

How NHS Improvement is transforming its way of providing analytical support

Jhung-Ha Kwon, Head of Analytical Development, NHS Improvement Analytics Hub



Introduction and session agenda



Jhung-Ha Kwon, Head of Analytical Development, NHS Improvement

- **Experience** – over 16 years' experience in technology and consulting
- **Expertise** – enterprise data management, analytics and business intelligence
- **Sector** – health, energy, retail, financial services, etc.

■ Where are we with data and analytics

■ What analytics platform and tools do we have

■ How do we meet different analytical needs by different types of users

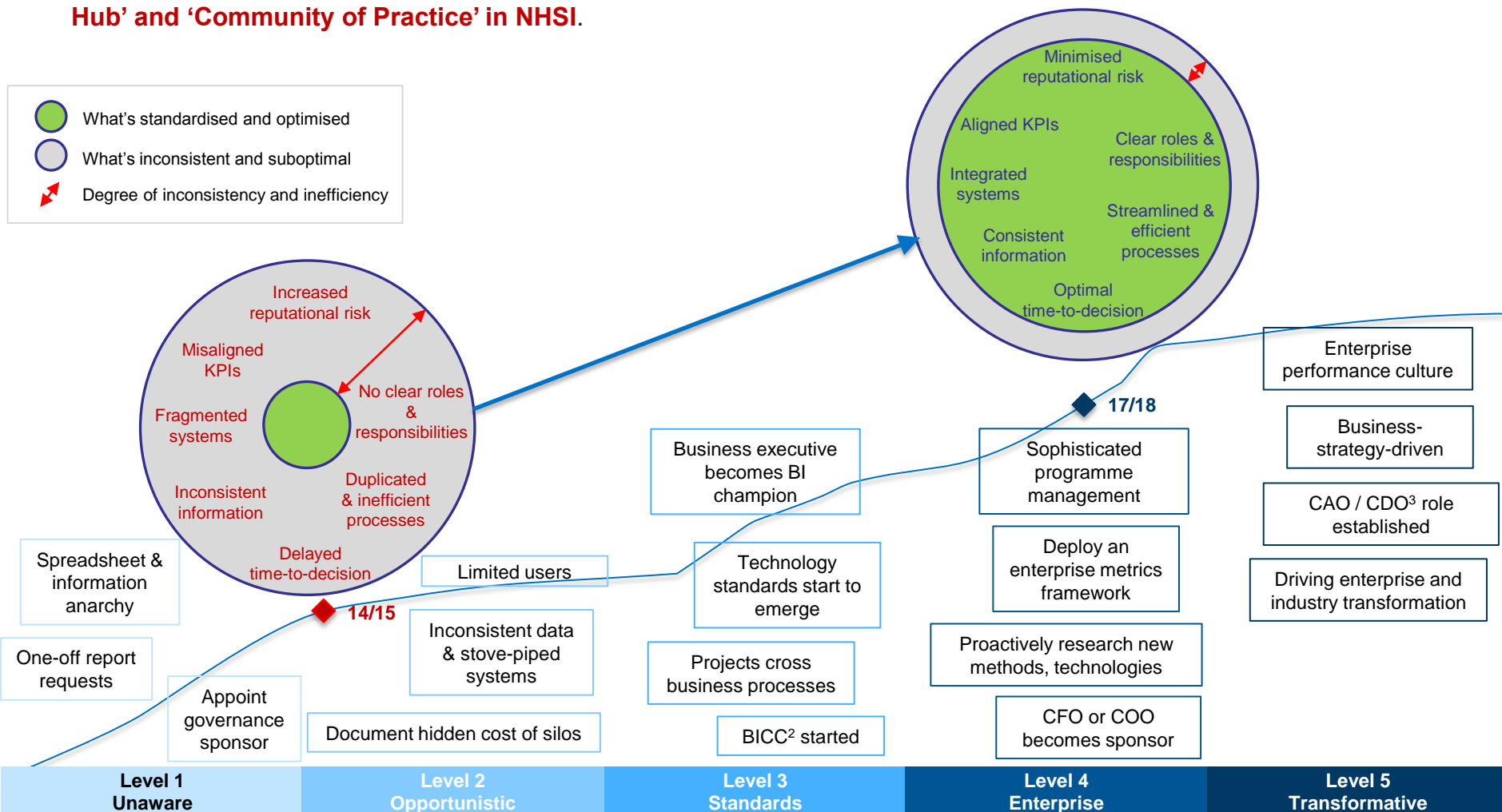
■ Q&A

Where we are with data and analytics?

Improvement

In 2014, our analytics maturity level¹ was at best 'opportunistic', typified by the symptoms of information silos; however it presented a huge opportunity for efficiency gains through data integration and optimised, standardised analytics processes. We are making steady progress towards the 'enterprise' level by embedding the 'Analytics Hub' and 'Community of Practice' in NHSI.

- What's standardised and optimised
- What's inconsistent and suboptimal
- Degree of inconsistency and inefficiency



¹ This is based on [Gartner's BI and analytics maturity model](#).

² BICC = Business Intelligence Competency Centre, equivalent to Analytics Centre of Excellence

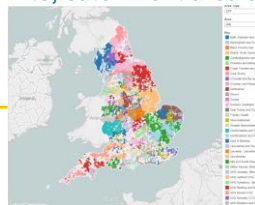
³ CAO = Chief Analytics Officer / CDO = Chief Data Officer

SIP* analytics workbench for self-service

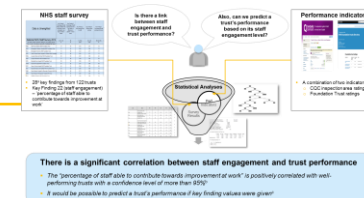
Data discovery & dashboards for self-service and enterprise information sharing, e.g. Reference Cost Browser, HES Browser, System Economics Dashboard, SOF Dashboard



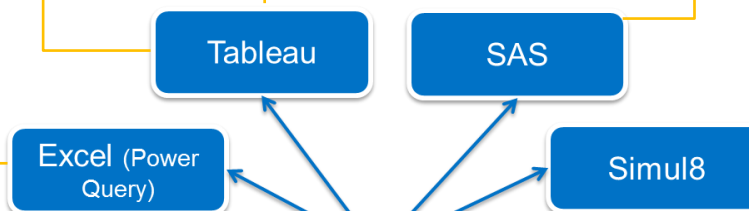
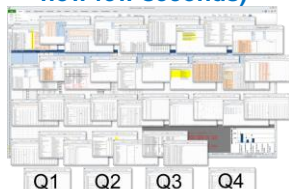
Customised mapping & spatial analytics, e.g. STP (Sustainability and Transformation Plan) footprints, catchment area analysis



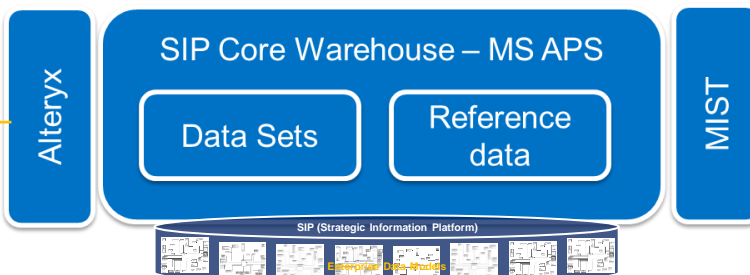
Statistical analysis, advanced analytics and modelling, e.g. strategic tariff model, predictive analytics (NHS staff survey PoC), A&E driver analysis



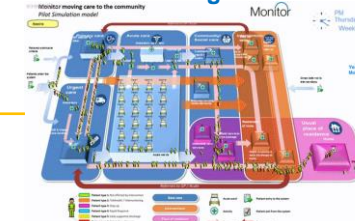
Enables analysts to run ad hoc analysis through a familiar Excel add-on, e.g. LHE A&E volume analysis (before WTE 6 weeks; now few seconds)



SIP – Line of Business view of the data (data mart)



Discrete event simulation, e.g. moving care into the community setting



MIST File Load Report

File Type	Analysis	DEV	DIT	Rep
Number of File Types on Backlog	36	7	3	6
Number of Working Days (11 April Sat)	18	32	2	1
Files Reg'd per Day	2	32	2	1
Files Loaded & Committed	0	32	2	1
File Type & Sub Type	Analysis	DEV	DIT	Rep
MIST_Load_PlacementOrganisation	13			
MIST_Load_FranchiseFamily_Insured	6			
MIST_Load_FranchiseFamily_Mental	6			
MIST_Load_FranchiseFamily_Maternity	6			

A framework to standardise and automate data loading processes with full audit records, e.g. patient experience data, ESR data

Fully quality-assured data sets in enterprise data models with full auditability and traceability, e.g. entire HES MMES, SUS PbR, HES Casemix, Reference Costs, etc.

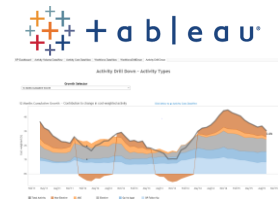
Tools for self-service analytics

alteryx



Alteryx is a self-service analytics tool to help analysts themselves prepare, blend and analyse a variety of data sets, e.g. trust-level clinical data, geospatial data, through a user-defined workflow to support their research work and to deliver ad-hoc analysis.

Tableau is a data visualisation tool selected as an enterprise Business Intelligence (BI) and reporting solution for NHS Improvement to provide the business easy access to data and information with self-service capabilities.

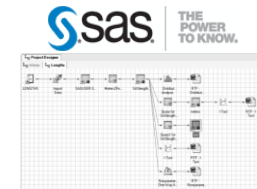


SIMUL8

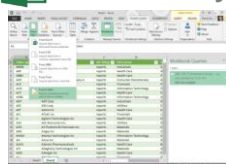


Simul8 is software used to simulate systems that involve processing of discrete entities at discrete times for planning, design, optimisation and reengineering of real production, manufacturing, logistic or service provision systems to improve performance and service levels

SAS is a data analysis tool that helps advanced users to carry out data analyses, including varied statistical analysis tasks, e.g. descriptive statistics, exploration of distributions to test hypotheses, etc., write code, and publish results.



Power Query



Microsoft Power Query for Excel is an Excel add-in that provides the self-service Business Intelligence for identifying, combining, and refining data across a wide variety of sources.

Analytics Hub & CoP – some of our work

Patient Experience Headlines Tool



"Thank you for creating this!", User at Birmingham Community Healthcare NHS Foundation Trust

"Very clear & easy to interpret.", User at North Cumbria University Hospital NHS Trust

HES Browser

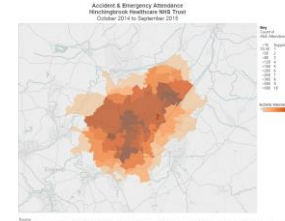


"Straightforward to use and very useful for data analysis and visualisation.", Analyst

"The functionality is simple yet flexible, as opposed to Dr Foster which is so slow and restrictive.", Analyst

"Very useful! Instead of having to request every conceivable split of the data from I&A team we can explore this ourselves.", Economist

Driving Time Analysis – Hinchingsbrooke Service Reconfiguration



"A useful tool to illustrate concentrations of activity origin for provider sites.", Analyst

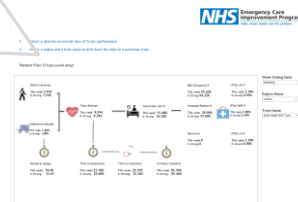
Simulation – Moving Care into Community Settings



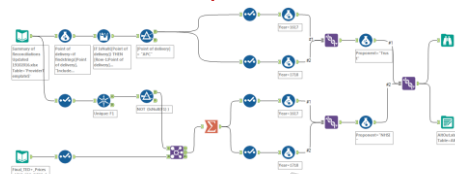
"The analytics team added significant value to our project as well as meeting our discrete information needs.", Economist

"My experience of working with the team has been mainly positive; with expert knowledge and communication being a highlight. I ... hope to work with the team again soon.", Programme Lead

ECIP A&E Performance Dashboard

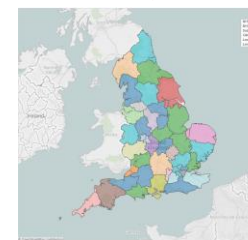


Finance Impact Assessment



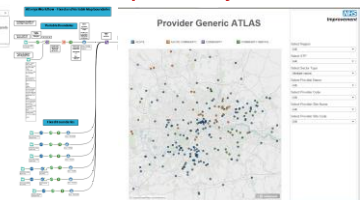
"(I) did this off my own back but this 1/2 day of my time including learning. Could have saved about 3 days of other staff time.", Analyst

Interactive Map – STP footprints, NHS regions, etc.



"This is fantastic!", Financial Analyst

Spatial Analytics



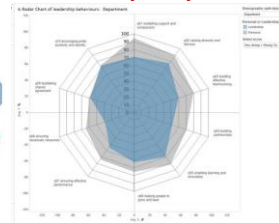
"Fairly intuitive & will ... have value as we try to map where the many health economies are ... we support.", Project Manager

Sentiment Analysis

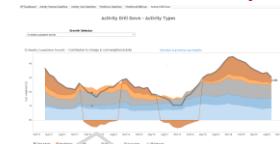


"Key benefit is reduction in manual analytic resource and automation.", Project Manager

Culture & Leadership Survey Analytics

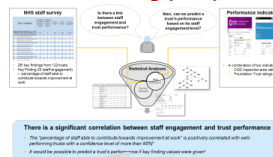


System Economics Dashboard – Workforce Productivity



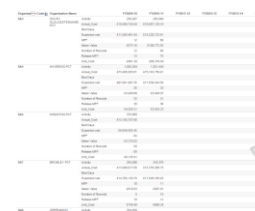
"I love it! Very well done.", Project Sponsor

Trust Performance Predictive Modelling (POC)



"(This triggered) lots of thoughts and ideas about where this can go.", Project Sponsor

Reference Cost Browser



"It has created a single point of reference for an oft-used data source in an interface that allows for incredibly quick and insightful analysis and visualisation.", Analyst

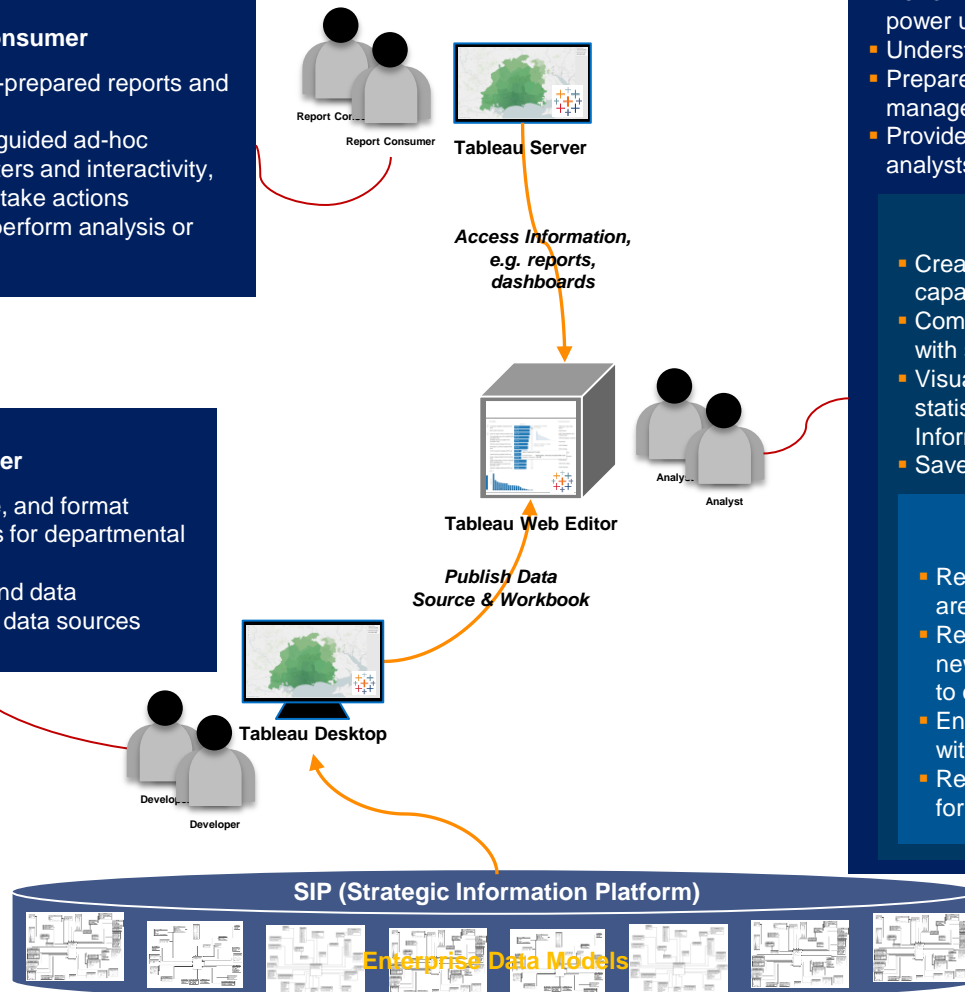
Self-service – different users and needs

Report Consumer

- Gain insights from well-prepared reports and dashboards
- Provided with minimal guided ad-hoc analysis using parameters and interactivity, to make decisions and take actions
- No desire and time to perform analysis or development

Developer

- Design, build, configure, and format reports and dashboards for departmental / enterprise reporting
- Model, prepare and blend data
- Publish workbooks and data sources



Analyst

- Perform analysis using workbooks produced by developers or power users (no Tableau web authoring capability)
- Understand data well for analysis
- Prepare reports based on analysis for report consumers, e.g. management, the public
- Provide and validate soft intelligence / commentary (senior analysts)

Power User

- Create workbooks with Tableau web authoring / editing capability
- Competent to use Tableau to perform advanced analysis with slice-and-dice, drill-down, and advanced features
- Visualise analysis and run analytics (descriptive statistics) using quality-assured data from SIP (Strategic Information Platform)
- Save and share analysis outputs

Super User

- Responsible for managing a relevant team (project) area for user access and information sharing
- Responsible for cascading knowledge of data, e.g. new Tableau features, analytics products and tools to other analysts in the team
- Ensure compliance with Information Governance within the team
- Represent the team in an analytics user group / forum

SIP

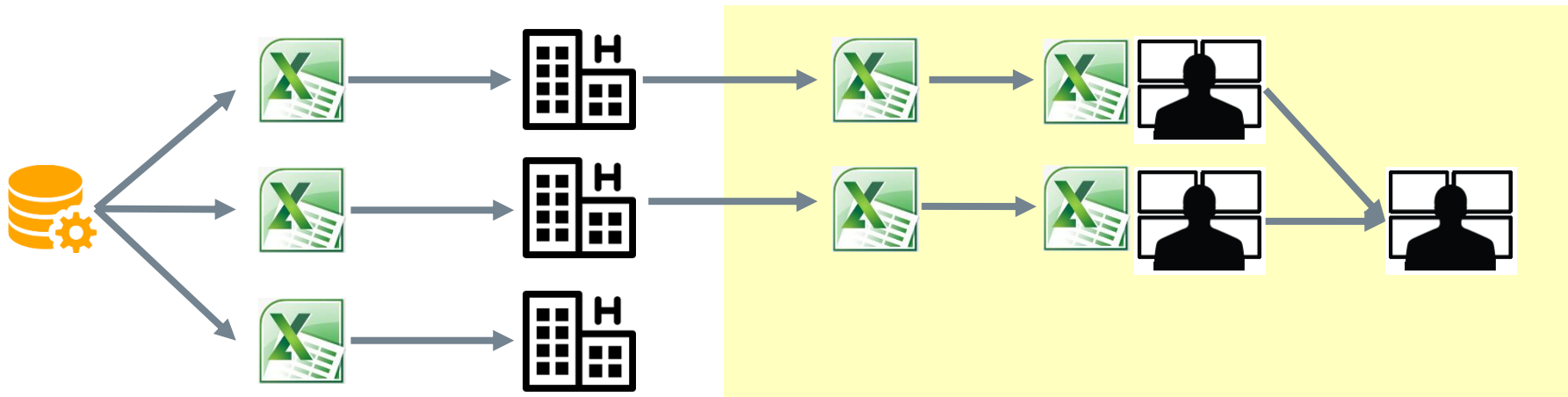
- Single-version-of-the-truth data assets
- Quality-assured and version-controlled
- Auditable and traceable

Data Assets – HES MMES, SUS PbR, HES Casemix, Reference Costs, FTC, FIMS, Ambulance Quality Indicators, Cancelled Elective Operations, Bed Availability and Occupancy, Hospital Activity, Diagnostics Waiting Times and Activity, A&E, RTT, DTtoC, CCC, UOC, Winter Daily, Cancer Waiting Times, ICD, OPCS, ERIC, QOF, ONS, NPSD, etc.

Finance Impact Assessment – before

Improvement

- NHSI Finance sends individual Excel sheets to all trusts with NHSI ‘impact’ estimations re ‘controls totals’ (where trusts agree how much money they will budget to spend next year)
- NHSI Finance requests returns on equivalent information from trusts’ impact analysis
- **The returns, when received, are manually pasted into individual trust-specific sheets**
- **The individual sheets are then being reviewed by various personnel who assess them on a by-trust basis and report back key items (difference areas) for review / escalation**



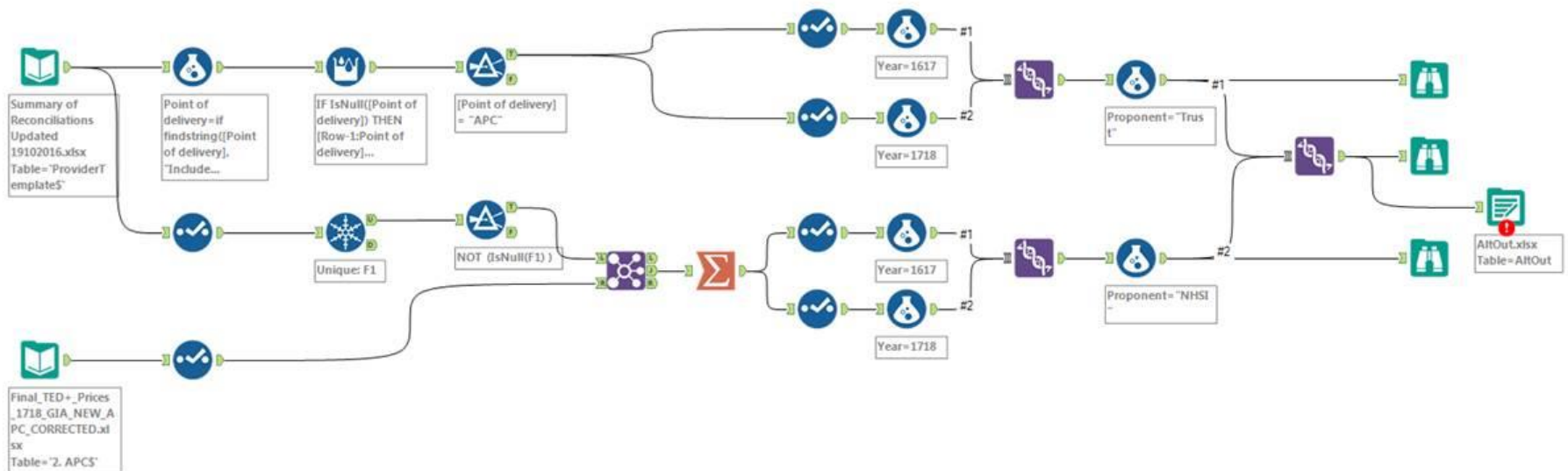
Before – three days of manual processing

Finance Impact Assessment – after

Improvement

- An analyst used Alteryx to create a repeatable workflow to compile returns, process data and produce outputs
- **It took half a day for the analyst to create the workflow including learning**
- The workflow can be easily re-run with new / late input instead of drip feed
- Analysis on output could be standardised easily and far more efficiently, e.g. Top 10 differences for each trust, overview output (spot trends)

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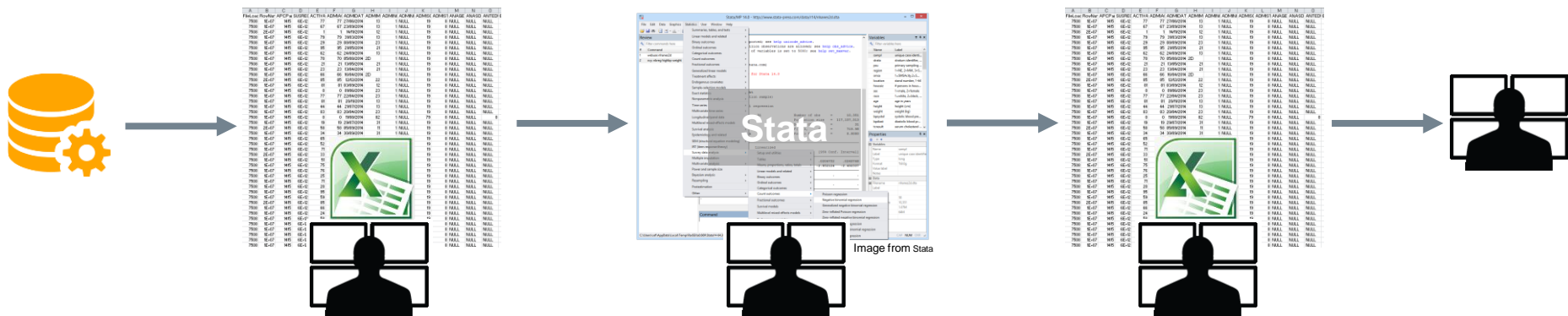


After – few seconds with a click

- ~300 data items x ~160 million records for 'Admitted Patient' (~800 million records for 'Outpatient')
- Billions of data points
- Arcane – largely stored as codes, in particular, reference data – no decoding thru reference data
- No SCDs (Slowly Changing Dimensions) – provider merger
- Manual loads of HES data into heap tables (no index) in SQL Server 2008
- **Answering even a simple question was very difficult, if not impossible**



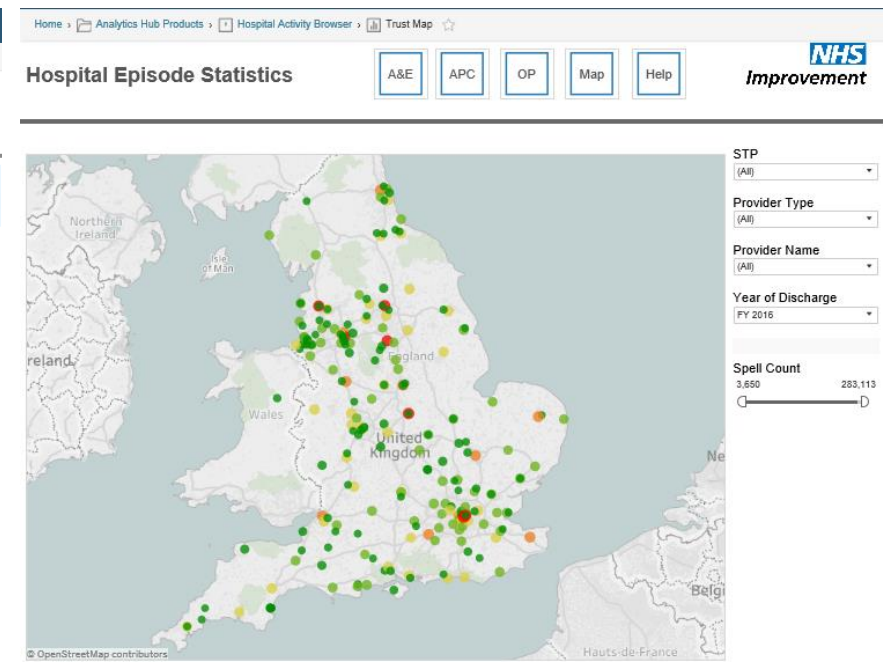
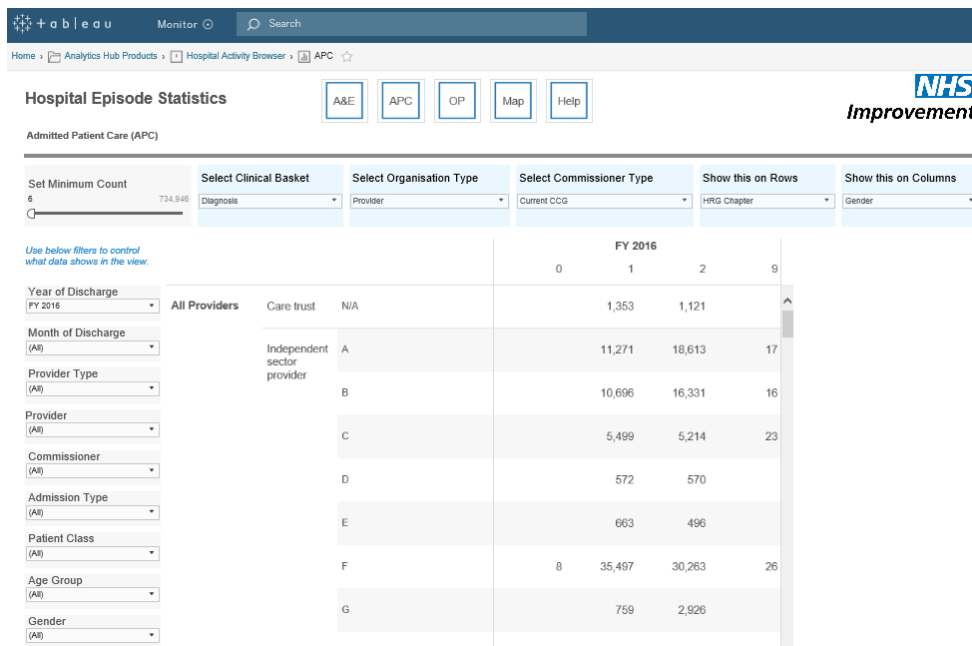
I need information on activity and Length of Stay (LoS) by provider code from 2009.



Before – minimum several days

HES data analysis – after (1 of 2)

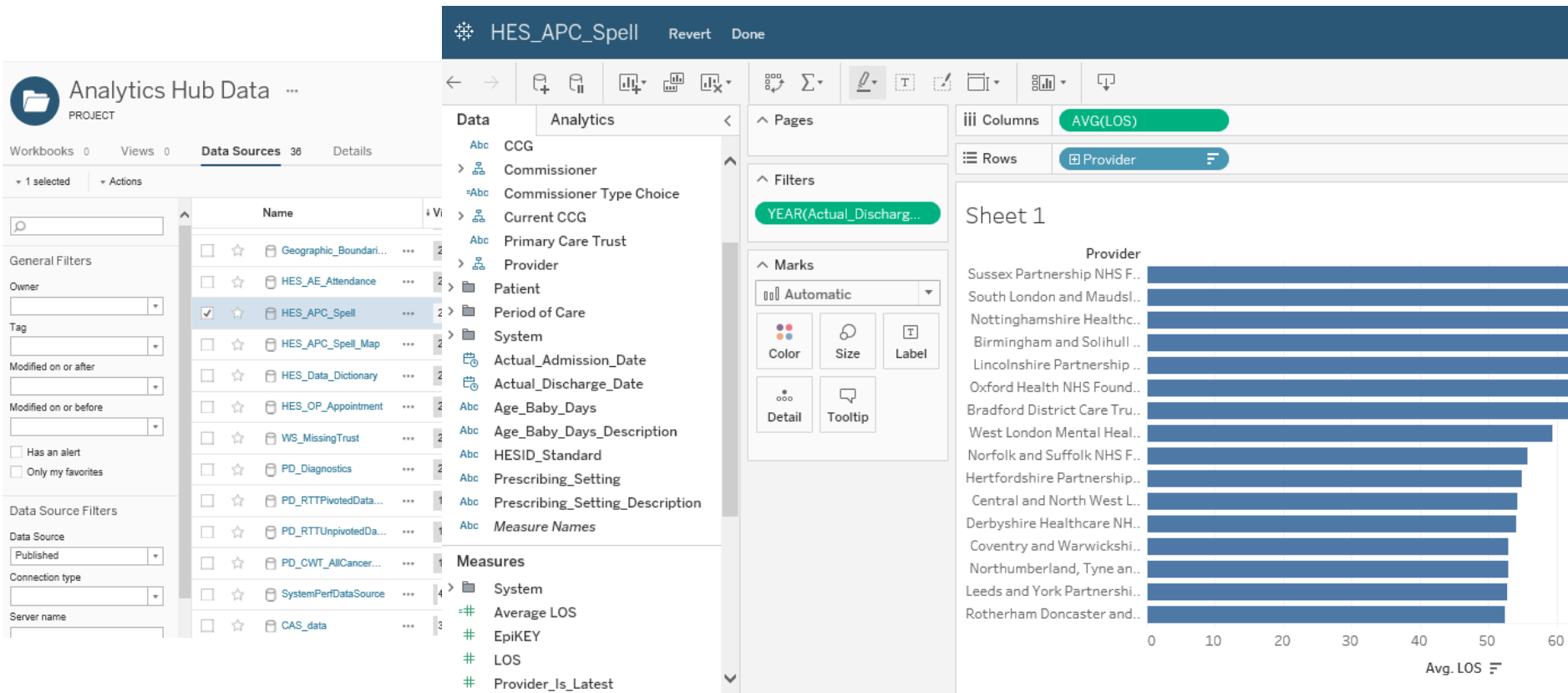
- NHSI Analytics Hub developed a Tableau product called HES Browser, with standard reference and data quality information of the dozens of key dimensions, to:
 - provide analysts easy access to large Hospital Episode Statistics (HES) data sets with built-in report structures
 - let analysts quickly see patterns in these very large data sets, enabling rapid exploratory analysis, with help of visualisation, e.g. maps



After – several minutes

HES data analysis – after (2 of 2)

- Through an intuitive drag-and-drop web user interface, analysts can develop their own reports, including visualisations, dynamic calculations and custom filters



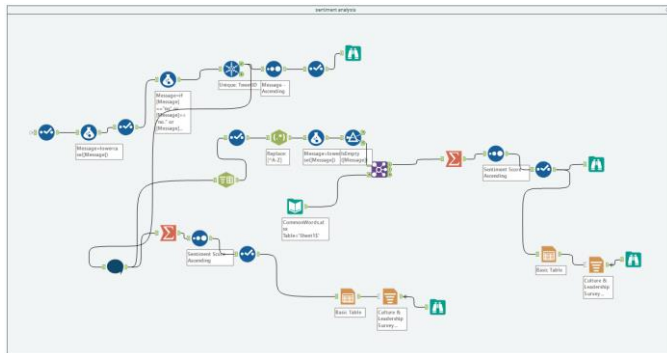
After – several minutes

Culture and leadership survey analytics

- This on-demand service forms part of the diagnostic toolkit within [an overarching two-year culture programme](#) by NHS Improvement, the Care Quality Commission (CQC) and The King's Fund
- Helps diagnose a trust's current culture and target the right areas for a collective leadership strategy

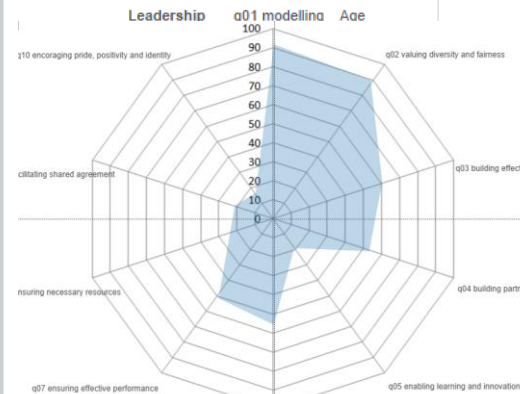
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alteryx

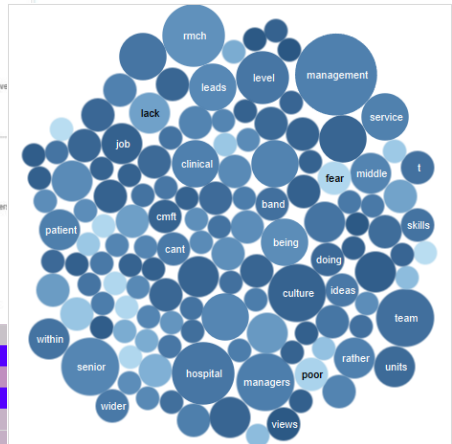
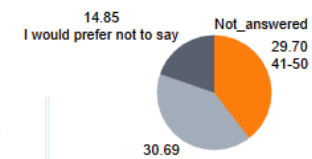


3. Response Rate

Personal Or .. Behaviour tit., Demographi.



Ethnic background	Asian/Asian B.	86.7	93.3					
	Black/Black B.	100.0	100.0					
	I would prefer...	77.8	83.3					
	Mixed	100.0	100.0					
	White	92.9	91.1					
Occupational background	Medical and dental	89.0	90.1					
Religion	Christian	93.5	93.5	61.3	58.1	25.8	58.1	54.8
	Hindu	87.5	100.0	62.5	62.5	12.5	50.0	56.3
	I would prefer...	78.9	84.2	36.8	63.2	10.5	57.9	50.0
	Muslim	100.0	50.0	100.0	100.0	0.0	50.0	50.0
	No religion	89.3	89.3	71.4	53.6	28.6	60.7	69.6
Sexual orientation	Bisexual	0.0	100.0	100.0	0.0	0.0	0.0	50.0
	Gay man	100.0	100.0	33.3	66.7	66.7	66.7	66.7
	Gay woman (l.)	100.0	100.0	0.0	100.0	0.0	100.0	100.0
	Heterosexual	92.3	92.3	63.1	60.0	23.1	58.5	56.2
	I would prefer...	76.5	76.5	47.1	52.9	5.9	47.1	52.9



Patient Experience Headlines Tool – before *Improvement*

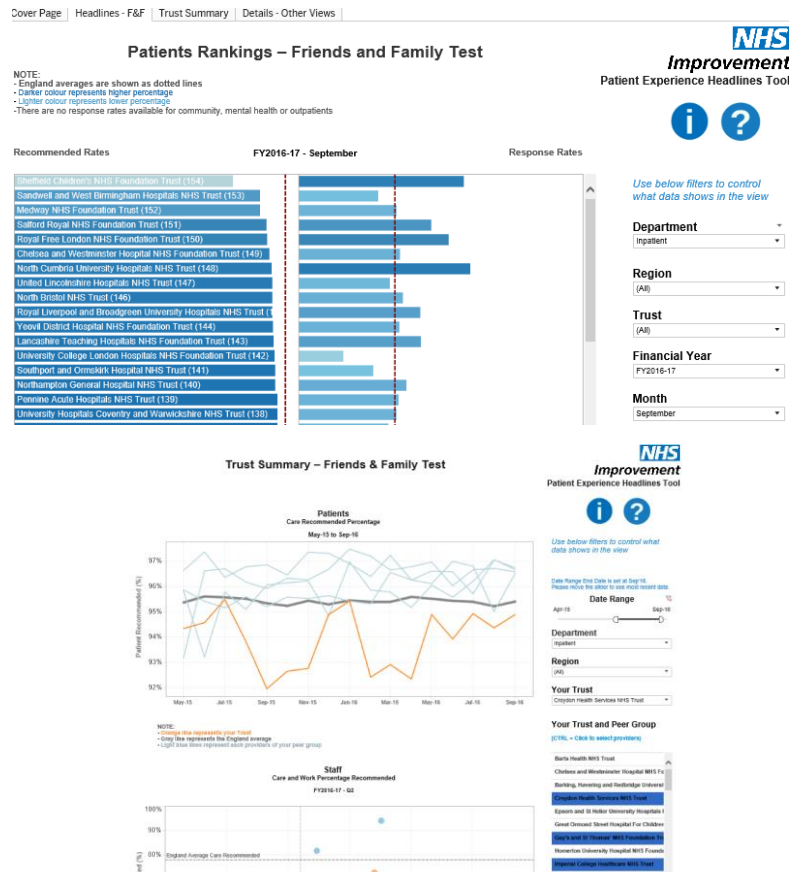
- An Excel file with over 30 data sets, e.g. Friends & Family (Staff, A&E, Ambulance, Community, Inpatient, Maternity, Mental Health), A&E Survey, Cancer Survey, Children & Young People's Survey, Acute Inpatient Survey, Complaints (NHS Digital), CQC NHS Health Care Ratings, ESR Substantive Staff Survey, PLACE Organisation Scores, etc.

Index	Friends & Family Tests Feb-16									Friends & Family Tests Feb-16						FFT Staff 201516 - Q2						
	Inpatients			A&E			Ambulance			Community			Mental Health			CARE		WORK				
	Recommend nd	Not Recommend nd	Response Rate	Recommend nd	Not Recommend nd	Response Rate	Recommend nd	Not Recommend nd	Response Rate	Recommend nd	Not Recommend nd	Response Rate	Recommend nd	Not Recommend nd	Response Rate	Recommend nd	Not Recommend nd	Recommend nd	Not Recommend nd	Response Rate		
SFT	95.6%	2.6%	45.8%	87.0%	7.5%	26.0%										87.4%	2.7%	69.6%	14.2%	15.0%		
als NHS FT	97.5%	0.7%	27.4%	94.4%	2.7%	14.2%				96.3%	0.0%	15.8%				84.9%	4.7%	75.2%	13.6%	14.4%	100%	
	94.0%	0.0%	6.4%	66.7%	28.6%	0.4%						0.0%	0.0%	0.0%		84.4%	2.6%	55.9%	21.5%	8.7%		
	96.5%	1.4%	33.3%	80.1%	11.3%	17.5%										81.5%	5.0%	67.7%	12.5%	14.3%		94%
ge University Hospitals	93.1%	2.5%	32.0%	75.5%	12.7%	10.9%										65.1%	10.8%	51.8%	22.9%	2.7%	97%	
ity Hospitals NHS FT	97.3%	0.9%	20.3%	85.1%	10.3%	18.9%										76.0%	7.7%	63.4%	15.2%	21.8%		
	95.6%	1.2%	12.3%	91.2%	5.3%	1.6%				95.6%	1.0%	13.2%				70.4%	10.3%	55.1%	24.0%	14.3%	95%	
	96.5%	1.4%	36.4%	70.3%	18.2%	18.6%										81.5%	13.3%	56.8%	36.5%	8.8%	100%	
al NHS FT	91.0%	4.1%	17.6%	78.8%	15.4%	11.2%								0.0%	0.0%	90.1%	3.3%	70.3%	11.0%	5.8%	88%	
	100.0%	0.0%	100.0%													94.3%	0.3%	69.8%	10.1%	5.8%	90%	
: NHS FT	96.0%	1.0%	25.4%	91.8%	4.6%	17.7%				98.1%	0.2%	4.2%	97.3%	0.0%	3.7%	79.5%	4.4%	69.4%	12.0%	24.6%		
	95.1%	1.8%	28.2%	81.0%	11.6%	18.6%				89.8%	2.5%	9.6%				78.2%	5.6%	63.7%	15.3%	24.3%	88%	
VHS FT	97.1%	0.8%	13.8%	63.1%	22.6%	1.3%						9.6%				74.2%	8.3%	60.0%	18.3%	7.3%	100%	
y Hospitals NHS Trust	97.7%	0.8%	10.8%	88.5%	7.5%	18.3%										68.9%	3.8%	53.5%	22.6%	24.4%	91%	
NHS Trust	97.2%	1.5%	17.7%	91.6%	4.7%	8.4%										77.3%	6.1%	58.0%	19.5%	8.2%	97%	
	96.7%	1.9%	18.8%	71.4%	20.1%	1.8%										84.4%	6.3%	73.0%	11.1%	18.7%	98%	
VHS FT	97.0%	0.8%	33.5%	84.8%	10.6%	9.7%				85.8%	3.6%	12.6%				78.6%	5.7%	48.9%	28.8%	13.0%	93%	
s NHS FT	96.8%	1.2%	16.2%	92.7%	3.5%	22.3%										90.5%	2.2%	67.2%	14.9%	23.0%	98%	
Hospitals NHS FT	94.0%	1.7%	13.0%	86.5%	7.7%	7.6%				93.5%	3.2%	0.2%				76.6%	8.1%	59.5%	17.4%	10.8%	100%	
ital NHS FT	93.0%	3.5%	28.8%	86.7%	7.4%	16.4%				95.7%	0.0%	4.2%				79.7%	0.0%	63.5%	18.9%	2.2%	92%	
IS FT	96.3%	1.1%	31.8%	81.8%	11.7%	17.0%										61.4%	2.3%	43.2%	18.2%	1.2%	97%	
SFT	97.6%	0.4%	14.6%	97.2%	1.0%	9.8%										80.3%	7.8%	69.1%	15.1%	9.6%	93%	
NHS FT	96.5%	0.7%	28.3%	84.9%	10.6%	22.1%										64.9%	11.2%	46.3%	23.3%	4.7%	100%	
NHS FT	96.3%	1.4%	13.1%	80.7%	12.3%	14.7%										93.8%	1.0%	83.5%	3.1%	2.4%		
n NHS FT	92.0%	0.8%	11.5%	90.0%	2.9%	10.1%				97.5%	0.6%	13.4%				62.3%	17.7%	54.1%	31.8%	2.8%	95%	
i Trust	92.4%	2.3%	26.8%	90.6%	3.6%	14.4%				96.2%	1.5%	3.2%				61.4%	16.0%	53.3%	25.5%	16.3%		
Trust	97.5%	0.8%	12.2%	91.8%	3.3%	3.0%										88.3%	1.3%	80.0%	7.1%	7.9%	98%	
	94.9%	2.1%	18.8%	80.9%	10.7%	16.3%										88.1%	2.7%	69.7%	11.0%	15.5%	96%	
itals NHS FT	96.7%	0.5%	23.4%	85.8%	8.7%	1.7%										77.2%	9.2%	75.2%	10.7%	5.2%	96%	
T	98.4%	0.5%	22.3%	84.6%	8.4%	22.1%										80.3%	4.1%	59.0%	20.3%	11.1%	98%	
IHS Trust	96.6%	0.9%	45.7%	79.9%	12.8%	19.7%										69.7%	11.1%	47.5%	36.0%	5.3%	96%	
	96.0%	1.0%	39.2%	90.2%	5.9%	25.9%				89.9%	3.2%	21.0%				79.5%	7.1%	55.4%	17.3%	3.2%	95%	
NHS FT	94.7%	1.8%	33.8%	77.9%	13.3%	26.7%										75.7%	7.6%	53.2%	26.5%	27.5%	95%	
S Trust	98.0%	0.6%	48.5%	79.9%	13.2%	21.7%				94.7%	1.6%	3.1%				76.6%	6.5%	67.5%	14.0%	25.6%	96%	
Hospitals	97.3%	0.5%	13.1%	90.1%	5.4%	8.0%				96.8%	1.2%	0.9%				65.2%	12.5%	46.1%	29.7%	15.8%	94%	
y Hospitals NHS Trust	95.1%	2.2%	23.7%	87.4%	7.7%	8.5%										80.4%	5.5%	64.0%	14.3%	12.0%	94%	
	97.3%	0.7%	28.8%	89.5%	3.7%	17.6%				100.0%	0.0%	14.1%				81.1%	6.0%	64.5%	18.4%	9.7%	97%	
	97.1%	1.2%	16.6%	87.3%	4.2%	35.3%							100.0%	0.0%	12.2%	84.1%	5.6%	68.9%	15.3%	7.0%	98%	
st	95.7%	2.0%	31.7%	79.8%	13.7%	19.3%										80.6%	5.6%	72.1%	11.3%	27.5%	100%	
SFT	95.6%	0.8%	16.4%	76.0%	14.2%	2.5%										92.2%	2.0%	86.3%	9.8%	0.7%	85%	
For Children NHS FT	98.3%	0.8%	23.7%													95.7%	0.8%	71.0%	10.4%	12.9%		
FT	92.7%	2.7%	23.8%	92.0%	4.2%	4.4%				96.0%	0.6%	1.2%				80.5%	5.2%	63.6%	18.0%	11.4%	100%	
	95.3%	2.0%	28.8%	84.3%	9.4%	16.6%				98.1%	0.0%	3.4%				91.9%	2.4%	75.9%	10.5%	10.9%	100%	
	95.7%	1.3%	30.8%	86.1%	8.6%	20.8%										88.8%	3.3%	74.6%	11.2%	9.3%	93%	
	91.3%	4.9%	38.7%	90.3%	4.7%	13.1%				95.2%	1.6%	12.0%				90.3%	1.6%	66.1%	7.3%	3.6%	92%	
	93.6%	1.8%	25.5%	78.7%	12.6%	14.5%				98.2%	1.2%	3.3%				63.6%	10.9%	54.1%	20.6%	4.8%	92%	
JHS Trust	97.2%	0.5%	44.4%	95.2%	0.4%	8.7%										71.8%	9.7%	49.5%	34.0%	6.0%		

Patient Experience Headlines Tool – after

Improvement

- An interactive benchmarking tool envisioned with the use of Tableau early 2016
- Developed in partnership with trusts to enable staff to access key sources of published patient experience measures all in one place
- Users can get a sense of how an organisation is doing compared to others
- Publicly accessible dashboard ([link – Patient Experience Headlines Tool](#))



CQC Scores

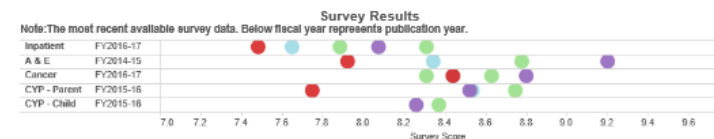
This will always show latest CQC scores as of date irrespective of selected financial year

Trust	Rating	Overall	Caring	Effective	Responsive	Safe	Well-led
Croydon Health Services NHS Trust	RUG	Overall	Caring	Effective	Responsive	Safe	Well-led
Epsom and St Helier University Hospitals NHS Trust	RVR	Overall	Caring	Effective	Responsive	Safe	Well-led
Guy's and St Thomas' NHS Foundation Trust	RU1	Overall	Caring	Effective	Responsive	Safe	Well-led
Kingston Hospital NHS Foundation Trust	RAX	Overall	Caring	Effective	Responsive	Safe	Well-led
London North West Healthcare NHS Trust	R1K	Overall	Caring	Effective	Responsive	Safe	Well-led

PLACE Scores

FY2016-17

Category	R1K	RAX	RU1	RUG	RVR
Cleanliness	97	96	99	99	99
Condition	92	90	94	96	89
Demerits	98	96	90	95	92
Food	90	92	92	90	91
Privacy	70	89	87	80	76
Disability	70	70	70	66	74



Q&A and wrap-up

Q&A