WELCOME TO

The NHS Data & Information Conference 2022

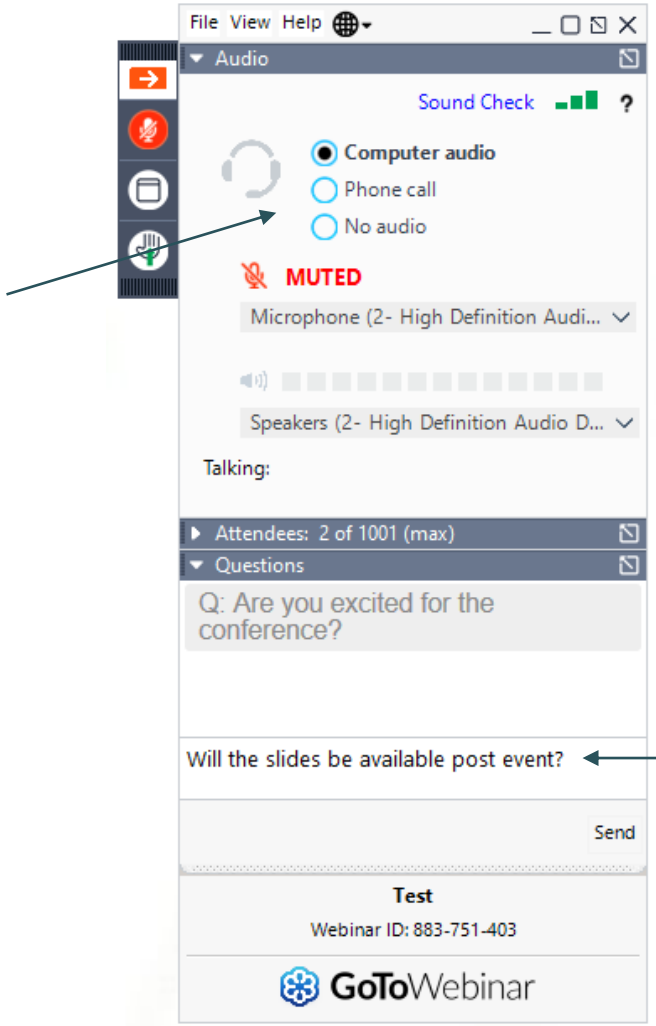
Check Out Our Agenda Here...

Thursday 13th October 2022- 10:50am – 15:00pm – GoTo Webinar

Conference hosted by Convenzis Group Limited

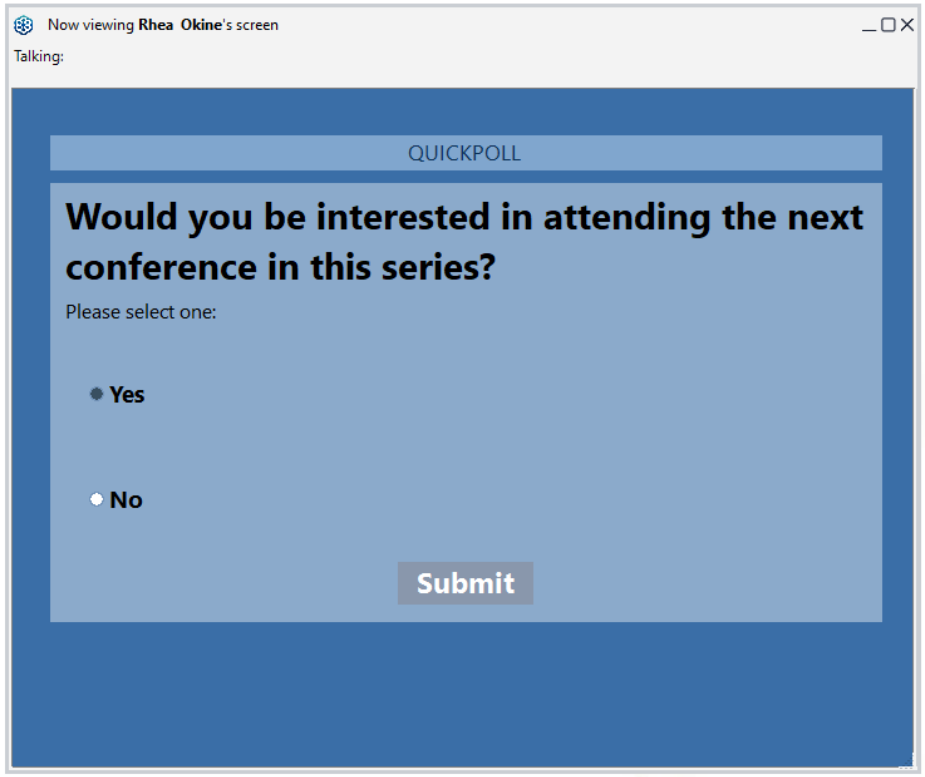
The NHS Data & Information Conference 2022

Make sure you are connected via Computer Audio for the conference. You can test your audio via the 'Sound Check' tab.

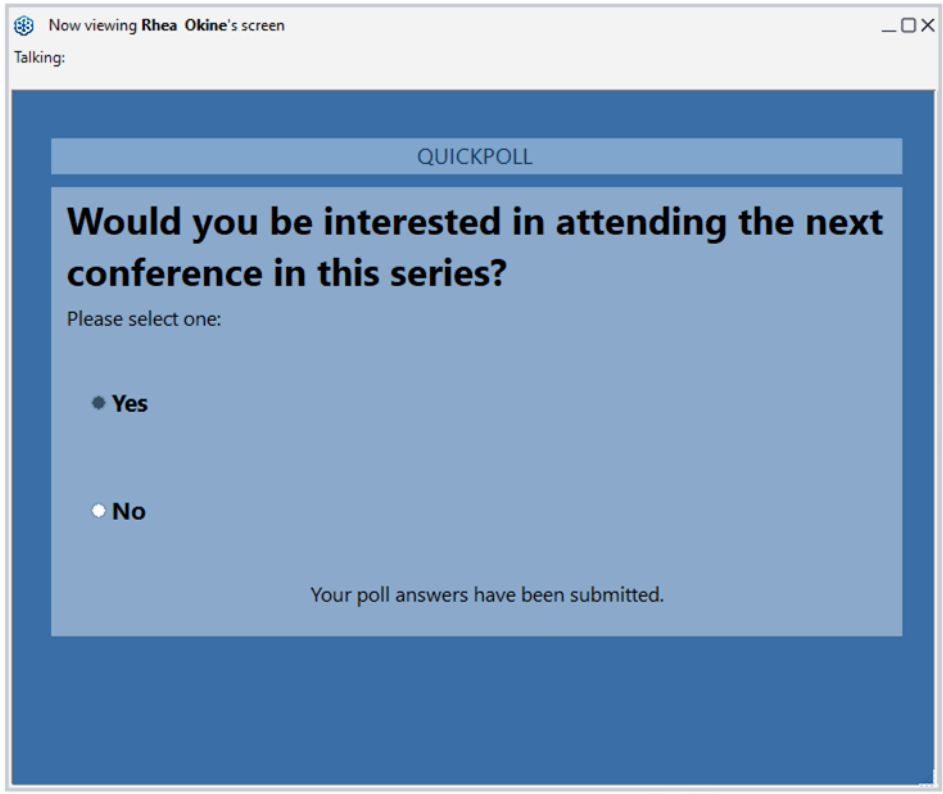


If you have any questions or comments for Speakers across the day, please expand the Questions Section on the GoToWebinar panel. You will not be able to see each others questions.

The NHS Data & Information Conference 2022



Click on **one** of the multiple choice options, then press '**Submit**'



Once **Submitted** your screen will look like this

The NHS Data & Information Conference 2022

SPEAKING NOW

Andy Rees

Clinical Trials Operations Manager
NHS Digital

I will be discussing…

"NHS Digi Trials – providing data and technology solutions for clinical trials"

The NHS Data & Information Conference 2022

UP NEXT...

TRUSTMARQUE

The NHS Data & Information Conference 2022

SPEAKING NOW

Dick Wall

BI consultant
Trustmarque

Claire Burnett

Sepsis Lead Nurse and Critical Care Outreach Nurse

We will discuss…

”Fear of Real Time Data Analytics & Actionable Intelligence”

Fear of Real-Time Data Analytics and Actionable Intelligence

Claire Burnett
Quality Lead for Sepsis Deterioration, Royal Berkshire Hospital

Dick Wall
Data Solutions Architect, Trustmarque

Built on BEDROCK DATA WAREHOUSE & ANALYTICS

Hosted on Microsoft Azure

Delivered by TRUSTMARQUE

About Trustmarque

Real-time data you can plan on, act on, count on

- Long-standing NHS collaboration (30 years+)
- Deep understanding of your healthcare Technology challenges
- NHS-ready data warehouse, built on Bedrock
- Data to improve outcomes in the NHS
- We support the NHS to deliver better care

NHS Trust data issues

The true impact

Never enough time

Skills deficit aging infrastructure

Reports backlog

Real time analatics?

Develop operational / clinical tools

Unreliable and incoherent systems

Mixed Infrastructure

Out of support

'Why Drs hate their computers' - The New Yorker

Can screens come between Drs and patients?

“All these different technologies and apps on these iPads....they’re either slow, or they’re cumbersome, or they require a lot of data entry and they’re not efficient.”

By Atul Gawande

Full article: Why Doctors Hate Their Computers | The New Yorker

It’s now time to deliver the right data, to the right people at the right time and improve outcomes in the NHS.

Built on BEDROCK DATA WAREHOUSE & ANALYTICS

Delivered by TRUSTMARQUE

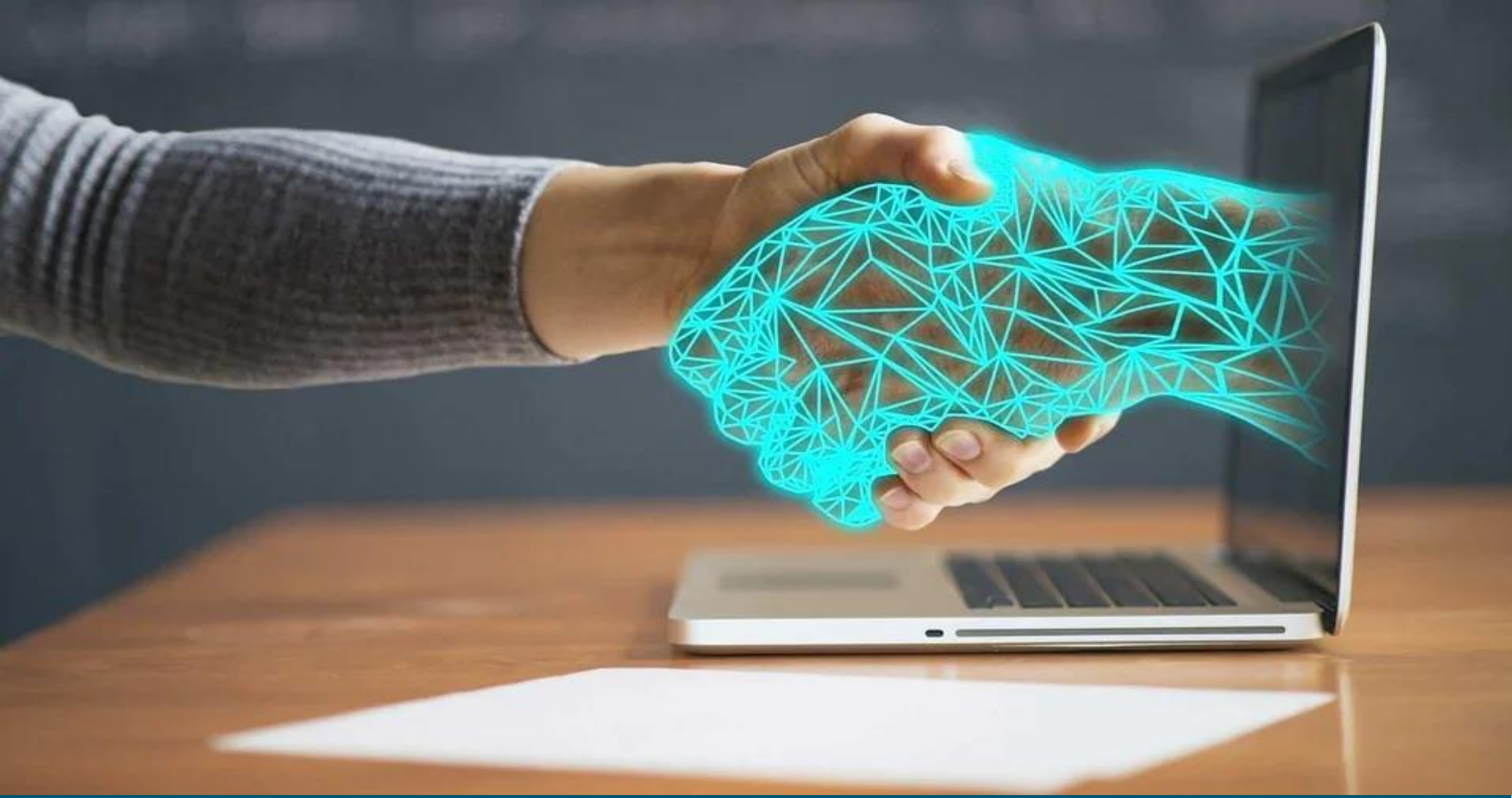
Hosted on Microsoft Azure

TiNA dashboard - live demo

Built on BEDROCK DATA WAREHOUSE & ANALYTICS

Delivered by TRUSTMARQUE

Hosted on Microsoft Azure



trustmarque.com/digitalhospitals

BEDROCK DATA WAREHOUSE & ANALYTICS

TRUSTMARQUE

Microsoft Azure

Questions and discussion

Claire Burnett
Quality Lead for Sepsis Deterioration, Royal Berkshire Hospital

Dick Wall
Data Solutions Architect, Trustmarque

Built on BEDROCK DATA WAREHOUSE & ANALYTICS

Hosted on Microsoft Azure

Delivered by TRUSTMARQUE

The NHS Data & Information Conference 2022

SPEAKING NOW

Dr Simone Yule

GP, Clinical Director and PHM lead
Dorset ICS and NHSEI

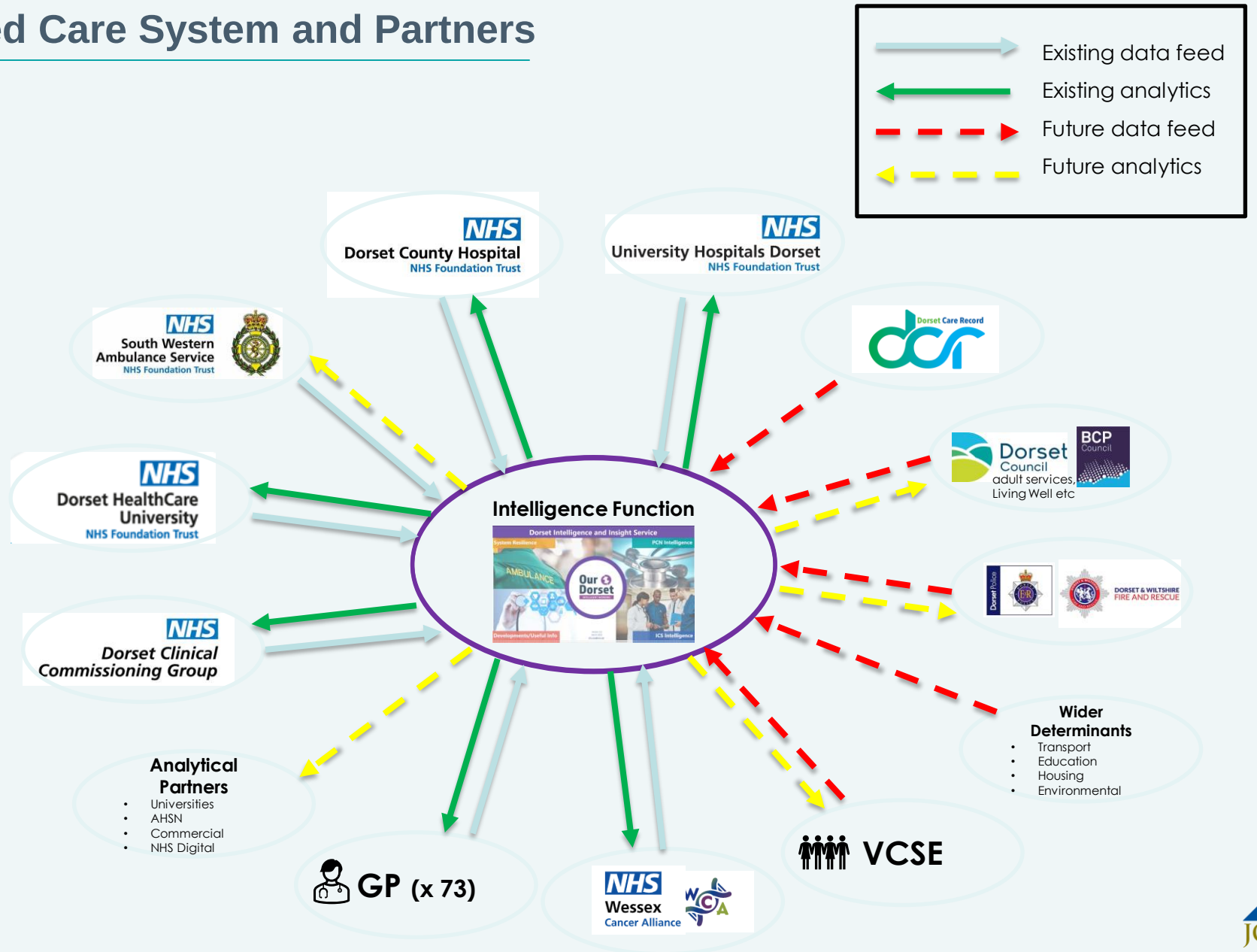
I will be discussing…

"Underpinning population health management with data Population health management"

An overview of a PHM approach using linked data to design interventions and the use of predictive algorithms in the development of a proactive care programme.

Dr Simone Yule GP/Clinical Lead PHM

Dorset Integrated Care System and Partners

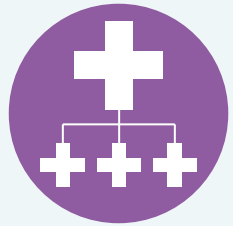


JOHNS HOPKINS

Welcome to the DiiS

The DiiS is being used every day by health and care professionals across Dorset to make evidence-based decisions to improve the health and wellbeing of our population.

- **Cloud hosted, locally shared data warehouse for shared intelligence and insights reporting**
- **Tool at the forefront of Dorset's COVID-19 analytical response linking data from primary care, acute and community providers on a near real time basis**
- **Monitoring disease and condition pathways across primary and secondary care**
- **Case finding / Targeting for individuals or cohorts (including secure re-identification of patients or service users to those who manage their care)**
- **Population Health Management: the ability to group by medical, mental health, demographic and socio-economic markers to identify points of earlier intervention in the pathway**
- **Provision of wider population-based insights to enable the use of social prescribing including the services from voluntary sector organisations**



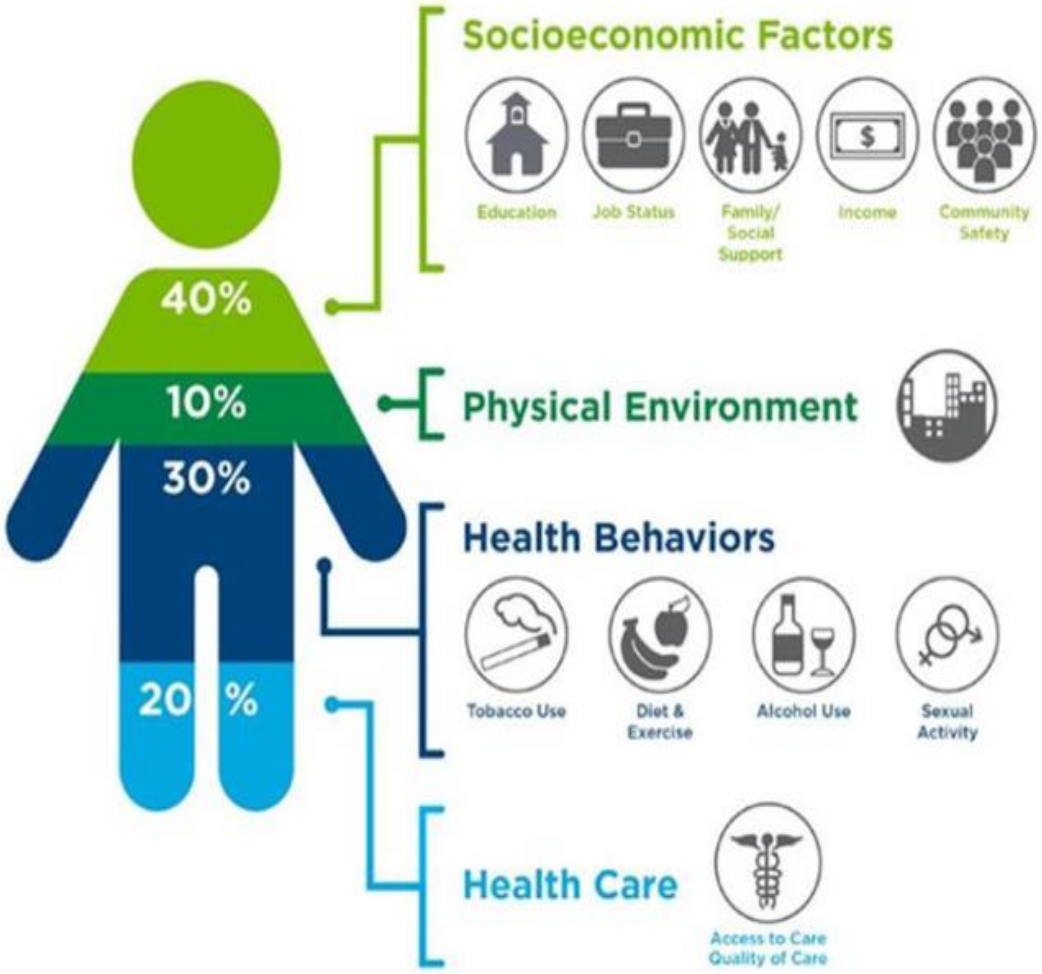
18
primary care networks

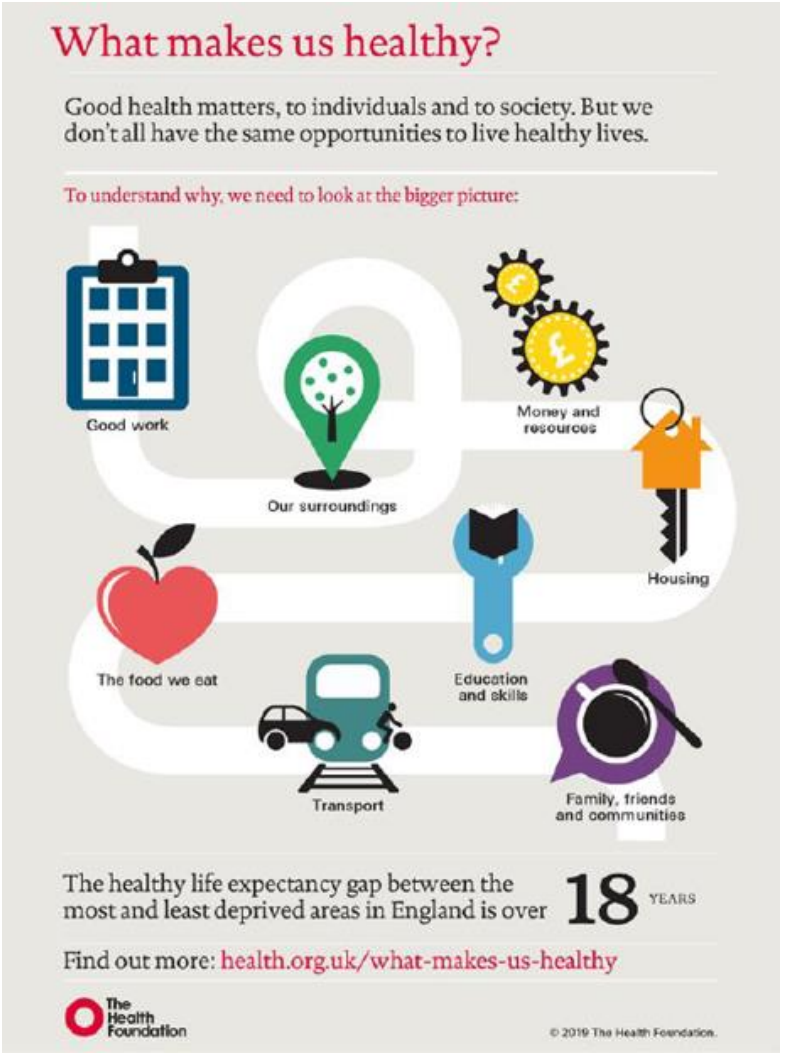
73
GP practices

818,000
registered population

Our Dorset

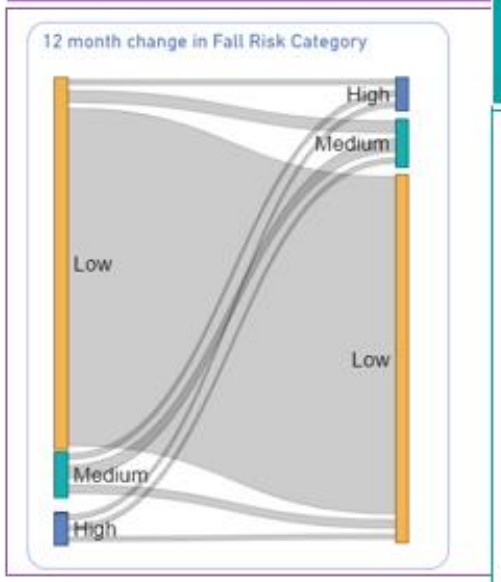
Determinants of Health





Using linked data enables us to take into account the wider determinants of health effecting a holistic approach.

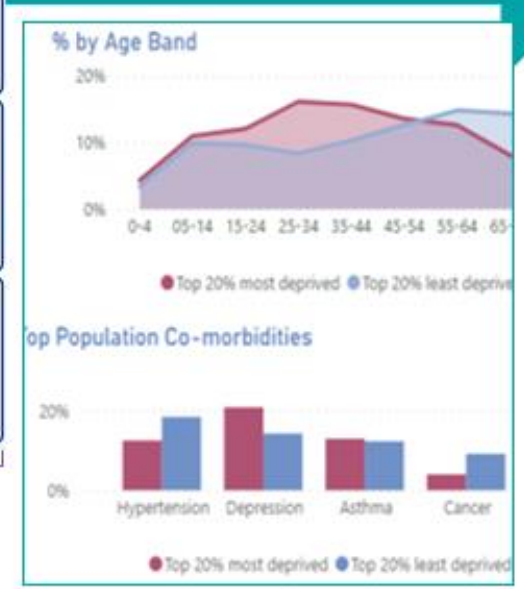
Falls Risk Score



Risk Stratification

Frailty insights

Health Inequalities

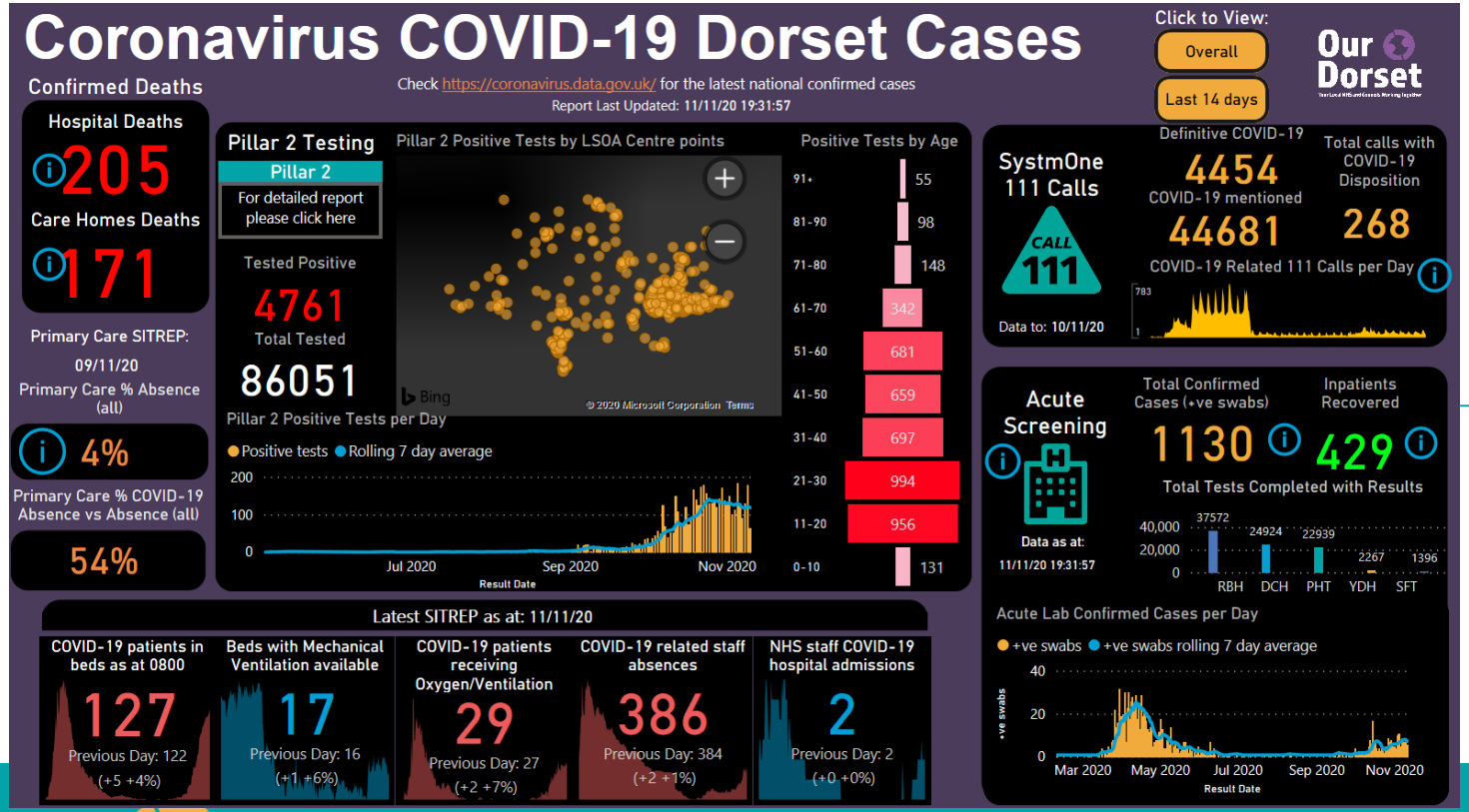


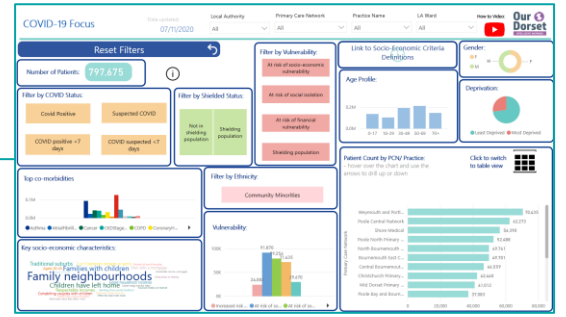
Our Dorset
Your Local NHS and Councils Working Together

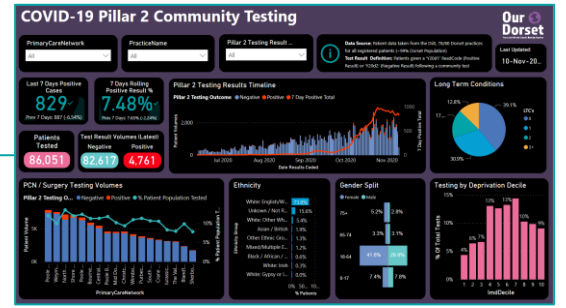
Creating Actionable Insights - DiiS

How DiiS supported the COVID-19 response

Automated, live data provides a system–wide view of COVID cases, across acute, community and primary care settings, enabling us to better understand the spread of the disease locally and model capacity and demand. Analytics focusing on vulnerable or at risk populations, including those with mental health conditions, has helped clinical colleagues to identify specific groups who may benefit from a directed, pro-active approach. Using this data they have focused their workforce on these groups dependent on social as well as clinical need.





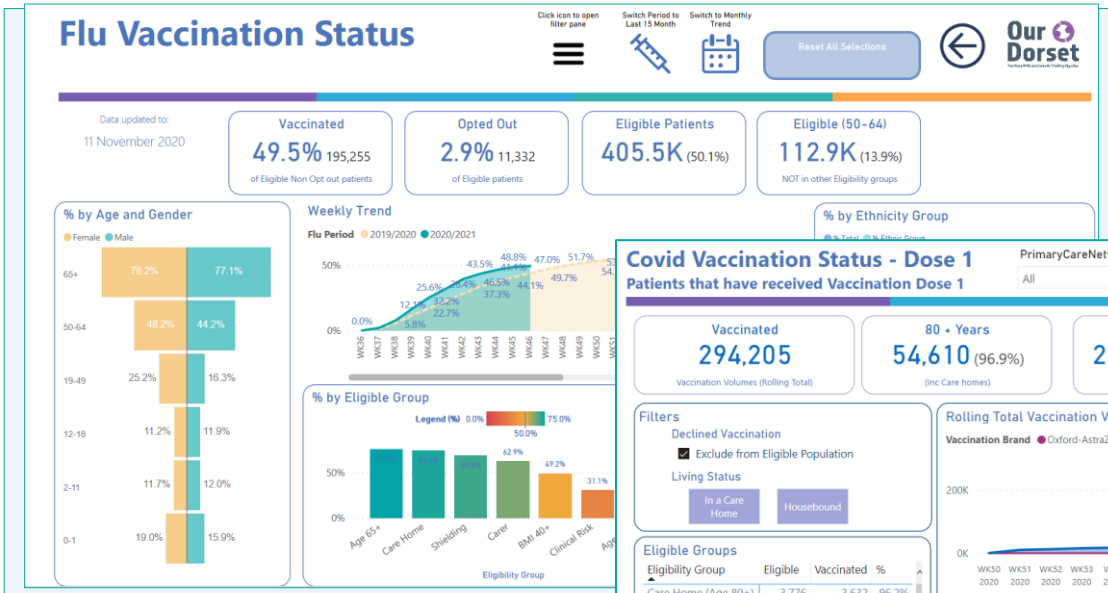


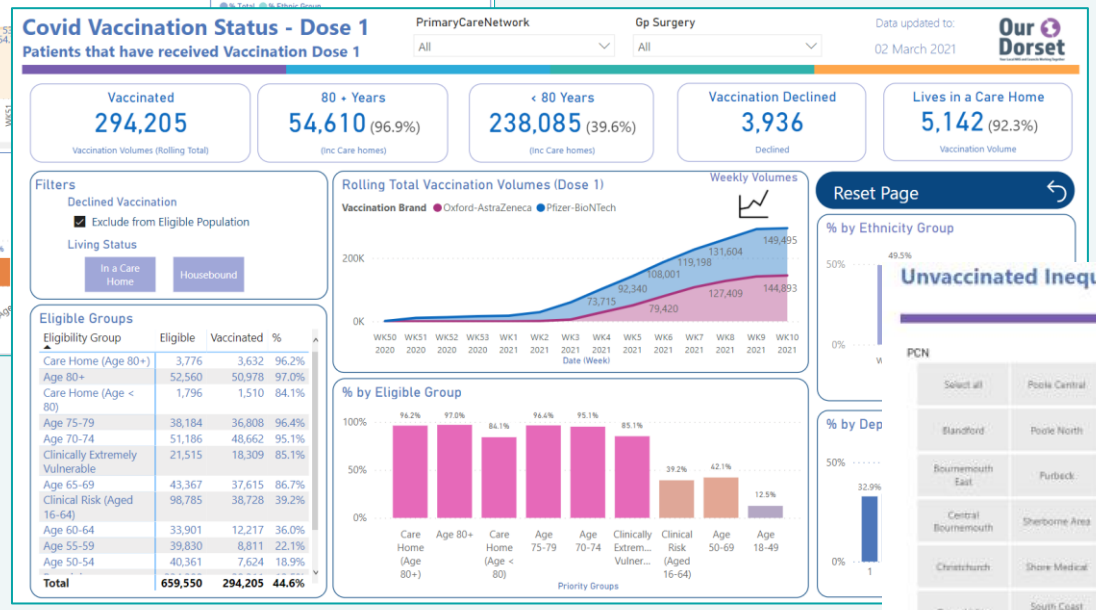
Our Dorset

"Perfect. The COVID insights are really helpful… to identify groups… and then identify those individual patients."

How data supported the COVID-19 response

“The depth and quality of data now available in one place is astounding.”





the COVID pandemic has highlighted the health inequalities experienced throughout our communities. A live view of our patients covid and flu vaccination status is informing the winter flu campaign informing comms strategies as well as helping clinicians to target hard to reach populations.

How DiiS supports PHM

“Improving the health of Dorset’s population will depend not only on clear vision, leadership and high quality services but on embedding a strong and consistent Population Health Management approach. This must be developed at all levels of our ICS – whether this be at primary care network, integrated health and care partnership or at ICS level. We will at all times look to improve care, identify gaps in care and target populations who will benefit from a risk stratified approach to the way we look after people, embedding service redesign and quality improvement to improve outcomes. This will be achieved through the development of new care models in our evolving Primary Care Networks and the wider system that support them. The Dorset executive is committed to embedding this approach, building on the success of the first pilot areas and rapidly rolling out the development programme to all newly formed PCNs and the wider system.”

– Sam Crowe, PHM SRO & Director of Public Health

For more information, on PHM, visit https://nhsdorsetccg.sharepoint.com/sites/iwp/SitePages/PHM.aspx

The Vale Primary Care Network (PCN)

The Vale recognised that overall health is determined by a range of social, economic and environmental factors, and that social prescribing could address and support individual needs in a holistic way by asking ‘What matters to you most?’. They also identified that 30% of clinical appointments were related to one or more non-clinical need(s). During the initial COVID-19 lockdown, they looked at their team of Social Prescribers and how they could work closely with key partners in a proactive approach.

Weekly Huddle

Clinicians, link workers, self-management coaches and social prescribers discussed and reviewed cases.

Segmentation

Using the DiiS COVID-19 Insights report they ran searches for people with significant risk factors. The data was segmented using criteria including social vulnerability, mental health and long-term health conditions.

Intervention

They designed a different intervention for each group. For example, for those at low risk but with a history of mental health issues they texted out contact details of relevant support groups, helplines and websites.
They asked their frailty Advanced Nurse Practitioners to contact those with significant Covid-19 health risk to identify any current unmet clinical needs whilst the Social Prescribing team contacted a group with low Covid-19 risk and social vulnerability to offer a conversation about their current support needs.

From a cohort of 94 contacted, 75% received a social prescribing offer with a recorded outcome; these were people who had not approached any services themselves and most were struggling with the impact of lockdown.

“Looking at how we can deploy our community teams to focus their workload to get best value and outcomes. Historically there has been no evidence or data to inform us of who needs care, when, how and why. By using the data, we can now target populations in a proactive manner and hopefully improve outcomes possibly measured by a reduction in segmental drift.”

– Local GP

How DiiS supports PHM

COVID-19 Risk Groups

Data updated: 01/03/2021

Local Authority: All | Primary Care Network: All | Practice Name: All | LA Ward: All

How to Video:

Our Dorset – INTELLIGENT WORKING

Reset Page

Link to Risk Group and Mental Health Criteria Definitions

Link to Socio-Economic Criteria Definitions

Filter table by patient variables:

- ☐ COPD
- ☐ Diabetes
- ☐ CKD Stage 3-5
- ☐ In a care residence

Filter by COVID Status:

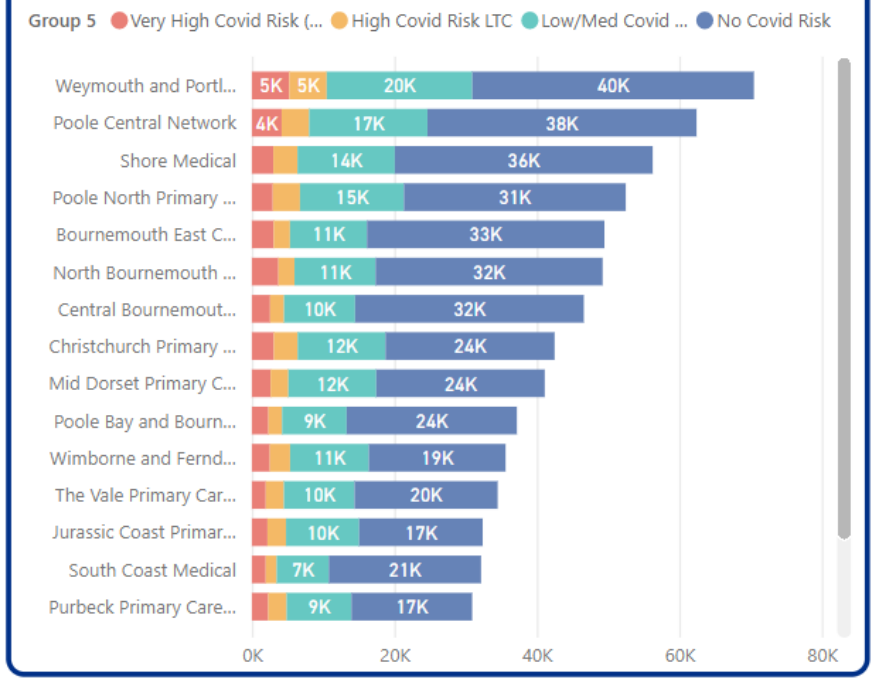
- ☐ Covid Positive
- ☐ Suspected COVID
- ☐ COVID positive <7 days
- ☐ COVID suspected <7 days

Risk Group Matrix:

Risk Group Name	Very High Covid Risk (Shielded)	High Covid Risk LTC	Low/Med Covid Risk LTC	No Covid Risk	Total
Mental Health Risk and Social Vulnerability	1,130	464	914	1,144	**3,652**
Mental Health Risk	4,135	2,114	7,016	14,278	**27,543**
Social Vulnerability	5,170	4,792	9,463	7,304	**26,729**
Increased Risk of Serious Illness	2,821	3,311	13,803	4,136	**24,071**
No Mental Health Risk, Social Vulnerability or Serious Illness Risk	37,711	39,972	182,781	459,189	**719,653**
Total	**50,798**	**50,568**	**213,728**	**485,503**	**800,597**

COVID-19 Risk Groups Prevalence:

- hover over the chart and use the arrows to drill up or down



For Practice Use ONLY - Click on the buttons above to drill down on cohorts and patient detail:

PersonKey	Age	Gender	PrimaryCareNetwork	SurgeryName	Risk Group
1	23	Male	The Vale Primary Care Network	The Blackmore Vale Partnership	Low/Med Covid Risk LTC
2	90	Male	Weymouth and Portland Primary Care Network	Royal Crescent Surgery	Low/Med Covid Risk LTC
3	21	Male	Mid Dorset Primary Care Network	Queens Avenue Surgery	No Covid Risk
4	19	Male	South Coast Medical	The Grove Surgery	No Covid Risk
5	71	Female	Weymouth and Portland Primary Care Network	Royal Crescent Surgery	Low/Med Covid Risk LTC
6	56	Female	Bournemouth East Collaborative Network	Shelley Manor & Holdenhurst Medical Centre	No Covid Risk
7	23	Male	Bournemouth East Collaborative Network	Shelley Manor & Holdenhurst Medical Centre	No Covid Risk

How DiiS supports PHM

Cross cohort considerations for further tailoring of care offer

- English not first language
- Digital literacy, access
- Key worker?
- Caring responsibilities, who? How?
- Crowded or poor quality housing
- Access to outdoor space

Covid Care Models matrix	No specific Covid risks	Single high risk (local)	Multiple High Risk (local)	Very High Risk/Shielding (National)
All / no specific vulnerabilities	• Whole population messaging on social distancing, health and well-being support and exercise • Maintain social distancing • Social Prescribing to Help and Kindness website for pan-Dorset support directory.	• Practice nurse check in by phone • Holistic care planning/care plan virtual review/LTC patient APP • Sign posting to tele health options national/local for particular conditions e.g. Help Diabetes management web	• Proactive Remote monitoring of blood pressure, blood sugars, weight, drinking etc via patient APP • Virtual Group consultations for linked LTC Somerset LTP patterns)	• Personalised messaging on social distancing and health management for specific groups e.g. cancer, maternity, heart failure, diabetes etc where remote on is not possible upport to address long term ue ding telephone befriending online , Livewell Dorset etc
Mental health	• National websites, apps helplines (guided by Nat Covid workstream) • Leaflet drop • Town council helpline • Social Prescribing to Help and Kindness website for pan-Dorset support directory.	e check in wellbeing worker planning in with patient (and carer where relevant) • Health champion virtual groups • Social prescribing signposting to Dorset MIND for online group support. and access to The Vale First Contact MH practitioner., Steps to Wellbeing.	• Clinician for initial contact proactive case management /MH virtual review • Holistic MDT care planning in partnership with patient (and carer where relevant) • Health Champion virtual support eg. Mindful Café online for dementia.. • Social Prescribing – referral to The Vale MH practitioner., Steps to Wellbeing.	• Proactive support offer phone call • virtual MH review • town council helpline • Telephone b • Local author • Social Prescr The Vale First Steps to Well prescription
Social vulnerability	• Leaflet drop • Town council helpline • Social prescribing wellness call from Help & Care or local SP practitioner. Social Prescribing to Help and Kindness website for pan-Dorset support directory.	• Practice nurse check in • Care coordinator assigned • Holistic care planning in partnership with patient (and carer where relevant) • Practice Nurse for initial contact, then care coordinator with MDT • Social prescribing support signposting to Livewell Dorset/Age Concern	• Clinician for initial contact proactive case management • Holistic MDT care planning in partnership with patient (and carer where relevant) • LA team to support access and training for remote tech from govt scheme. • Health champion peer support . For LTC/Self management.	• Proactive support offer phone call • town council helpline • Telephone befriending • Local authority support • Social Prescribing to self management service offer, signposting to community volunteer support.
Social vulnerability + mental health	• Social prescriber assigned to conduct Wellness Call': • check in, social and practical prescribing including food bank access , town council helpline citizens advice, and broad RVS support • Social Prescribing to Help and Kindness website for pan-Dorset support directory.	• Practice nurse check in • Health and wellbeing worker assigned • Holistic care planning in partnership with patient (and carer where relevant) • Practice Nurse for initial contact, then health and wellbeing worker with MDT - • Social prescribing support -care co-ordinator appointed, coordinated personal care plan	• Clinician for initial contact, proactive case management • Holistic MDT care planning in partnership with patient (and carer w • LA team to support a remote tech from go • Health champion virt	• Proactive support offer phone call • town council helpline • Telephone befriending • Local authority support • Social prescribing - personalised care plan agreed and implemented, offer virtual peer support online or telephone., link to volunteer support.
Increased risk of serious illness with COVID-19 Diagnosed/suspected Male/age/obesity/dementia etc	• Raise awareness via social media etc regarding risk factors for illness • Social Prescribing to Help and Kindness website for pan-Dorset support directory.	• HCA proactive approach • Monitoring via patient APP and pulse oximetry • Social prescribing offer such as LWD smoking cessation support., weight management support for obesity	• Clinician lead proact and monitoring • Monitoring via patient APP and pulse oximetry using virtual ward approach • Social prescribing offer such as LWD smoking cessation support., weight management support for obesity	• Monitoring via patient APP pulse oximetry virtual ward approach • Daily contact with clinician virtually • Social prescribing offer - LWD smoking cessation support., weight management support for obesity reduction , offer of LWD behaviour change coaches ..

Social prescriber resource targeted to where most needed

Making use of community based assets

Cross provider approach to health and social care support offer

Digital technology working alongside more traditional delivery

Dorset Intelligence and Insight Service.

Fall Risk

Data is for 65+ opted in population only

13 May 2022

Local Authority & Ward: All

PCN/GP Surgery: Multiple selections

Reset Filters

Our Dorset

A Risk of Fall model was applied to the 65 and over population of Dorset who had not opted out of having their data shared. Details of the model and the predictors used to create the model can be found on the Fall Risk Model page.

Total Patients

7,047

Filter by Risk of Fall : Low | Medium | High

Too many patients to Re-Identify, apply further filters

Filter by:

Structured medication review in the past 12 months

Yes

No

PersonKey	TenYearAgeBand	ProbabilityFall	FallCategory	Electronic Frailty Index Score	eFrailty	FallDeficits
137	60-69	2%	Low	0.08	Fit	Female|1–5 outpatient visits previous 12 months|A+E investigation previous 3 months
162	70-79	10%	Low	0.14	Mild	Female|COPD|Depression|Asthma|Polypharmacy 10 or more unique drugs
179	80+	5%	Low	0.22	Mild	Polypharmacy 1-4 unique drugs|Male
220	60-69	-100%	None	0.03	Fit	Male
233	60-69	1%	Low	0.00	Fit	Female
274	80+	18%	Low	0.28	Moderate	Female|1–5 outpatient visits previous 12 months|GP/Hospital Code of fall (Any)|Polyph

Filter by Vulnerabilities:

- Social Isolation
- Socio-Economic Vulnerability
- Financial Vulnerability
- IMD Decile 1-3

Filter by Comorbidity:

- Asthma
- Depression
- Osteoporosis
- COPD
- Diabetes
- Severe Mental Health
- Ckd Stage 3-5
- Hypertension
- Stroke
- Dementia
- Learning Disability
- Urinary Tract Infection

Filter by Long Term Condition Count: 1 | 2 | 3+

Filter by Distinct Drug Count: 1 - 4 | 5 - 9 | 10+

Filter by Frailty Score: Mild | Moderate | Severe

Filter by BMI: Normal | Overweight | Obese | Underweight

Filter by Patient Characteristics:

- 60-69
- 70-79
- 80+
- Female
- Male
- Smoker

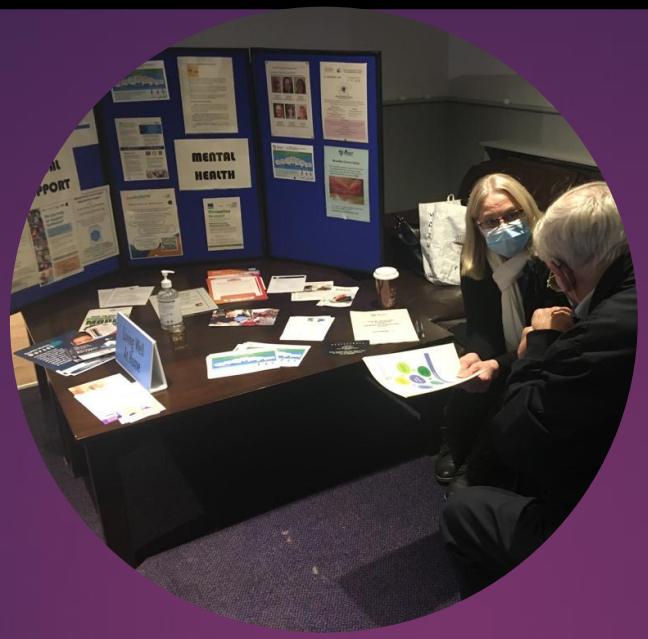
Filter by Patient Status:

- Does not live in a care home
- Lives in a care home
- Is housebound
- Is not housebound
- Does not have carer
- Has carer

Our Falls Risk Model

- With data that we already hold we screen the entire population for risk based on the following questions:

  - What is the age/gender of the patient?
  - How many times have they been in hospital recently as:
    - An Inpatient
    - An Outpatient
    - An A&E Attender
  - Have they had a fracture recently?
  - Do they have Osteoporosis?
  - Have they had a fall in the last six/twelve months?
  - Do they have COPD?
  - Do they have depression?
  - Do they have Mental Health?
  - Do they have Asthma?
  - Do they have a history of UTIs?
  - Is the patient receiving Polypharmacy?



- PARTNERSHIP WORKING IN A NON MEDICAL SETTING
- CREATING A SERVICE WITH LITTLE CHANGE IN COMMISSIONING
- IDENTIFICATION OF THE CORRECT COHORT- DATA IS ONLY AS GOOD AS CODING
- EVALUATION AND PROOF OF OUTCOMES –LONG TERM vs SHT TERM

Evaluation

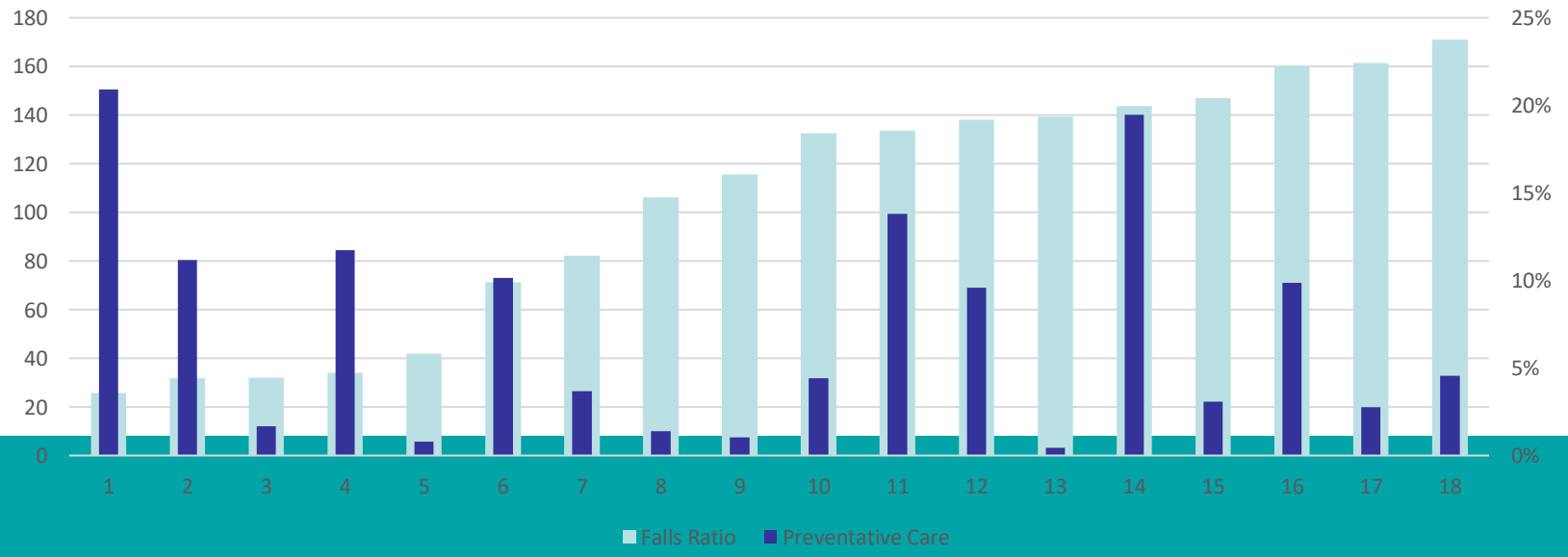
Patients from 1st Sept - 4th April	
Total Invited	131
Average Age	81.6yrs
Percentage Male	40%
Percentage Female	60%

Data from random sample (22 attendees, 2 from each clinic since 12/10/21)	
Average frailty	4.5
Average loneliness score	3.6
Average TUG	16.02secs
Total reported falls across group	6
Meds stopped (total for all pts)	7
F/U arranged after clinic	63%
Average HCP appts pre-clinic (3mths)	1.4
Average HCP appts post-clinic (up to 3 mths)	0.8
Emergency care episodes pre-clinic (3mths)	0.28
Emergency care episodes post-clinic (3mths)	0.09

	Patients from one sample clinic (Nov 21)
Total attended	8
Average Age	80.3yrs
Percentage Male	25%
Percentage Female	75%
Average frailty score (Rockwood CFS)	4
Total reported falls across group	1
Average loneliness score	No Data
Average TUG	No Data
Meds stopped (total for all pts)	0
F/U arranged after clinic	50%
Average HCP appts pre-clinic (3mths)	0.9
Average HCP appts post-clinic (up to 3 mths)	0.3
Emergency care episodes pre-clinic (3mths)	0.06
Emergency care episodes post-clinic (3mths)	0

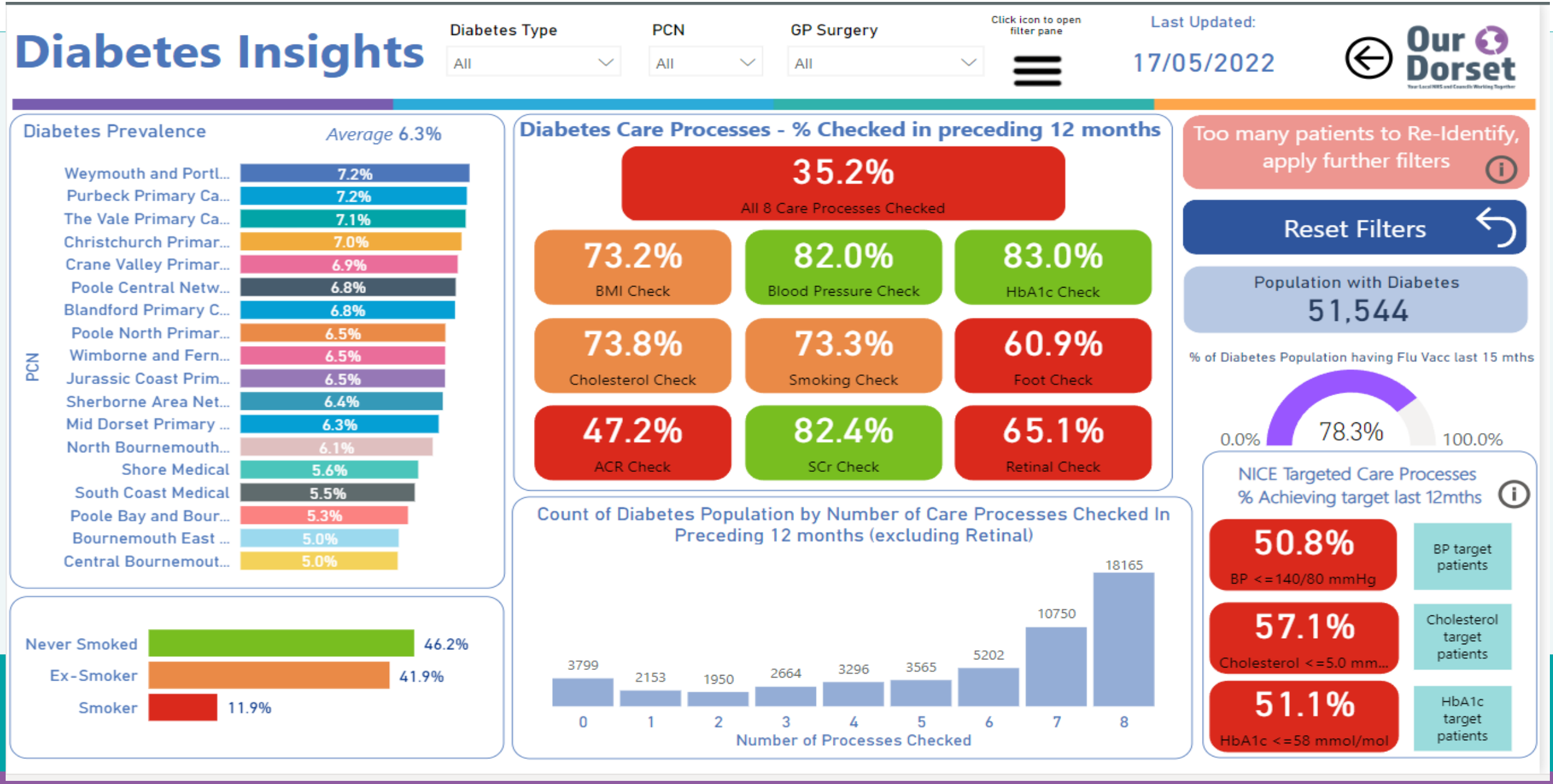
- Across whole 65+ population we identified that 1.5% of individuals have had any falls prevention activities in the past twelve months.
- In the current high risk group this is 8.1%, compared with 0.9% in the lower risk strata which is reassuring.
- Is this enough/fully representative of all care activities?

One PCN had an expected number of emergency admissions for/with a fall to be 274.
Their actual number of events was 71 – this gave them the lowest rate across Dorset.
They also happened to be the PCN that had the highest proportion of high risk patients who had received some form of preventative care in the past 12 months (21%).



Our Dorset
Your Local NHS and Councils Working Together

Diabetes: Dorset Insights

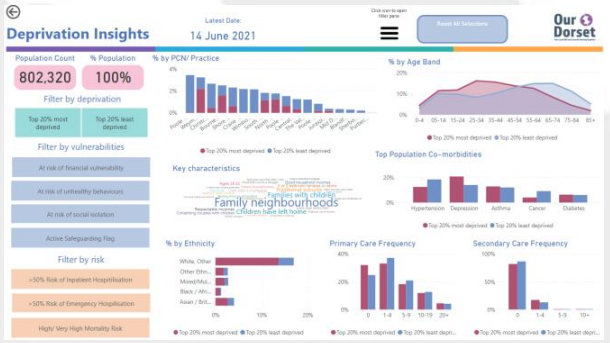


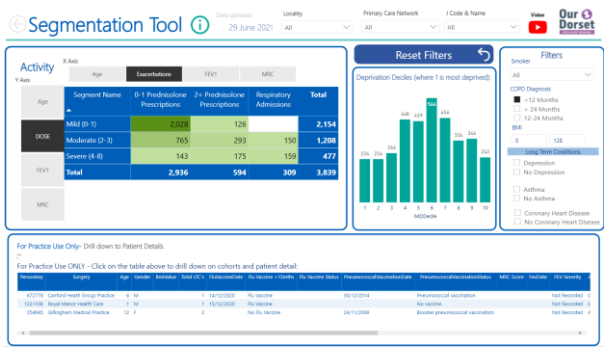
Linked data supports a risk stratified approach to COPD

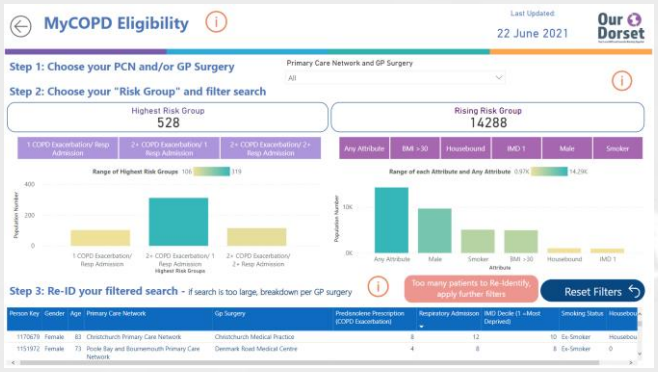
Population Health Needs Assessment and understanding of burden of Disease

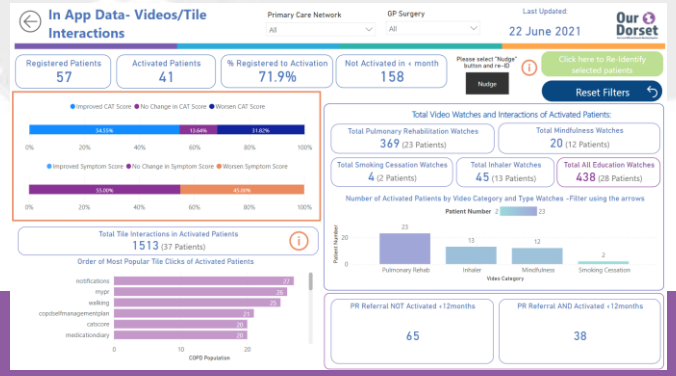
Identify rising risk and stratify/segment into risk categories

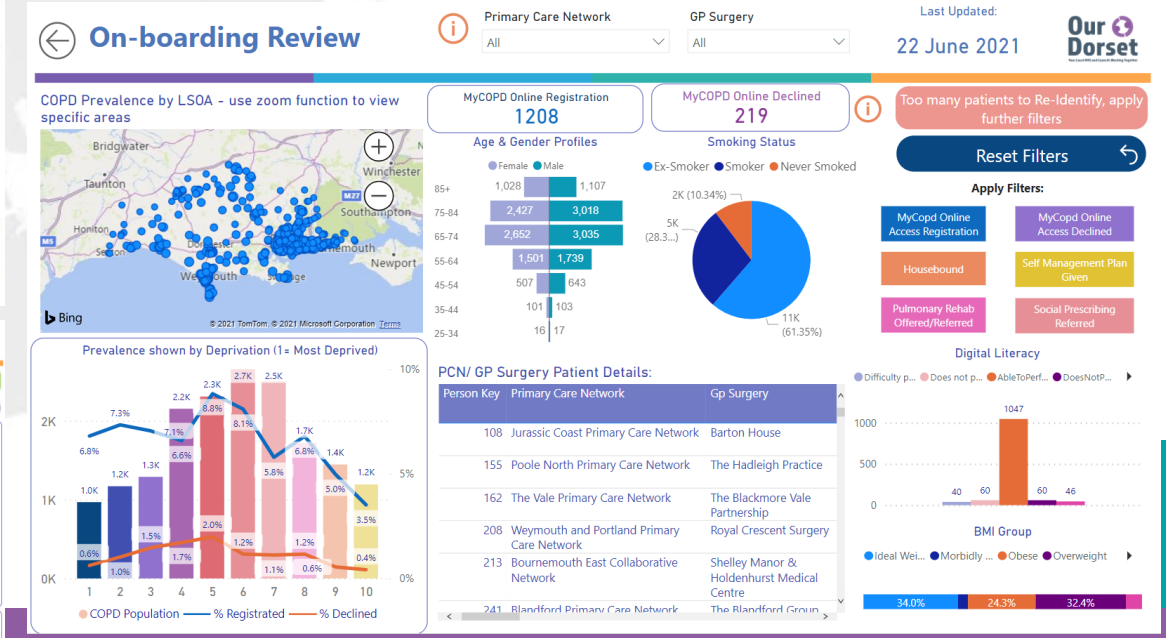
- High Risk – co design pathway with acute physician
- Medium risk – pulmonary rehab
- Low Risk - Referral to digital self management app (MyCOPD)









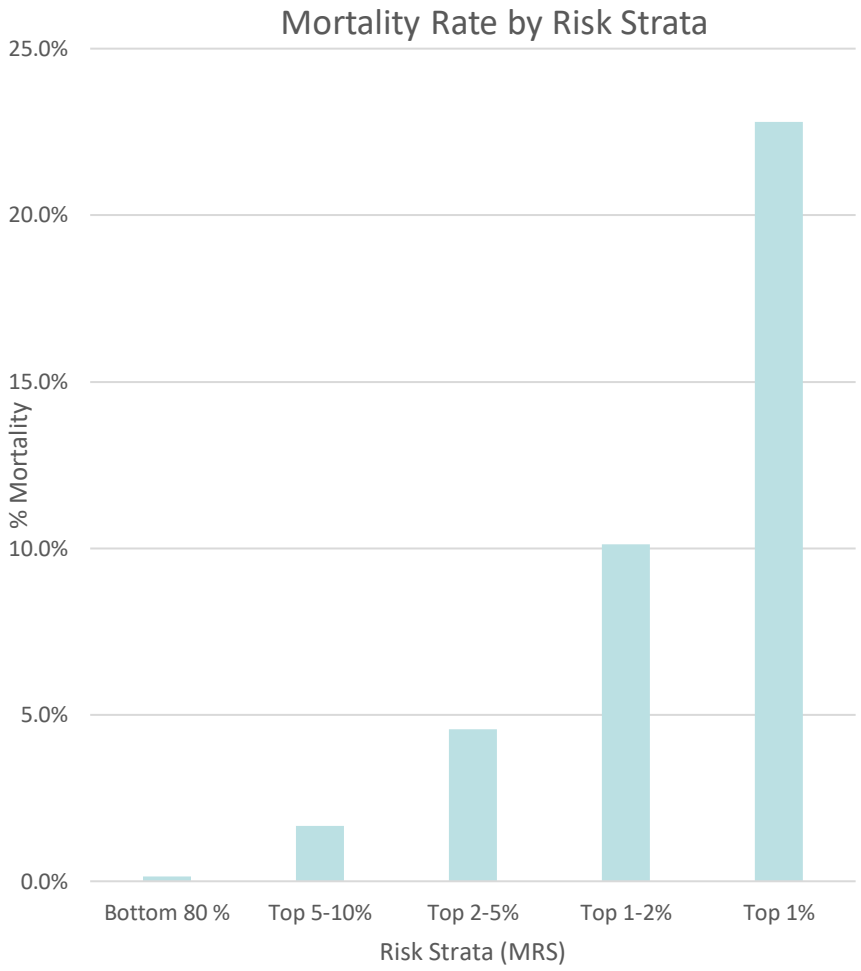


Digital Solutions – COPD
A PHM approach enables us to risk stratify our COPD population

Very severe FEV1 < 30% / MRC 4-5	67 PATIENTS	14 PATIENTS	10 PATIENTS
Severe FEV1 30-50% / MRC 3	58 PATIENTS	20 PATIENTS	4 PATIENTS
Mild/moderate FEV1 > 50% / MRC 1-2	288 PATIENTS	20 PATIENTS	4 PATIENTS
	<2 AECOPD /year	≥ 2 AECOPD /year	≥ 1 COPD admission/yr

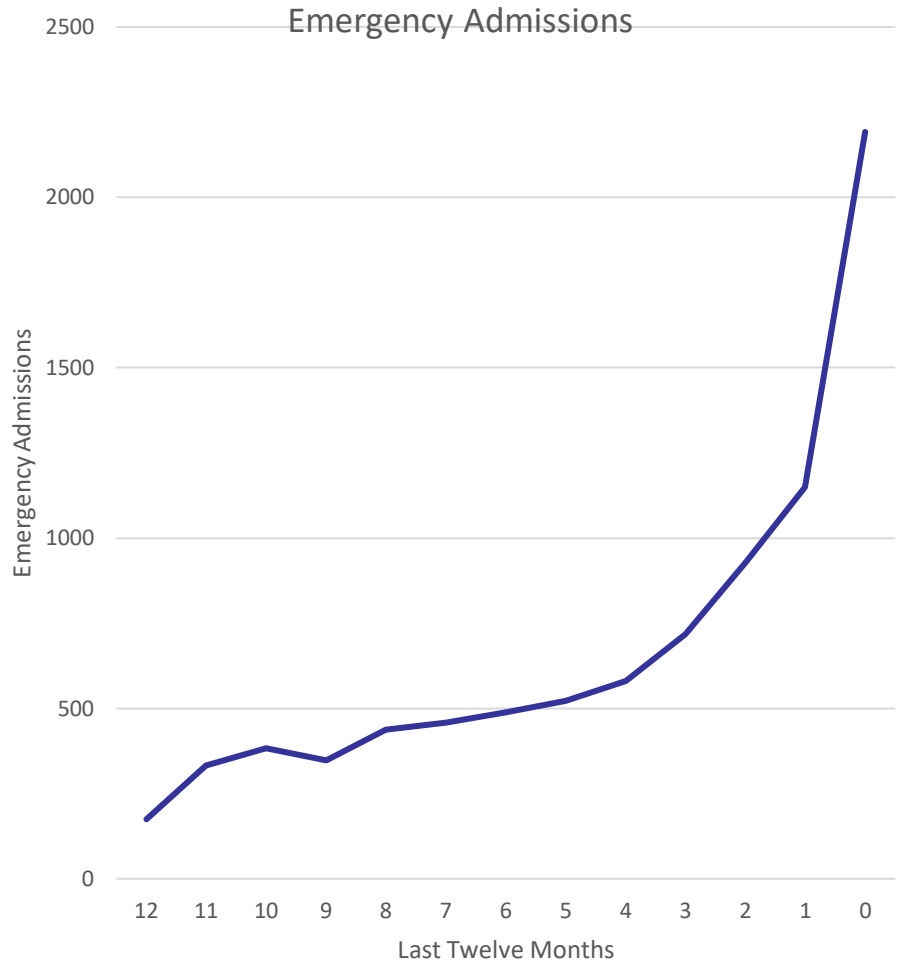
**AECOPD = prescription for amoxycillin/ doxycycline/clarithromycin with or without prednisolone course

Low risk	Medium risk	High risk
Practice nurse follow up Education programme (HCA supported) MyCOPD App Peer support	Specialist nurse follow up Rapid access admission prevention Pulmonary rehab/ MyCOPD Advanced care plans	Specialist nurse follow up Rapid access admission prevention/ telehealth Carousel clinic (holistic review) Pulmonary rehab/ MyCOPD Oxygen reviews Palliative care & advanced care plans



Using mortality risk algorithm to predict EoL needs

- **Sollis Clarity calculates mortality risk scores that predict mortality in the next twelve months**
- **We scored every resident of Dorset in March 2021 and stratified people into different groups, given their risk score**
- **We then evaluated how many people within each group actually died in the next twelve months (Mar'21 – Mar'22)**
- **We can clearly see an association between the risk scores and observed outcomes**
- **This would suggest the model has good utility to be used in practice**

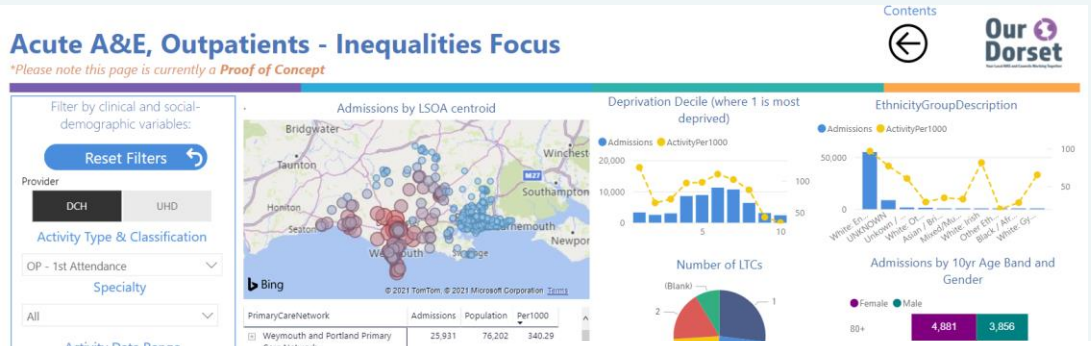


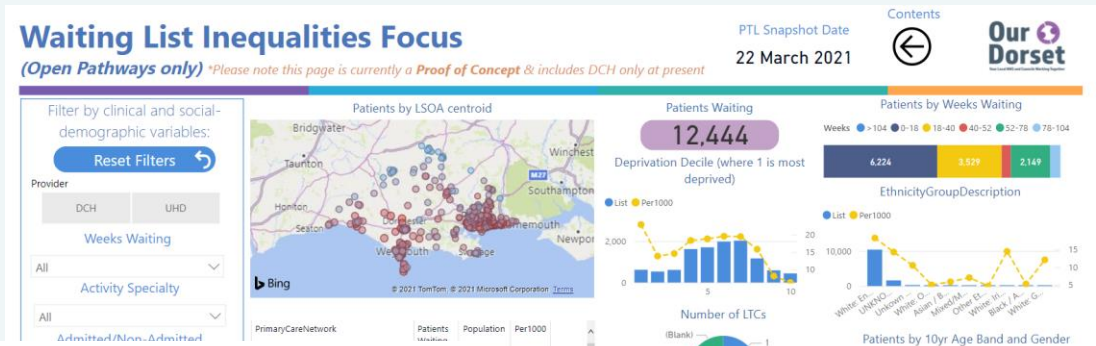
- **There are 71,550 residents who were identified as the top 5% risk**
- **Of these 7,129 actually died**
- **We can see on the left what happened to those individuals in their last twelve months of life**
- **More than £14m acute care cost in the last three months alone**
- **More than 43K inpatient bed days in the last three months**
- **This follows a similar pattern when we review A&E attendances**
- **It is believed that much of this activity is unnecessary and modifiable**

What happens to people in the last 12 months of life and how much is modifiable?

Our Dorset
Your Local NHS and Councils Working Together

How DiiS supports the inequalities agenda





Cancer and Inequalities

*Cancer patients with a recorded Treatment Start Date on SCR only

Latest Date:
15 June 2021

PrimaryCareNetwork, GpSurgeryName
All

Our Dorset

Filter by clinical and social-demographic variables:

Reset Filters

Treatment Start Date Range
2019/20

Acute Care Provider
DCH
PHT
RBH

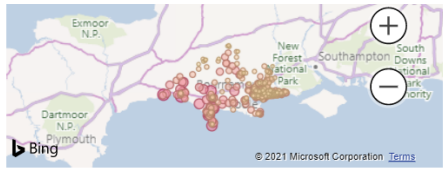
Emergency Presentation?
No (Other)
Yes

BMI >30
Top 20% least deprived
Smoker
Top 20% most deprived
LD/SMI
Communi... Minorities
At risk of social isolation
At risk of unhealthy behaviours

Those who have a Cancer Treatment Start Date
3,036

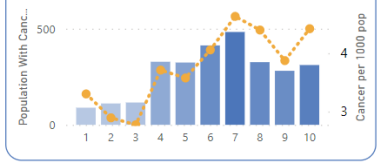
Prevalence per 1000
3.79

Those with Cancer Treatment Start Date by LSOA

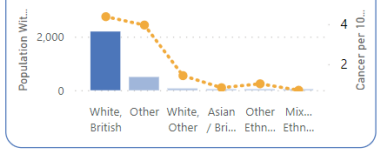


PrimaryCareNetwork	Cancer	Population	per1000
Blandford Primary Care Network	109	24,242	4.50
Bournemouth East Collaborative Network	93	52,239	1.78
Central Bournemouth Primary Care Network	94	48,489	1.94
Christchurch Primary Care Network	176	48,578	3.62
Crane Valley Primary Care Network	102	32,448	3.14
Jurassic Coast Primary Care Network	315	38,746	8.13
Mid Dorset Primary Care	325	44,931	7.23
Total	**3,036**	**801,881**	**3.79**

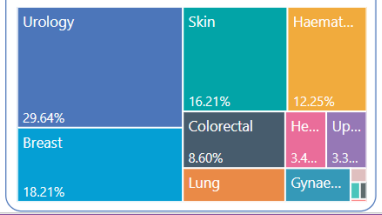
Deprivation deciles (where 1 is most deprived):



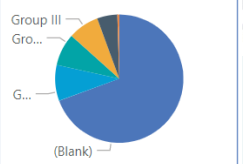
Ethnicity



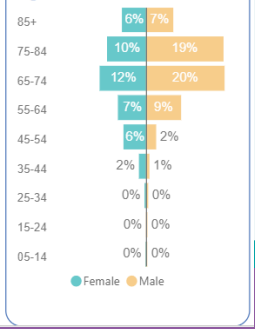
Diagnosed Cancer Site



Staging Group (Final)



Age Profile



The NHS Data & Information Conference 2022

UP NEXT...

Piota

The NHS Data & Information Conference 2022

SPEAKING NOW

Chris Elkin

Head of Healthcare
Piota Healthcare Apps

I will be discussing…

"Case Study - Piota Healthcare Apps"

COMFORT BREAK

The NHS Data & Information Conference 2022

SPEAKING NOW

Daniel Hallen

Head of Digital Technology & Digital Urgent & Emergency Care
NHS England and Improvement - North West

I will be discussing…

"Data, To Me, To You"

Data, To Me, To You

Data security in the NHS and the value of our data.

Daniel Hallen

Pronouns: he/him

Head of Digital Technology & Digital Urgent & Emergency Care, NHSE NW

The “What”

Processing Data

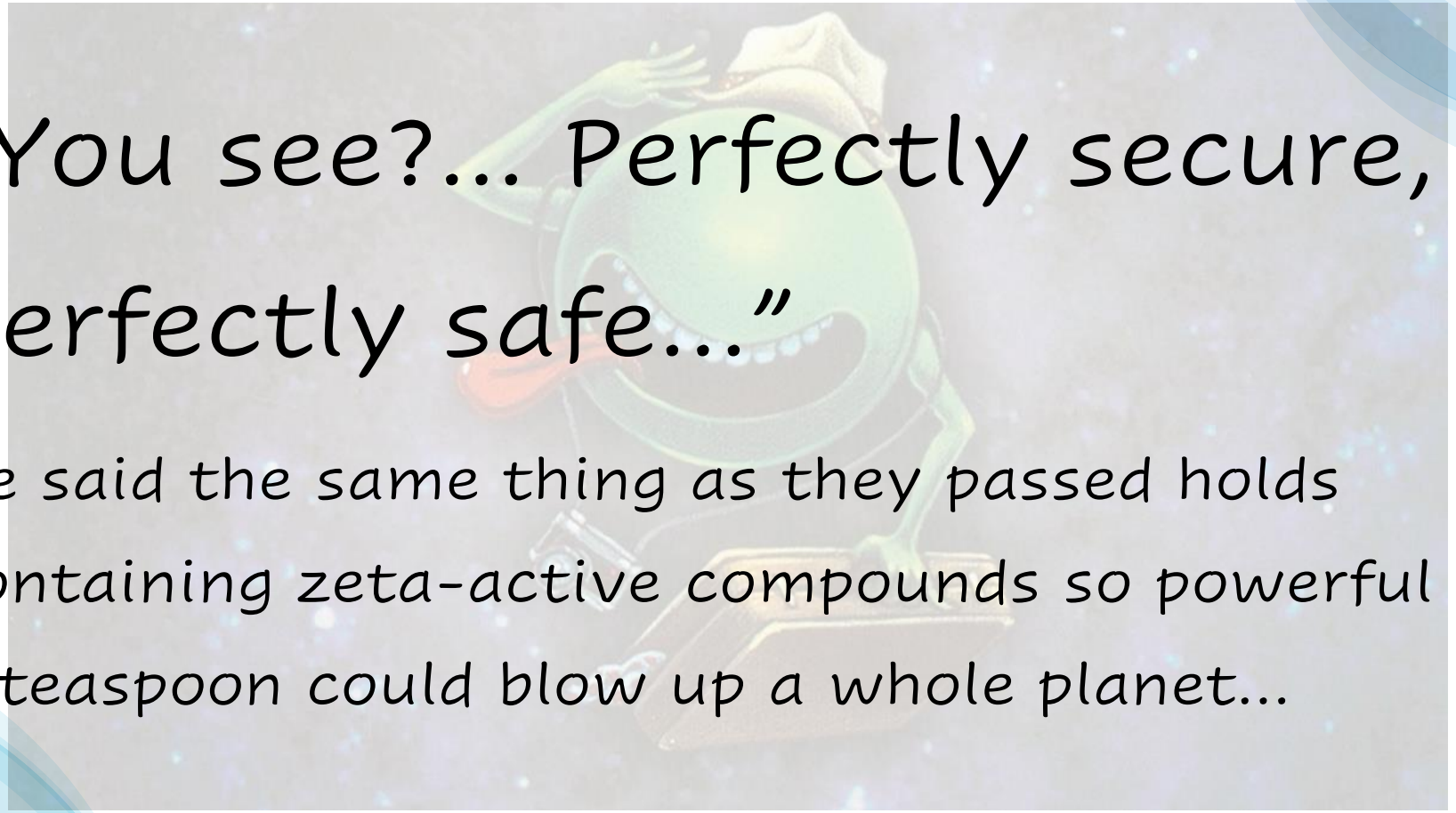
securely,

by means of appropriate technical

and organisational

measures

Data, To Me, To You



"You see?... Perfectly secure, perfectly safe..."

He said the same thing as they passed holds containing zeta-active compounds so powerful that a teaspoon could blow up a whole planet...

Data, To Me, T

Social Burglaries

Posting on social media when you go away could result in burglary

750,000+

Brits reveal their holiday plans in public social media posts in 30 days

Over 760,000 people 'checked in' on Facebook at UK airport locations in 30 days in June/July 2017

663,462 public posts on Twitter mentioned being at a UK airport

Nearly 68,000 instagram posts were tagged with a UK airport location

The top 10 UK airports for Brits 'checking-in' on Facebook in 30 days*

*30 days (mid June to mid July 2017)

1. Heathrow
2. Gatwick
3. Stansted
4. Birmingham
5. Luton
6. Glasgow
7. Edinburgh
8. Newcastle
9. Bristol
10. East Midlands

What do people share?

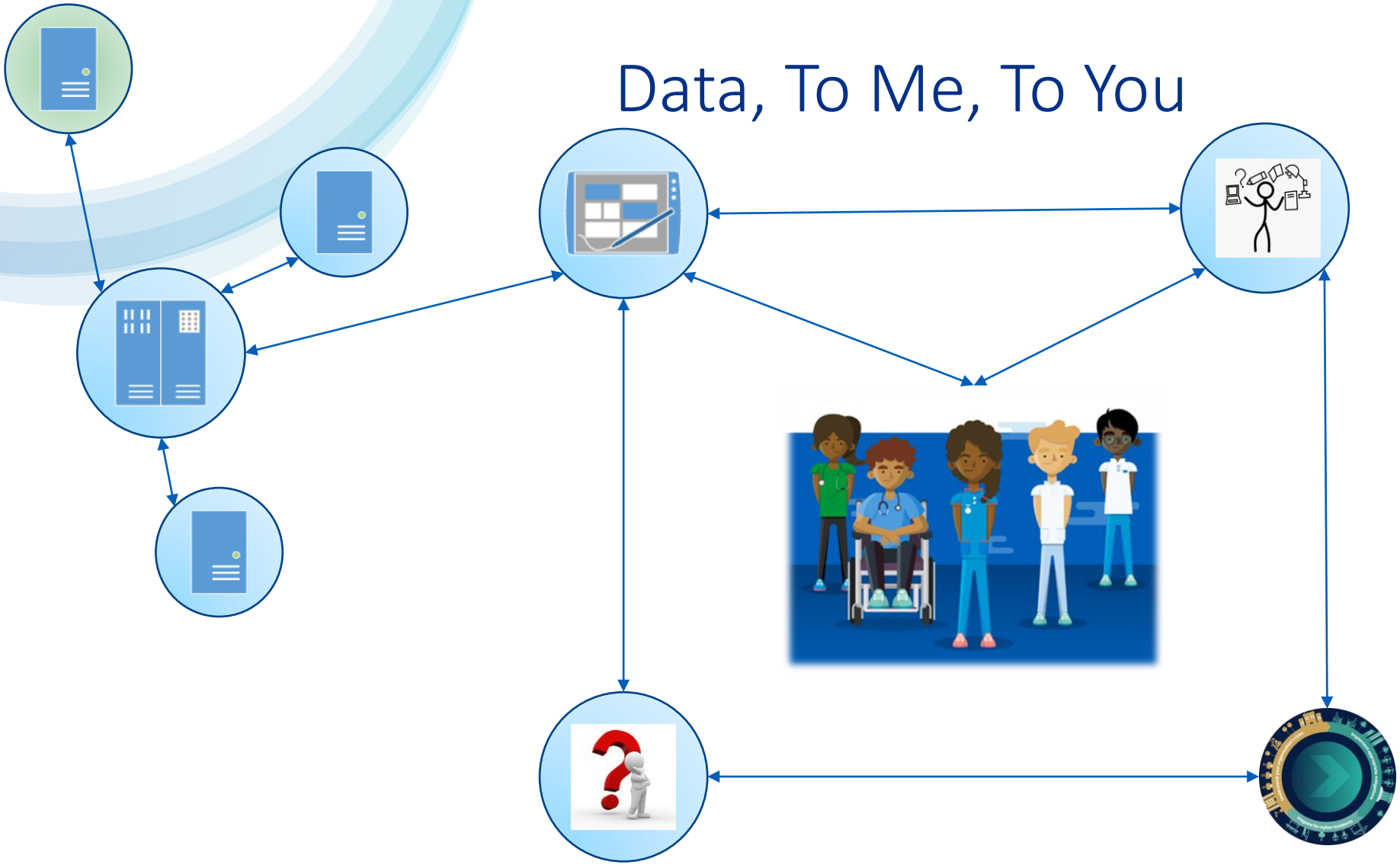
- 44% photos of each other
- 28% boarding, runway, planes
- 16% alcohol
- 8% passports
- 6% food
- 5% boarding passes

70

Data, To Me, To You

Data, To Me, To You

Data, To Me, To You



Data, To Me, To You

Data, To Me, To You

Thank You

Twitter @DanielJHallen
LinkedIn: danieljhallen

The NHS Data & Information Conference 2022

UP NEXT...

The NHS Data & Information Conference 2022

SPEAKING NOW

Teo Redondo

CTO & Head of Research & Development
LIBNOVA

David Giaretta

CEO
Giaretta Associates

We will discuss…

”Healthcare Data Management: Digital Preservation of Medical Records”

The NHS Data & Information Conference 2022

SPEAKING NOW

Jon Coolican

Head of Data Controls & Governance - NHS Arden & GEM CSU

Diane Clark

Senior Business Analyst - NHS Arden & GEM CSU

We will discuss…

”Linking Health and Social Care Data to Improve Services”

NHS
Arden and
Greater East Midlands
Commissioning Support Unit

Linking health and social care data to improve services

Jon Coolican and Diane Clark
NHS Arden & GEM CSU

HTN Digital Social Care & Mental Health
#HTNNow

www.ardengemcsu.nhs.uk/asccld

Arden&GEM
Health and social care systems support

Session overview

- The data landscape
- North West pilot
- A national programme
- Benefits
- Lessons learned
- What next
- Questions

NHS
Arden and
Greater East Midlands
Commissioning Support Unit

Arden&GEM
Health and social care systems support

About NHS Arden & GEM CSU

NHS Arden and Greater East Midlands Commissioning Support Unit

OUR CUSTOMERS

90+

Working with a customer base of 90+ organisations across health and care systems

- NHSE
- ICSs
- ICBs
- Trusts
- Primary Care
- Local Authorities

OUR BUSINESS

£95m
Turnover 2021/22

£34m
Generated in new business 2021/22

OUR PEOPLE

1,000+
Multidisciplinary staff

2021/22 HIGHLIGHTS

2 National award wins (and 4 shortlistings) in 2021/22

Providing IT support to over 40,000 users

National health inequality programme launched

Supporting COVID-19 recovery:
- Backlogs
- Capacity
- Front line

Helping systems to prepare:
- Transformation
- OD
- PMO

OUR ACCREDITATIONS

INVESTORS IN PEOPLE™ We invest in people Silver

INVESTORS IN PEOPLE® We invest in wellbeing Gold

ISO 9001 ISOQAR REGISTERED UKAS MANAGEMENT SYSTEMS 0026

ISO 14001 ISOQAR REGISTERED UKAS MANAGEMENT SYSTEMS 0026

CYBER ESSENTIALS CERTIFIED PLUS

Background and data landscape

- **PCTs** (pre-2012) – linking data across health and social care took place but was inconsistent and uncontrolled
- **Health and Social Care Act 2012**
  - Set out NHS Digital's (NHSD) responsibilities including the collection, analysis and presentation of national health and social care data
  - NHSD also have the powers to act as a safe haven and collect, hold and process personal confidential data (PCD) for purposes beyond direct patient care e.g. commissioning, planning, population health management
- **The DSfC programme** established a number of regional processing centres, known as **Data Services for Commissioners Regional Offices (DSCROs)** – these regional offices support the information needs of commissioners with the provision of appropriate data controls
- DSCROs are part of, and responsible to NHSD
- DSCROs perform their services with staff from Commissioning Support Units (CSUs) who are seconded into NHSD and work with data in the regional processing centres (RPCs)

Note: *Upcoming merger of NHSD into NHSE, though we expect a DSCRO-type function to remain*

Background and data landscape

Practically, what does a DSCRO do?

- Manages data warehouses, databases and huge numbers of datasets from across the health system
- Keeps data secure, restricting access to authorised users only
- Works at scale across large geographical regions and with multiple organisations.

DSCROs typically receive **1000s of national and local data flows** each month through a variety of routes:

- Database to database transfers
- sFTP
- Secure email
- DLP (Data Landing Portal)

Data flows are both **manual and automated** with various levels of **standardisation**

Datasets can include a **few or 1000s of columns** of data and **10s to 100s of millions of rows**

Manages patient identifiers

Date of birth → Age
Postcode → LSOA
NHS number → pseudonym
Derive other data fields where appropriate

Only allow data to be released using **authorised means, to authorised users,** in an allowed format

Data is typically released **'pseudonymised'**

Anonymised in line with the ICO Anonymisation Code of Practice
Personal non-confidential data

Data typically released via the DCSRO's **CSU Data Management or Business Intelligence Services**

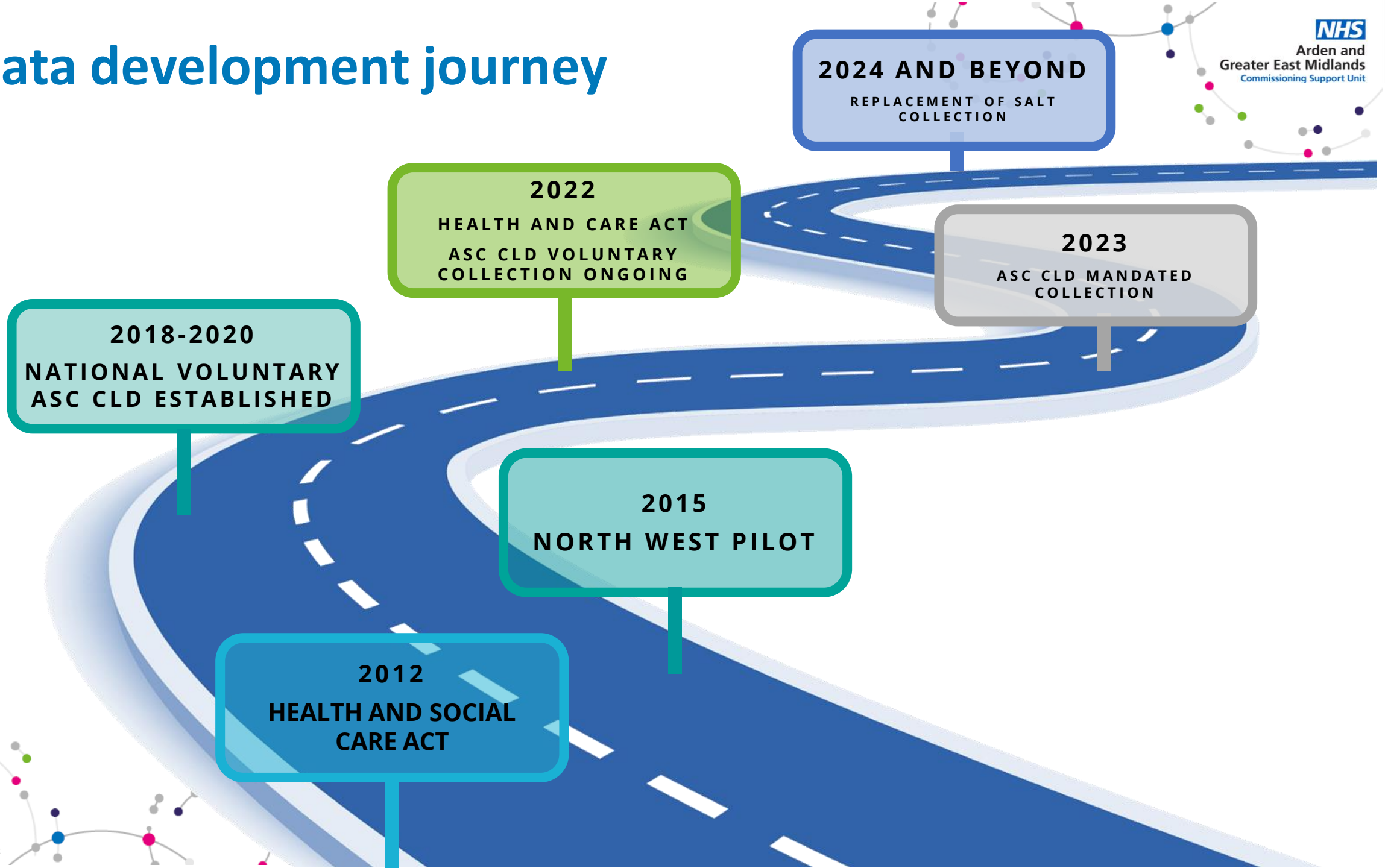
Benefits of using a DSCRO

- **Expertise** in managing all aspects of datasets
- Positioned to **operate at scale** and manage multiple datasets
- **Subject matter experts** who can advise on national datasets, and understand local variations and nuances
- Already hold health data, so social care data (with NHS number) can be **consistently pseudonymised** to allow linkage

NHS Arden and Greater East Midlands Commissioning Support Unit

Arden&GEM Health and social care systems support

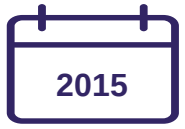
The data development journey



NHS
Arden and Greater East Midlands
Commissioning Support Unit

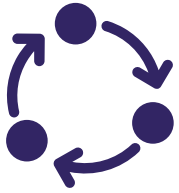
Arden&GEM
Health and social care systems support

North West pilot



Pilot work between the Department of Health and Social Care (DHSC) and NW DSCRO was first proposed in 2015

Main aim was to link health and social care data



Group established with 3 Clinical Commissioning Groups (CCGs) and Local Authorities (LAs)

MANCHESTER CITY COUNCIL

Liverpool City Council

ROCHDALE BOROUGH COUNCIL

Health/CCGs were the initial driving force

NHS Arden and Greater East Midlands Commissioning Support Unit

Arden&GEM Health and social care systems support

North West pilot – challenges

Governance

- Legal basis
- Purpose
- Organisations involved: LAs, CCGs, DHSC, NHSD/DSCRO, CSU
- Agreements needed:
  - ✓ Patient opt-outs?
  - ✓ Data Sharing Agreements?
  - ✓ Data Processing Agreements?
  - ✓ Privacy Notices?
  - ✓ Directions?
  - ✓ Data Provision notice (DPN)?

Data quality

- Recognition of data quality (DQ) issues:
  - ✓ Incomplete
  - ✓ Inconsistent
  - ✓ Out of date
  - ✓ Inaccurate
- Data was for pilot purposes only, not for making decisions based on it
- Sharing the data gave us the opportunity to start to address DQ issues

North West pilot

NHS
Arden and
Greater East Midlands
Commissioning Support Unit

OVERCOMING CHALLENGES

Governance was slow to work through

- Directions were drafted
- Data Provision Notices (DPNs) were needed

Some LAs had problems creating extract

- System and its local configuration has an influence on process

Data submission to DSCRO via DLP (Data Landing Portal) was preferred route

- Enables validation as part of submission

NHS number completion was variable

- Between 50 - 90%

IDENTIFYING BENEFITS

Benefits for CCGs

- Linked health and social care data
- More complete patient pathway

Potential benefits for LAs

- Replacement of SALT return
- Identify missing NHS Numbers
- Linked health and social care data

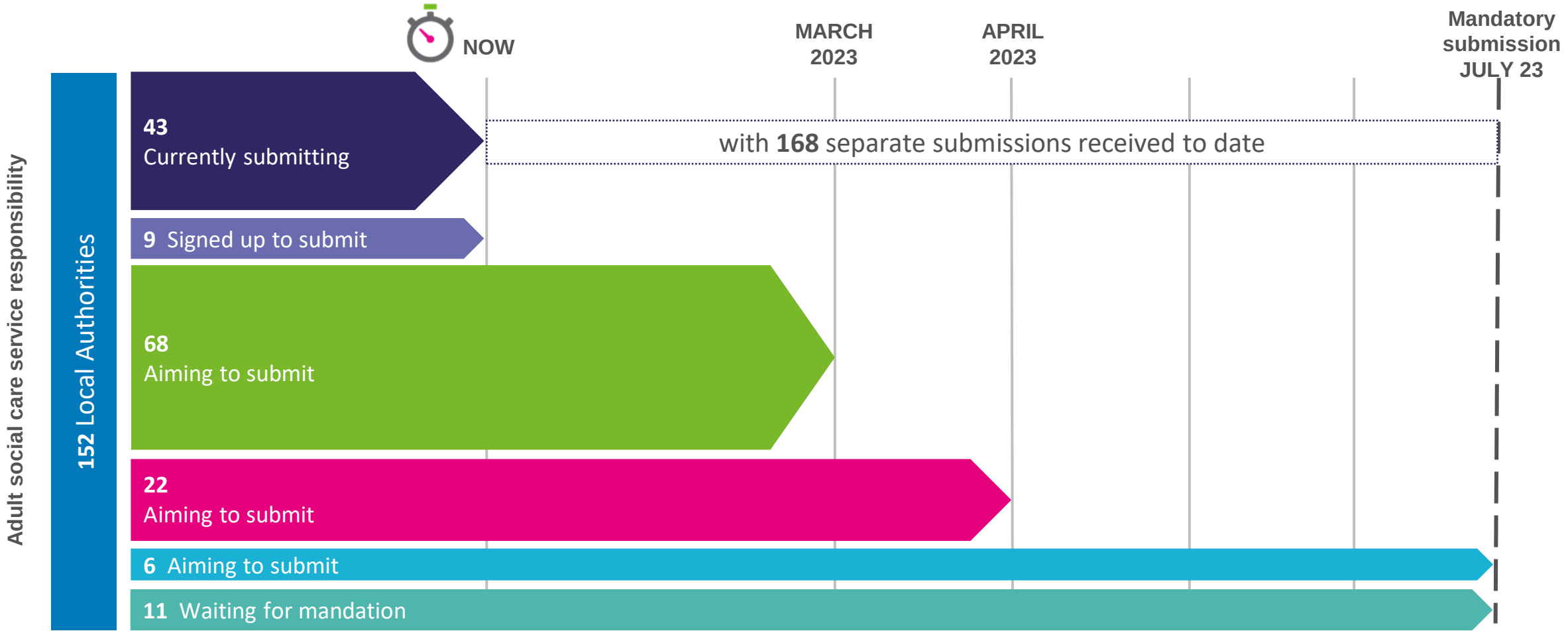
Arden&GEM
Health and social care systems support

A national programme

- The NW Pilot had proved the principle of an Adult Social Care Client Level Data collection
- Started work with DHSC on a national collection
- DHSC/NHSD – new Directions for a national but voluntary collection, Dec 2020
- Arden & GEM – Lead CSU/DSCRO
  - Working with the other DSCROs/CSUs to support all regions of England
  - Missing NHS number tracing
- CCGs and Local Authorities
  - Data submissions
  - Data disseminations and data sharing

A national programme – latest updates

NHS
Arden and Greater East Midlands
Commissioning Support Unit



Over **5000** sessions on the project webpage
www.ardengemcsu.nhs.uk/asccld

32 'buddy' introductions made

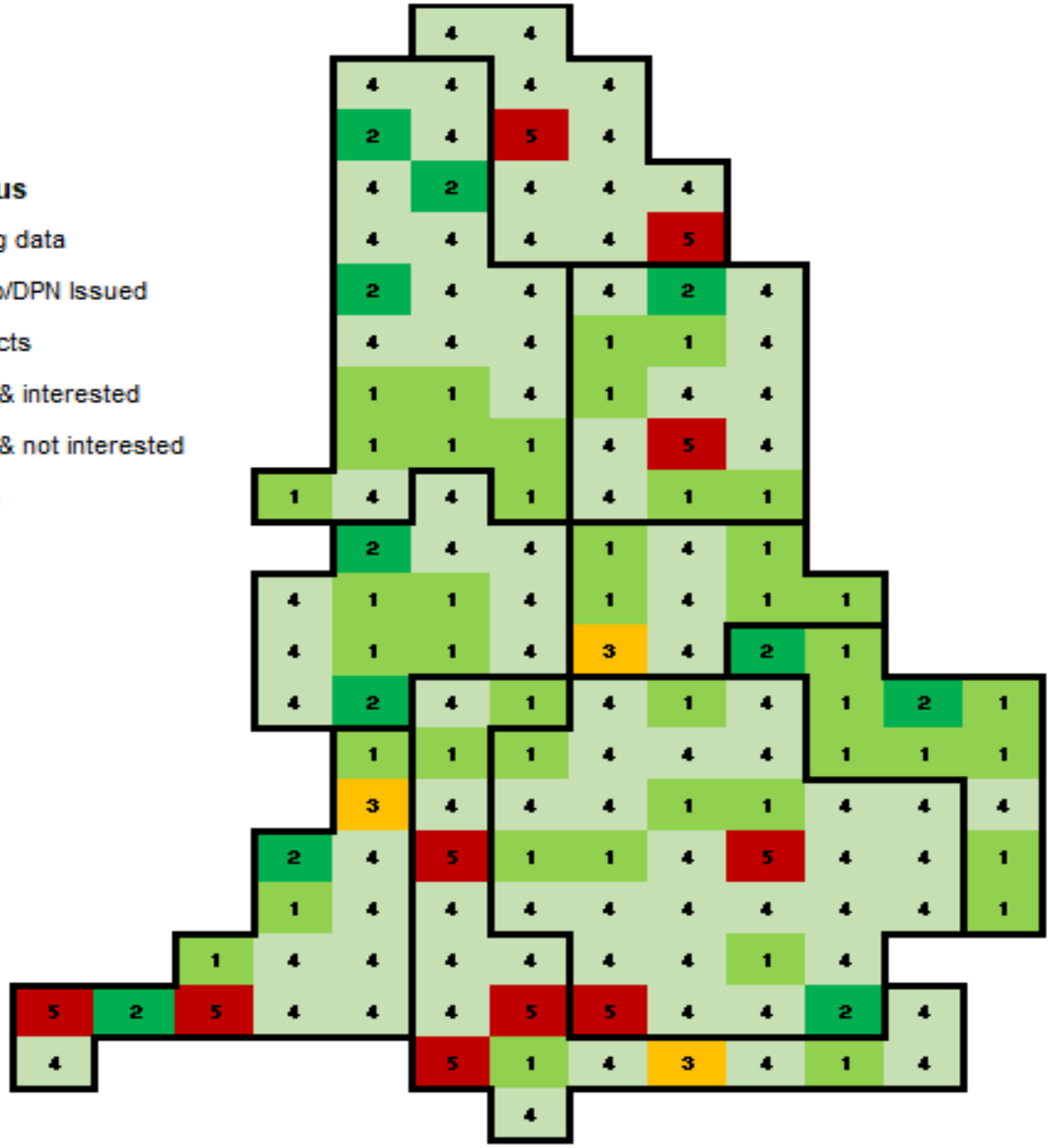
Arden&GEM
Health and social care systems support

A national programme – latest updates

Key:

Regions
LAs

	LAs		CLD Status
	43	29%	1. Submitting data
	11	7%	2. Signed up/DPN Issued
	2	1%	3. No Contacts
	84	56%	4. Engaged & interested
	10	7%	5. Engaged & not interested
	0	0%	6. Unknown



Benefits

Single source of the truth

A dataset that LAs can use to answer day-to-day requests from service areas and commissioners

National and local repositories

Improved data quality, including completeness of the NHS number

Improved communication and understanding

Improved consistency and transparency with central data transformations and standardised terminology

Providing more frequent and timely monitoring of social care activity, cost and outcomes

Linked health and social care data

Whole patient pathway and journey

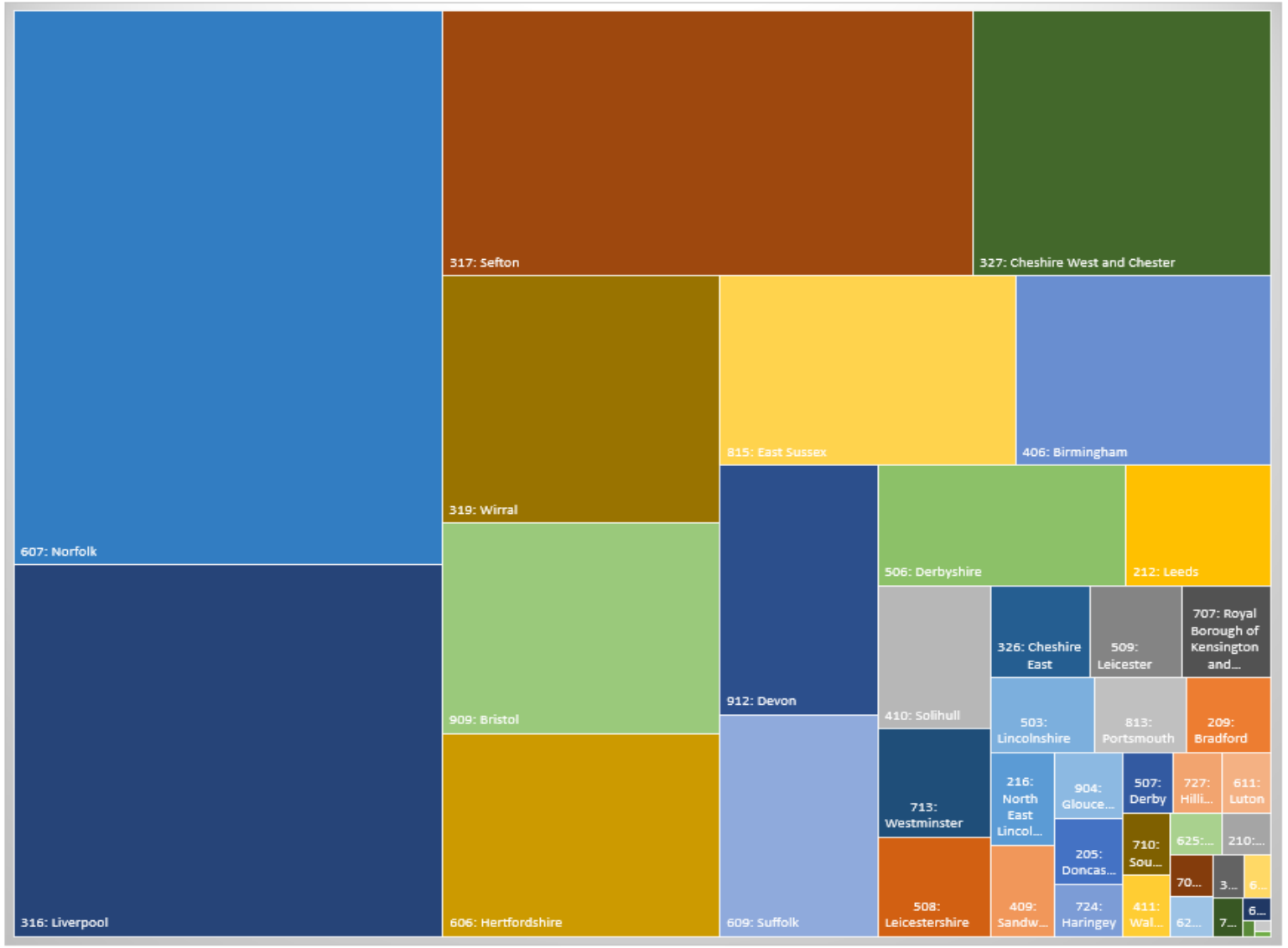
Seeing impact of health on social care and vice versa

Identifying where there are blockers in care pathway

Benefits – Data quality

NHS
Arden and Greater East Midlands
Commissioning Support Unit

Record Counts by Local Authority



Arden&GEM
Health and social care systems support

Benefits – Data quality

Arden and Greater East Midlands Commissioning Support Unit

Validity and Completeness Checks

Validity Check - data items with a defined list of values

	Valid %	Invalid %	Blank %
Overall scores	78%	8%	14%

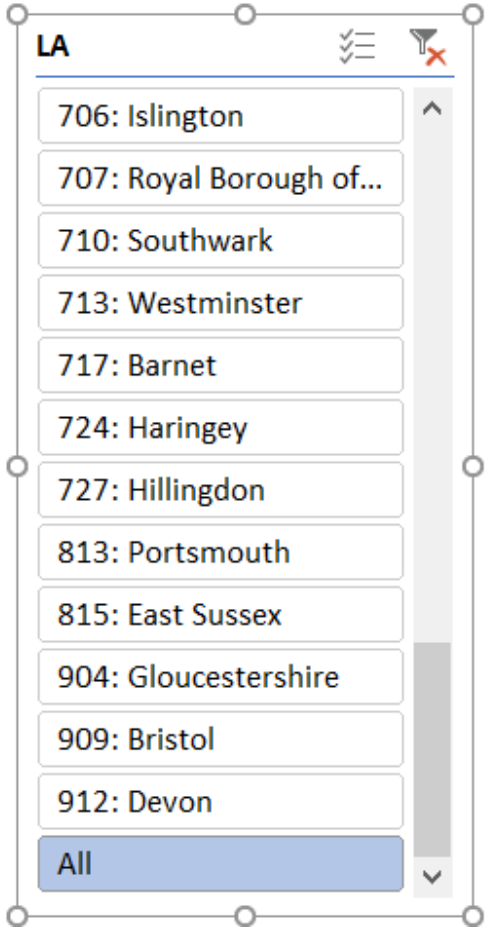
Data Item Name	**Valid %**	**Invalid %**	**Blank %**
Accommodation Status	61%	14%	25%
Assessment Type	75%	0%	25%
Autism Spectrum Disorder (ASD)	90%	0%	10%
Cost Frequency (Unit Type)	74%	6%	20%
Delivery Mechanism (Long Term Community or Prison Only)	67%	28%	5%

Completeness Check - data items without a defined list of values

	Complete %
Overall Completeness score	74%

Data Item Name	**Complete %**
GP Practice Code	35%
GP Practice Name	75%
LA Code	100%
Planned units per week	100%
Provider CQC ID	25%

Select Local Authority or All for all Local Authorities submitting:



Arden&GEM
Health and social care systems support

Case study – Liverpool

Liverpool City Council

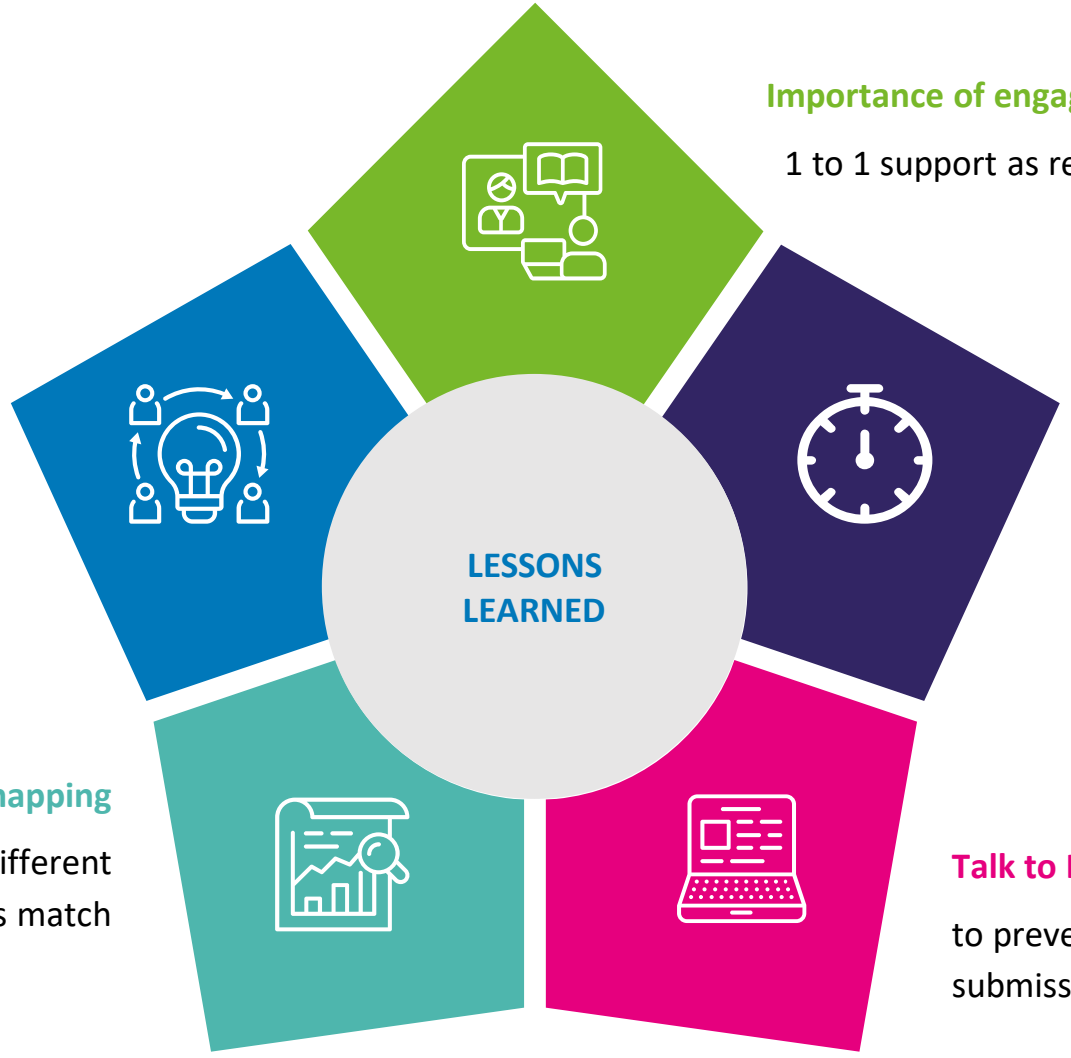
Liverpool was the first LA to formally signed up to CLD and began submitting data into the DLP in May 2021, with subsequent monthly uploads scheduled. The development was front-loaded to set up and configure, but now CLD supports business as usual reporting and requires 30 minutes per month to run

The CLD data set is very adaptable and fits well with the rapidly developing nature of social care without disrupting local process. Its modular nature lends itself to being able to explore innovative approaches to data collection and analysis. Liverpool is currently using Power BI, but we did also experiment with SSRS, Tableau and Business Objects (WEBI).

The long term benefits of this data resource cannot be understated. We have positioned the CLD to be the building blocks of all data and intelligence requirements for the LA.

We can never forget that all data collected and shared must be for the benefit of the service user. It should be core to the principles of any data sharing project that the service users are the central and loudest voices, after all who is better placed in the whole system.

Lessons learned



Importance of engagement with LAs

1 to 1 support as required to address issues and concerns

Reference group supported establishment of collection

representatives across regions and systems

Flexibility in submissions and submission deadlines

- be mindful of the local pressures LAs are operating under
- focus on fixing DQ at source, not after submission

Importance of data mapping

data descriptors within different organisations don't always match

Talk to IT departments

to prevent commons issues e.g. firewall blocking submission, validation tool macros disabled

A national programme – next steps

NHS
Arden and
Greater East Midlands
Commissioning Support Unit

DHSC/NHSD – new Directions for a national *mandated* collection

- Starting April 2023
- Updated specification and guidance in response to feedback
- Dataset to be a new data standard

Mandated submissions for all councils

- Minimum quarterly
- More frequent submissions
- Support with automation of submissions to reduce burden

Arden & GEM – Lead working with all other DSCROs/CSUs

- Improved DQ reporting
- More frequent submissions e.g. monthly, in line with health and requirements following Covid

Integrated Care Boards (ICBs) and Local Authorities

- Closer working across health and social care as part of ICB formation
- Linked data to be shared with ICBs and LAs and other ICS partners

Arden&GEM
Health and social care systems support

What next – longer term?

- Enhanced data derivations returned to local authorities
- Extraction direct from systems
- Central collection by NHSD

Any questions?

Get in touch with us at:

www.ardengemcsu.nhs.uk/asccld

@ardengem

contact.ardengem@nhs.net

Arden&GEM
Health and social care systems support

The NHS Data & Information Conference 2022

SPEAKING NOW

Jonathan Bridges

CIO

Exponential-e

Afshin Attari

Director of Public Sector & Unified Platforms - Exponential-e

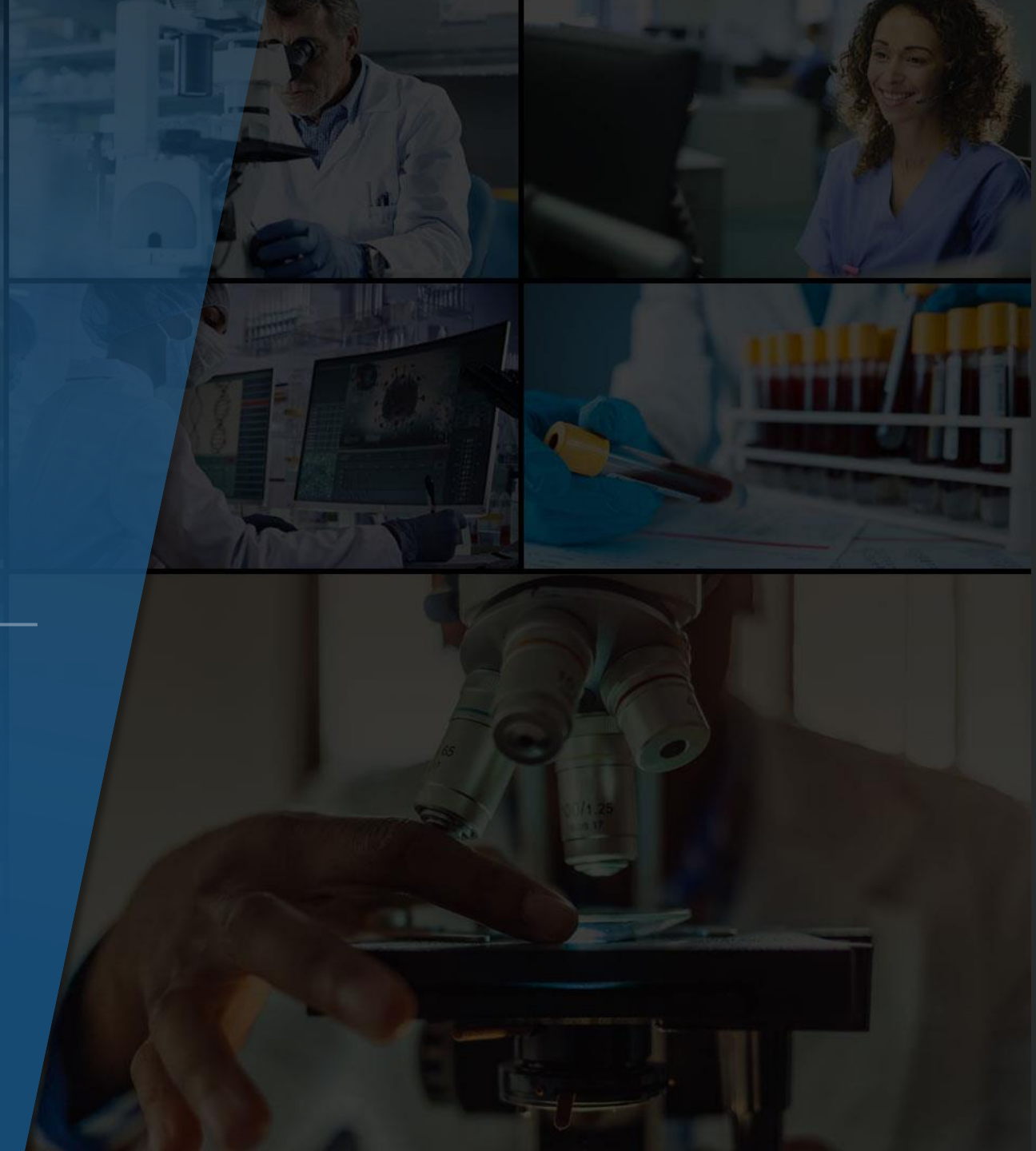
We will discuss…

”Case Study - Exponential-e”

exponential-e
APPLIED INNOVATION

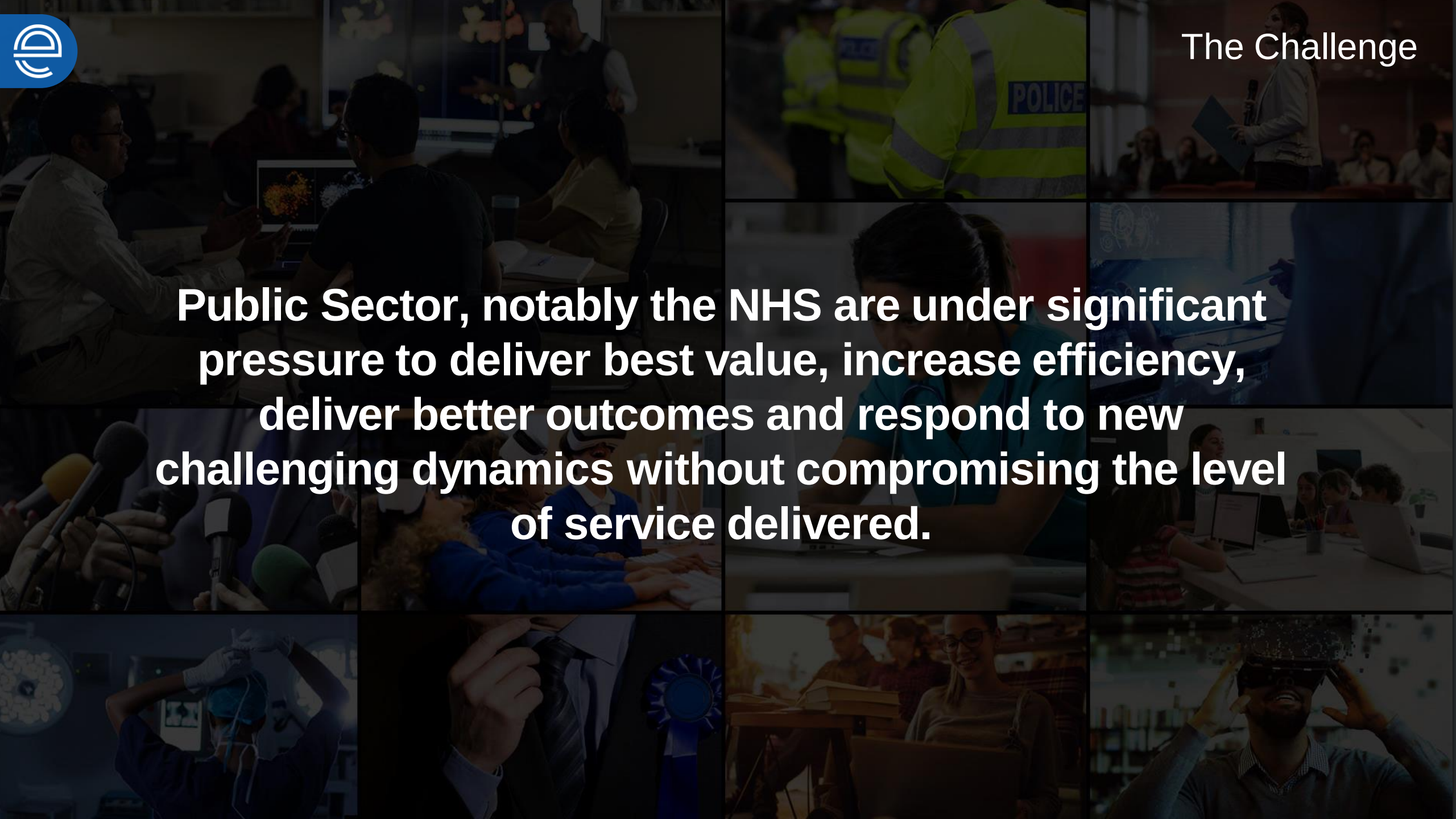
Supporting the NHS in Response to change

The Digital Transformation Opportunity

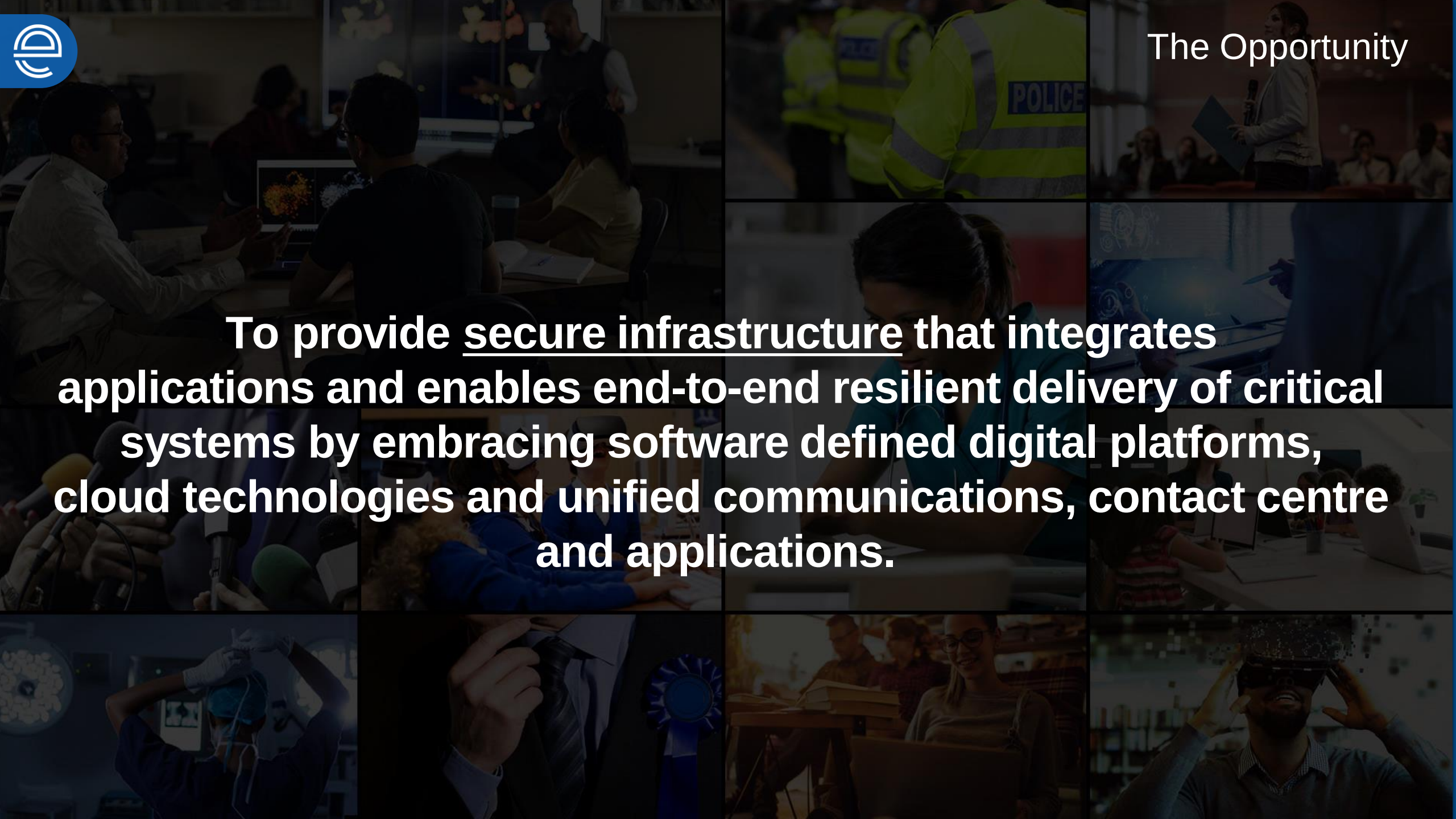


Afshin Attari
Director of Public Sector & Unified Platforms

Jonathan Bridges
Chief Innovation Officer



Public Sector, notably the NHS are under significant pressure to deliver best value, increase efficiency, deliver better outcomes and respond to new challenging dynamics without compromising the level of service delivered.



To provide secure infrastructure that integrates applications and enables end-to-end resilient delivery of critical systems by embracing software defined digital platforms, cloud technologies and unified communications, contact centre and applications.

Agile Blue Print

Empower
your employees

Engage
Citizens

Deliver operational
outcomes

Accelerate innovation
& support change

AUTHORITY

AGILITY	FLEXIBILITY	PERFORMANCE	FUTURE-PROOF

UCC & Applications

Hybrid Cloud

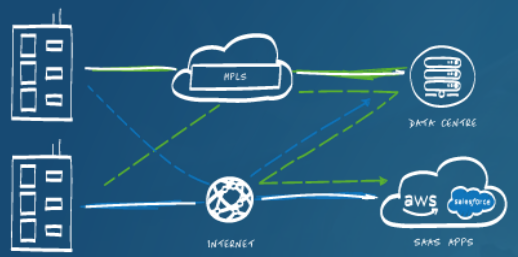
SaaS Apps

App Re: Design

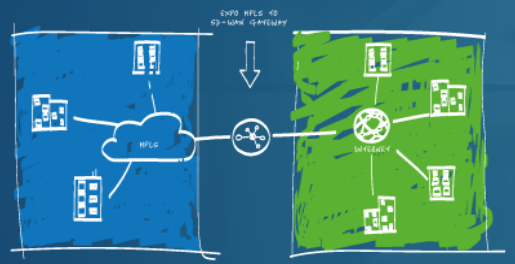
Telemedicine

Exponential-e Ltd is delivering a robust and innovative solution to allow NHS users access to telemedicine systems via a secure encrypted platform. This service, meeting all standards of Health and Social Care Network (HSCN) connectivity, will allow healthcare practitioners covering 133 locations within HM Prisons, Young Offender Institutes, Secure Children Homes and Immigration Removal Centres to reduce offsite and outside visits to less secure locations and provide assessment at the point of patient.

INTERNET OFFLOAD & INTERNET FIRST

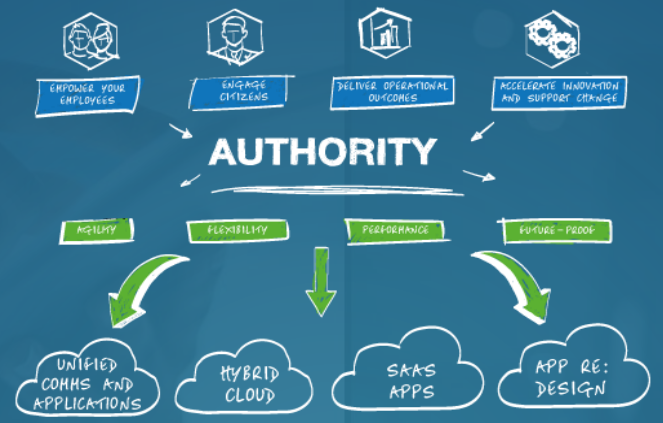


DISTRIBUTED WORKFORCE



SECURITY COMPLIANCE & PCI

DIGITAL TRANSFORMATION

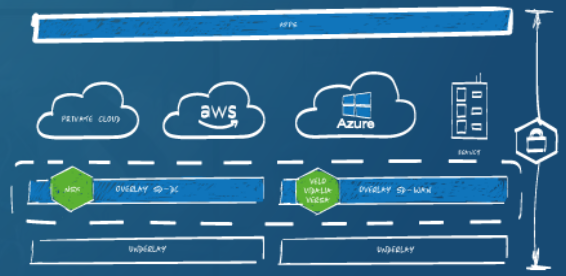


CHALLENGE: NETWORK TRANSFORMATION

SEAMLESS TRANSITION

HOLY TRINITY:OVERLAY

FULL STACK



The WYAAT, West Yorkshire Association of Acute Trusts

This project (delivered by us) is spearheaded by Leeds Teaching Hospital to provide a centralised cloud-based resource whereby the six trusts will have access to a shared platform presenting predictive and analytical pharmaceutical data provided by the Omnicell application which was designed to help streamline operations, lower costs, and deliver a better patient experience.

NHS Airedale NHS Foundation Trust

NHS The Leeds Teaching Hospitals NHS Trust

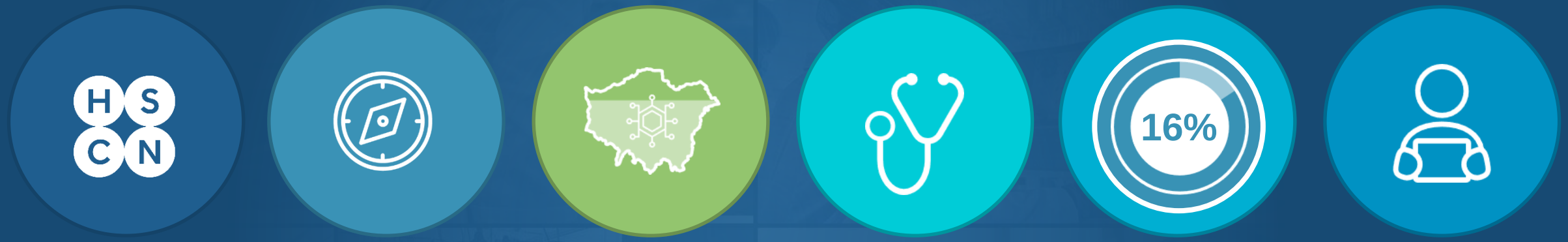
NHS Calderdale and Huddersfield NHS Foundation Trust

NHS Harrogate and District NHS Foundation Trust

NHS Bradford Teaching Hospitals NHS Foundation Trust

NHS Mid Yorkshire Hospitals NHS Trust

Trusted partner of the NHS



HSCN Stage 3 Compliant

9 ISO
Accreditations

+65%
of London's NHS Organisations

70+
Health Organisations

16%
of all HSCN Circuits

Trusts, ICS, CCGs, GPs, Community, STPs

Clients


NHS England
NHS Digital
Department of Health & Social Care
abpi
Bringing medicines to life
BMA
hcpc
MHRA
NHS The Leeds Teaching Hospitals NHS Trust
NHS King's College Hospital NHS Foundation Trust
NHS Guy's and St Thomas' NHS Foundation Trust
NHS South London and Maudsley NHS Foundation Trust
NHS St George's University Hospitals NHS Foundation Trust
The ROYAL MARSDEN NHS Foundation Trust
NHS Kingston Hospital NHS Foundation Trust
NHS Epsom and St Helier University Hospitals NHS Trust
NHS The Hillingdon Hospitals NHS Foundation Trust
NHS South West London and St George's Mental Health NHS Trust
NHS Oxleas NHS Foundation Trust

exponential-e
APPLIED INNOVATION

Accelerating Digital innovation to advance human progress

Picture Archiving and Communication System (PACS) Ready Stacked Solutions

A.I & ML Solutions

Managed and Professio

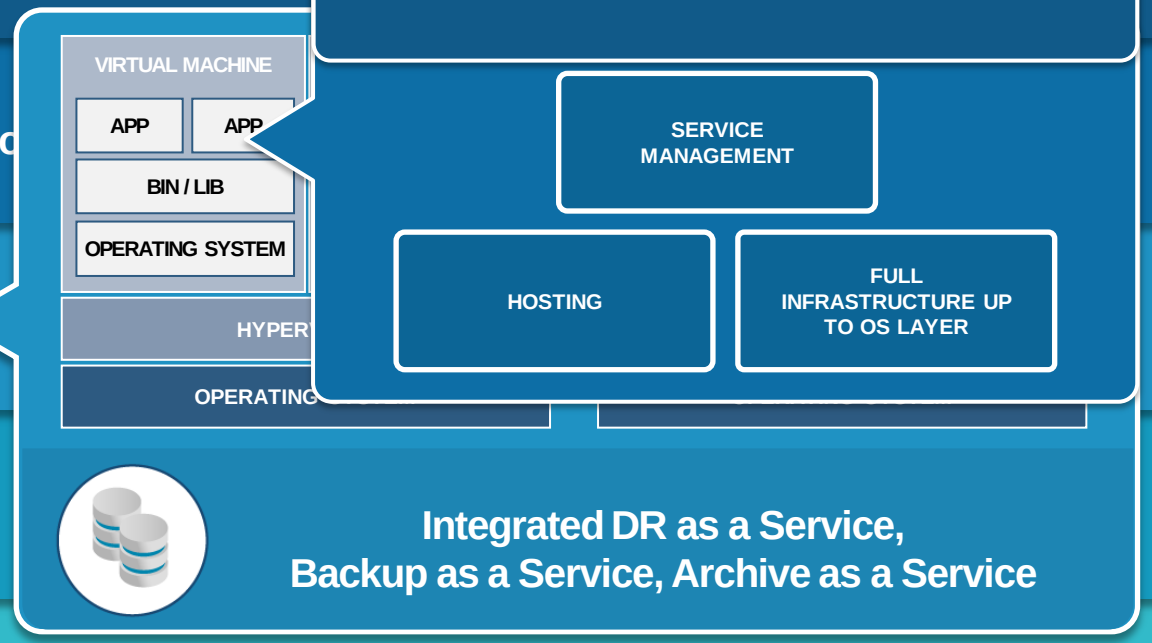
DRaaS and BUaaS

Long Term Archive Tier

Fast Tier 1 & Medium Tier 2 Storage

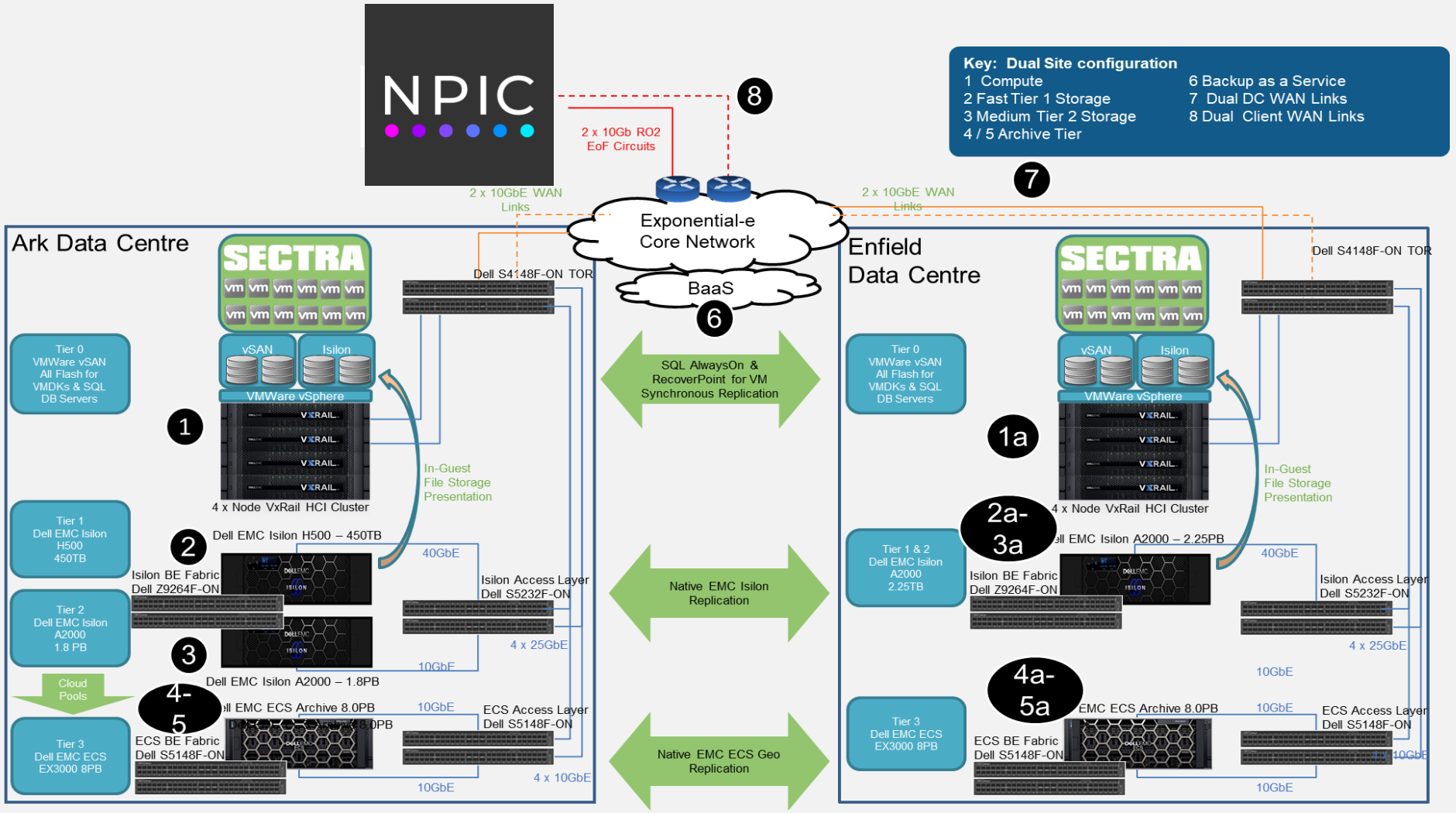
Sustainable Datacentres Hyperconverged Modular Infrastructure - VXRail

Time to value 6-8 weeks



Integrated DR as a Service,
Backup as a Service, Archive as a Service

NPIC & Exponential-e



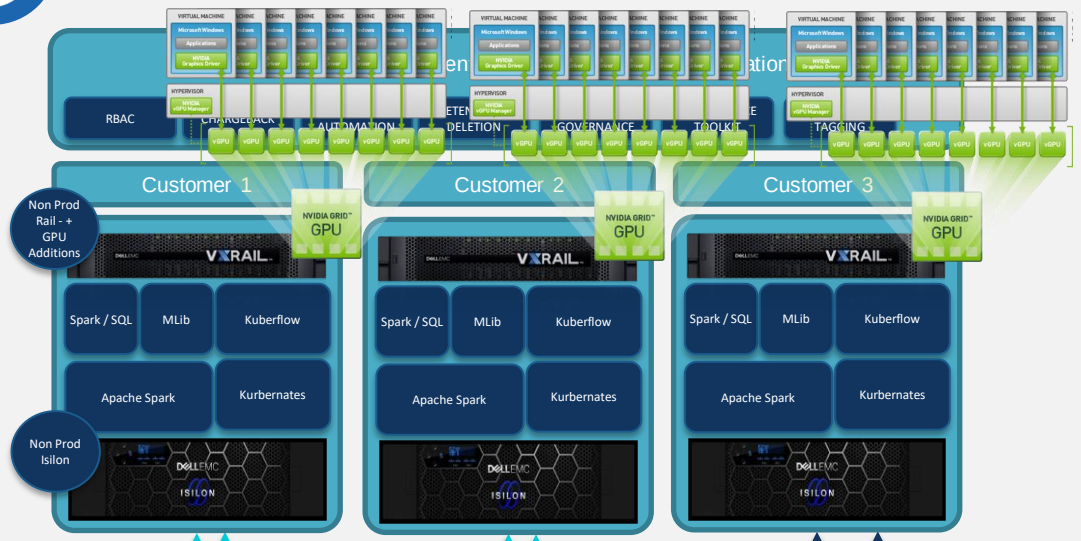
Bash Hussain, Deployment Director at NPIC said:

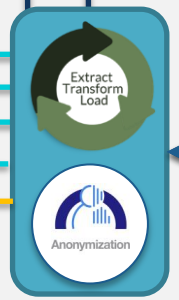
"We have achieved a key milestone for the NPIC programme which has significant infrastructure needs for storage and processing of clinical images. Working alongside Exponential-e will provide the programme with a resilient, scalable platform needed to meet both our clinical and research ambitions."

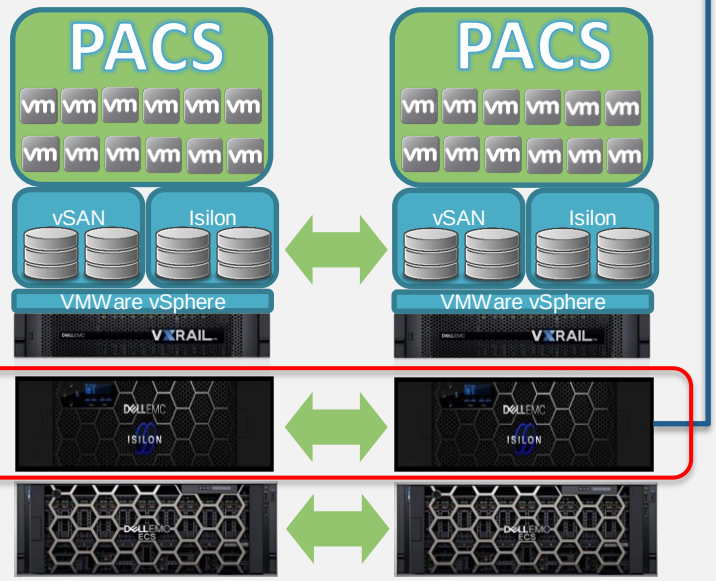
Charles Wilce, Sr. Dir. EMEA Sales: Unstructured Data Solutions adds

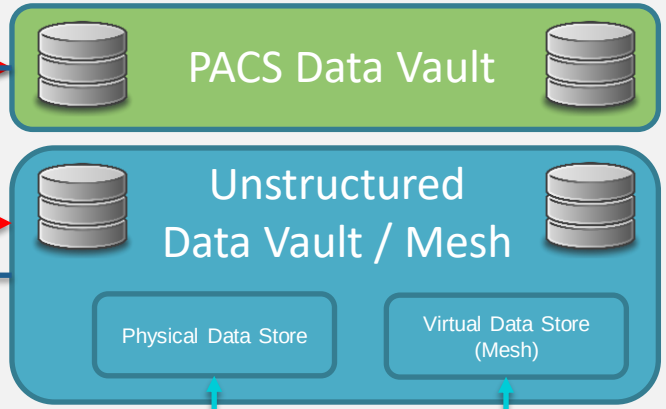
"The combination of Dell EMC PowerScale and Dell EMC ECS object storage with Exponential-e technology will deliver AI-driven insight for NPIC to improve both the quality and outcomes of patient treatment," said Charles Wilce, senior director, EMEA Sales, Unstructured Data Solutions, Dell Technologies. "By harnessing this data in the most meaningful ways, we're able to help our customers drive human progress through data insights and technology innovation.

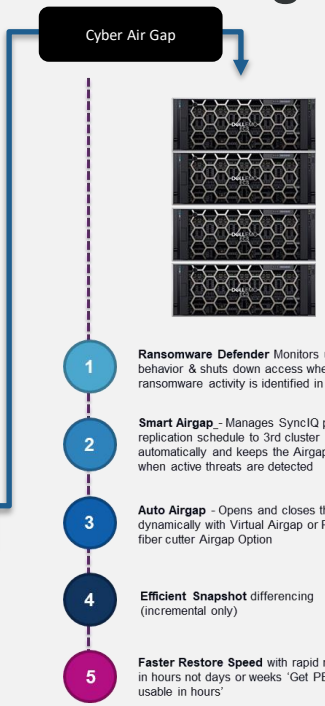
TRE Integration





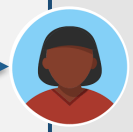






Trusted Research Environments (TRE) | Clinical

Data Architecture

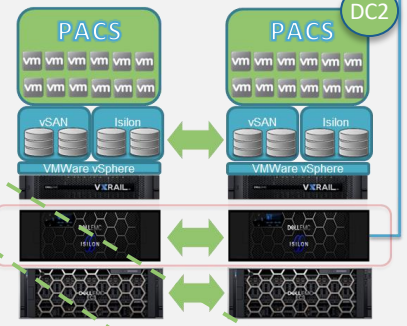


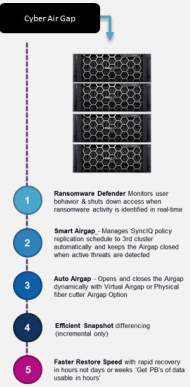
Parallel Request Goes to TRE Environment Build team to automate the delivery of TRE workbench

TRE Automatically deployed and data copied from staging areas to the Data Storage layer in the TRE

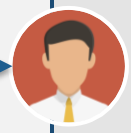
Throughout a Meta Data Map is collated and securely stored to allow for digital tractability, audit and reconnection where required of research findings to original clinical data

Centralised PACS and Cyber Recovery Platform distributed across 2 x DC's and integrated to customer side scanners with dedicated WAN / HSCN Connectivity





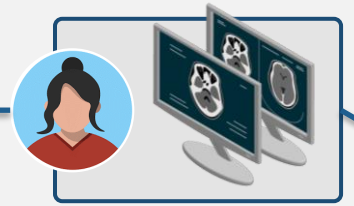
Data gets moved in to a Data Staging area to ensure segregation of TRE from Clinical production service and final validation steps completed on data to verify Anonymization measure met



Data request goes via the TRE approval process to agree to data set provision

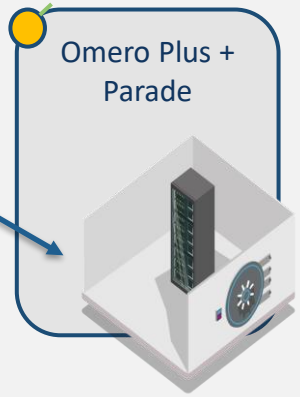
Data request goes in to System Administrator / Image Data and Metadata Curator. Via Clinical Omero instance data identified on Source lcoations

In the New TRE side of the service, Second Omero instance + Parade established, deployed on localised Private Infrastructure

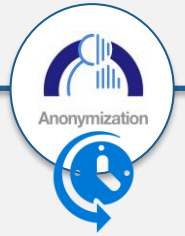


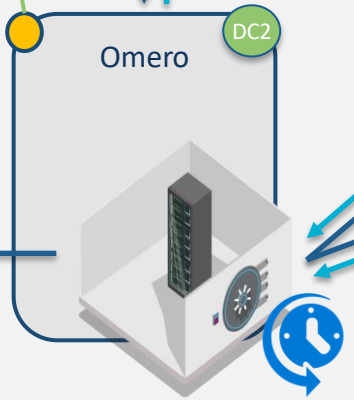
Researcher logs in via a secure Virtual Desktop Image (VDI) to Omero Plus and searches for the data that they would like to use within their TRE.

Added decision made on environmental size required for research AI

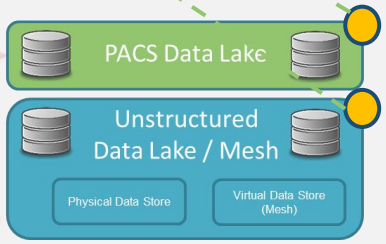


Batch process established on agreed change schedule e.g. Nightly, Weekly, Monthly to copy across Data but in transit, auto anonymization completed against agreed criteria





In Clinical Production side of the service, Omero instance established, deployed on localised Private Infrastructure in Secondary DC



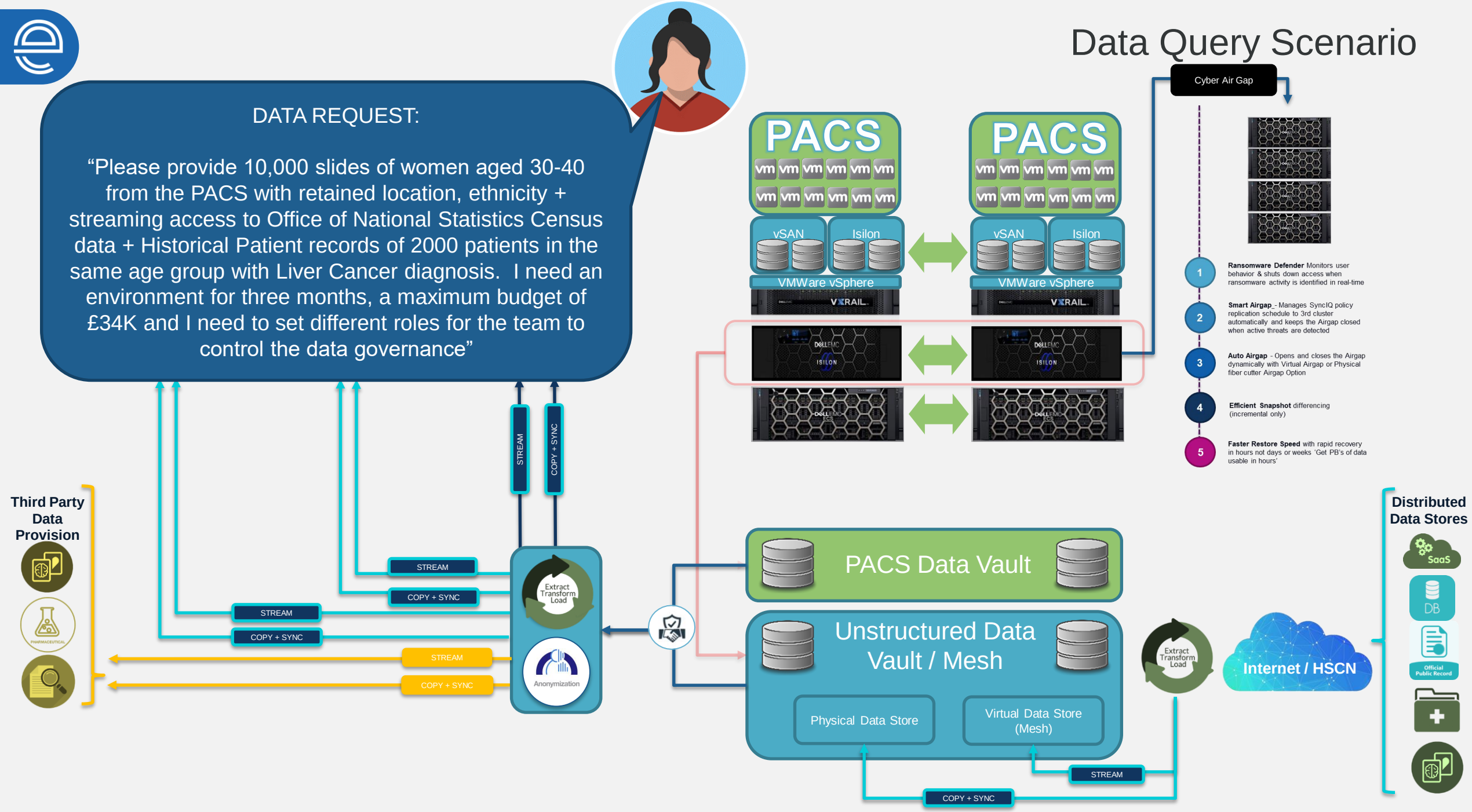
PACS Data in phase one indexed in Omero Plus. Future indexation to wider data sources in unstructured Data Vault

Repeat indexation based on agreed change schedule e.g. Nightly, Weekly, Monthly

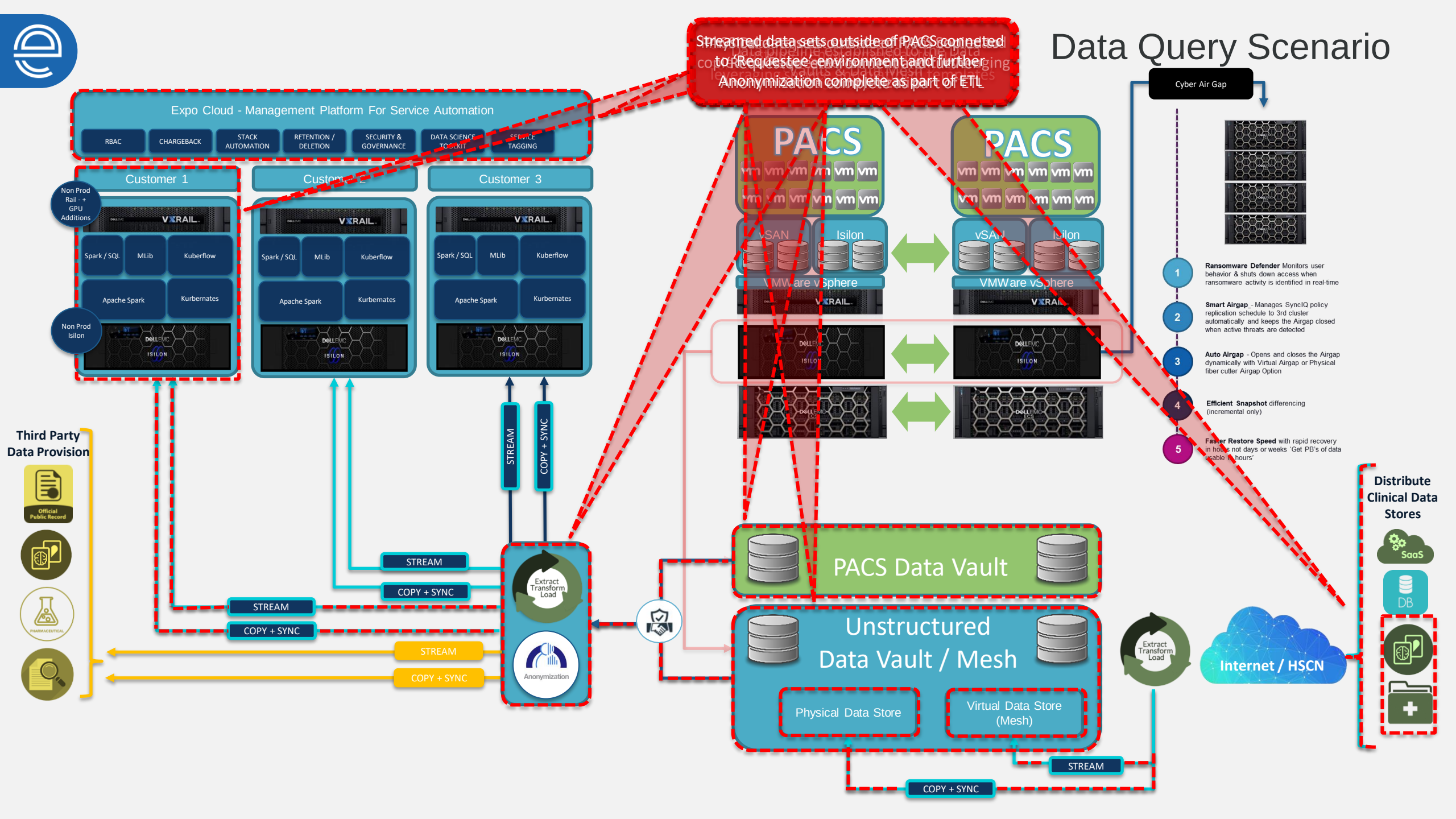
Data Query Scenario

DATA REQUEST:

"Please provide 10,000 slides of women aged 30-40 from the PACS with retained location, ethnicity + streaming access to Office of National Statistics Census data + Historical Patient records of 2000 patients in the same age group with Liver Cancer diagnosis. I need an environment for three months, a maximum budget of £34K and I need to set different roles for the team to control the data governance"



Data Query Scenario



Growing Cyber Threat on Data

54%

Of cyber claims based on ransomware up from

13%

between 2014 and 2020

$13m

average cost to organizations resulting from

cyber crime

Cyber Recovery Vault

67%

of IT decision makers are

not very confident

that all business-critical data can be recovered in the event of a destructive cyber attack

Service Provider

Ransomware Defender

Analyst view

Threat of New Ransomware Models is the Top Emerging Risk Facing Organizations

(Gartner)

Once trust is lost, he stresses, “customers will always look for an alternative”

(Forrester)

Only **13%** of organizations reported experiencing a ransomware attack/breach and not paying a ransom

(IDC)

Ransomware costs should reach **$265** billion by 2031

(Cybersecuirty Ventures)

64.8% of polled executives say that ransomware is a cyber threat posing major concern to their organizations over the next 12 months

(Deloitte)

28% of Chief Executives “strongly agreed” with the statement, suggesting that most are not overly confident in their ransomware preparations

(KPMG)

Addressing Data Growth with **Cyber Protection**

One Strategy

IT Workloads

Archiving

Home Directories

Video Surveillance

File Shares

Engineering Workloads

Artificial Intelligence

Data Analytics

Assisted Driving

Internet of Things

Production Workloads

Energy

EDA

Life Science

Media & Entertainment

Financial

Manufacturing

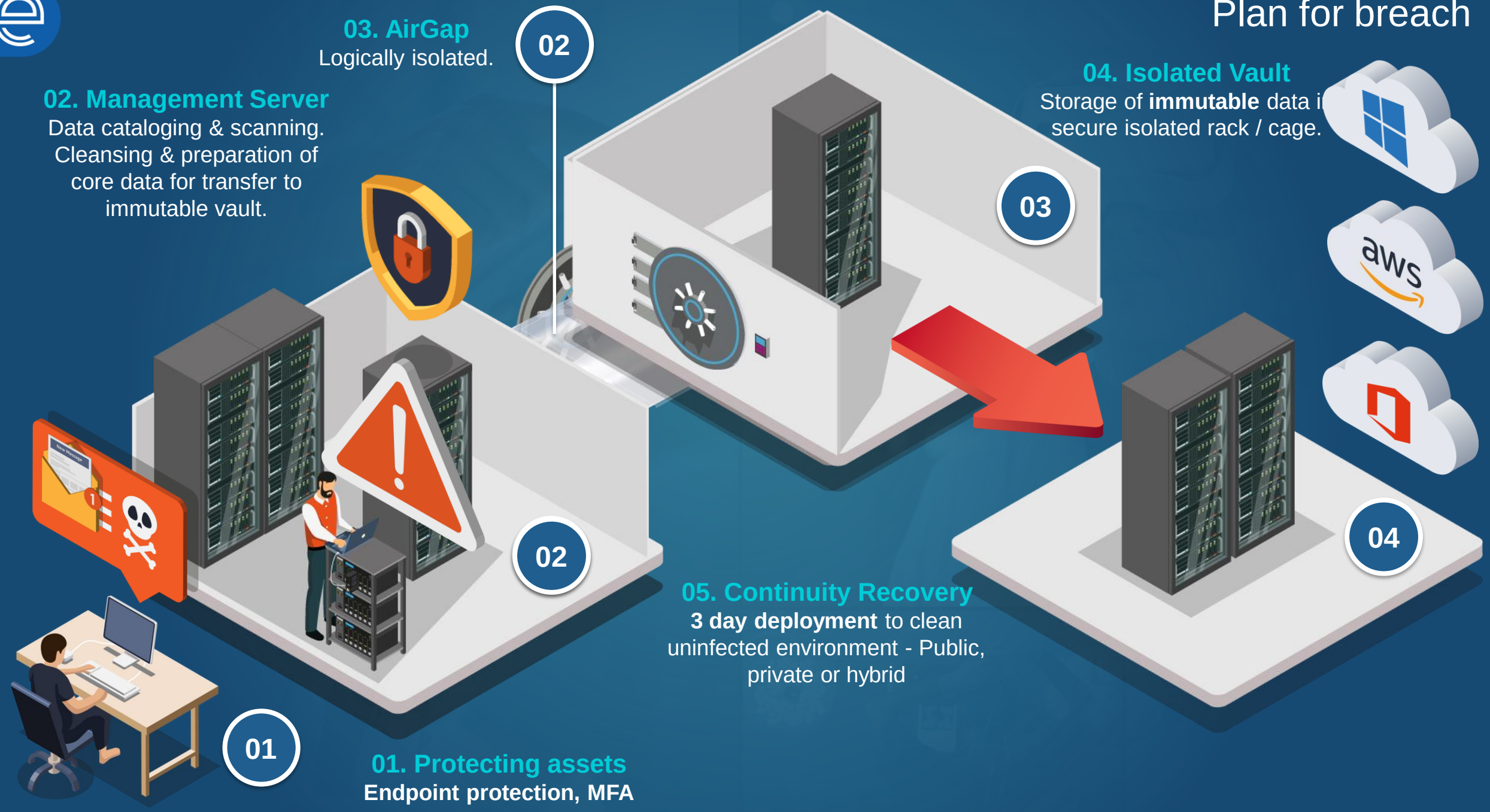
Unstructured Data (80%)

Plan for breach

03. AirGap
Logically isolated.

02. Management Server
Data cataloging & scanning. Cleansing & preparation of core data for transfer to immutable vault.

04. Isolated Vault
Storage of **immutable** data i
secure isolated rack / cage.



05. Continuity Recovery
3 day deployment to clean uninfected environment - Public, private or hybrid

01. Protecting assets
Endpoint protection, MFA

Benefits

Safety / Security

- Protection against misidentification errors
- Permanent non perishable record
- Potential Integration with patient identification systems
- Fully integrated Ransomware protection

Efficiency / Suitability

- Pathologist efficiency
- Parallel workflows
- Remote / Flexible working / part time workforce
- Highly sustainable data footprint

Quality

- Second Opinions
- Specialist Opinions
- Rapid access and review of previous history
- Annotations and measurements
- Rapid time to value

AI Enablement

- Large scale image comparison
- Predictive and Prescriptive outcomes
- Large scale data sharing and collaboration
- TRE integration for Deep learning and advancement in patient outcomes

The NHS Data & Information Conference 2022

SPEAKING NOW

Ming Tang

Chief Data and Analytics Officer
NHS England

I will discuss…

” Harnessing the power of data to drive change in the NHS”

Harnessing the power of data to drive change in the NHS

Better Insights. Better Decisions. Better Health.

Ming Tang
Chief Data and Analytics Officer
NHS England and NHS Improvement

Context – The NHS is a complex ecosystem

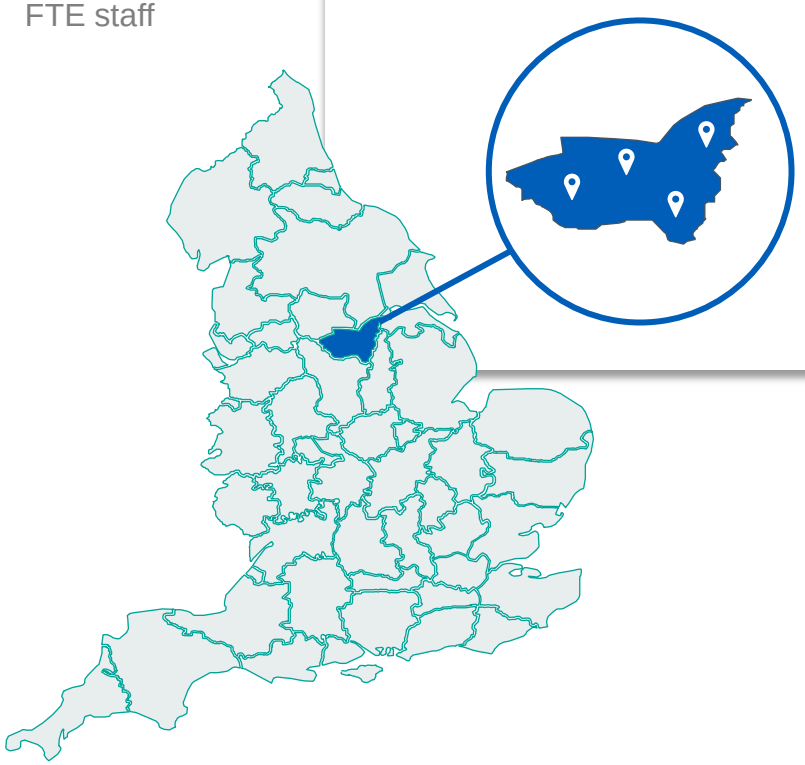
NHS England

Care Quality Commission

Place Based Partnerships

£190.3 billion

1.227 million
FTE staff



Integrated Care Systems
(42)

Integrated Care Boards

Commission and deliver joined-up approaches to improving health and care outcomes

Local authorities
(152)

GP practices working together with community, mental health, social care, pharmacy, hospital and voluntary services (1,250)

Integrated Care Partnerships

Providers work together to deliver care by agreeing to collaborate rather than compete.

NHS Providers

Acute Trusts
(124)
250,000 daily outpatient
47,000 daily inpatient
67,500 daily A&E attendances

Mental Health
(50)
1.6m contacts

Community
(826)
0.38m daily care contacts

Ambulance
(10)
30,000 daily 999 calls
20,390 daily call-outs

Other Providers

GP Practices
(15,119)
1.3m daily appointments

Voluntary Sector

Social Enterprises

Private

Primary Care Networks

Joining of NHS England and NHS Digital

NHS England

NHS Digital

Beginning of a transformation journey that provides the opportunity to:

Create one function to drive the use of data within health and social care

- Review what health and social care data is captured.
- Consider the ways we collect data and its purposes
- Minimise the movement of data across system to enable a rapid analytical pipeline
- Invest in architecture to implement FDP, SDEs
- Empower systems to lead locally
- And do this all in a smarter way

Provide secure access to data for analytical insights that support decision making to improve care delivery and system planning, and to support research into new treatments.

Underpinned by Strategies to support the power of data

Data Saves Lives: Reshaping Health and Care with Data

Building and Maintaining Public Trust

Patients	NHS Services	NHS and Adult Social Care Systems	Medical Research
Improving Individual Care	Speed up diagnosis	Plan local services	Life saving medical research

Goldacre Review: Better, broader, safer: using health data for research and analysis

- Platforms and security
- Modern, open working methods for NHS data
- Data curation and knowledge management
- NHS data analysts
- Governance
- Approaches and strategy

Making data more accessible

Secure Data Environment and Federated Data Platform will be the default way to access NHS health and social care data for research in diseases and conditions affecting the population, development of new treatments and the analysis of how health and care is delivered to continually improve it.

Deliver a more robust, flexible and scalable end to end service for:

- care planners,
- analysts and
- researchers

across the health and care ecosystem in the UK.

Federated Data Platform will be an ecosystem of technologies and services implemented to deliver:

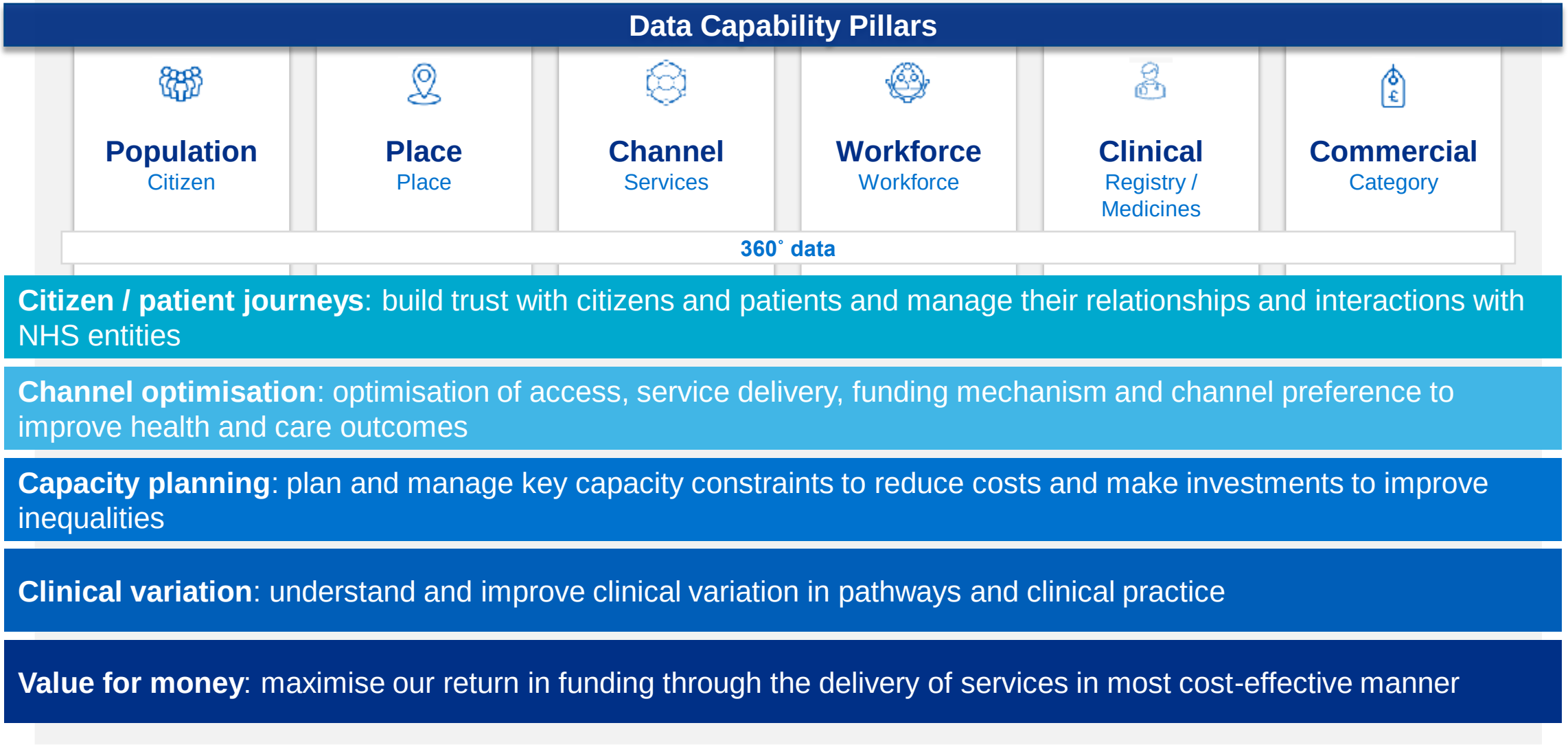
1. Better outcomes for population health,
2. Tackle inequalities,
3. Co-ordinate care,
4. Speed up diagnosis,
5. Plan local services,
6. Support research into new treatments.

Secure Data Environments will improve:

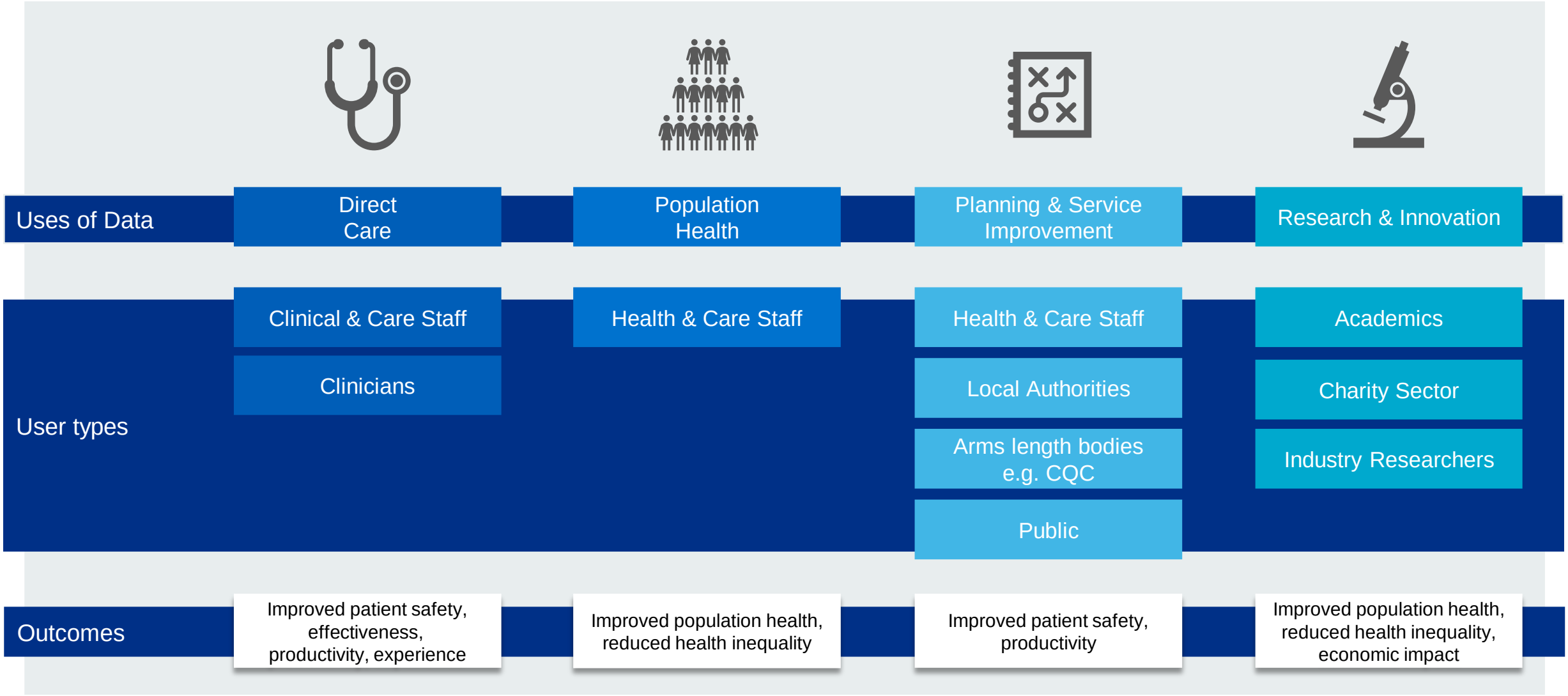
1. **Patient privacy**: removing personal detail to keep patient information confidential, and generally providing aggregate anonymised results.
2. **Security:** systems have high level of protection.
3. **Efficiency:** linked data to speed up decisions and discovery of new treatments.

Secure Data Environments will provide the ability to access one source of data rather than replying on disseminated datasets.

Data and Analytics Capability Framework to provide reference points and enable business insights



Four key uses of data – designing appropriate data governance and processes for different uses of data



Towards transformation: extending value through insights and improved decision making

1. **Situational awareness** – COVID-19 Strategic Decision Makers Dashboard
2. **Predictive analytics** – COVID-19 Early Warning System for hospital admissions
3. **COVID Vaccination operating picture** – Health Inequalities Focus
4. **Data, Analytics and Machine Learning** – A driver for recovery
5. **Trust Care Coordination** – Improving Elective Recovery and Scheduling
6. **ICS Care Coordination** – Improving decision making through shared visibility

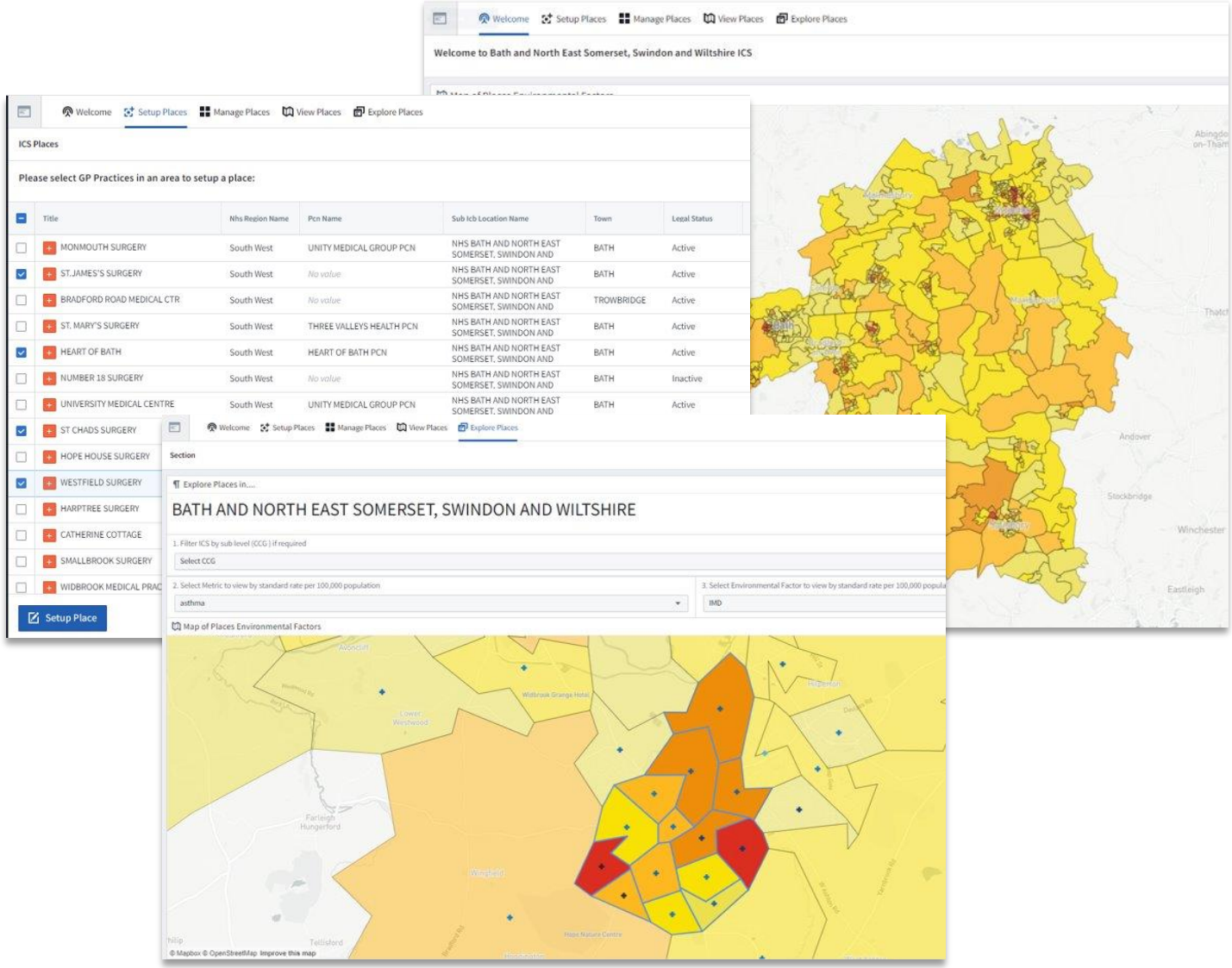
Population and Person Insight (PaPI)

National datasets cut by segments based on common healthcare needs

- Includes secondary, emergency care, community services and specialised services data
- Understanding the population by cohorts of similar health and care needs enables person-focussed health system.
- Data can be viewed through several lenses; from national right through to PCNs.

ICS Place Tool

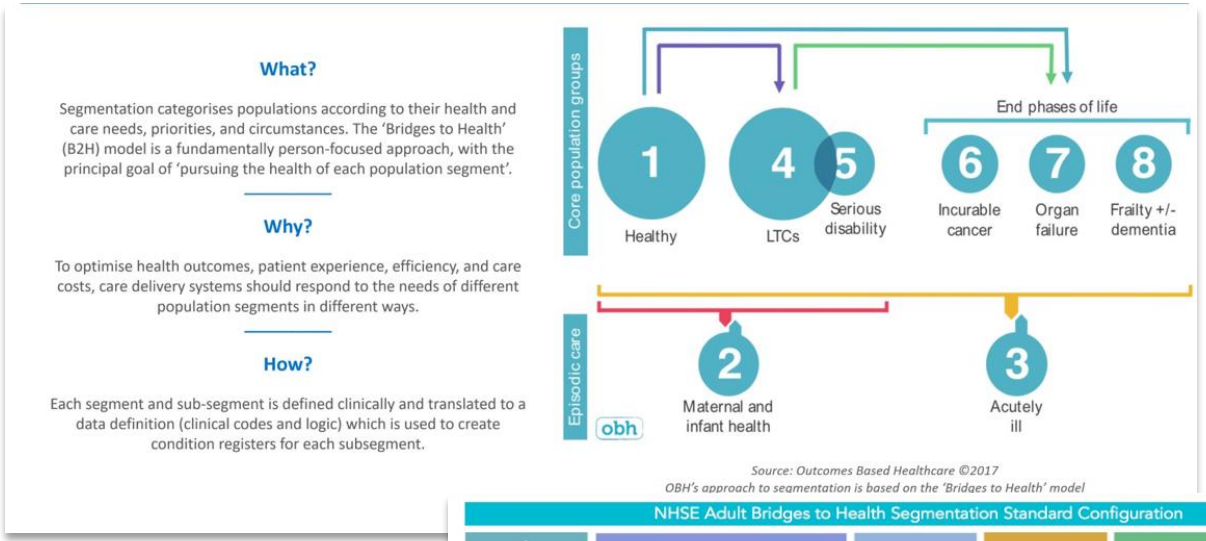
- build a Place, or multiple Places, within an ICS's geography
- explore and visualise data and metrics relevant to health and care
- inform where to deploy resources to reduce health access inequity and achieve PCN level targets

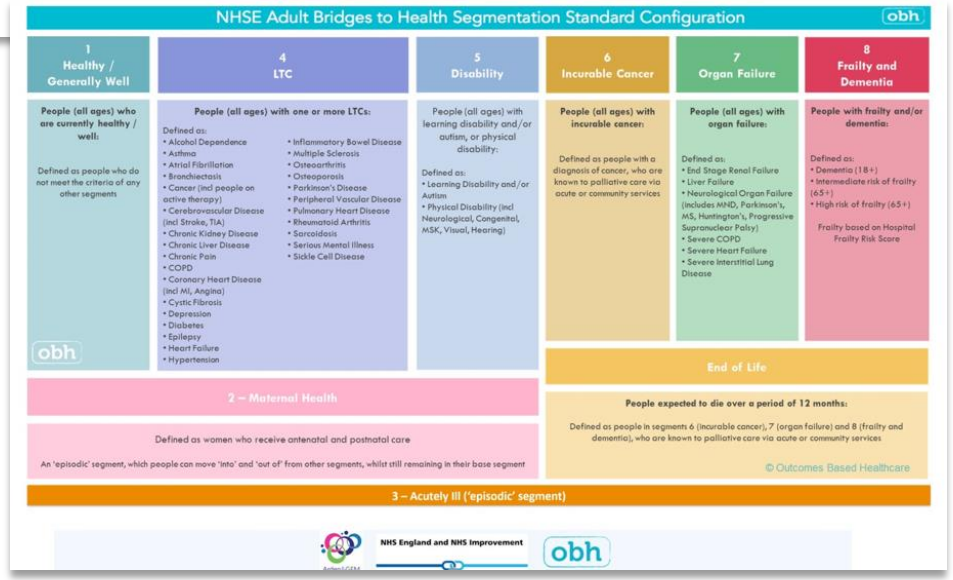


Bridges to Health Dataset

Bridges to Health segmentation dataset enables deeper insight into:

- people who are healthy,
- people with long term conditions,
- people with disability,
- people who are nearer the end of life with cancer, organ failure, frailty and dementia.





ICS Capability, Blueprint Application

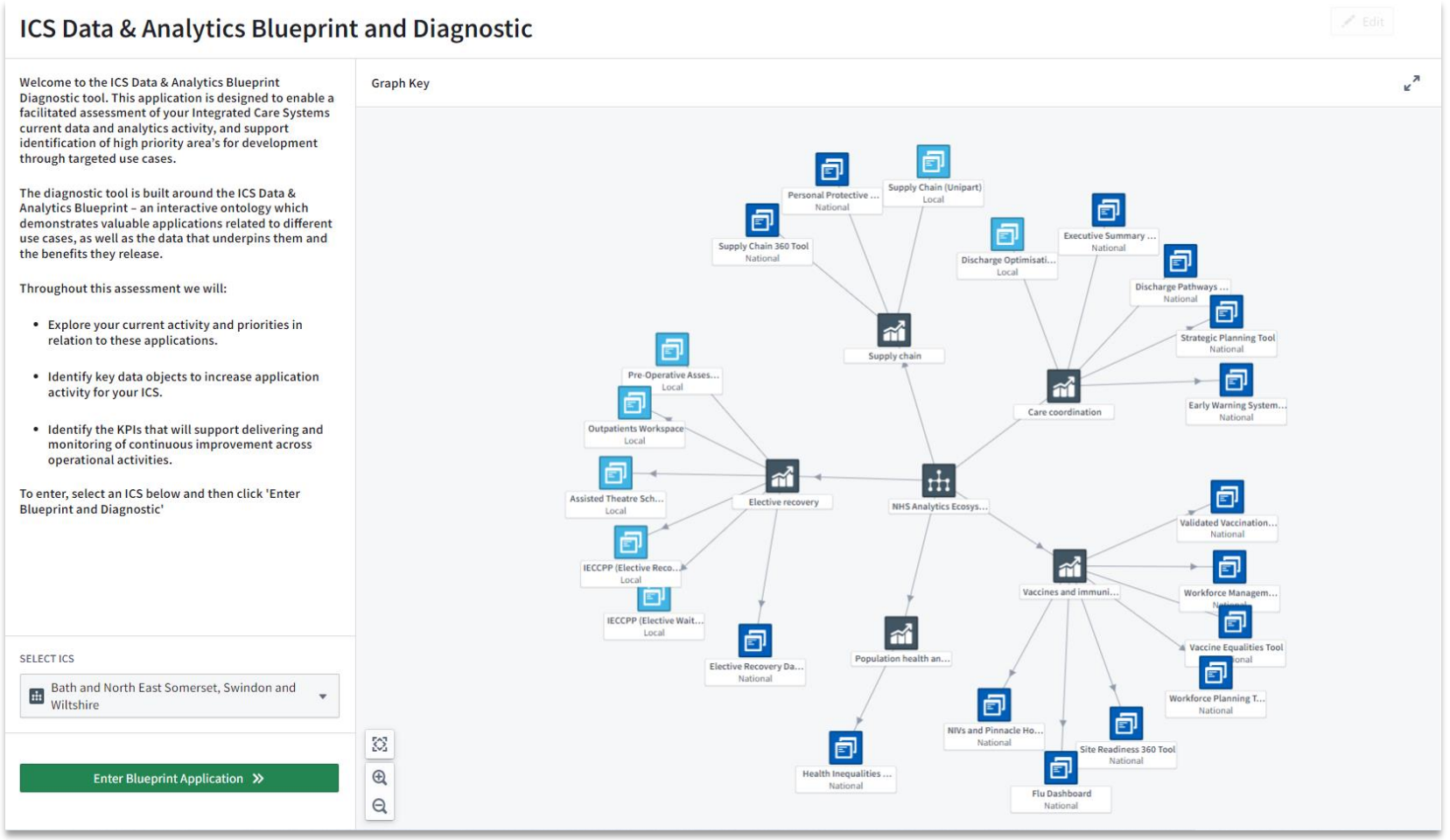
ICSs will initially assess themselves across 5 use cases:

1. Elective Recovery
2. Supply Chain
3. Care Coordination
4. Vaccines & Immunisations
5. Population Health

ICSs will be able to:

- determine what data they collect
- which KPIs to monitor to support their delivery

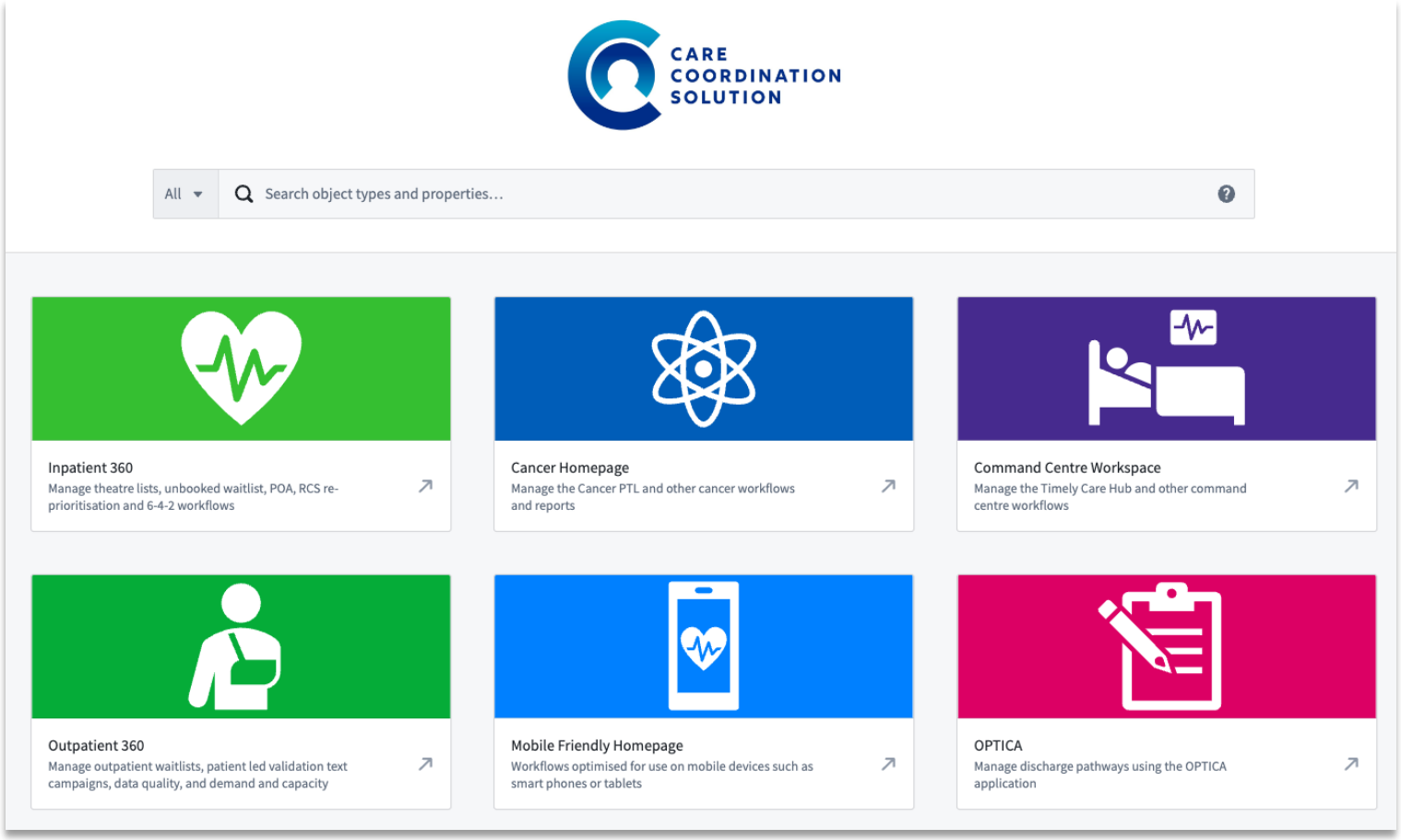
ICSs can also include any local data collections supplementing their insight capabilities.



Care Coordination Solution

Everything in our hands

Information from multiple sources presented in-context and actionable for faster treatment of patients in most need



Better, faster, information-based decisions

Operational tools for waiting list management, patient prioritisation and theatre scheduling workflows

Clinicians, operational staff schedulers and data quality specialists have high quality waiting list data to treat as many different people as possible

Simpler Processes for Improving elective waiting list data

Data quality teams can clean and correct data

Implementing changes back to source systems improves information for all system users

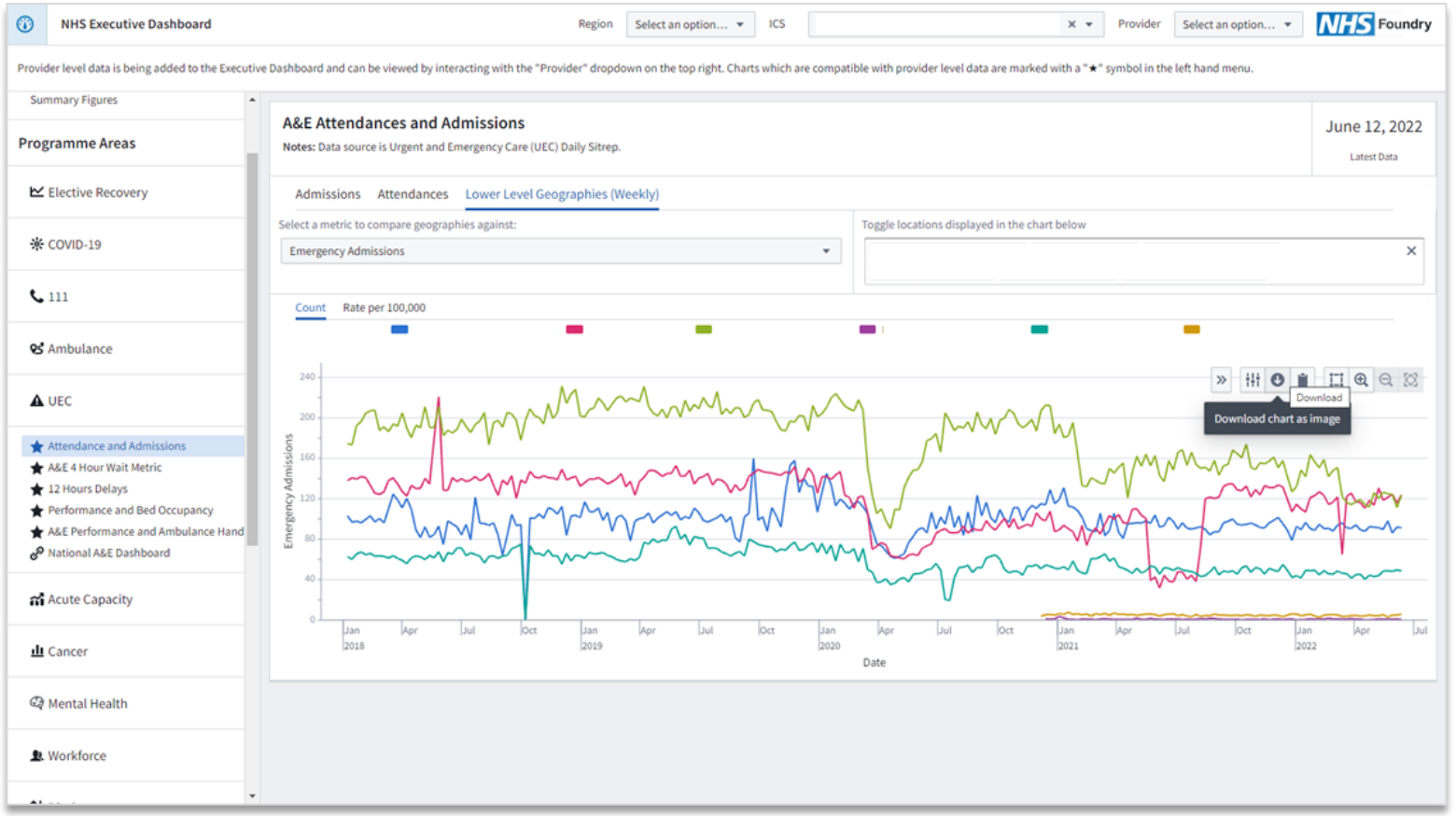
Better Care Coordination at all levels

Securely share pseudonymised data within one platform

Leaders at system, regional and national levels can make better decisions, improving the coordination of care across trusts

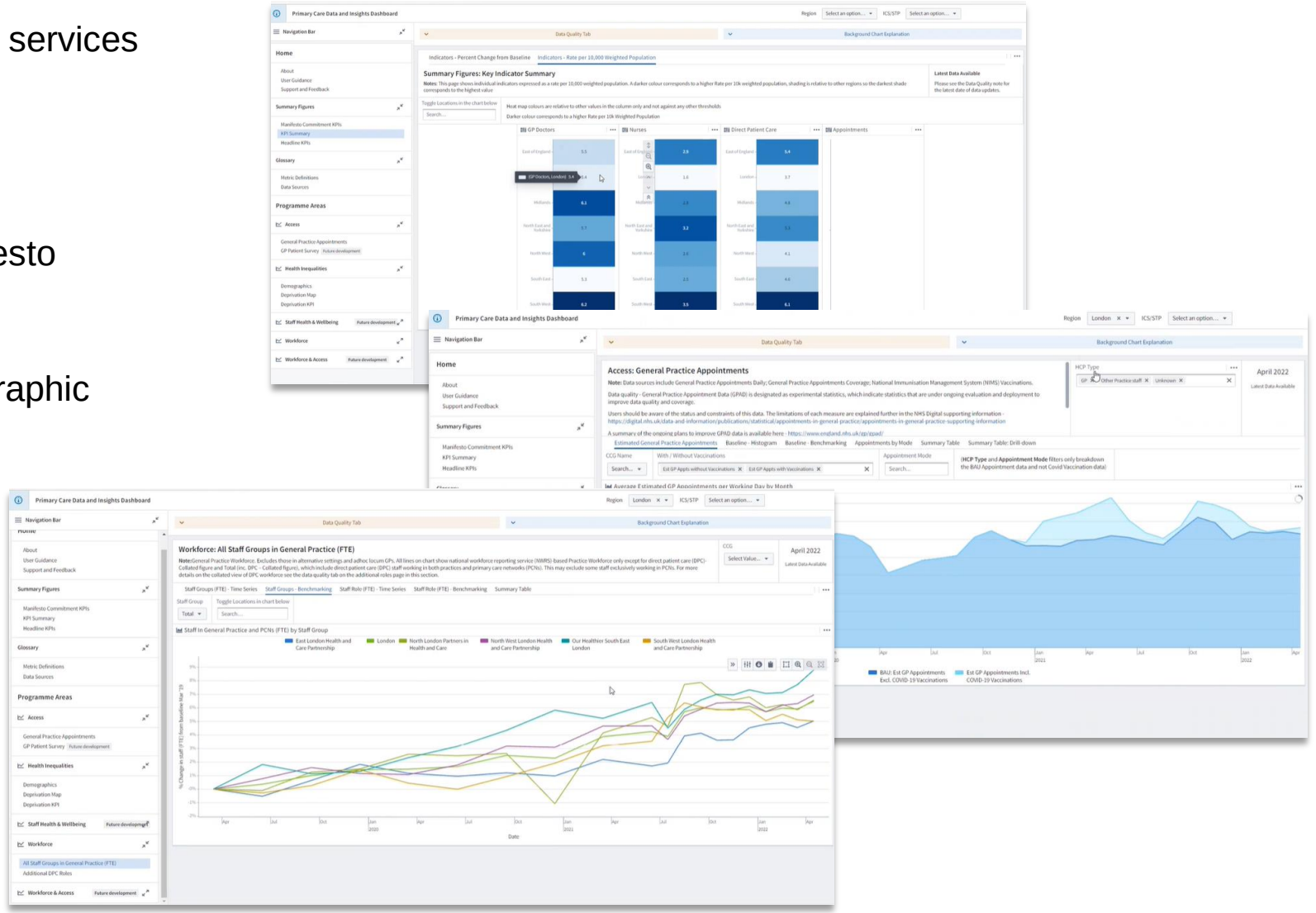
ICB Executive Dashboard

- Support ICBs in strategic planning across the quadruple aim of healthcare.
- Key management information across different areas (acute, primary care, mental health, discharge, capacity).
- One consistent dataset that can be used by all parts of the system.
- information updated automatically.
- Preparation for Board reporting.



Primary Care Dashboard

- wide range of data relevant to primary care services
- enables improvement and primary care transformation
- includes data relating to the national manifesto commitments for primary care
- initial health, equity, and population demographic views
- Ongoing development:
  - GP workforce
  - patient satisfaction
  - staff health and wellbeing
  - community pharmacy
  - dentistry



Thank you.

Better Insights. Better Decisions.
Better Health.

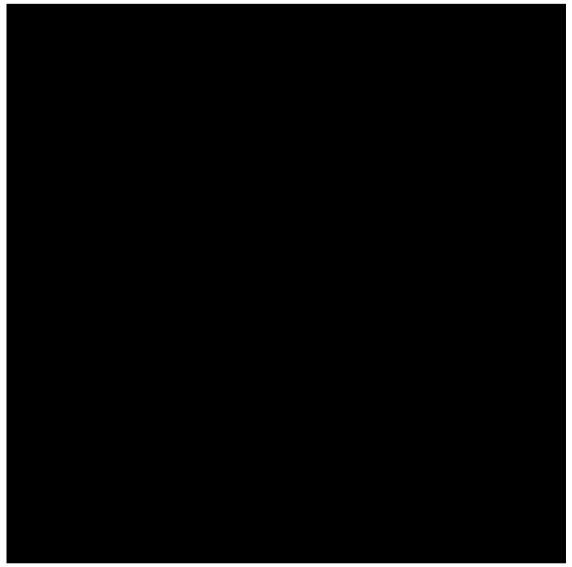
The NHS Data & Information Conference 2022

UP NEXT...

zivver

The NHS Data & Information Conference 2022

SPEAKING NOW



Amir Khan

Public Sector Specialist

I will discuss…

” Setting the digital security standard”

The NHS Data & Information Conference 2022

SPEAKING NOW

Dr Anguraj Sadanandam

Team Leader
The Institute of Cancer Research

I will discuss…

” AI/ML-based integration of multi-modal and pre/clinical data to globally translate stratified medicine”

ICR The Institute of Cancer Research

The ROYAL MARSDEN NHS Foundation Trust

AI/ML-based Integration of Multi-modal and Clinical Data to Translate Stratified Medicine

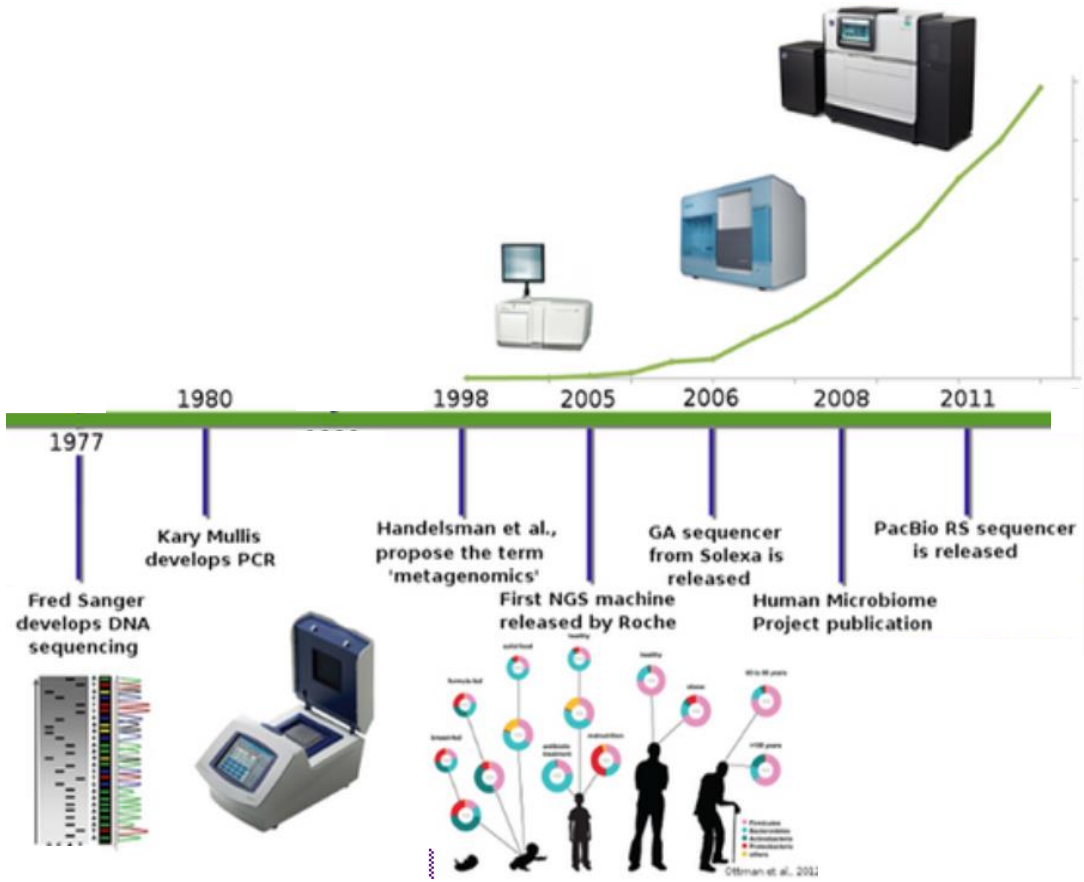
Anguraj Sadanandam, Ph.D.
Director, Centre for Global Oncology
Reader and Team Leader
Systems and Precision Cancer Medicine Team
Division of Molecular Pathology
Institute of Cancer Research (ICR), London, UK

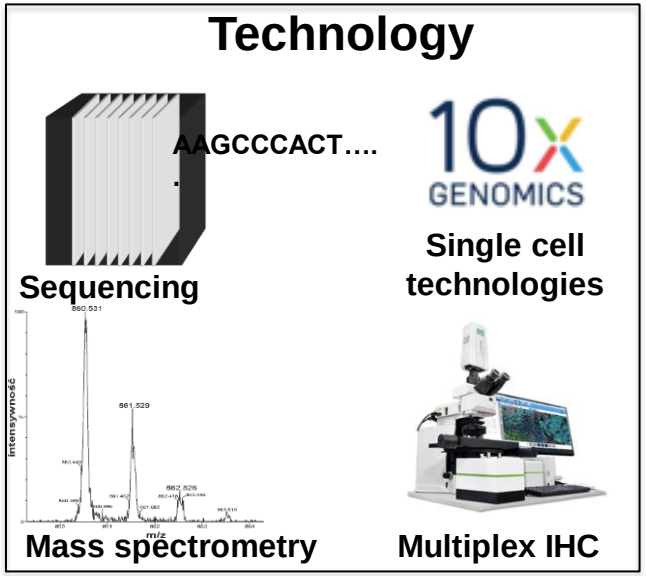
Research Collaborator
Mayo Clinic, Rochester, MN, USA

Founding Member, Indian Cancer Genome Atlas

Molecular Biology is Evolving Fast

Techniques are Evolving Rapidly…



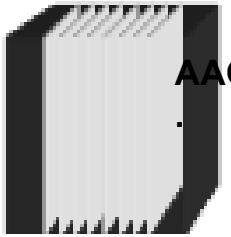


Beyond 2011

modified from Front. Genet., 2015

BIG Data Generation

Technology

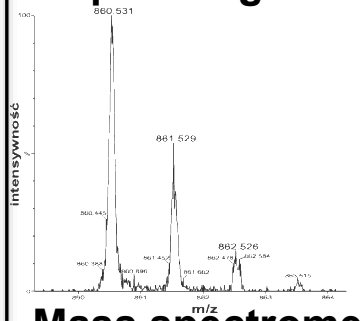


AAGCCCACT….

Sequencing

10x GENOMICS

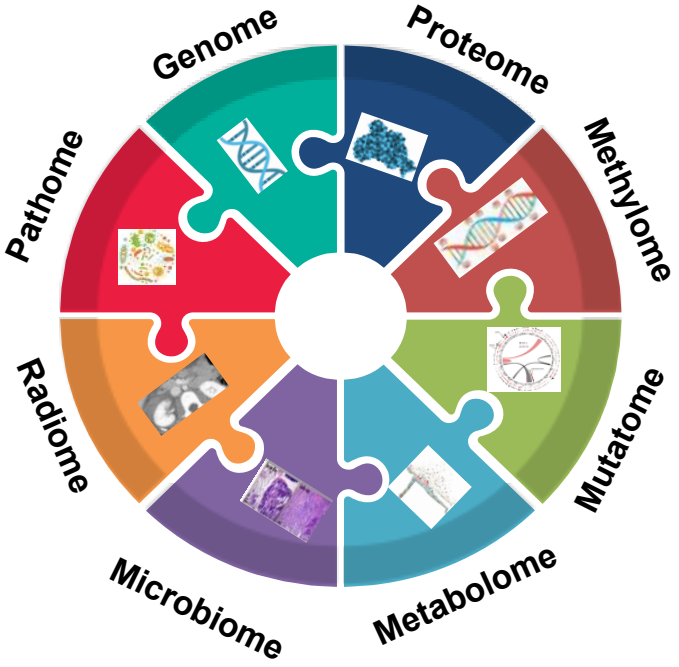
Single cell technologies



Mass spectrometry

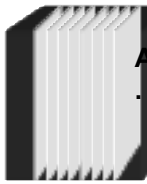
Multiplex IHC

Multi-modal profiles



Omics (Data/Information) + Phenotypes (Knowledge) → Personalised Therapy (Wisdom)

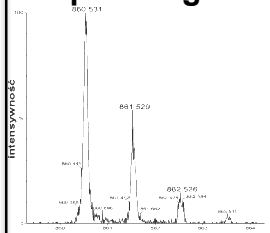
Technology



Sequencing

10x GENOMICS

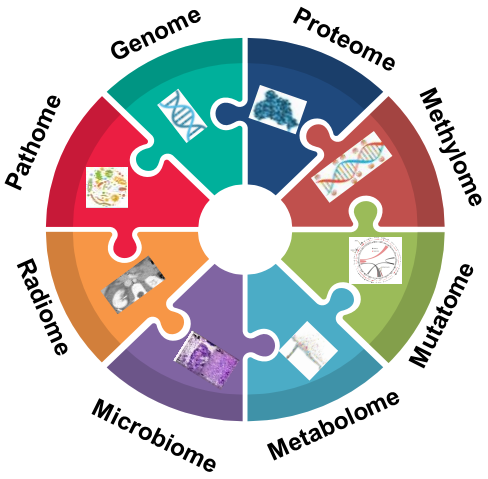
Single cell technologies

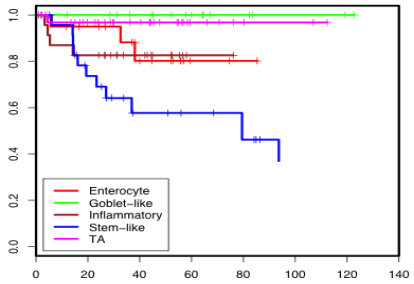


Mass spectrometry

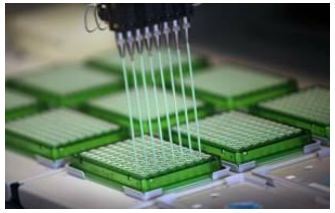
Multiplex IHC

Multi-omics profiles





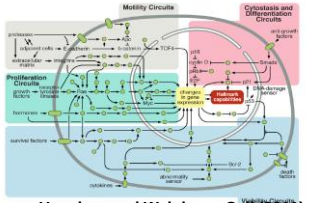
Patient prognosis and treatment response



http://www.sanger.ac.uk

Drug Response data from ~1000 cell lines and ~200 compounds

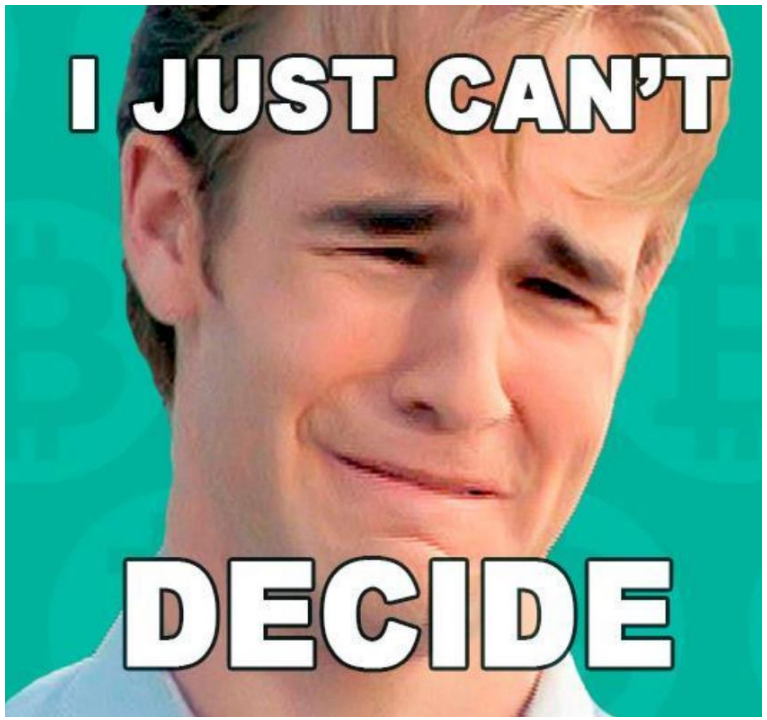
Preclinical trials



Hanahan and Weinberg, Cell (2011)

Pathways

Tumor Phenotypes



https://medium.com/

Know Your Patient - KYP

Clinical question first

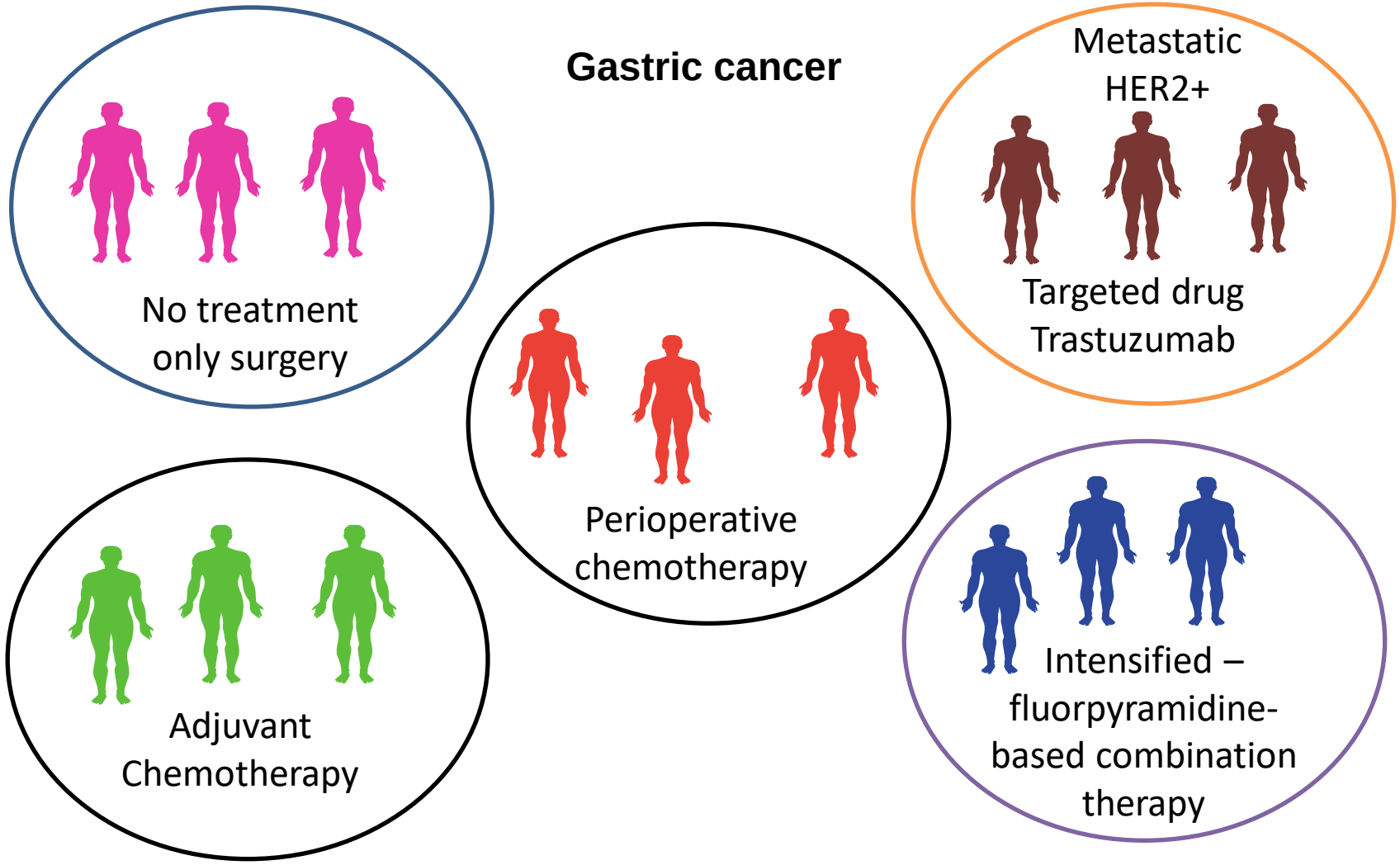
Current Medicine: "One Size Fits All" Healthcare

The problem is, we are all very different!

https://www.slideshare.net/AmirAbbasHedayatiAsl/personalized-medicine-in-pediatric-cancer

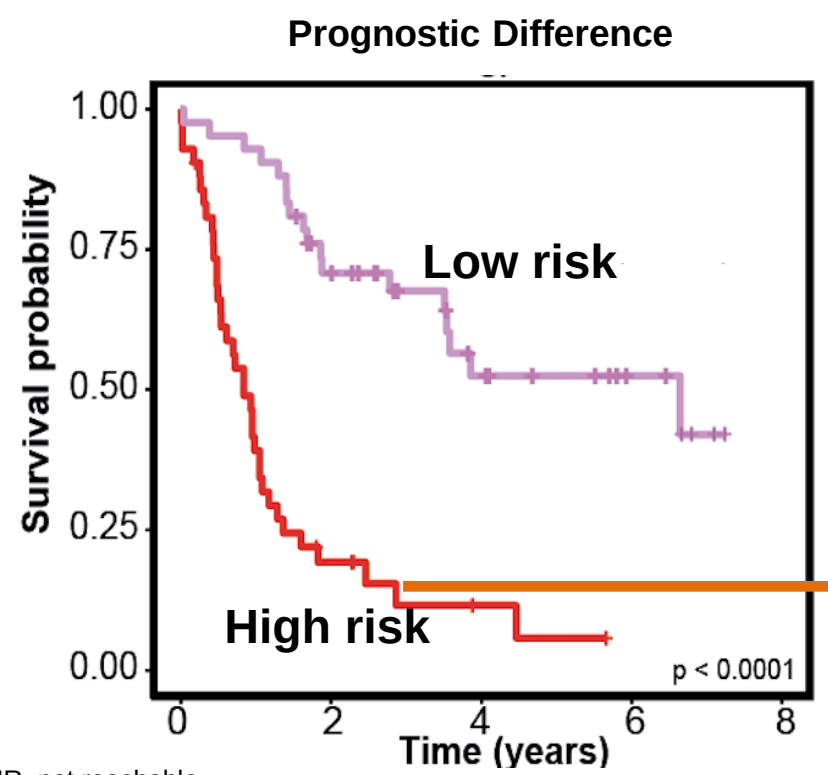
Personalised Medicine

1. Personalised medicine = match patients to therapies~ multiomics

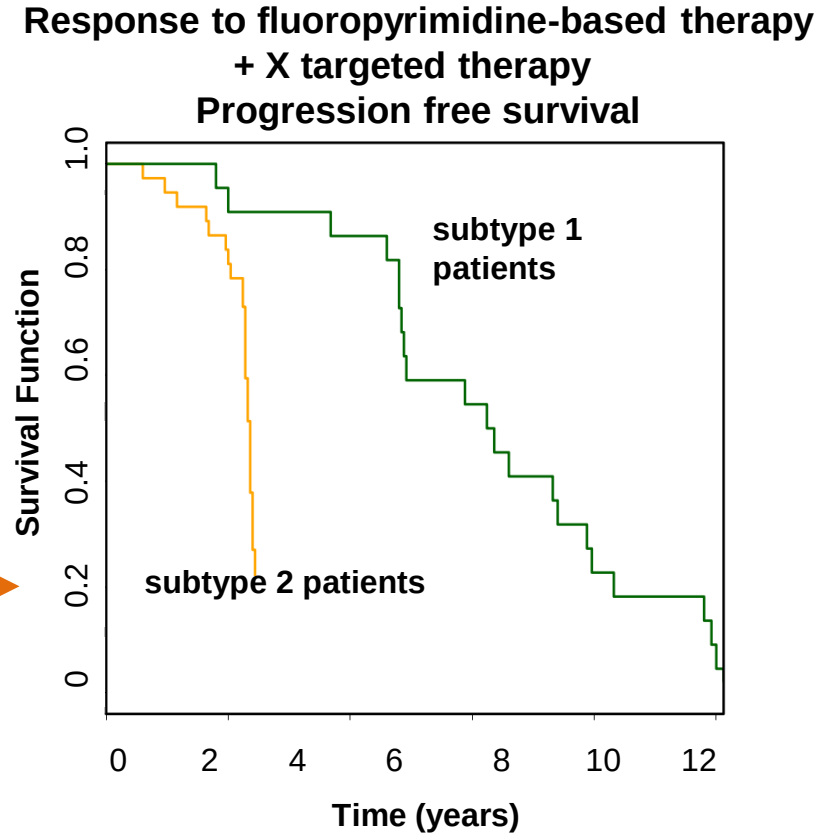


2. Prolong Survival (Prognosis) with Precise Treatment Strategies

Inoperable gastric cancer – perioperative chemotherapy



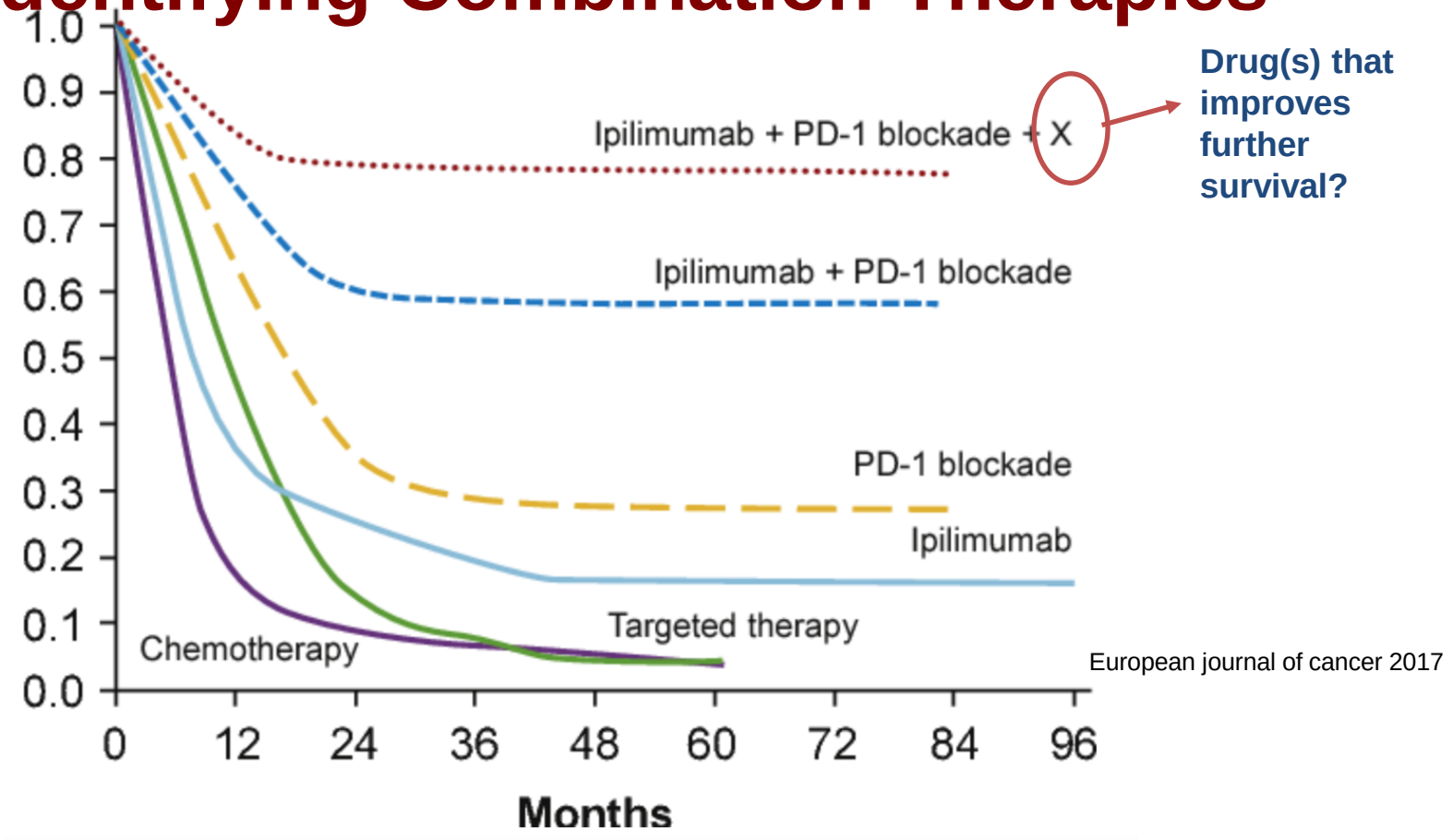
NR, not reachable



Smyth and Sadanandam, et al., Annals of Oncology 2018

The heterogeneity in these tumors shows different responses to therapy and suggests *precise/personalized medicine and combination therapies*

3. Improve Patient Survival by understanding Drug Resistance and Identifying Combination Therapies



European journal of cancer 2017

Compared to traditional therapies anti-checkpoint treatments improve patient survival in certain cancers

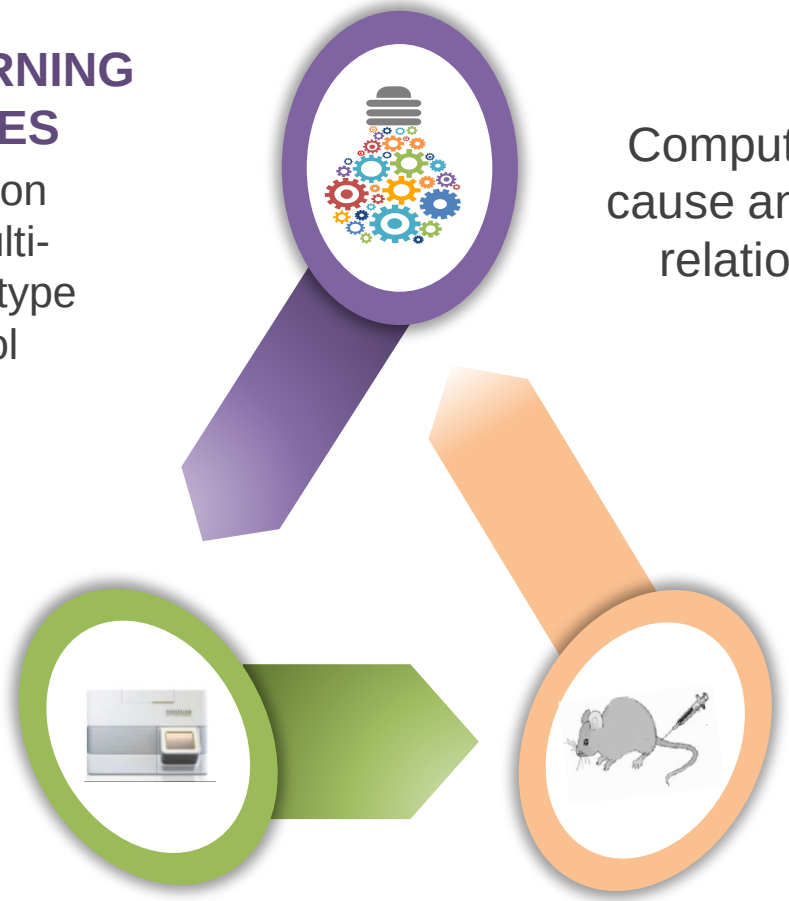
How to find the best combination of immunotherapies with standard of care treatments?

Interdisciplinary Lab

MACHINE LEARNING APPROACHES

Next generation integrated multi-omics + phenotype – unique tool

Computational cause and effect relationship



COMPANION DIAGNOSTIC ASSAY

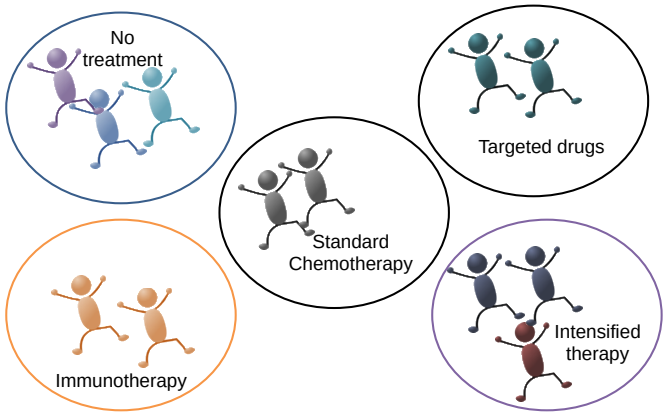
Biomarker and assay development.
Currently at the stage for regulatory approval and commercialization

PERSONALISED PRECLINICAL TRIALS

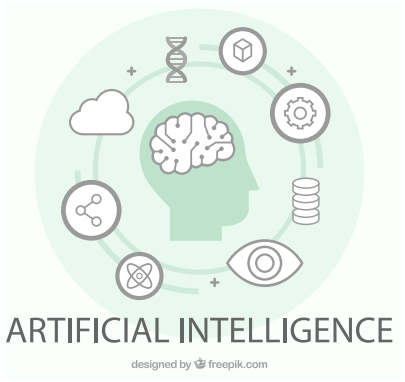
15 unique patient-based mouse, organoid and cell line models matched to patient profiles

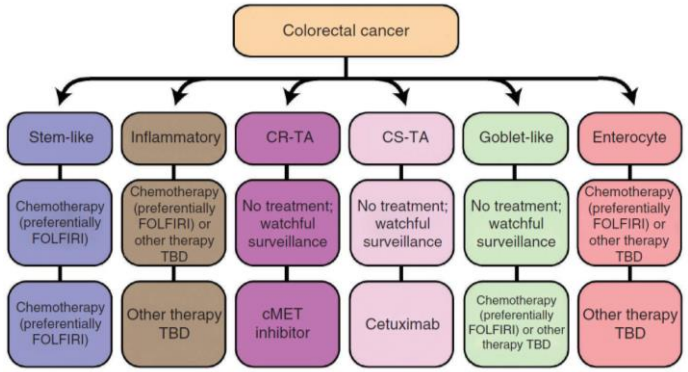
Developing Companion Cancer Diagnosis

Data generation and mining for biomarkers + **Stratification for personalised treatment** + **Clinical biomarker assays using technologies and software**



Technology

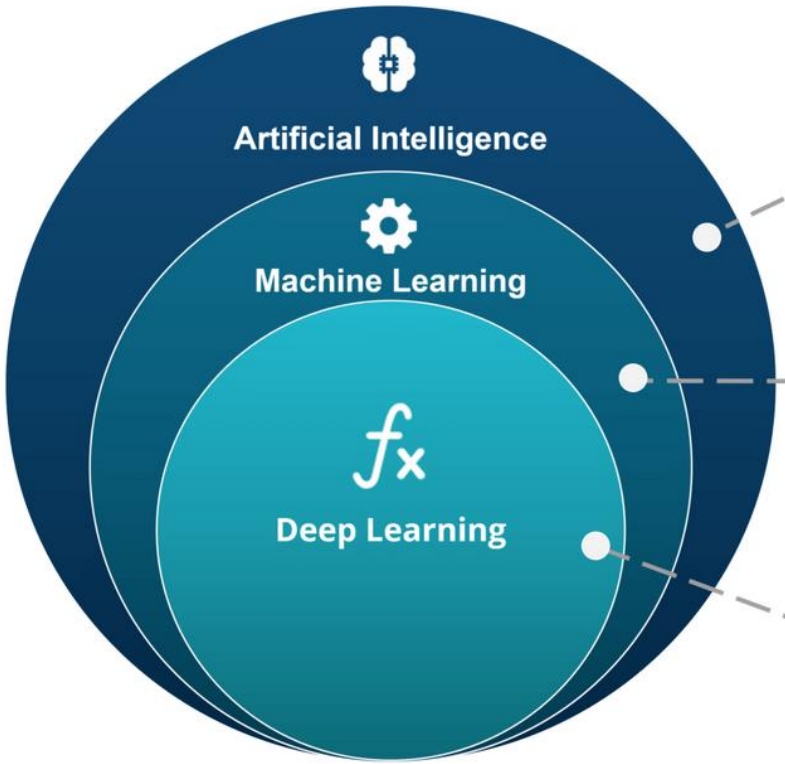




Sadanandam et al, Nature Medicine 2013

Software

AI vs. Machine Learning vs. Deep Learning



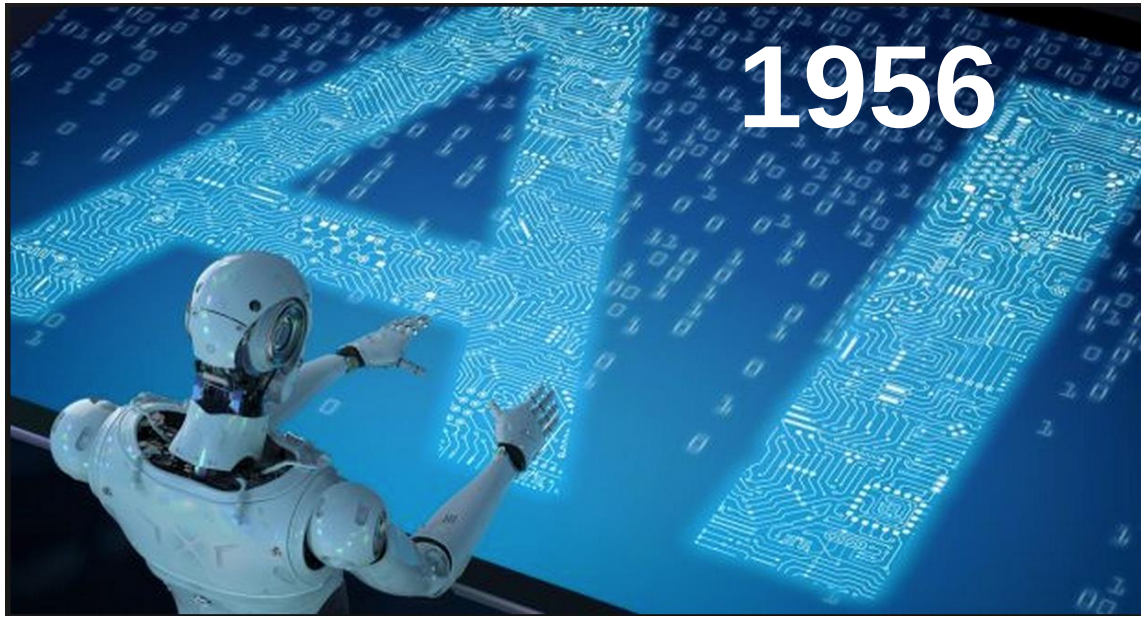
ARTIFICIAL INTELLIGENCE
A technique which enables machines to mimic human behaviour

MACHINE LEARNING
Subset of AI technique which use statistical methods to enable machines to improve with experience

DEEP LEARNING
Subset of ML which make the computation of multi-layer neural network feasible

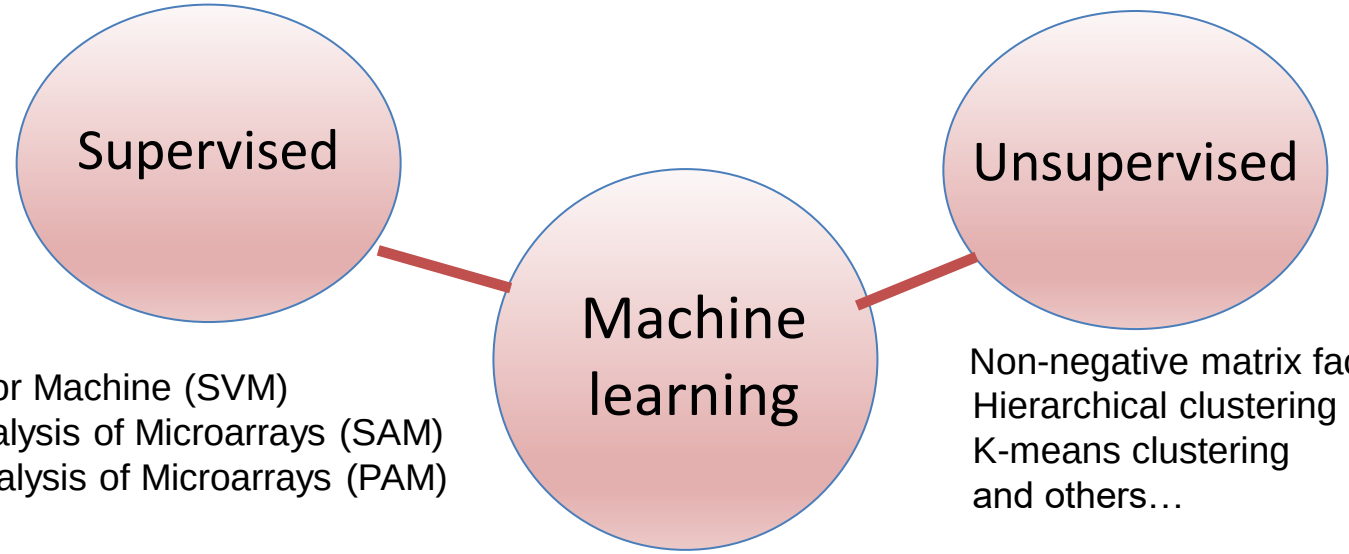
https://www.edureka.co/blog/ai-vs-machine-learning-vs-deep-learning/

Is AI Achievable?



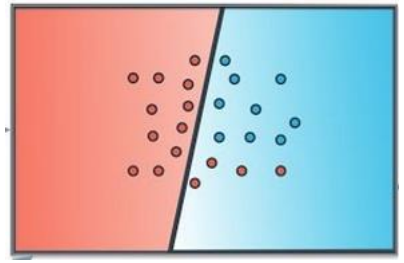
Source: google images

Machine Learning and their Types

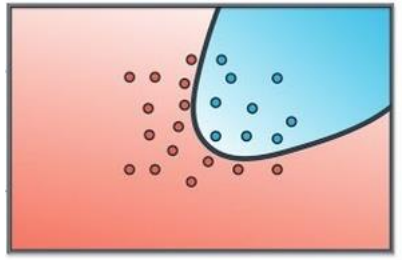


Support Vector Machine (SVM)
Statistical Analysis of Microarrays (SAM)
Prediction Analysis of Microarrays (PAM)

Non-negative matrix factorization (NMF)
Hierarchical clustering
K-means clustering
and others…



Mostly linear modeling like linear regression

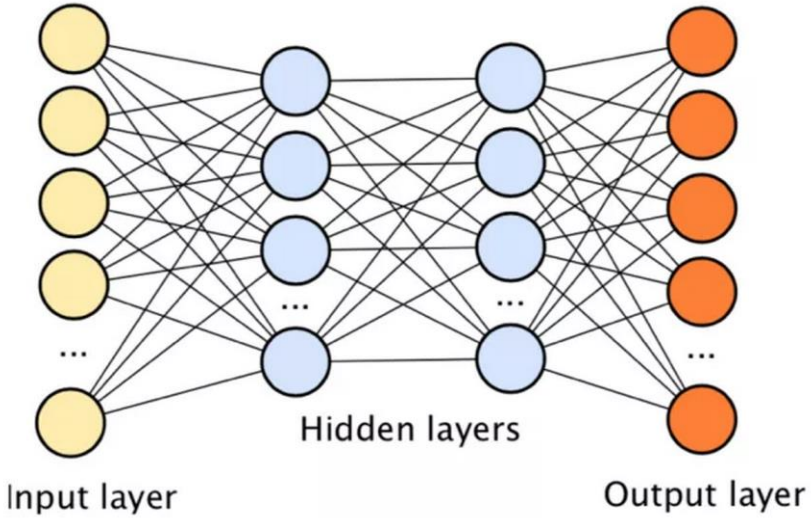


Sometimes non-linear modeling like mixture models

https://analyticks.wordpress.com/

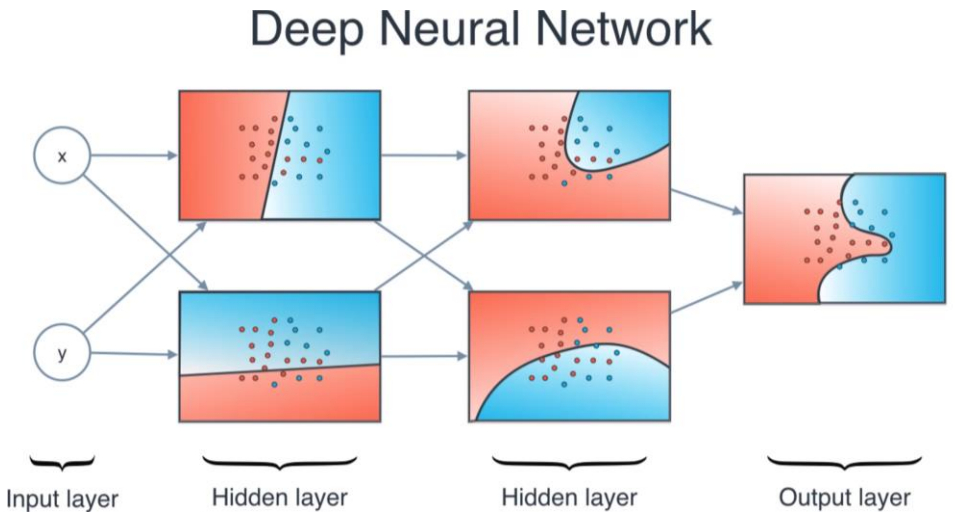
https://www.wordstream.com/

Deep Learning involves Neural Network



Deep learning mostly involves supervised learning

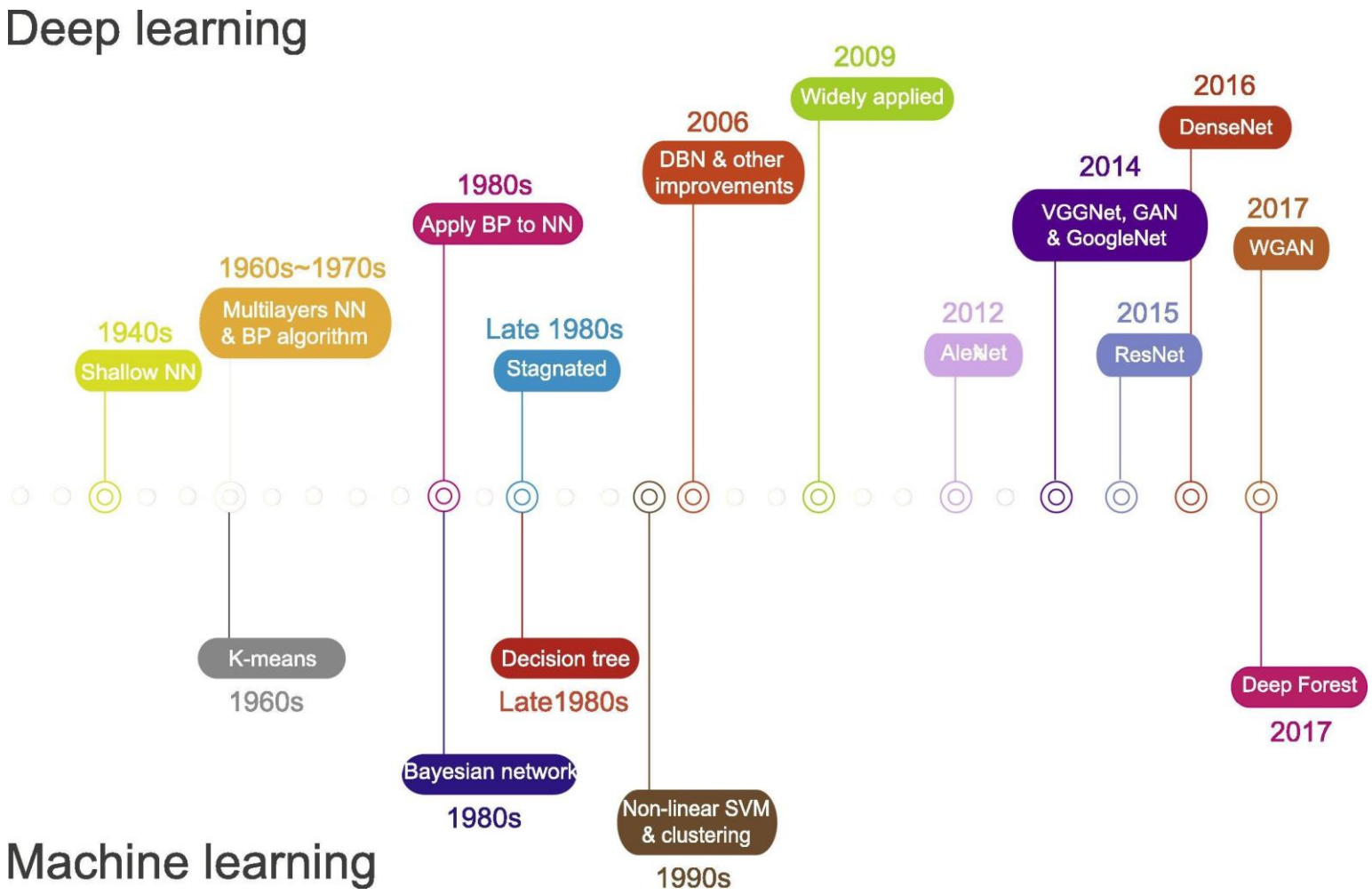
Certain times it can involve unsupervised learning



https://www.experfy.com

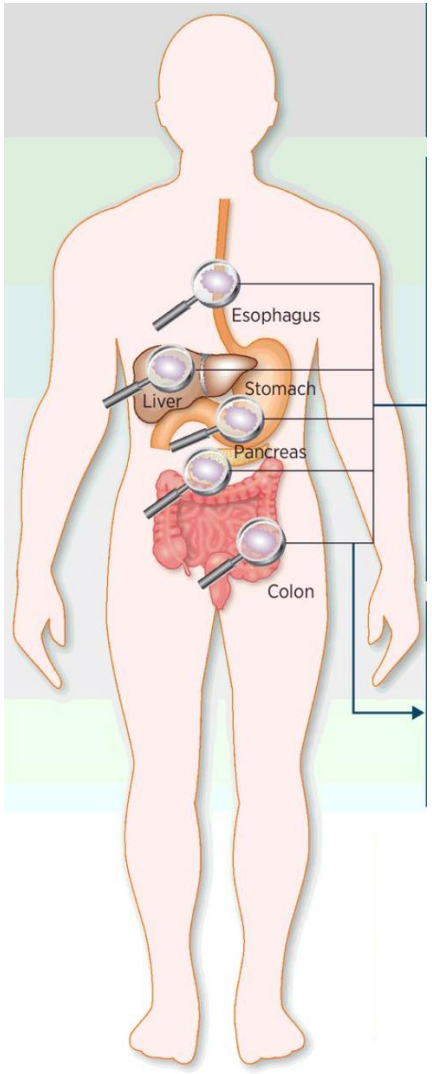
https://www.youtube.com/watch?v=BR9h47Jtqyw

Timeline of Machine and Deep Learning Approaches



Cao et al., Genomics, Proteomics and Bioinformatics 2018

Gastrointestinal (GI) Cancers



CCR Reviews

Incidence

Mortality

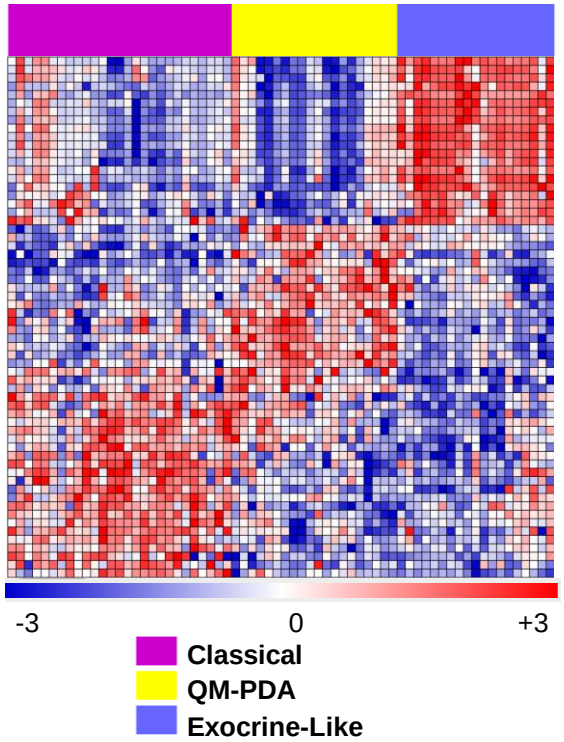
Major GI cancer types

- **Colorectal**
- Gastric
- Esophageal
- **Pancreatic**

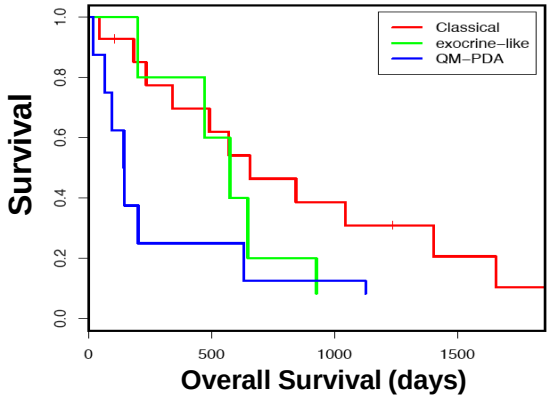
CRUK statistics 2014

Example 1 – Patient Stratification for Therapy in Pancreatic Adenocarcinoma (PDA)

Unsupervised and supervised analysis of patient samples

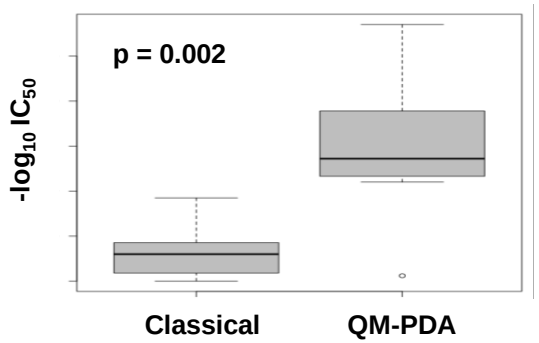


Patient Prognosis



Treatment response modeling using cell lines

Gemcitabine - Chemotherapy

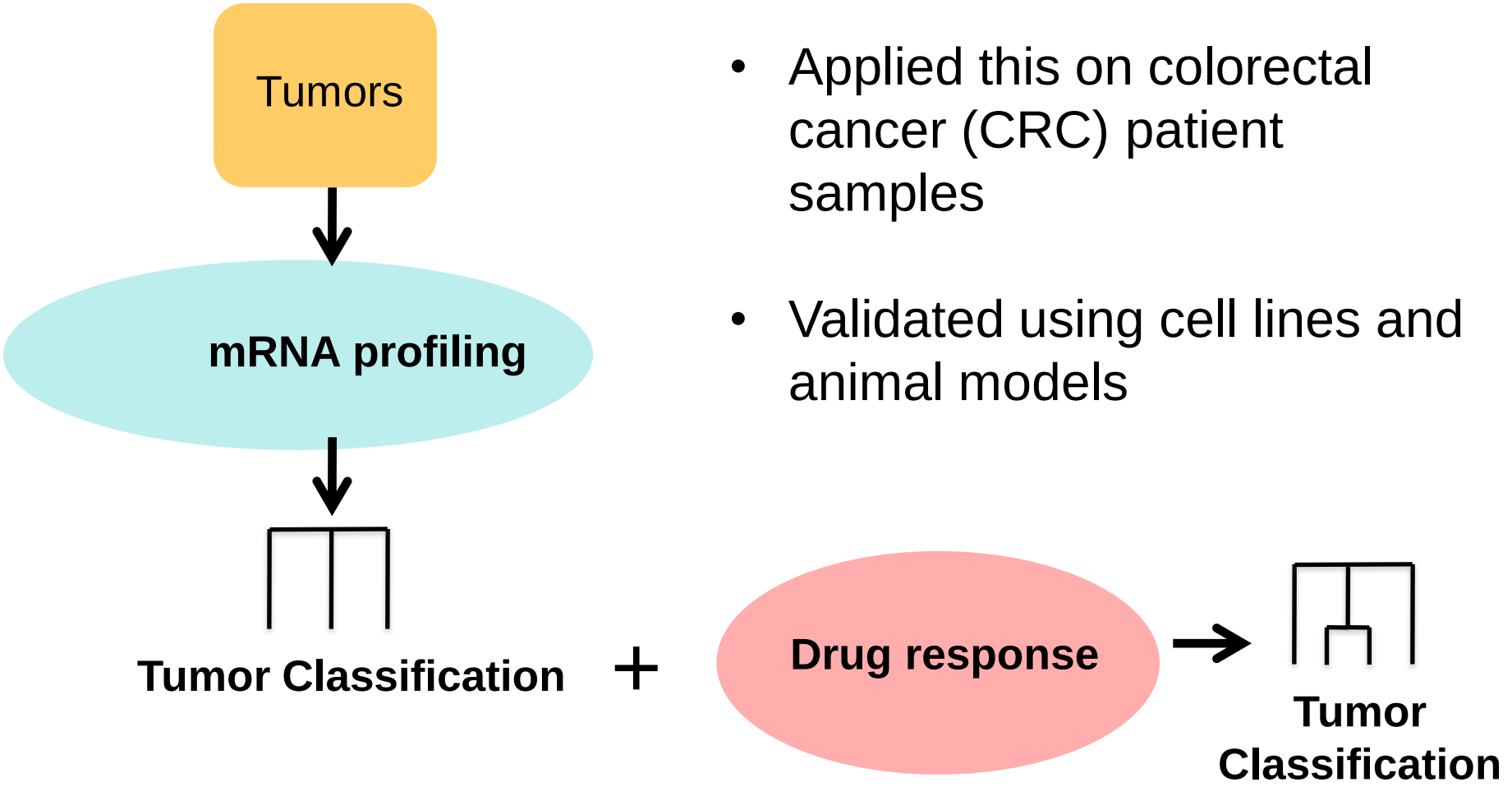


Demonstrated to be true in patient samples by Moffitt et al., Nature Genetics 2015 and Bailey et al., Nature 2016

- Supervised SAM analysis predicted 62 gene signature (*PDAssigner*) associated with the subtypes
- Univariate and multivariate clinical outcomes showed prognostic differences
- Cell line models showed differential treatment responses

Collisson and Sadanandam, et. al., *Nature Medicine* 2011

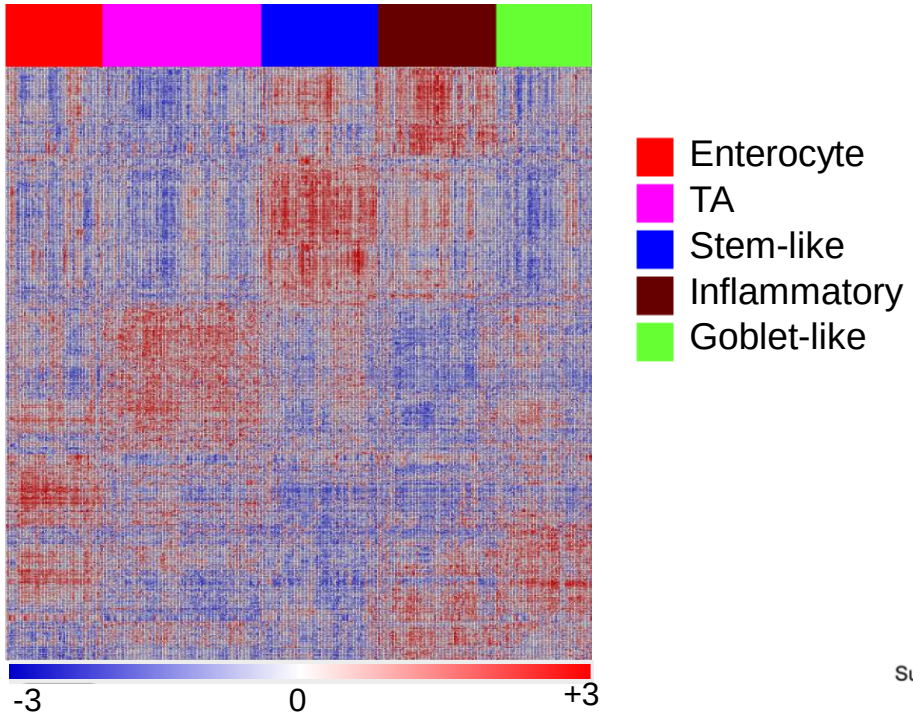
Example 2 - Discrete Genome-Phenome Integrative Analysis Strategy in Colorectal Cancer



- Applied this on colorectal cancer (CRC) patient samples
- Validated using cell lines and animal models

Molecular-Drug Response Subtypes of CRC with Prognostic Differences

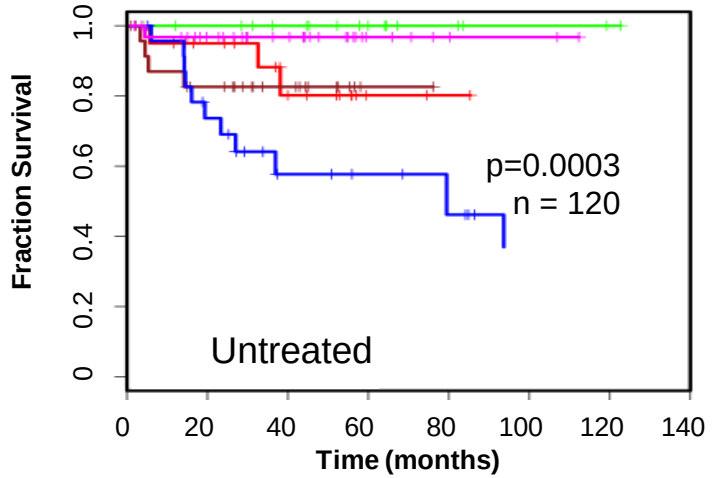
Unsupervised and supervised methods - subtypes in CRC patients tumors



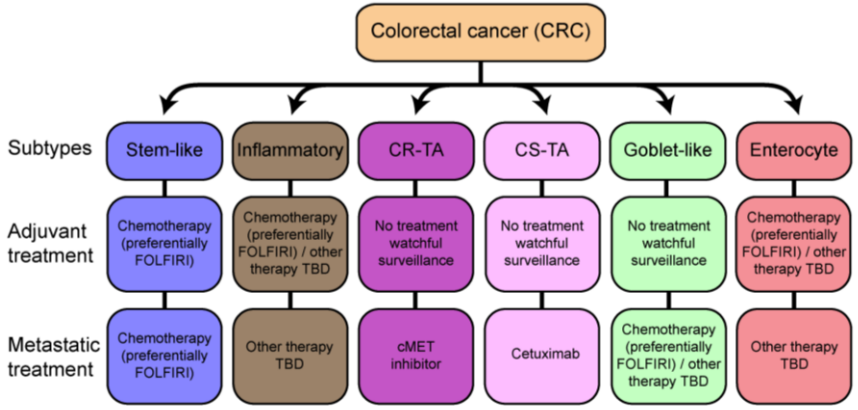
786 gene signature (CRCassigner)

CRC – colorectal cancer

Disease free survival differences in CRC subtypes

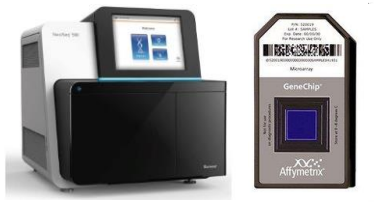


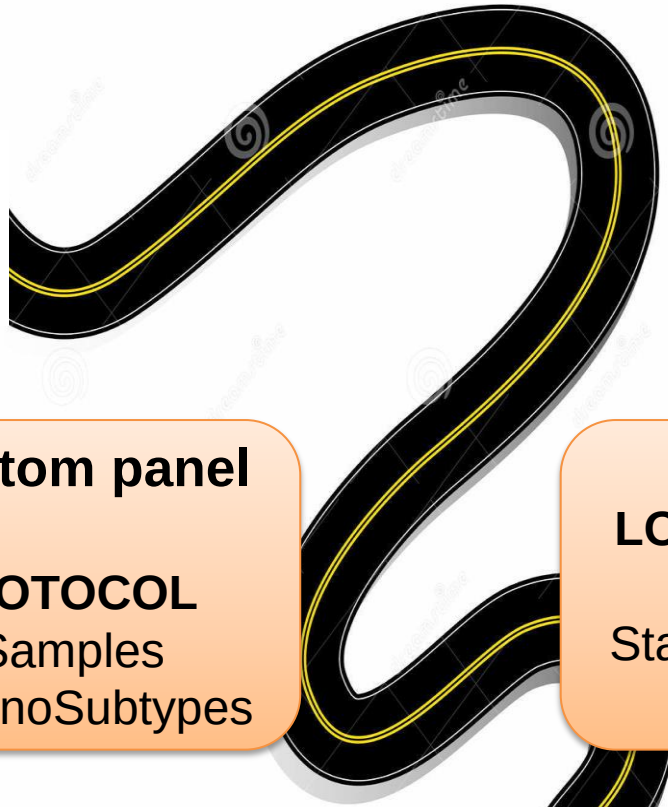
Molecular + drug response CRC subtypes associated with clinically available treatments

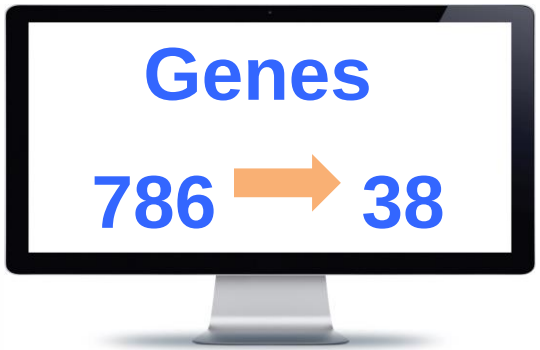


Sadanandam, et al., *Nature Medicine*, 2013
CRCS consortium Nature Medicine 2015

CRC Subtype-specific Multiplex Assay







Intense computational methods developed and used

NanoString Custom panel

STANDARD PROTOCOL
Fresh Frozen Samples
RNAseq versus NanoSubtypes

LOW COST PROTOCOL

Standard versus Low cost

LOW COST PROTOCOL

FFPE samples

1. Ragulan, et al., bioRxiv 2017; 2. Ragulan, et al., ESMO 2017; 3. Sadanandam et al., ESMO 2017; 4. Fontana et al., ESMO 2017; 5. Fontana et al, ASCO GI 2017; 6. Tarazona and Fontana, et al., ESMO 2018

NanoCRCA Subtyping Biomarker Assay with Treatment Predictive Potential

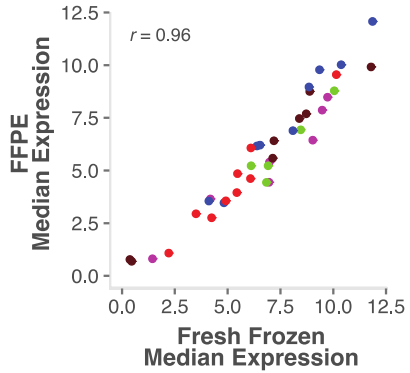
NanoCRCA (CRCAssigner) Assay

Concordance between platforms n=413

CRCA-786 (RNAseq)
CRCA-38 (RNAseq)
NanoCRCA (NanoString)

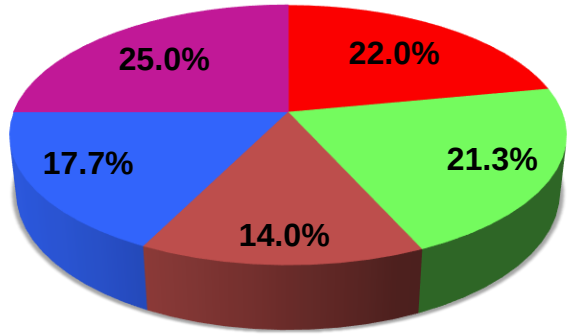
Enterocyte
Goblet.like
Inflammatory
Stem.like
TA

FFPE vs fresh frozen n=24

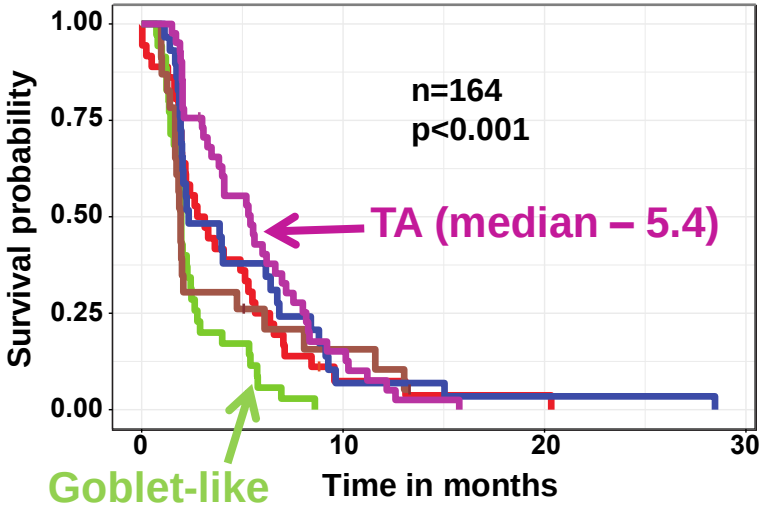


Ragulan, et al., Nature Scientific Reports 2019

Cetuximab treated FFPE samples



Cetuximab - progression free survival



Fontana, et al., JCO PO 2020

CRCAssigner (CRCA) Predicts Response to FOLFOXIRI/Bevacizumab

ASCO 2020 and World GI Congress 2020

CMS subtypes are Prognostic

Consensus Molecular Subtypes and CRCAssigner classifications in metastatic colorectal cancer: prognostic and predictive impact in the TRIBE2 study.

Borelli B., Fontana E., Giordano M., Antoniotti C., Bergamo F., Murgioni S., Pietrantonio F., Morano F., Tamburini E., Boccaccino A., Santini D., Conca V., Pella N., Maiello E., Ugolini C., Fontanini F., Falcone A., Nyamundanda G., Sadanandam A., Cremolini C.

On behalf of the GONO (Gruppo Oncologico del Nord Ovest, Italy) investigators.

Abstract ID: 4016

Background

- ✓ Consensus Molecular Subtypes (CMS) and CRCAssigner (CRCA) demonstrated prognostic value in multiple studies, but their predictive role has never been assessed with regard of the adoption of the triplet FOLFOXIRI plus bevacizumab as intensified upfront therapy.

  Sadanandam et al, Nat Med 2013; Guinney et al, Nat Med 2015; Lenz et al, JCO 2019; Stintzing et al, Ann Oncol 2019

- ✓ Recently the TRIBE2 study (NCT02339116) demonstrated the superiority of FOLFOXIRI/bev compared to a pre-planned strategy of doublets/bev.

  Cremolini et al., Lancet Oncol 2020

- ✓ Given the poor prognosis associated with early stage stem-like/mesenchymal subtypes we hypothesized that these subtypes might highly benefit from the intensified upfront therapy.

  Sadanandam et al, Nat Med 2013; Guinney et al, Nat Med 2015

Patients and Methods

- ✓ Naive formalin-fixed paraffin-embedded tissue samples were classified into CMS and CRCA subtypes using a custom validated nCounter assay (Nanostring tecnologies).
- ✓ The impact of subtypes on progression free survival (PFS) and overall survival (OS) was evaluated in the profiled population.
- ✓ Subgroup analyses of FOLFOXIRI/bev versus doublets/bev for PFS and OS were performed according to CRCA and CMS subtypes.
- ✓ An interaction test was applied to determine the impact of both classifiers on treatment effect.

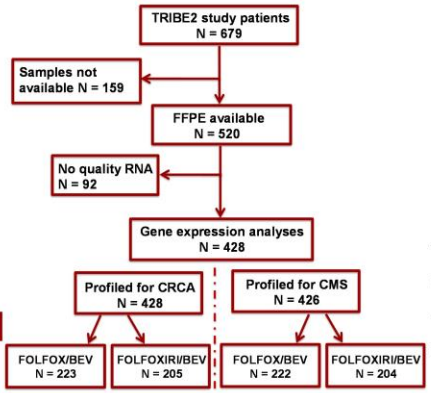
ICR The Institute of Cancer Research

CONQUER CANCER® THE ASCO FOUNDATION MERIT AWARD RECIPIENT

Eisai Inc. Endowed Merit Award

Supported by Eisai Inc.

Study population

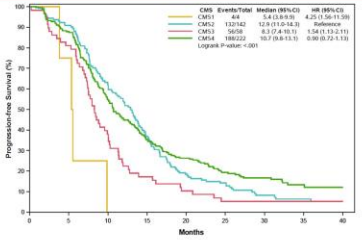


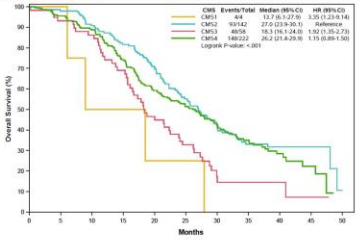
Characteristics of patients in the gene expression population

	N (%)
Right primary tumour	180 (42)
Synchronous	384 (90)
Resected primary tumour	263 (61)
Not liver-only disease	303 (71)
RAS mutant	274 (64)
RAS and *BRAF* wild-type	96 (22)
BRAF mutant	45 (11)
Missing data	13 (3)

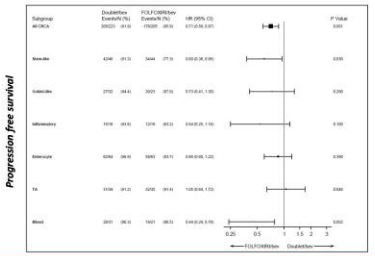
Acknowledgement: *F.E., S.A., N.G. acknowledge NIHR Biomedical Research Centre at The Royal Marsden, the ICR and Cancer Research UK.*
Funding: *This project was supported by GONO and ARCO Foundations.*

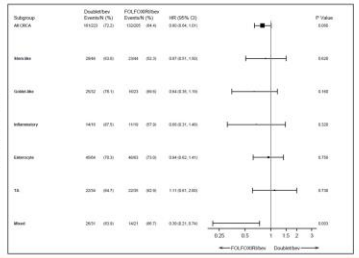
Results





- ✓ CMS subtypes revealed significant associations with PFS and OS in the TRIBE2 profiled population.
- ✓ In the multivariable model after adjustement for the significant covariates (gender, ECOG PS, liver only disease, primary tumour site, resected primary tumour, *RAS/BRAF* mutational status and MSI status) CMS classification retains its prognostic impact (PFS, *P*=0.01; OS, *P*=0.08).
- ✓ No interaction effect between treatment arm and CMS subtypes was found (PFS, *P*=0.88; OS, *P*=0.55), thus the benefit from FOLFOXIRI/bev was consistent among all the subtypes.
- ✓ At the univariate analysis CRCA subtypes showed significant association with PFS (*P*=0.04) and OS (*P*=0.02), but in the multivariable model their prognostic role was not confirmed (PFS, *P*=0.36; OS, *P*=0.55).
- ✓ Significant interaction effect between treatment arm and CRCA subtypes was reported in terms of PFS (*P*=0.017) and OS (*P*=0.008).





Conclusions

CMS subtypes have a prognostic role in mCRC independently of *RAS/BRAF* status. CRCA classification may help identifying subgroups of patients (i.e. those with stem-like and mixed subtypes) who may derive a more substantial benefit from upfront FOLFOXIRI/bev.

b.borelli89@gmail.com

Borelli et al. ESMO Open 2021

Draw-backs Associated with Conventional Clustering Methods

NO immediate functional significance associated with the subtypes

Multiple steps involved to associate with clinical outcomes or other phenotypes

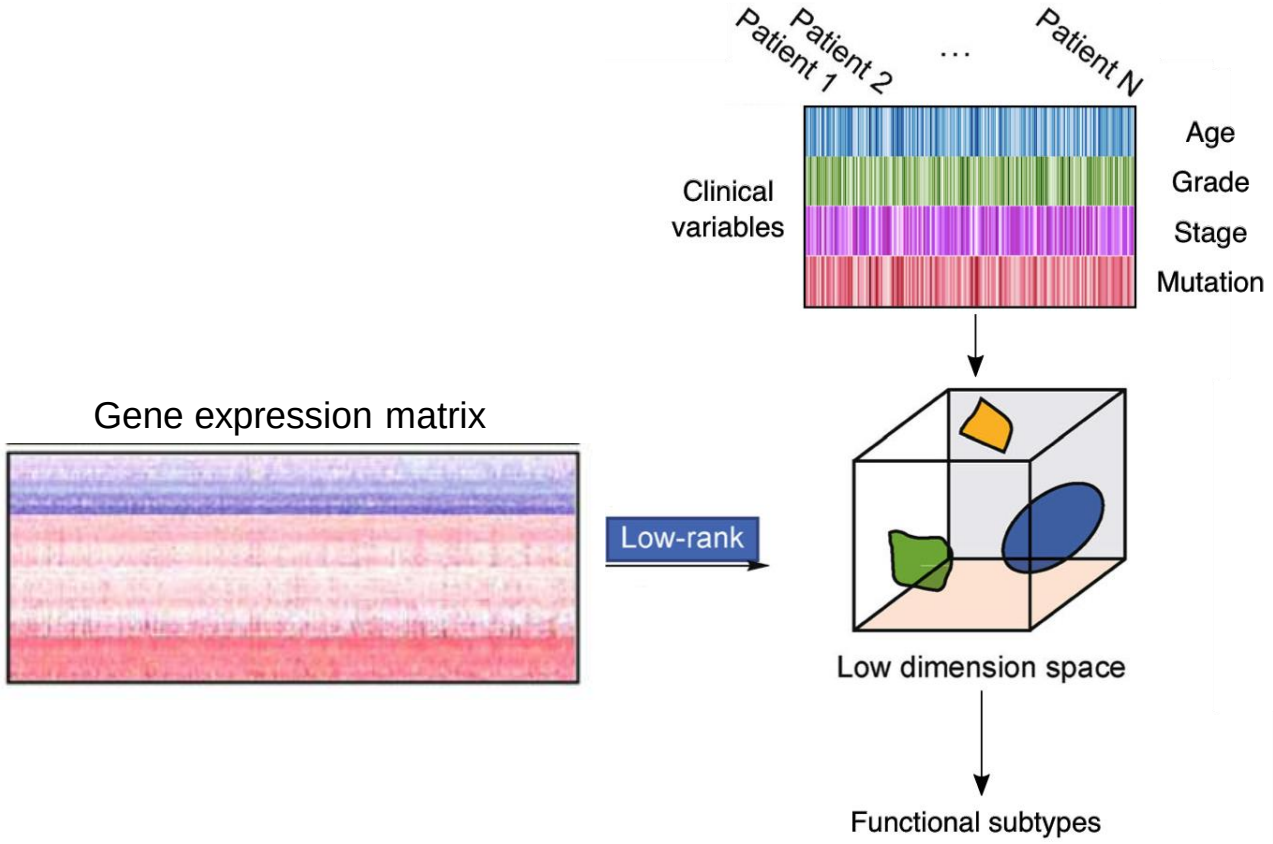
Genome-Phenome Integration

Functional Subtyping

PhenMap

A Next-Gen Bioinformatics Tool to Combine Omics Profiles with Phenotypes

PhenMap – metavariable modeling



Adapted from Wang et al., *Quant. Biol.*, 2016

Advantages of PhenMap (Functional Subtyping)

An all-in-one tool that can:

a) identify clusters (subtypes)

b) associate phenotypes (covariates) to clusters, by removing insignificant ones (provides explanation of clusters)

c) identify signatures that can distinguish these subtypes in other datasets

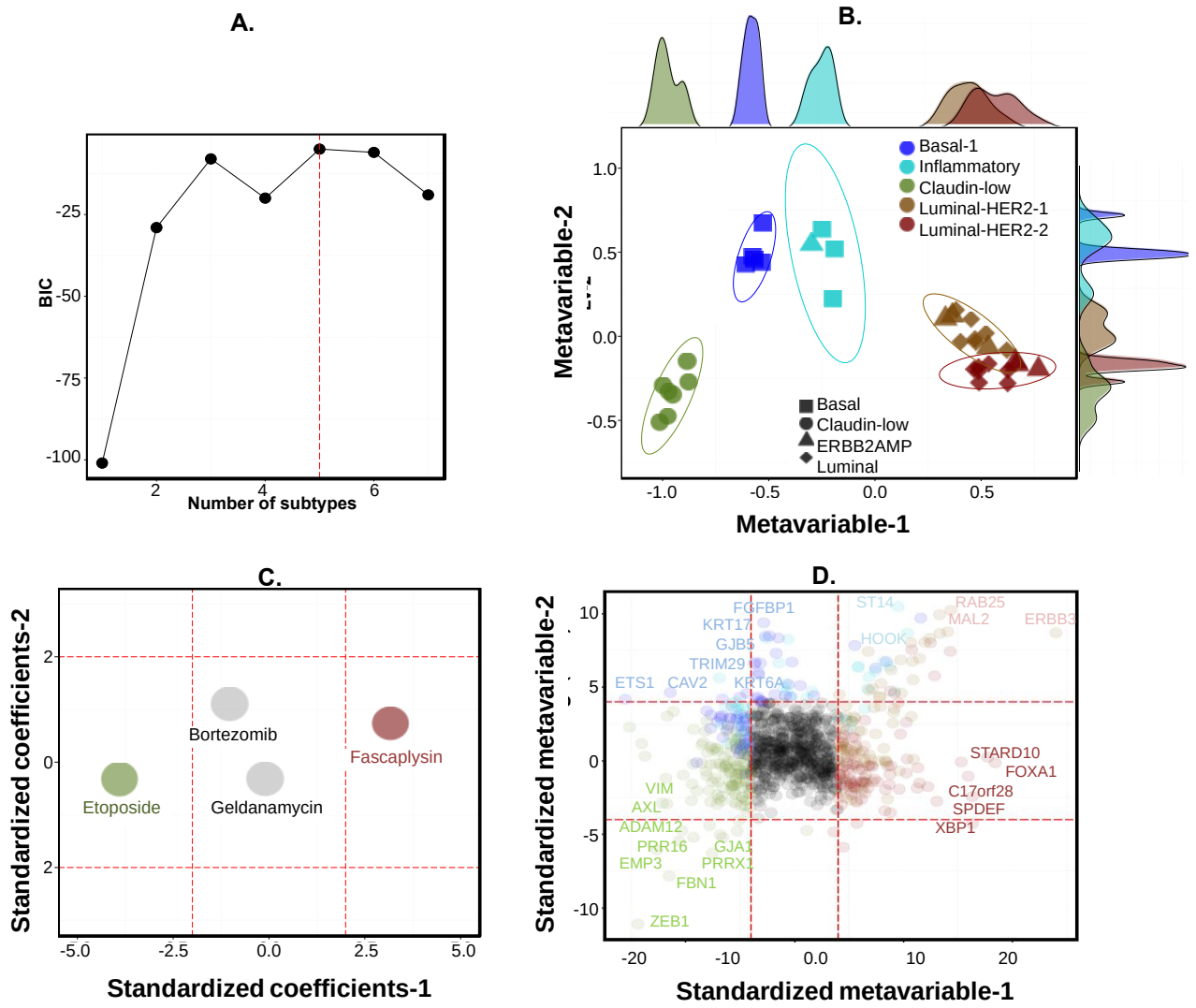
Example-1

Modeling Breast Cancer Drug Response

Functional Subtyping - Breast Cancer Cell Lines and Drug Response Data

- Gene expression profiles of 36 breast cancer cell-lines
- Drug response information for four drugs:
  - Etoposide,
  - Fascaplysin,
  - Bortezomib, and
  - Geldanamycin
- 996 most variables genes were selected
- Identify subtypes and drugs specific to each subtype

Simultaneous Identification of Subtypes and Associated Drugs in Breast Cancer Cell Lines



A – showing number of optimal subtypes

B – showing 5 optimal global subtypes

C – showing significant subtype-drug association

D – showing significant genes associated with subtypes

BIC – Bayesian information criteria

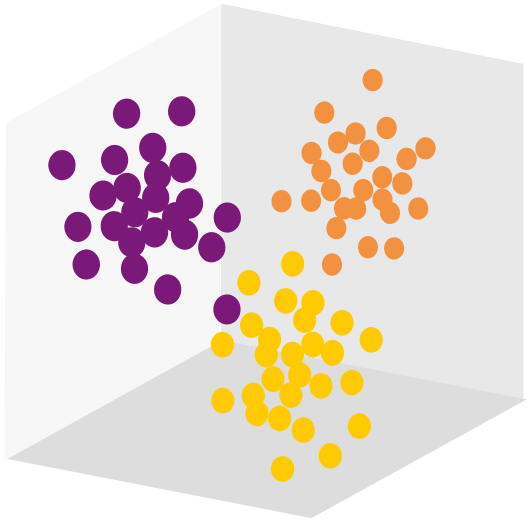
We have demonstrated this in multiple patient samples + clinical data

Nyamundanda and Sadanandam (unpublished)

Multi-Omics Subtyping

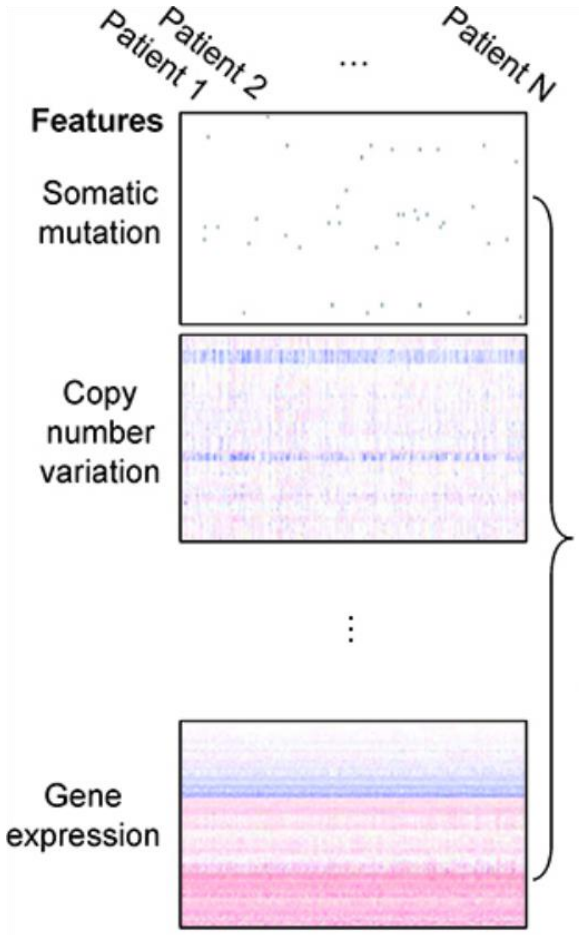
Multiomics data

mRNA
miRNA
Copy number
Methylation
Protein



Multiomics Subtypes and Signatures

Two Major Multi-Omics Integrative Subtyping Analysis



Discrete integration
- cluster-of-clusters
- reconciliation approaches
  - iPolycluster

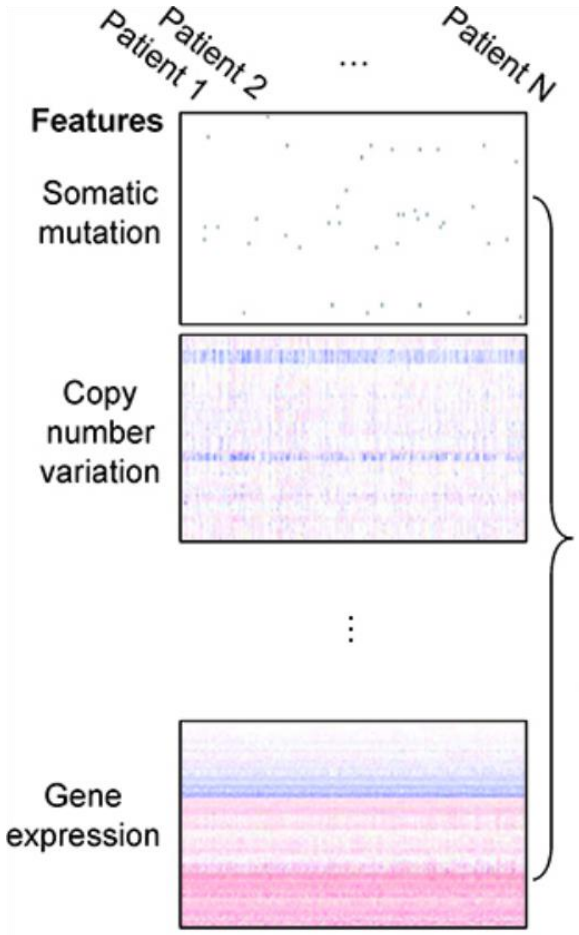
Direct integrative clustering
- iCluster and similar methods
- iPhenMap

Blue – tools developed by our lab

	Subtype A	Subtype B	Subtype C
Feature 1	High	Low	High
Feature 2	High	Low	Low
...	...	...	...
Feature *i*	Low	High	High
...	...	...	...
Feature *k*	Low	Low	High

Adapted from Wang et al., *Quant. Biol.*, 2016

Discrete Integration – Two Major Methods

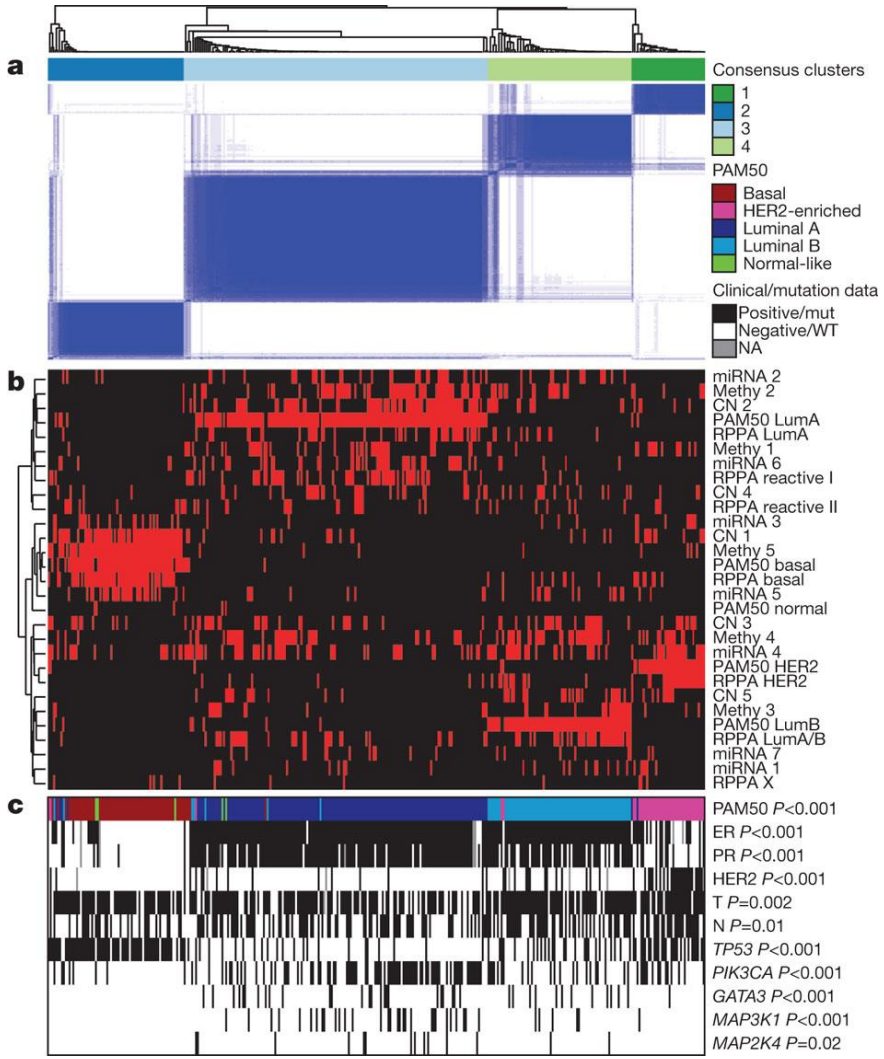


Discrete integration
- cluster-of-clusters

	Subtype A	Subtype B	Subtype C
Feature 1	High	Low	High
Feature 2	High	Low	Low
...	...	...	...
Feature *i*	Low	High	High
...	...	...	...
Feature *k*	Low	Low	High

Adapted from Wang et al., *Quant. Biol.*, 2016

Cluster of Cluster Analysis of TCGA Breast Cancer Data

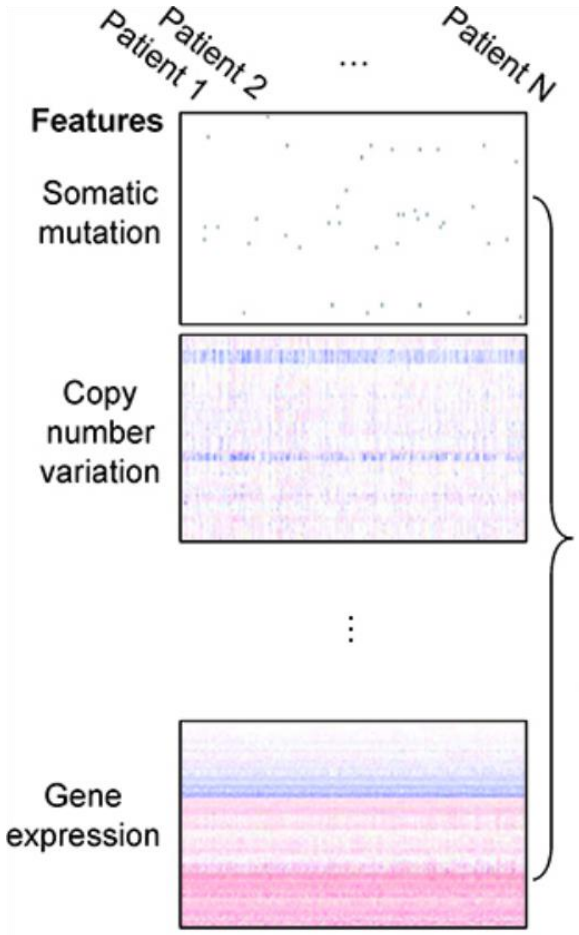


Subtypes identified from different platforms are clustered

Disadvantage – no true community of clusters revealed

TCGA, Nature 2012

Discrete Integration – Two Major Methods



Discrete integration

- reconciliation approaches
  - iPolycluster

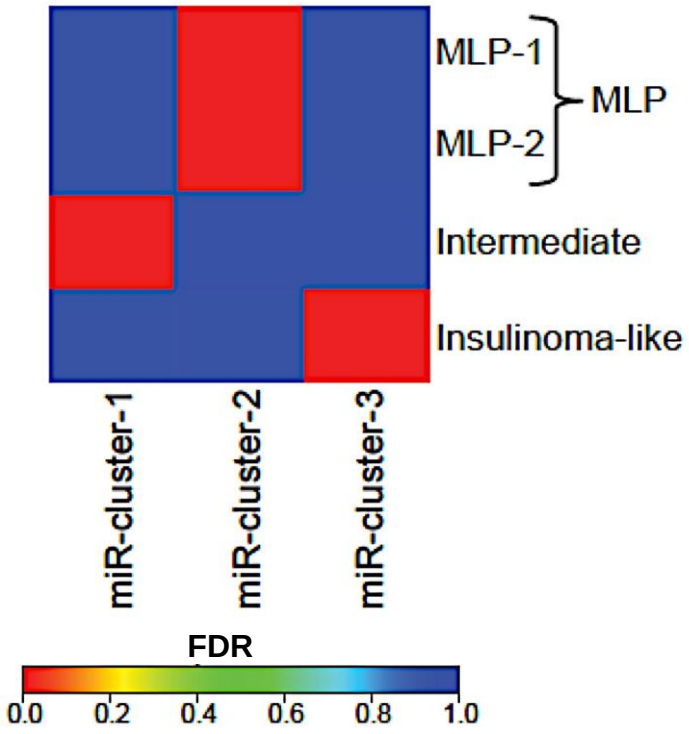
	Subtype A	Subtype B	Subtype C
Feature 1	High	Low	High
Feature 2	High	Low	Low
...	...	...	...
Feature *i*	Low	High	High
...	...	...	...
Feature *k*	Low	Low	High

Blue – tools developed by our lab

Adapted from Wang et al., *Quant. Biol.*, 2016

Multiomics Subtypes – Cluster Reconiciliation in Pancreatic NETs

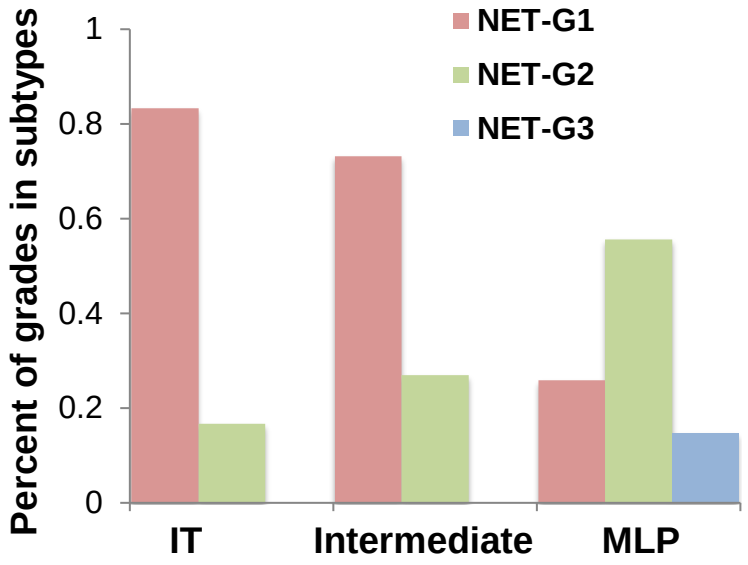
Reconciliation of miRNA and gene PanNET Subtypes



MLP – metastases-like primary

MLP patients had liver and LN metastasis

Association with clinical tumour grades with PanNET subtypes

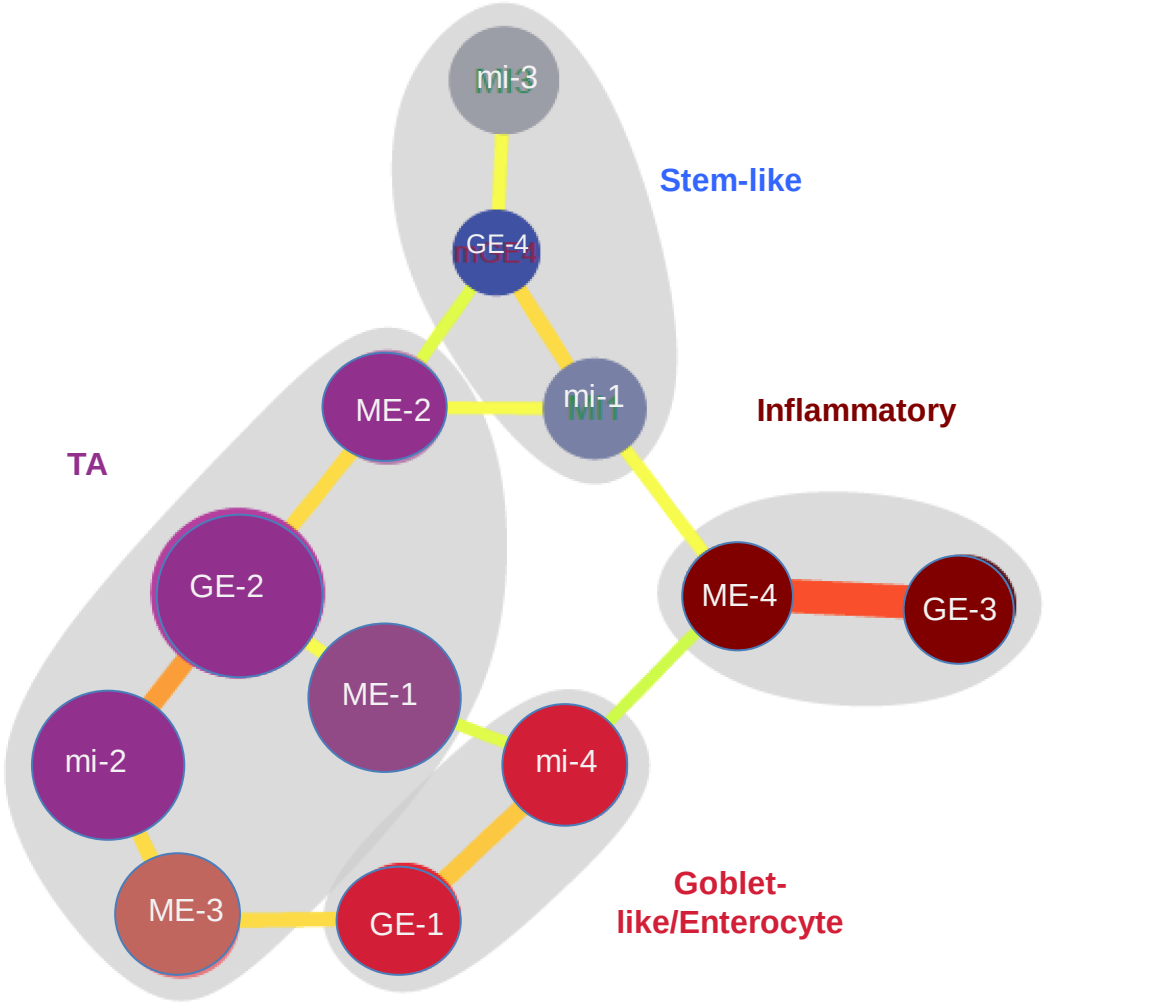


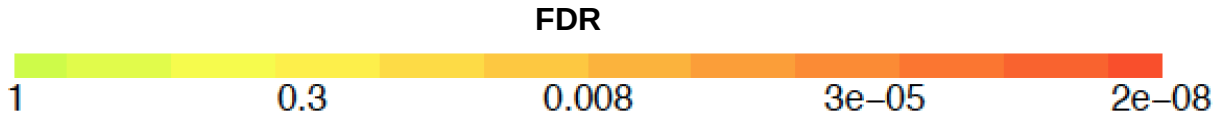
Clinically used tumour grades in PanNET are still heterogeneous

Tumour grades can be split across different subtypes

Sadanandam and Hanahan et al., *Cancer Discovery* 2015

Multiomics Subtyping using iPolycluster

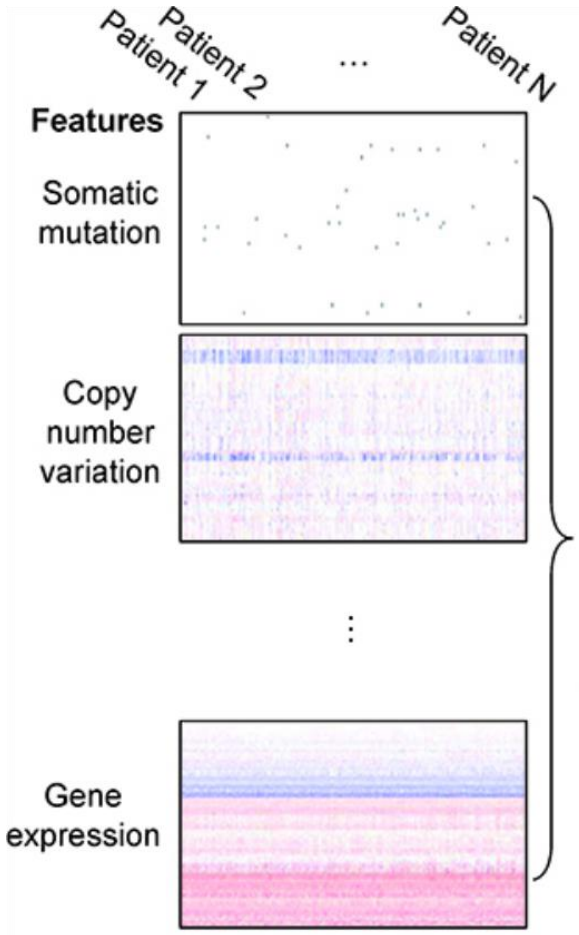




Disadvantage: Lose information with discrete approaches

Eason and Sadanandam, unpublished

Direct Integrative Clustering - iCluster

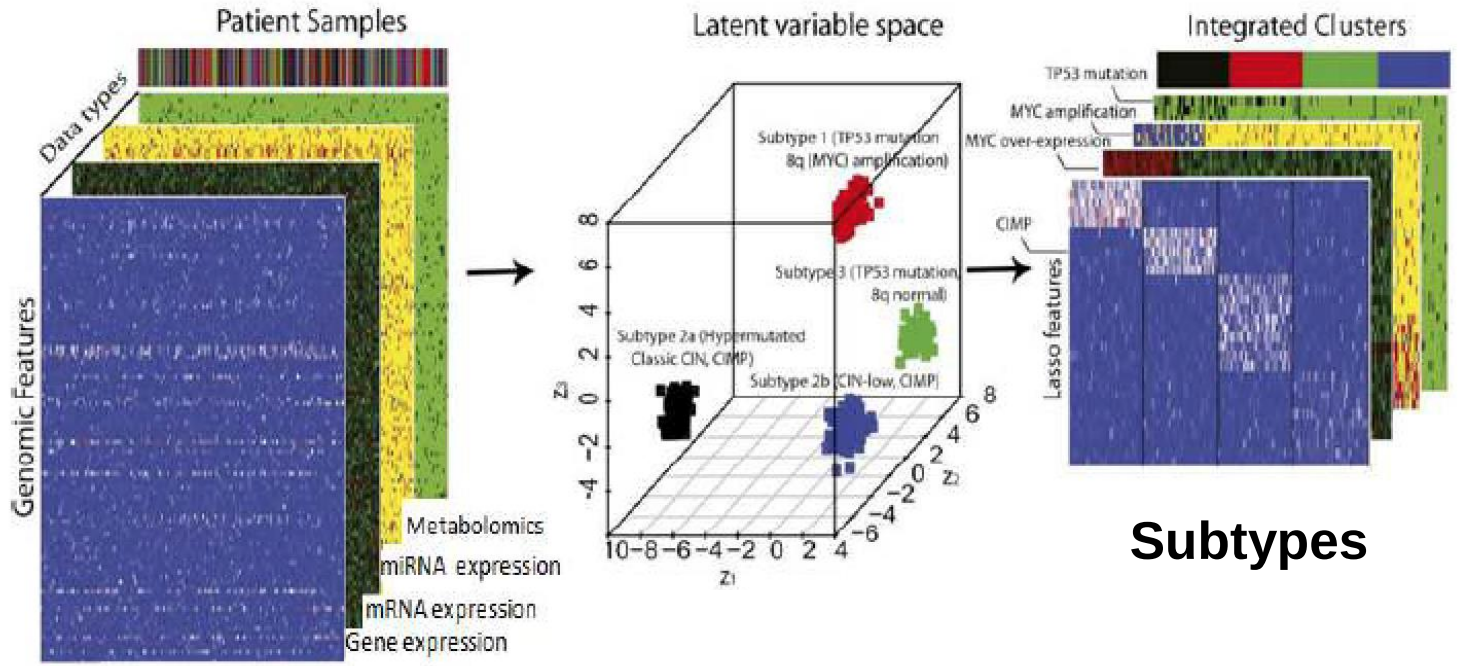


Direct integrative clustering
- iCluster and similar methods

	Subtype A	Subtype B	Subtype C
Feature 1	High	Low	High
Feature 2	High	Low	Low
...	...	...	...
Feature *i*	Low	High	High
...	...	...	...
Feature *k*	Low	Low	High

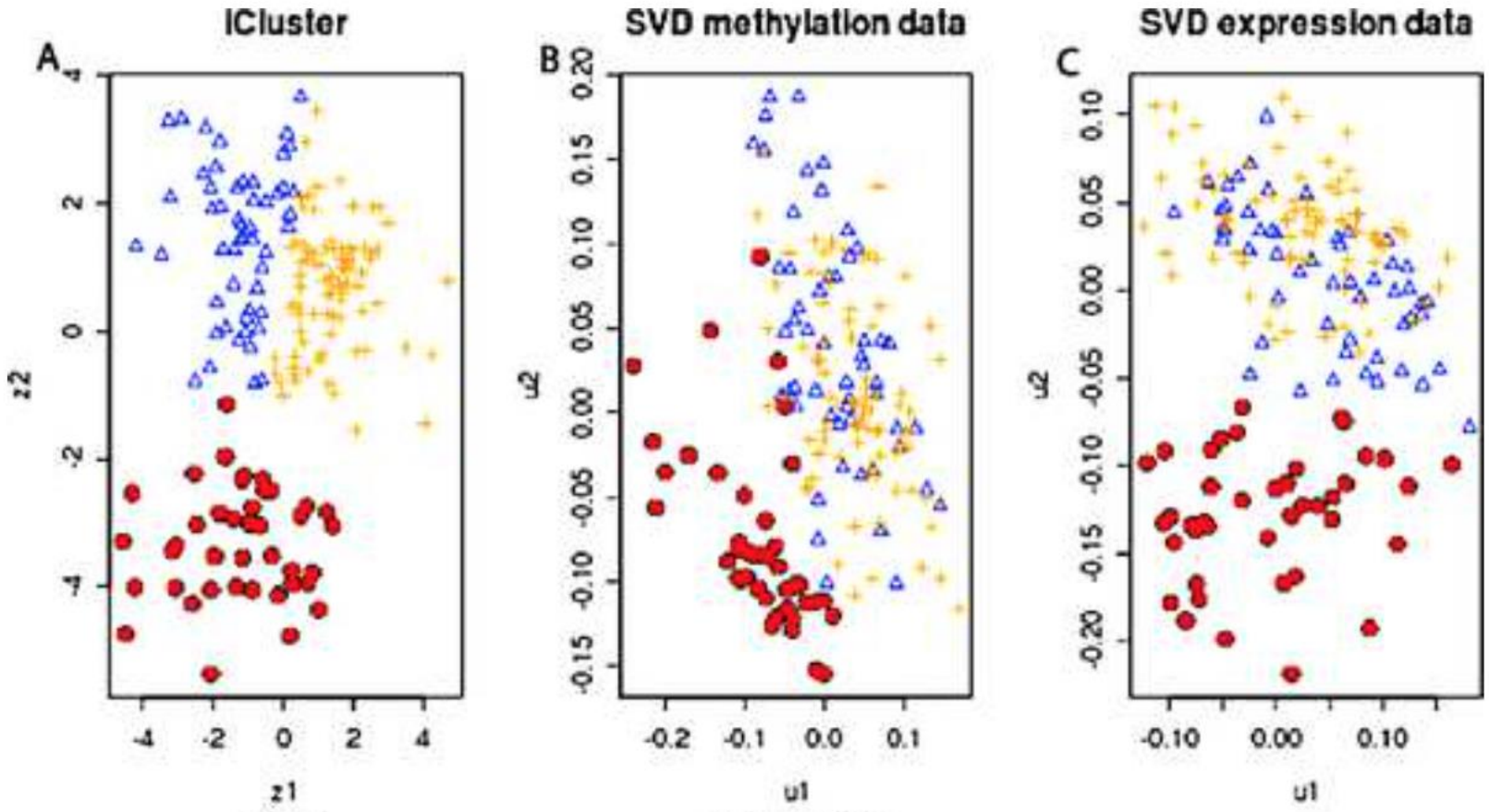
Adapted from Wang et al., *Quant. Biol.*, 2016

iCluster – Integrative Multi-omics Clustering



Shen et al., 2009

Integration of Breast Cancer Methylation and Gene Data using iCluster



Integrative clustering shows better resolution of subtypes than individual omic clustering

Holm et al breast cancer dataset

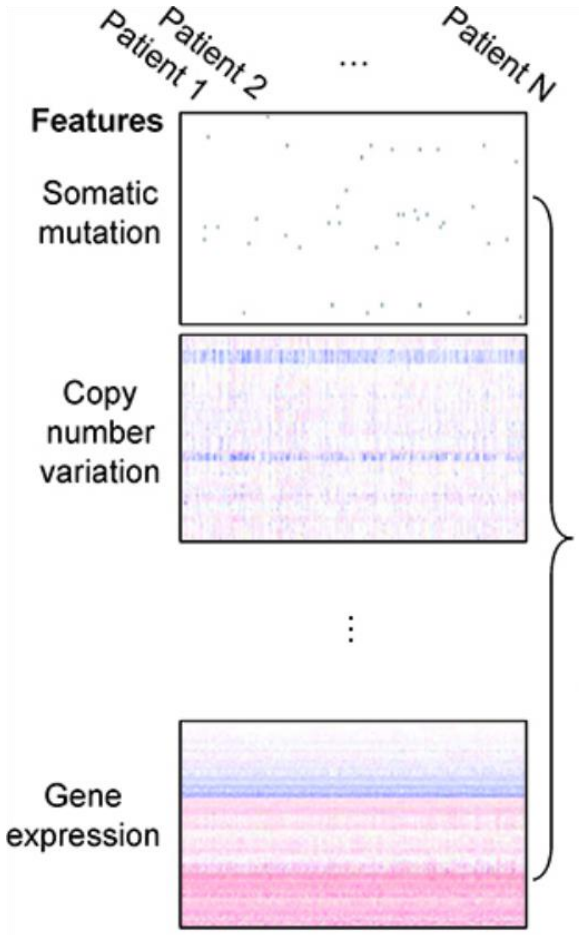
Shen, et al 2013

Draw-backs Associated with Direct Clustering Methods

NO immediate functional significance associated with the subtypes

Multiple steps involved to associate with clinical outcomes or other phenotypes

Two Major Multi-Omics Integrative Subtyping Analysis



Direct integrative clustering

- iPhenMap

Blue – tools developed by our lab

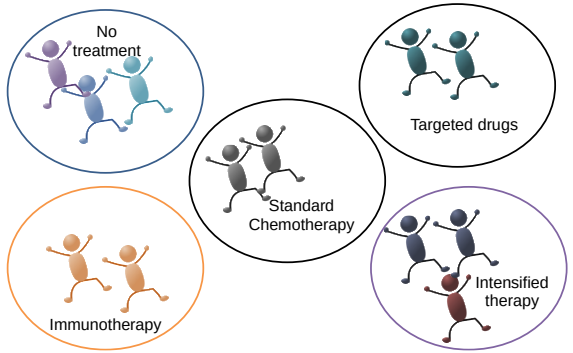
	Subtype A	Subtype B	Subtype C
Feature 1	High	Low	High
Feature 2	High	Low	Low
...	...	...	...
Feature *i*	Low	High	High
...	...	...	...
Feature *k*	Low	Low	High

Adapted from Wang et al., *Quant. Biol.*, 2016

Metavariable based Integrative Clustering of Multiomics and Phenotypic Data

Clinical variables

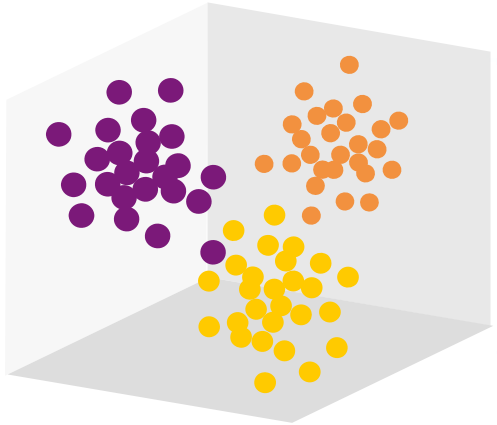
Disease settings
Grade
Treatment response, etc

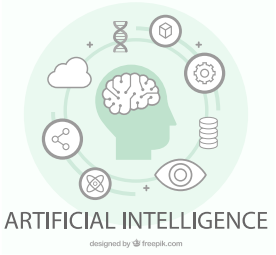


Multiomics data

mRNA
miRNA
Copy number
Methylation
Protein

Sequencing





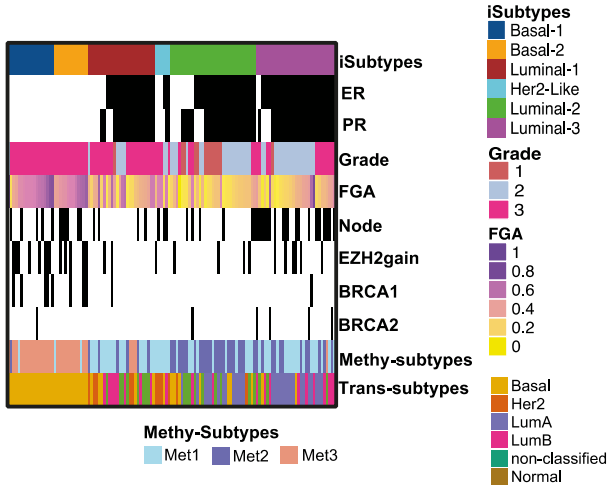
Functional Multiomics Subtypes and Signatures

Our in-laboratory developed tool **mphenMap/mMAP**

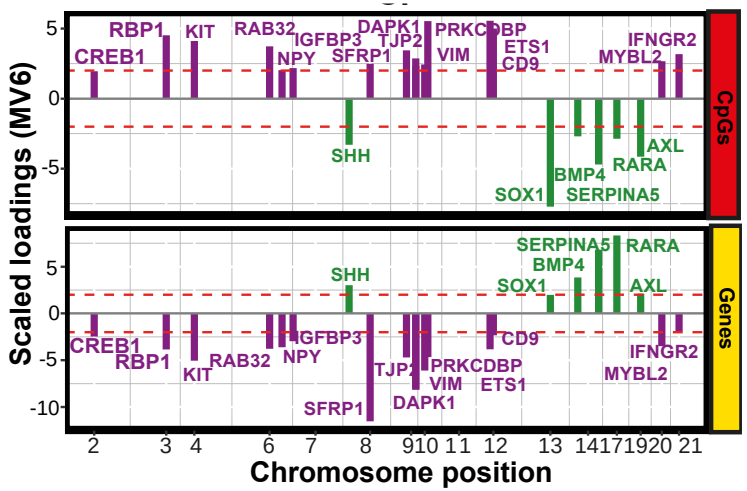
first of its kind

*m*PhenMAP – Integrating Gene and Methylation Data with Clinical Covariates

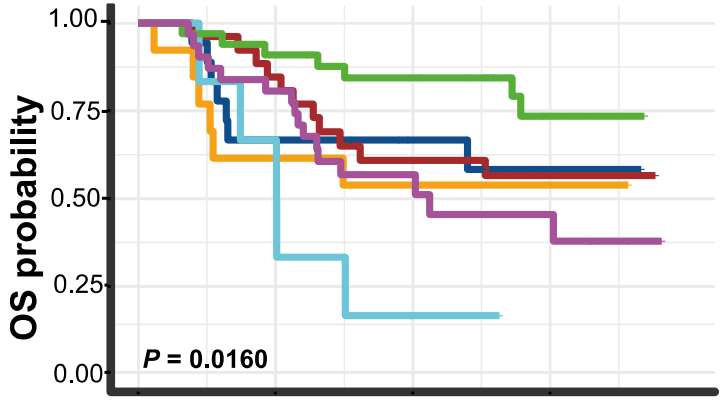
mPhenMap multiomics subtypes and clinical associations



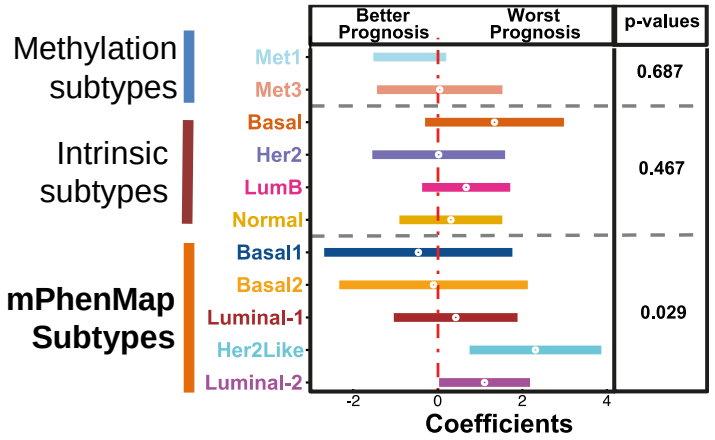
Multiomics Features



Differential Survival in mPhenMap Subtypes



Comparision of different classifications with mPhenMap Subtypes



Nyamundanda and Sadanandam, unpublished

Summary
Subtypes are Context Specific and Continuous

Subtypes are context-specific and continuous, hence, they may vary depending on:

a) Functional/phenotypic criteria

b) Features – molecular/metabolomic/histology

c) Tools or methods – consensus molecular CRC subtypes (CMS)

•Confounding factors can be identified using pathway analysis from sparse features

Acknowledgements

Sadanandam lab

Gift Nyamundanda
Chanthirika Ragulan
Krisha Desai
Patrick Varun Lawrence
Nagina Mangal
Aasia Hussain
Chloe Harris
Hari PS
Janki Insan

Funding Bodies

@LabSadanandam

https://www.sadanandam-lab.com/

THANKS FOR ATTENDING

The NHS Data and Information Conference 2022

CONVENZIS

REGISTER FOR OUR UPCOMING EVENTS!

NHS Radiology Conference

2022

Sign Up Here...

The NHS Patient Safety Conference

2022

Sign Up Here...

The NHS Population Health Management Conference

2022

Sign Up Here...