientists have a higher suggested entry bar in terms of academic qualifications and knowledge of relevant software/coding
- Data Scientists have an option under current NHS job structures to pursue an 'advanced specialist' pathway. For an Analyst to pursue this option, it is suggested that they transfer to the Scientist pathway

Whether the distinction is useful and whether it is maintained in practice we are less sure of as we see the Data Scientist title being used rather randomly and for perceived status in some cases rather than because of any technical distinction. It was outside of our remit to make a recommendation on this, but we believe that it needs consideration.

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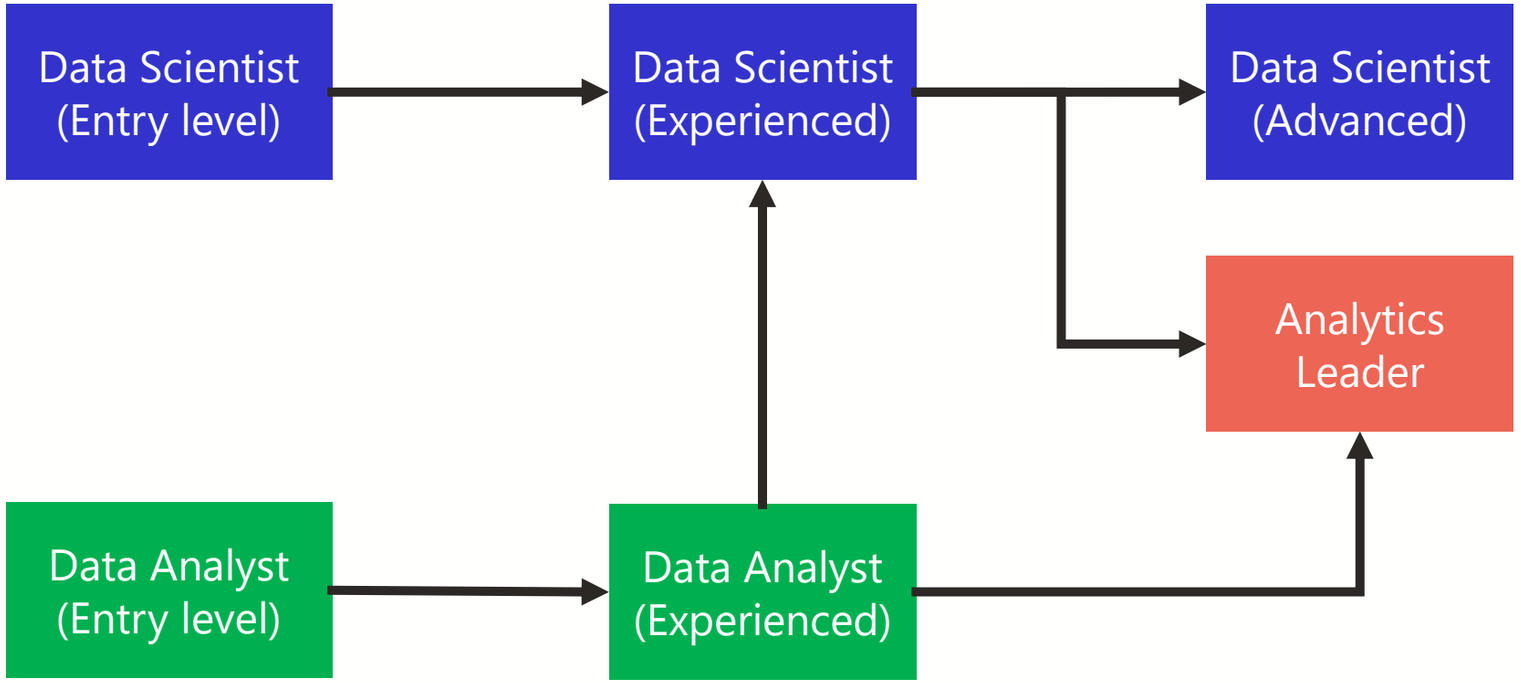
Career pathways at a glance



Data Scientist: Entry level pathway

Prerequisites:

Qualifications: Post-graduate degree in relevant subject or comparable professional experience
Software: R; T-SQL; Excel
Skills

Development c. 75% in role; 25% formal learning/training

Available training

Early Development

Doing mostly:
- Descriptive Analytics
- Explicative Analytics

Analytical Methods/health care context

Skills

Ready to progress

Doing more elements of:
- Problem formulation
- Data Management
- Predictive Analytics
- Prescriptive Analytics
- Evaluative Analytics
- Communicating analytical results
- Project Management

Experienced Data Scientist

Data Scientist: Experienced level pathway

Prerequisites:

Qualifications: Post-graduate degree in relevant subject or comparable professional experience
Software: R; T-SQL; Excel
Skills

Doing mostly:
- Problem formulation
- Data Management
- Predictive Analytics
- Prescriptive Analytics
- Evaluative Analytics
- Communicating analytical results
- Project Management

Development c. 90% in role; 10% formal learning/training

Available training

Mid-career Development

Leadership development/advanced analytical methods

Doing more:
- Leading Teams
- Coaching
- Decision Quality
- Advanced analytics

Skills

Ready to progress

Analytics Leader; Advanced Data Science Specialist

Data Analyst: Entry level pathway

Development c. 75% in role; 25% formal learning/training

Available training

Early Development

Prerequisites:

Software/coding; analytical methods/healthcare context

Doing mostly:

- Descriptive Analytics

Qualifications: Degree in relevant subject or comparable professional experience; apprenticeship
Software: Excel
Skills

Skills

Ready to progress

Doing more elements of:

- Problem formulation
- Data Management
- Explicative Analytics
- Predictive Analytics
- Prescriptive Analytics
- Evaluative Analytics
- Communicating analytical results
- Project Management

Experienced Data Analyst

Data Analyst: Experienced level pathway

Skills

Ready to progress

Analytics leader; Experienced Data Scientist

Development c. 90% in role; 10% formal learning/training

Available training

Mid-Career Development

Doing more:

- Leading Teams
- Coaching
- Decision Quality

Academic training; leadership development

Prerequisites:

Doing mostly:

- Problem formulation
- Data Management
- Explicative Analytics
- Predictive Analytics
- Prescriptive Analytics
- Evaluative Analytics
- Communicating analytical results
- Project Management

Qualifications: Degree in relevant subject or comparable professional experience; **Software**: Excel, T-SQL, R

Skills

Top end of pathway career options

There are two suggested options at the end of the pathways for Data Analysts and Data Scientists: **Analytical Leader** and **Advanced Data Science Specialist**.

As these two roles are not on a pathway to a further role, they do not lend themselves to this framework. As a starting point for describing these roles, an outline role specification for each has been included on the following slides. These should be viewed as the culmination of experience gained from completing the preceding pathways. These can be informed by any future work to establish a competency framework for healthcare analysts.

Analytical Leader – outline role specification

Has significant demonstrable experience in the following areas:

- Exercising autonomy within broad parameters
- Authority over all aspects of a significant area of work
- Contributes to the formulation and application of policy
- Contributes to the formulation and implementation of strategy
- Addresses complex, non-routine organisational problems
- Has a full range of strategic leadership and management skills
- Has an in-depth understanding of the industry and implications of emerging technologies on the wider business environment
- Coaching and overseeing career development of colleagues
- Advocate for the assessment of decision quality based on analytical outputs, including developing methods for doing so

Adapted from AphA and the NWSkDF

Advanced Data Science Specialist – outline role specification

Has significant demonstrable experience in the following areas:

- Strong programming experience using a range of coding practices to build scalable data products for a range of users within a technology context (e.g. Big data, unstructured cloud)
- Identifies efficient and effective ways to use data science to tackle business and organisational challenges, applying innovative techniques
- Applies a range of scientific methods through experimental design, exploratory data analysis and hypothesis testing to reach robust conclusions. Is confident in using analytical approaches and interpreting data
- Understands the ethical considerations of potential data science approaches, and the legislation applicable in this area, i.e. GDPR, DPA etc. Awareness of existing Government and other frameworks
- Continuously promotes professional development by expanding data science knowledge and sharing best practice across departments/industry
- Applies data science techniques to present, communicate and disseminate data science products to achieve and measure impact whilst maintaining user focus.
- Use data engineering and manipulation techniques to produce/ improve data product performance by selecting the most appropriate tools and technologies
- Understands the different product delivery methods and phases to contribute to decision making with impact. Use a range of data sources, analytical tools and techniques throughout the life cycle to develop and deploy robust data science solutions into the business
- Has an in depth understanding of the industry and implications of emerging technologies on the wider business environment

Taken from the Government Analysis Career Framework

High-level skills frameworks for analysts

The following slides describe the skills required on entry to each level of the career pathways, as well as the expectation of what skills will be developed as a healthcare analyst moves through that pathway. These skills are related to the Analytical Projects Typology. The framework is not designed to be exhaustive, but provide an indication as to the pace and scale of skills development as a career progresses.

These frameworks can support analytical leaders in recruitment and team development activities.

High-level skills framework for an entry Data Scientist

Career Stage	Descriptive Analytics	Explicative Analytics	Predictive Analytics	Prescriptive Analytics	Evaluative Analytics	Project Design, Management and Dissemination	Coding/software	Academic or equvelent
On entry	Summary statistics; data visualisation;	Inferential statistics and hypothesis testing					R; T-SQL; Excel	Post-graduate degree in relevant subject or comparable professional experience
To develop before progressing	Geospatial mapping; metric development;	Explanatory regression modelling; data mining	Time series forecasting; machine learning; simulation; epidemiological modelling; demand modelling	Optimisation; statistical process control	Experimental and quasi-experimental studies; cost effectiveness	Problem formulation; data management; communicating analytical results; project management		

High-level skills framework for an experienced Data Scientist

Career Stage	Descriptive Analytics	Explicative Analytics	Predictive Analytics	Prescriptive Analytics	Evaluative Analytics	Project Design, Management and Dissemination	Coding/software	Academic or equivalent
On entry	Summary Statistics; data visualisation; geospatial mapping; metric development;	Inferential statistics and hypothesis testing; explanatory regression modelling; data mining	Time series forecasting; machine learning; simulation; epidemiological modelling; demand modelling	Statistical process control; optimisation;	Experimental and quasi-experimental studies; cost effectiveness	Problem formulation; data management; communicating analytical results; project management	R; T-SQL; Excel	Post-graduate degree in relevant subject or comparable professional experience
To develop before progressing	Experience surveys;		Risk prediction;	Resource allocation; resource planning; scheduling; risk prediction	Causal inference; qualitative methods	Leadership development; coaching; decision quality		
Possible specialisms	Prevalence studies;	Observational (risk) studies; experience surveys; choice experiments	Scenario planning;	Opportunity assessments; options appraisals; decision aids	Directed and acyclic graphs; contribution and mediation analysis			

High-level skills framework for an entry Data Analyst

Career Stage	Descriptive Analytics	Explicative Analytics	Predictive Analytics	Prescriptive Analytics	Evaluative Analytics	Project Design, Management and Dissemination	Coding/software	Academic or equivalent
On entry	Summary Statistics; data visualisation;						Excel	Degree in relevant subject or comparable professional experience; apprenticeship
To develop before progressing	Metric development;	Inferential statistics and hypothesis testing; explanatory regression modelling;	Time series forecasting;	Statistical process control	Cost effectiveness; qualitative methods	Problem formulation; data management; communicating analytical results; project management	T-SQL; R	

High-level skills framework for an experienced Data Analyst

Career Stage	Descriptive Analytics	Explicative Analytics	Predictive Analytics	Prescriptive Analytics	Evaluative Analytics	Project Design, Management and Dissemination	Coding/software	Academic
On entry	Summary Statistics; data visualisation; metric development;	Inferential statistics and hypothesis testing; explanatory regression modelling;	Time series forecasting	Statistical process control	Cost effectiveness; qualitative methods	Problem formulation; data management; communicating analytical results; project management	T-SQL; Excel, R	Degree in relevant subject or comparable professional experience
To develop before progressing		Data mining	Demand modelling;	Options appraisals; resource allocation; resource planning; opportunity assessments;	Causal inference; experimental and quasi-experimental studies	Leadership development; coaching; decision quality		Post-graduate degree in relevant subject
Possible specialisms	Experience surveys; geospatial mapping; prevalence studies	Observational (risk) studies	Risk prediction; epidemiological modelling; scenario planning;	Optimisation; decision aids; scheduling;				

Objective 3: What are the implications for skills, career paths and training.

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Current training provision for analysts

The table on the following slide represents a mapping exercise of current training provision and providers available to healthcare analysts. This is based on desktop research; the analyst survey; and interviews with analyst leaders. This table is not exhaustive and should be reviewed and added to by stakeholders.

Current training provision for analysts

	Health context					Analytical methods																		Coding/Software		
	Data Analyst/Scientist Apprenticeships	Big Data and data science explained	Health Informatics	Health Economics	Population/ Public Health	Problem Structuring	DM: Data Ethics	DM: Data Linkage	DS: Data Visualisation	DS: Geospatial Mapping	EX: Data Mining	EX. Regression Modelling	PR: Time series Forecasting	PR: Demand Modelling	PR: Simulation	PR: Machine Learning	PR: Epidemiology	PS: Intro to Prescriptive Analytics	PS: SPC	PS: Decision Analysis	EV: Evaluation	EV: Causality	C: Knowledge Mobilisation	C: Leadership Development	R	SQL	Power BI
AphA							✓																			
Health Education England			✓	✓	✓																					
Government Statistics Service		✓					✓	✓	✓				✓			✓								✓	✓	
NHS R Community									✓				✓											✓		
Midlands Decision Support Network					✓				✓			✓	✓		✓					✓	✓	✓	✓	✓			
FutureNHS																									✓	
Healthcare Evaluation Data																✓								✓		
Kurtosis									✓										✓				✓			
Skills Development Network									✓														✓	✓	✓	✓
Operational Research Society						✓			✓	✓	✓							✓					✓	✓		
QA	✓	✓														✓									✓	✓
EDX		✓					✓		✓							✓								✓	✓	✓
WiseOwl																									✓	✓
FutureLearn		✓			✓		✓		✓		✓					✓								✓	✓	
Laria									✓																	
Udemy		✓														✓								✓		✓
Jumping Rivers		✓							✓				✓			✓								✓	✓	
Population Health Exchange					✓																					
NIHR CLAHRC North Thames																					✓					
Faculty of Public Health					✓												✓				✓		✓			
Public Health England	✓				✓				✓								✓						✓			
East Midlands AHSN		✓							✓																	
Strategy Unit															✓											
Software carpentry																								✓		
PenARC						✓																				
Mango		✓							✓				✓			✓								✓	✓	

Key: DM = Data Management; DS = Descriptive; EX = Explicative; PR = Predictive; PS = Prescriptive; EV = Evaluative; C = Communicating results

Where are the gaps in training courses for analysts?

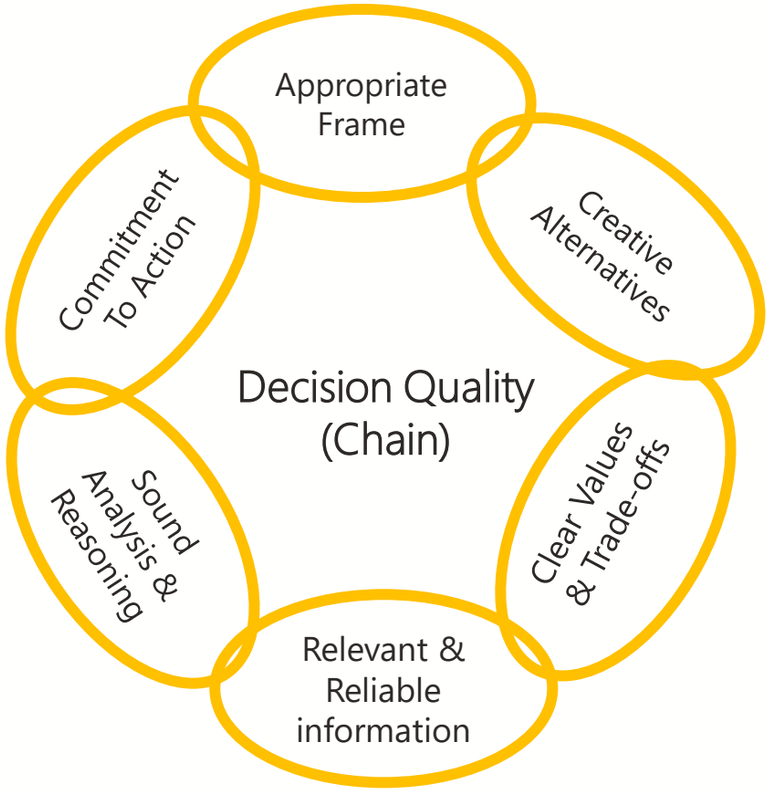
Through the desktop exercise, survey and stakeholder engagement, we have identified some possible gaps in training provision for healthcare analysts that may require consideration in order to develop high functioning analytical teams who are able to deliver work of all analytical ‘types’. It is expected that in reviewing the training provision, training in some of these areas may be surfaced.

Where are the gaps?

Analytical types, tasks and software	Identified gaps in training (tbc)
Data Management	Data processing
Descriptive	Metric development; prevalence studies; experience surveys
Explicative	Inferential statistics; observational (risk) studies; choice experiments
Predictive	Scenario planning; ex-ante modelling
Prescriptive	Opportunity assessments; options appraisals; resource allocation; resource planning; scheduling; optimisation;
Evaluative	Contribution; mediation and moderation analysis; cost effectiveness; ROI analysis

Appendices

Appendix A: The Six Dimensions of the Decision Quality Chain



- Appropriate Frame – are we addressing the right problem?
- Creative Alternatives - do we have a good set of alternatives?
- Clear Values & Trade-offs- does our decision fit our values and objectives?
- Relevant & Reliable information – do we have the necessary data and evidence?
- Sound analysis and reasoning – is our analysis logical and reasonable?
- Commitment to Action – are we ready to successfully implement this decision?

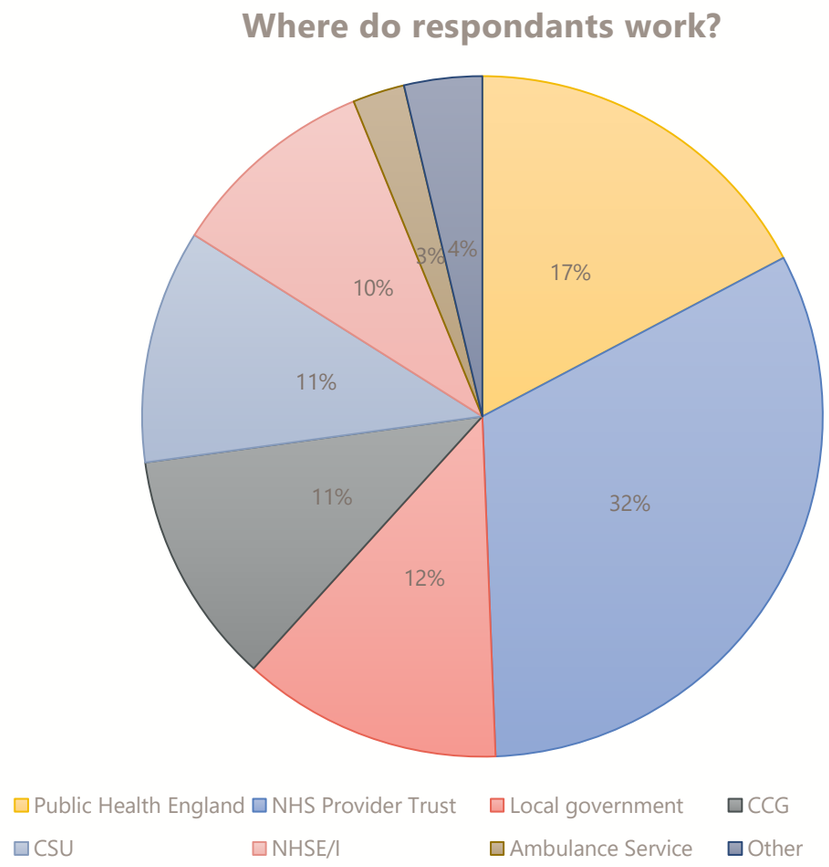
Appendix B: Analyst Survey

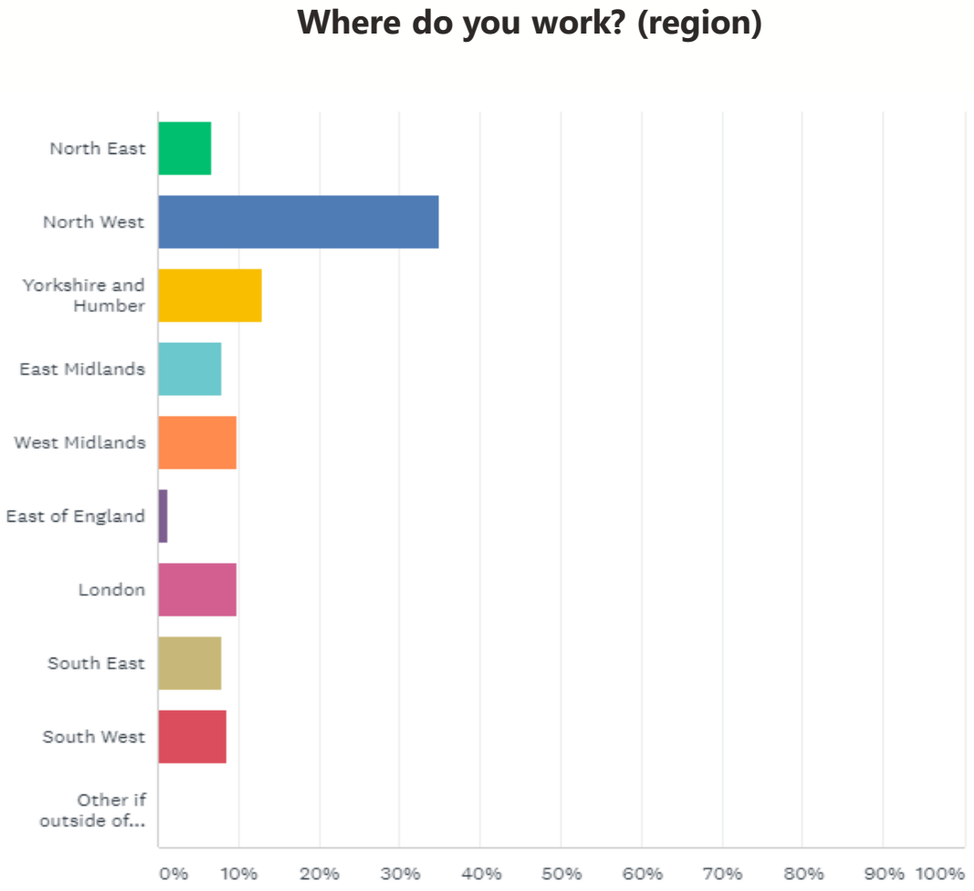
In April 2021, a survey was released via *Survey Monkey* inviting healthcare analysts to describe their employment context. **171 responses** were received. The questions in the survey focused on:

- Current employment details and experience
- Type of projects employed on against the project typology
- Training that has supported them in their career development
- Training needs

The following slides provides a summary of the responses.

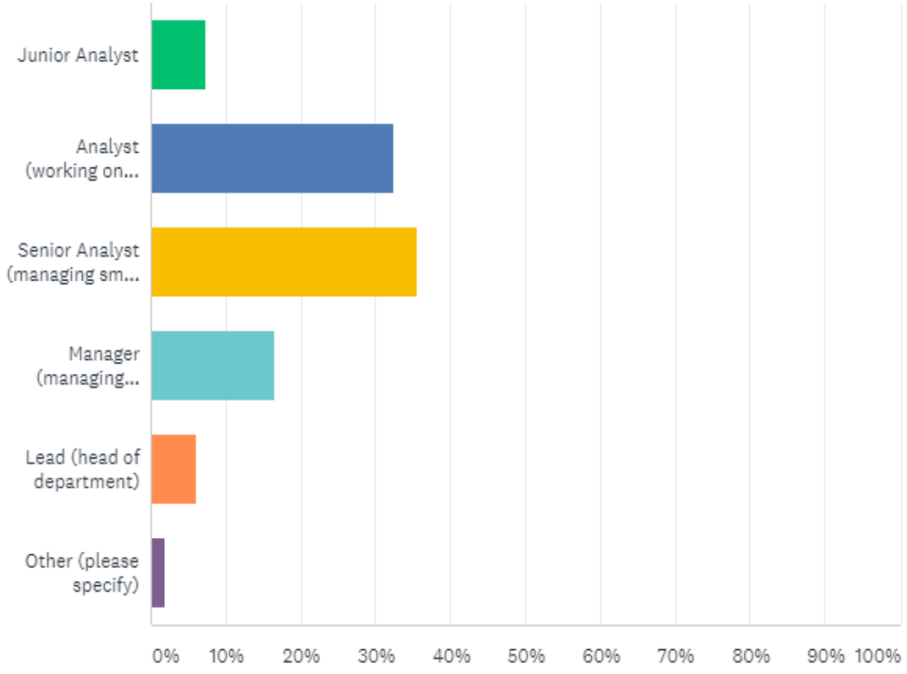
Who responded?



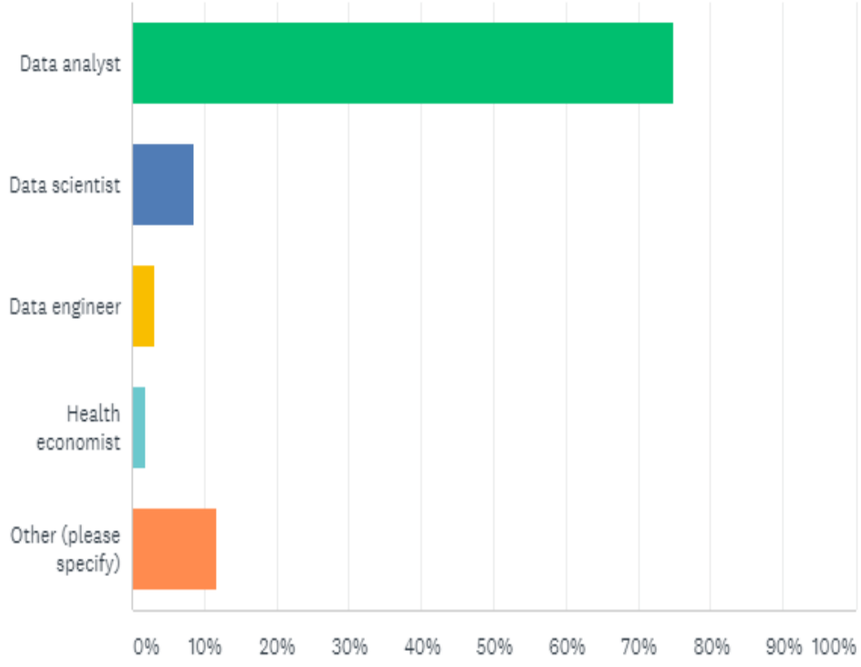


Who responded? (2)

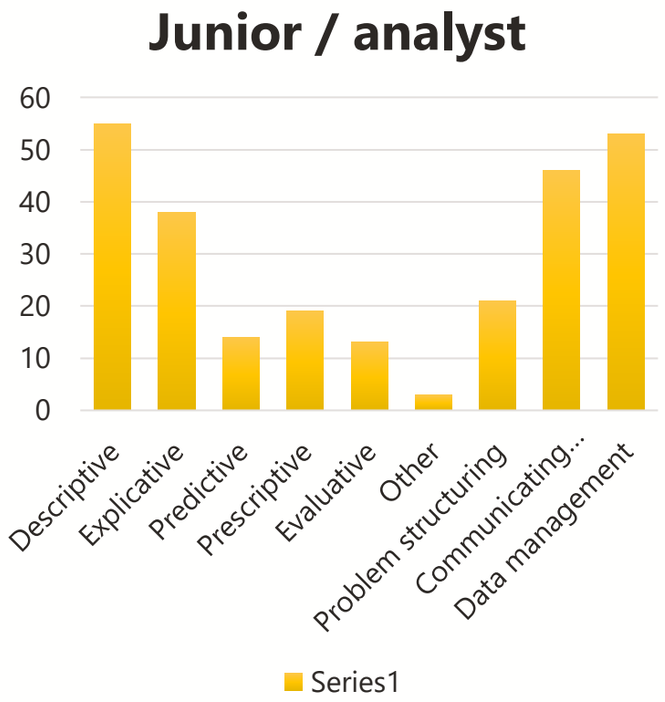
How would you describe your current role responsibility?

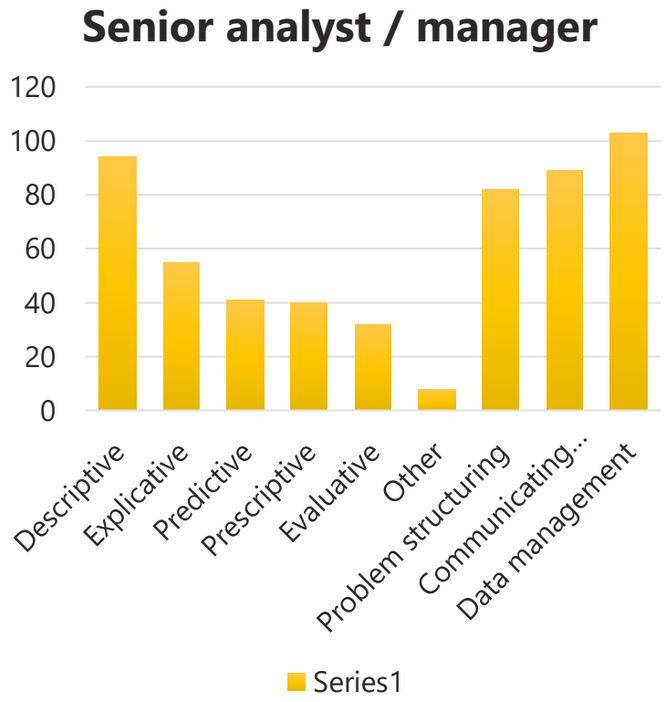


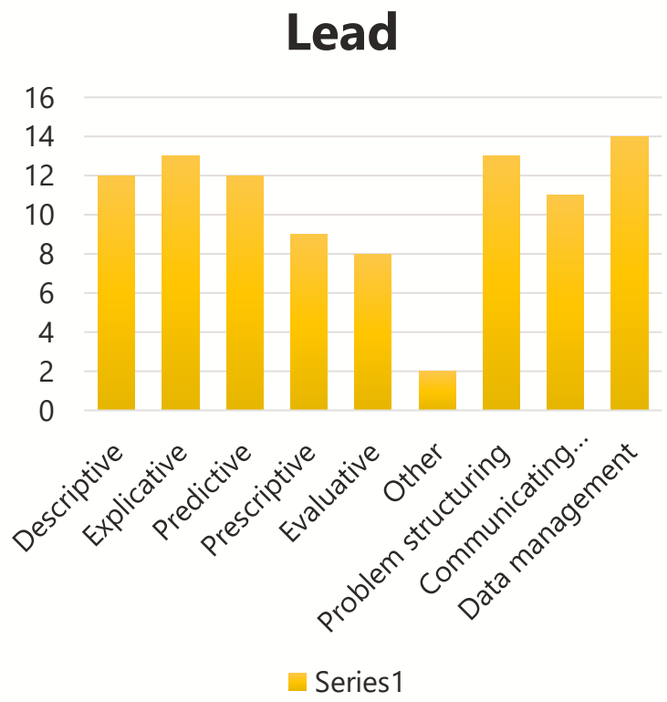
How do you self-identify?



What types of projects are analysts currently doing?

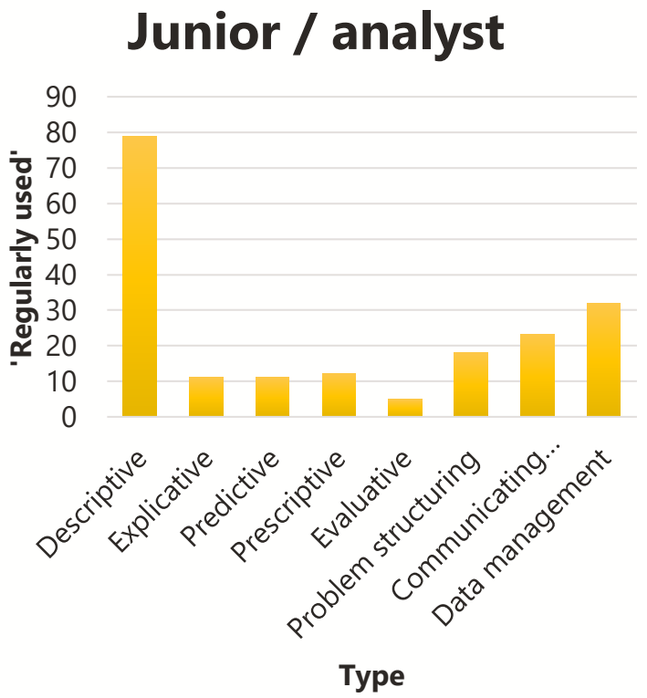


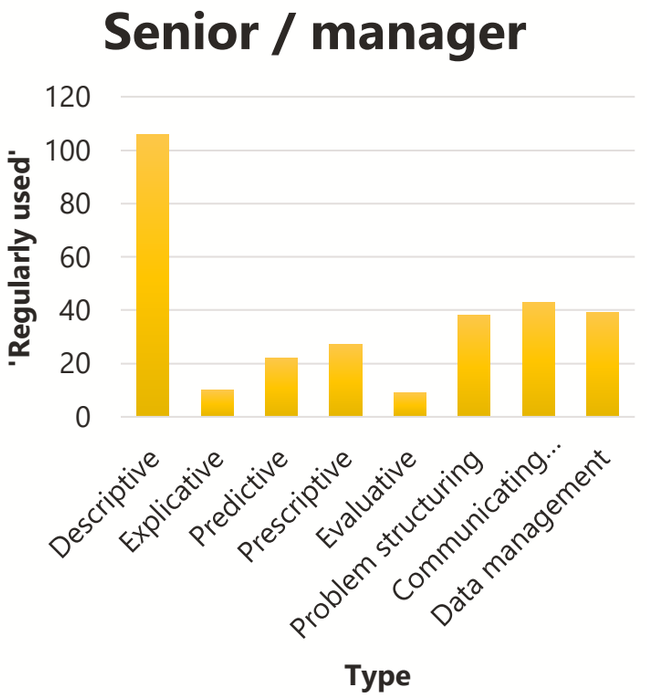


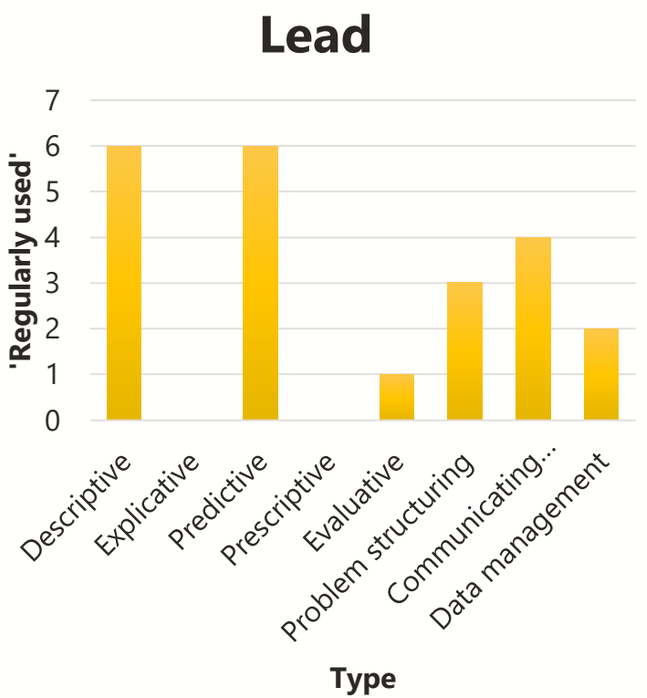


Based on 197 project examples

Which analytical methods are being regularly used?

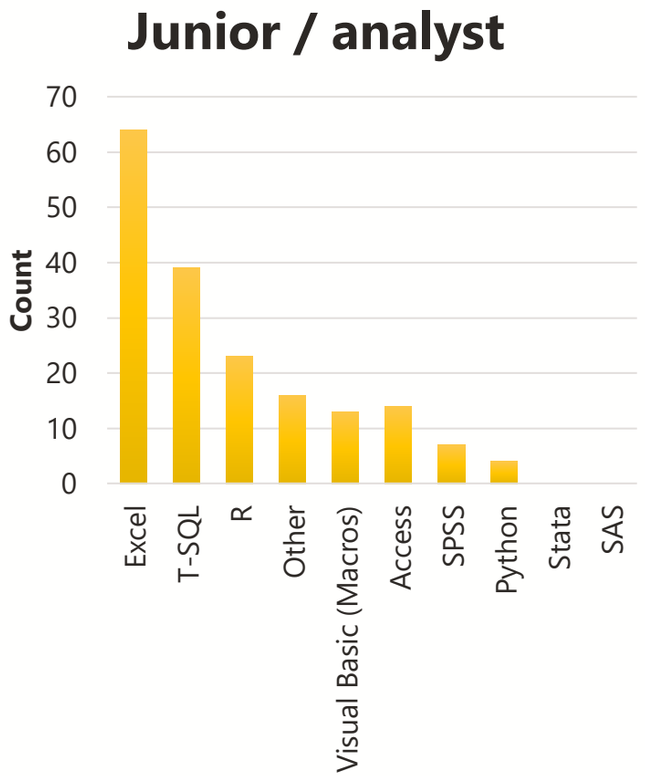


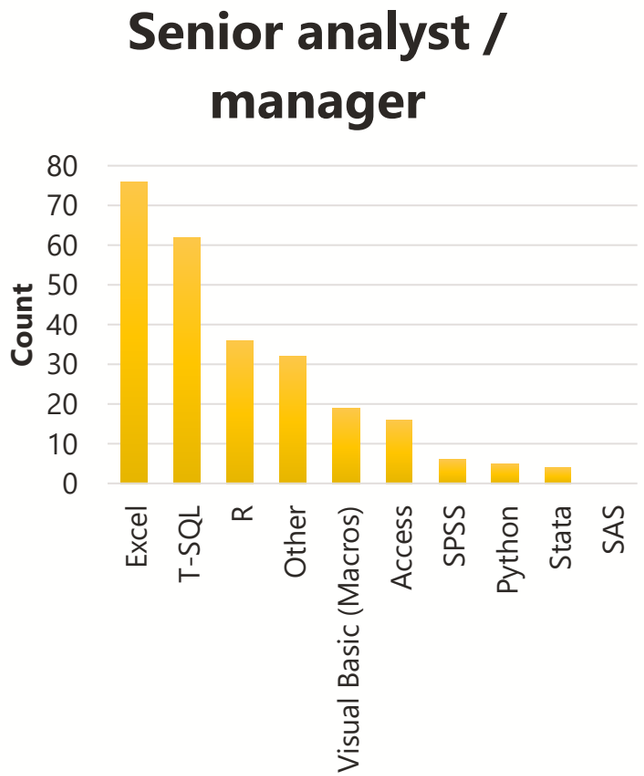


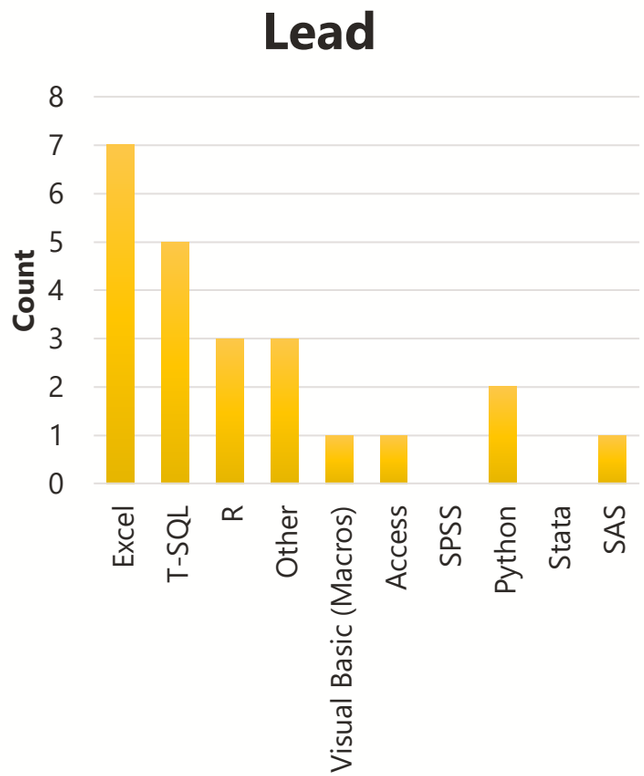


Based on responses to skills used regularly. To look at distribution only. Not for direct comparison of figures.

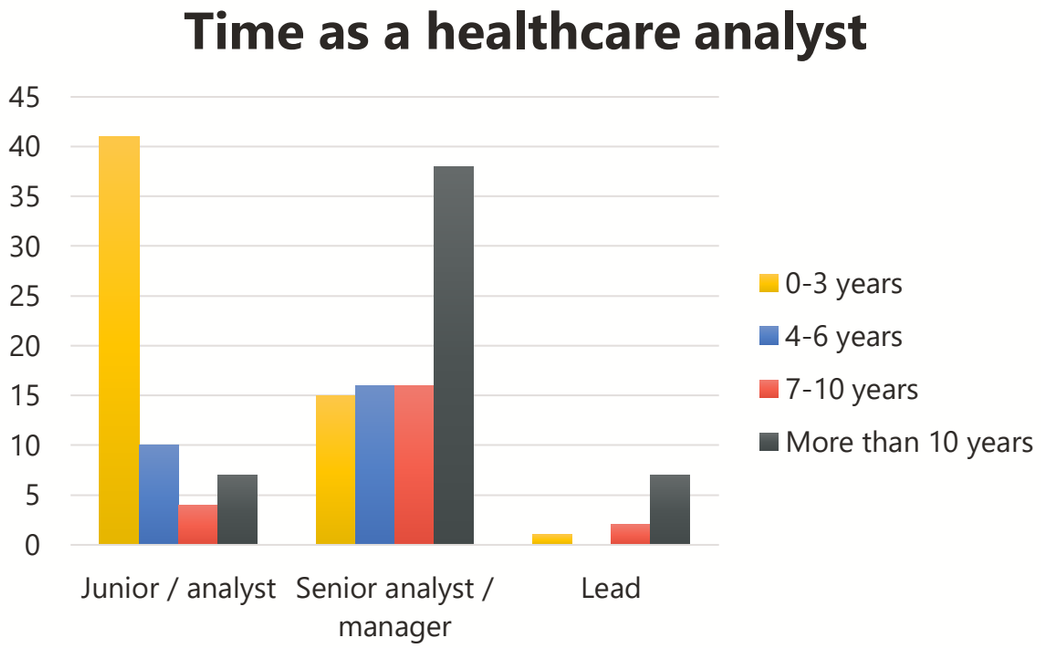
Routinely used software

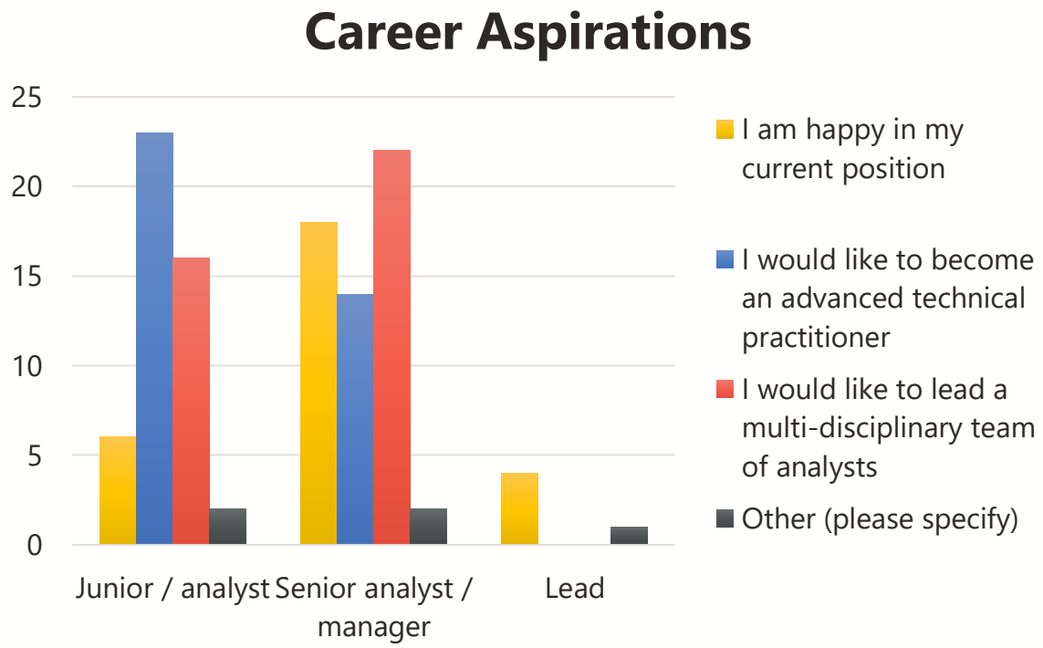






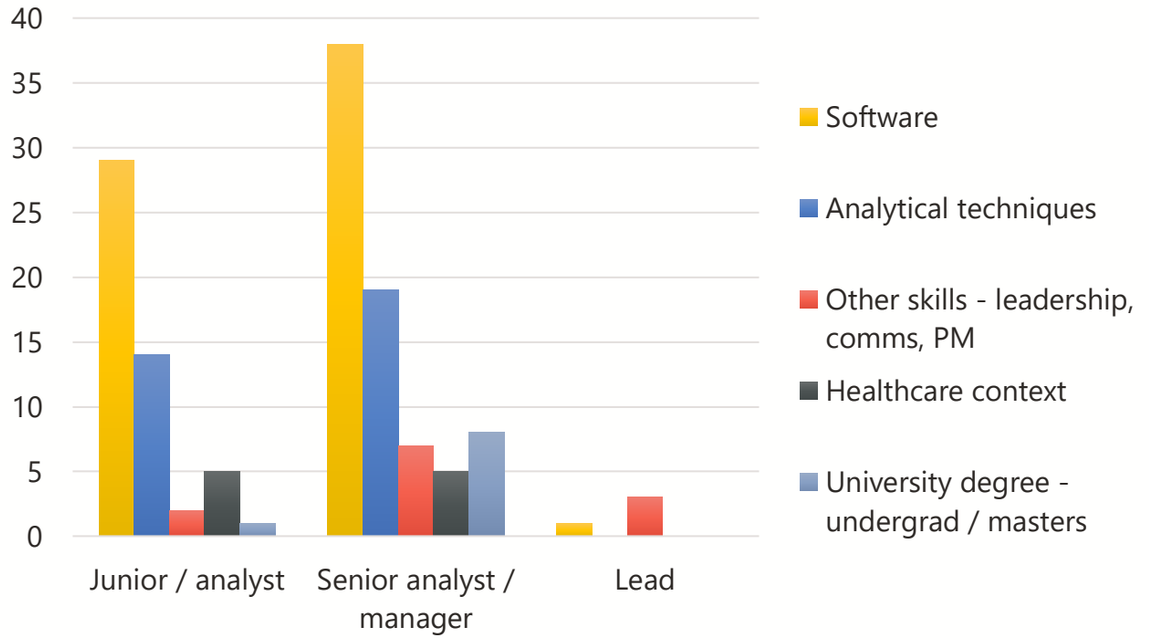
Career progress



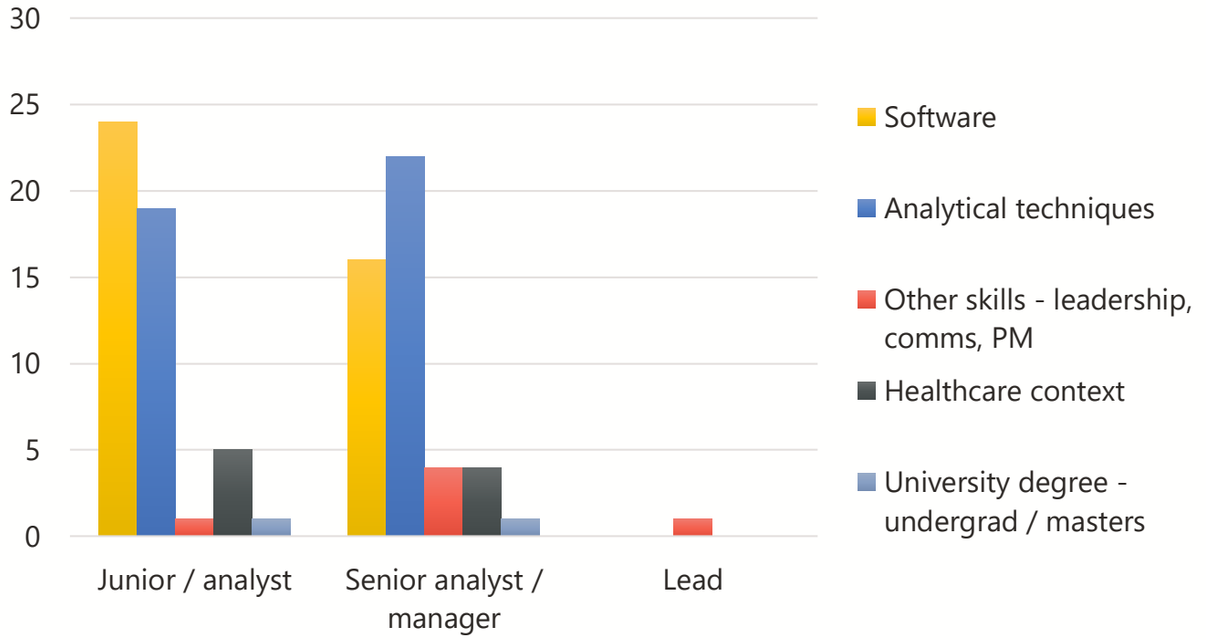


What training do healthcare analysts need to support their career progression?

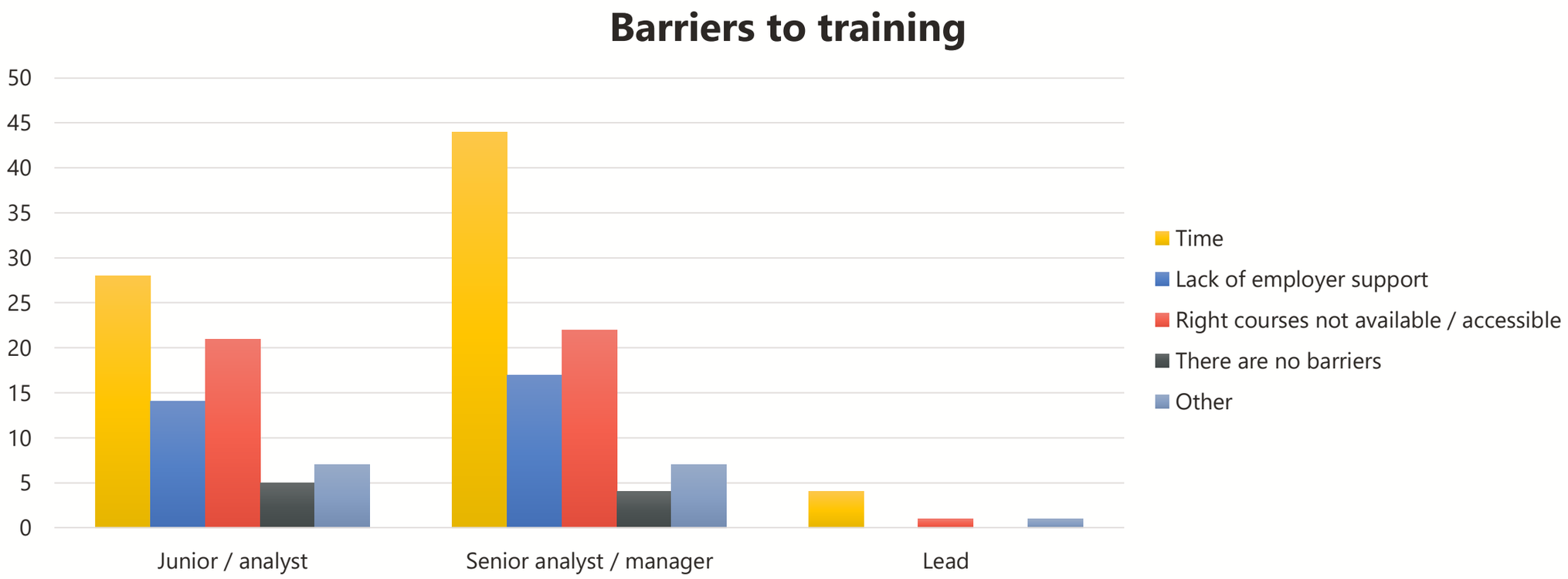
Training received that has enabled effectiveness



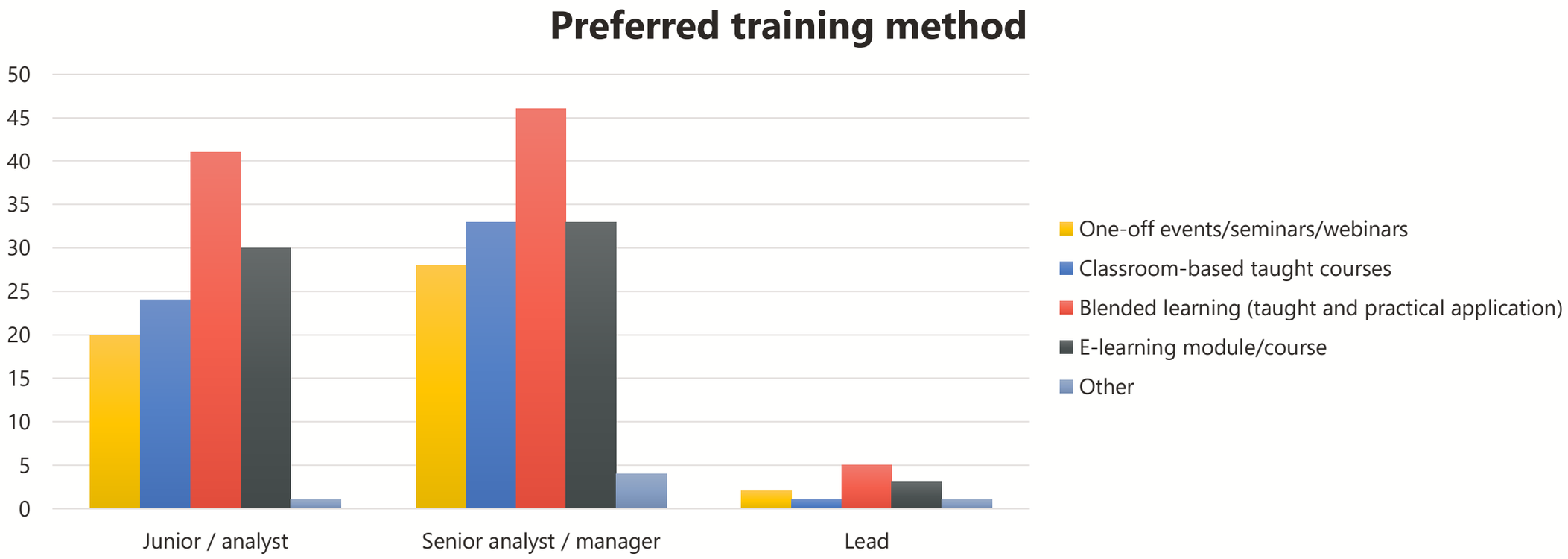
Skills that respondents would benefit from but are not knowingly catered for



Accessing training and development activities



Accessing training and development activities



Appendix C: Project workshop summaries

Stakeholder workshop

On 22 April 2021, a group of analytical leaders were invited to review the project's outputs and make recommendations as to what a national training offer for healthcare analysts might look like. The outputs from this workshop have informed the final recommendations.

Recommendations workshop

On 17 May 2021, representatives from the Strategy Unit and Health Economics Unit – two identified existing high-functioning analytical teams – considered the outputs from the stakeholder workshop to make final recommendations for this project.

Appendix D: Recommendations from summary report on Competency Frameworks for Health Service Analysts

In May 2021; AphA published their report on competency frameworks for health service analysts. This report made the following recommendations:

- Multi-agency steering group to be established to oversee the transition of health and care analytics from its current state to acceptance as a professional discipline;
- Current role of Chief Data and Analytics Officer at NHSE/I to be designated as Head of Profession for Analytics to provide focus and set direction of travel for analytical workforce across the NHS;
- Further work to be commissioned to establish a standardised framework for uniform adoption across the health and care system, drawing on the existing materials identified during the discovery work;
- Any such framework should be rounded and include the range of 'softer' skills which are often disregarded. There should be a clear alignment with training provision;
- The development of the framework should be undertaken in collaboration with a range of organisations from across the country, acting as pilot sites to test usage and uptake;
- In parallel with any work to produce a standardised competency framework, a national communications strategy should be worked up to prepare for roll-out.

The Strategy Unit.

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