Lessons Learnt from the Design and Delivery of a National System Dynamics Training Programme for the National Health Service in England

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Agenda

1. Problem Statement
2. Delivery Approach
3. Outcomes
4. Lessons Learnt

1. Problem Statement

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1. The English National Health Service

- **The National Health Service (NHS) England is the publicly funded healthcare system in England, and one of the four National Health Service systems in the United Kingdom.**
- The NHS provides healthcare to all legal English residents and residents from other regions of the UK, with most services free at the point of use for most people.
- Primarily funded by the government from general taxation (plus a small amount from National Insurance contributions),
- The NHS is overseen by the Department of Health and Social Care.
- It is the second largest single-payer healthcare system in the world after the Brazilian Sistema Único de Saúde.

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1. Understanding of the strategic and operating context

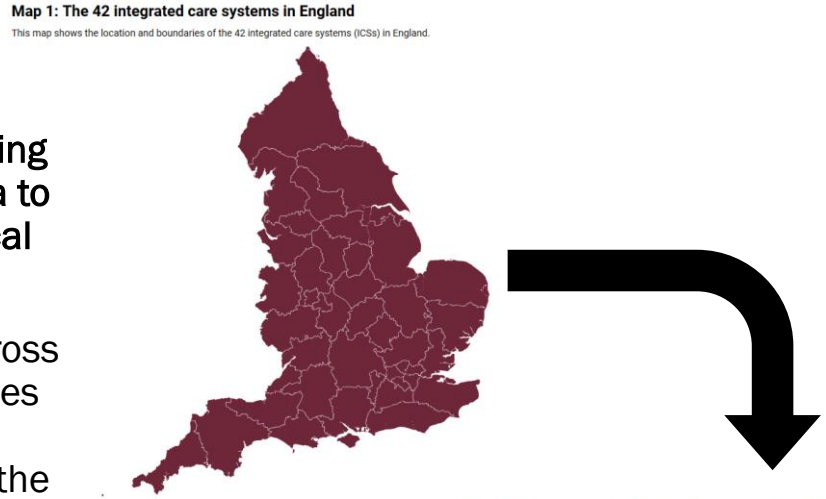
Integrated Care Systems (ICS) were established by the NHS in 2022, enabling NHS organisations, local councils and frontline professionals in a local area to collaborate and provide bespoke care suited to the unique needs of the local population.

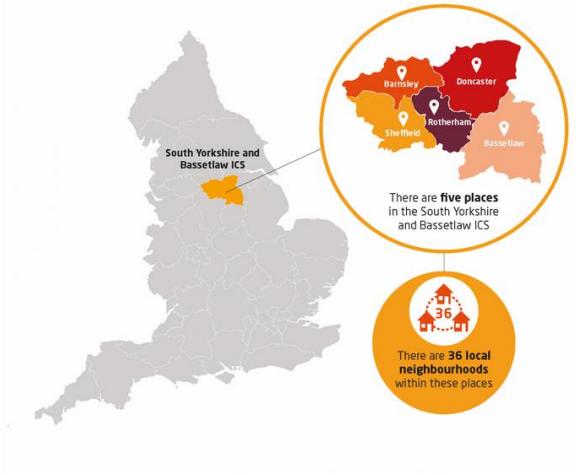
ICSs face a number of challenges associated with collaborative working across organisations such as differences in ways of working, organisational priorities and governance structures. Additionally, the return to normal services and working practices following the COVID-19 pandemic, as well as addressing the health inequalities is exposed.

Core ICS functions, namely capacity and demand modelling, enable providers to:

- assess population health needs and plan and model demographic, service use and workforce changes over time;
- plan and prioritise how to address those needs, improve population health and tackle inequalities; and
- ensure that priorities are funded to provide good value and health outcomes.

Capacity and demand modelling provides benefit across the system including for patients, staff and taxpayers.





The Kings Fund, 2022

1. The ICS landscape

- Changing population health and needs
- Lack of capacity / new skills required
- Need to integrate policies with the social care system
- Resource allocation
- System (in)efficiency
- Financial constraints
- Need to test different scenarios in a safe environment
- Combination of them (How to analyse them together?)

1. Typical questions that ICSs have… Not unique to a single ICS!

- How long it might take to bring back growing waiting lists to acceptable levels given current capacity constraints, and what might be the impact of these delays on people's health?
- What are the capacity and flow requirements in an effective hospital discharge pathway taking account of all relevant partners' contributions?
- What are the training and development gaps if the NHS is to have the capacity and skills needed to meet the challenges of changing population health needs into the late 2020's?
- What are the relative costs and benefits of undertaking proactive work with specific population groups over the short and longer term?
- What capacity is required to meet the needs of the population over 1, 2, 5 or even 10 years?

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1. The current use of System Dynamics in England

It was recognised that System Dynamics could be used to inform system wide decision making in the NHS and that there was a capability gap…

- There have been attempts to use SD and other modelling approaches
- The use of SD is still very limited, there is more use of DES
- Usually dependent on the use of external consultancies
- Strong argument to improve internal capacity and capability
- Software could be a barrier (upfront cost), as open source software might not offer all features yet

NHS England commissioned the design and deliver a series of pilots to demonstrate the potential contribution that the modelling and simulation approach System Dynamics (SD) can make to the NHS demand and capacity planning challenge.

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2. Delivery Approach

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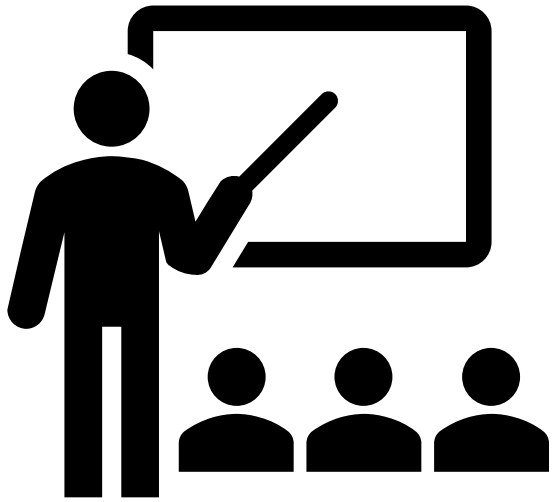
2. Required Learning Objectives

Design and deliver a series of pilots to demonstrate the potential contribution that the modelling and simulation approach System Dynamics (SD) can make to the NHS demand and capacity planning challenge.



- Have an understanding of **what system dynamics is** and its core concepts
- Understand how to use system dynamics techniques to **map, conceptualise and better understand systems**
- Understand the **advantages and disadvantages** of system dynamics
- Understand the **stages of developing** robust system dynamics models
- Develop **simple quantitative system dynamics** models using **Stella Architect**
- **Interpret** system dynamics models and system dynamics model results and how best to communicate them
- How to **encourage senior stakeholder buy in**.

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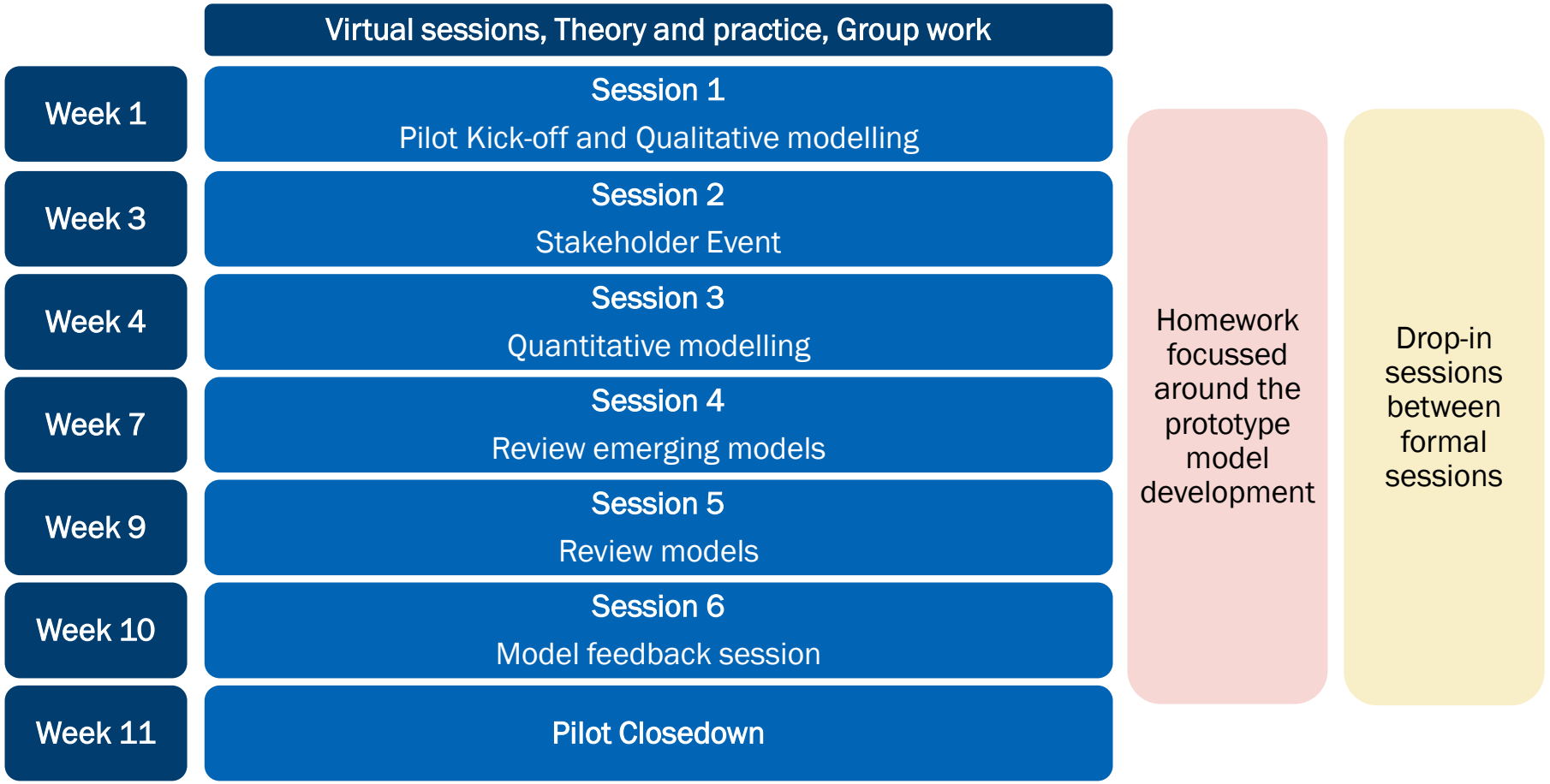
2. Overview of delivery ethos

- Each Pilot was designed for **up to 10** suitably qualified delegates
- To be **delivered online** to acknowledge C19 guidelines
- Formal **online two-hour learning sessions approximately every two weeks**, and **less formal 1 hour online drop-in sessions** between the formal sessions where progress can be discussed.
- **Mixed learning techniques**:
    - Slides covering theory and examples
    - Practical application – hands on use of Stella Architect
    - Group work and individual based learning
    - Homework!
- **Focus on problem-based learning** to encourage working together to build a prototype models.
- **Emphasizing group knowledge building** and working with **real world problems and data**.
- Sessions will be run using online resources **making use of collaboration tools** to rapidly build a community of practice.

2. Planned overview of a Typical Pilot



2. Emphasising robust development of System Dynamics models throughout

Model scoping

develop a clearly defined model specification

To be discussed in Pilot Sessions 1 and 2

Model construction

Development of the model based on best practices in model construction, for example unit consistency and mass balances.

To be discussed in Pilot Sessions 2 and 3

Model documentation

For example, internal model comments, model assumptions document, data dictionary and a user guide

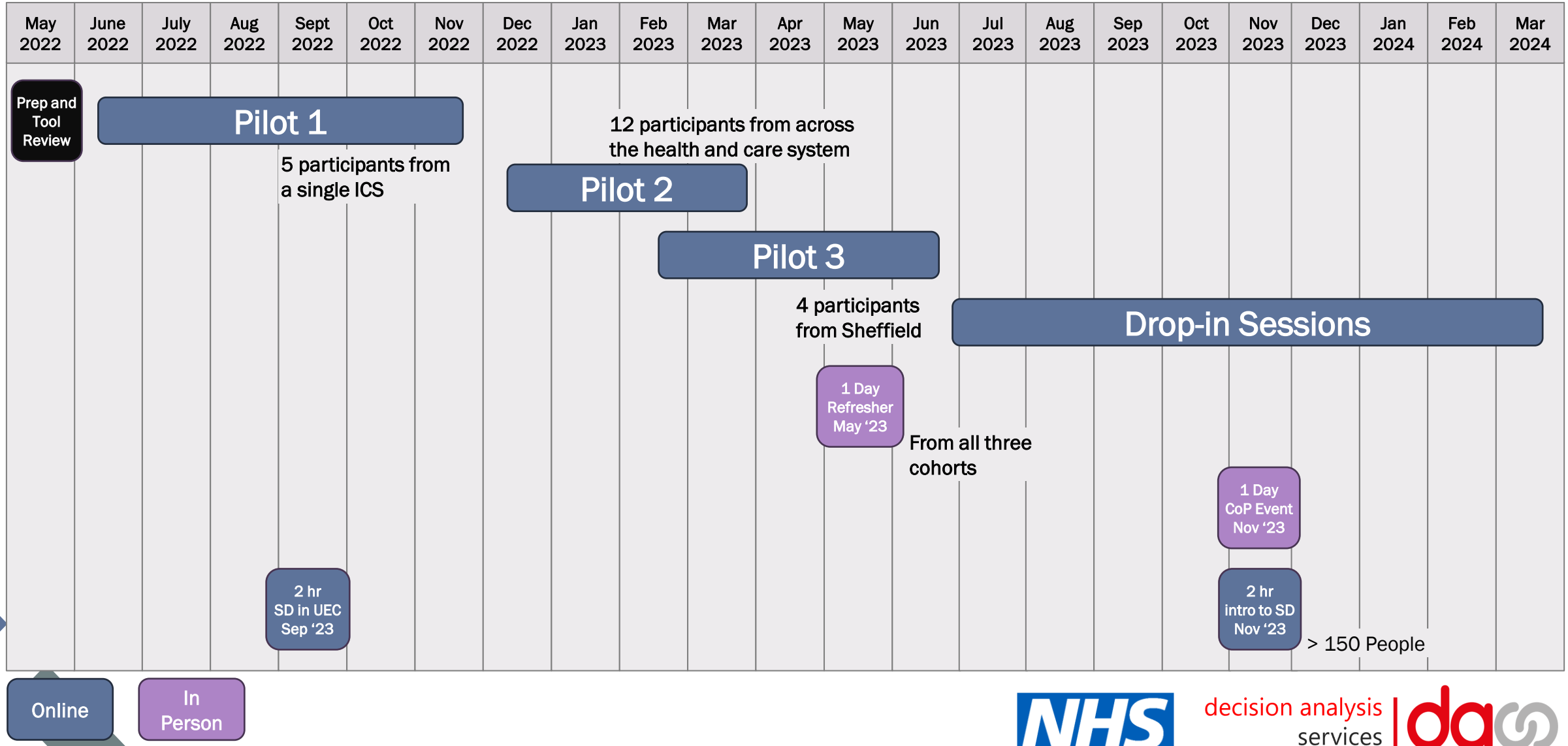
To be discussed in Pilot Sessions 4

Model testing

Model Validation and Verification based on a formal test specification

To be discussed in Pilot Sessions 5

2. Delivery Timeline



3. Outcomes

3. Outcomes

The three pilots were delivered to participants from across the English health and care system

Descriptions of three example models developed by the participants follow:

- Bristol, North Somerset and South Gloucestershire Integrated Care System
- NHS Blood and Transplant
- Sheffield City Council Public Health Intelligence Team and NHS Sheffield integrated Care Board

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NHS

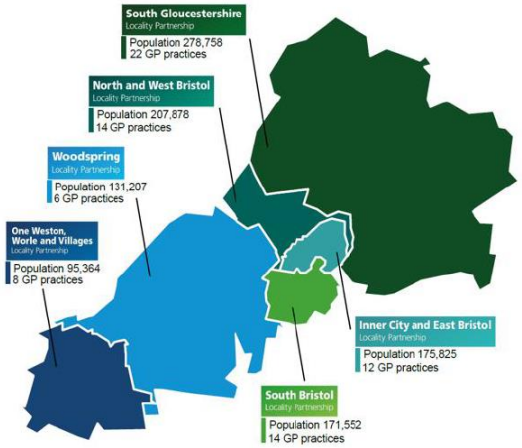
Bristol, North Somerset and South Gloucestershire

With thanks to Janine Ibrahim, BNSSG

Objective of the BNSSG System Dynamics based a[illegible]

The Bristol, North Somerset and South Gloucestershire Integrated Care System

Figure 1: Bristol, North Somerset and South Gloucestershire Integrated Care System



Population of 1 million served by:

- 6 integrated locality partnerships
- 3 local authorities and Health and Wellbeing Boards
- 56 children's centres
- 278 care homes
- 1 GP Federation & 1 GP Collaborative with circa 80 general practices and 20 primary care networks
- 1 of each Medical, Dental, Optometry and Pharmacy Committees
- 1 Primary Care 24/7 and 111 service
- 169 pharmacies
- 114 dental practices
- 79 opticians
- 1 community care provider
- 1 Healthwatch
- 1 mental health trust
- 1 ambulance service trust
- 1 Academic Health Science Centre
- 2 acute hospital providers
- Hundreds of voluntary, community and social enterprise organisations
- 1 Integrated Care Board planning NHS services

The Question:

How do we address the flow of patients across the Urgent and Emergency Care (UEC) Service in BNSSG over the next 5-7 years with a focus on reducing minor Emergency Department (ED) attendances in order to achieve better outcomes for patients, considering the availability of capacity, e.g. workforce and bed availability?

Impact of triage, assessment and routing (Right place, first time)

- System Clinical Assessment Service (SCAS)
- Increased redirection from ED using via streaming inc. ED Streaming Tool

Impact of additional downstream capacity (Right sized services to refer people to)

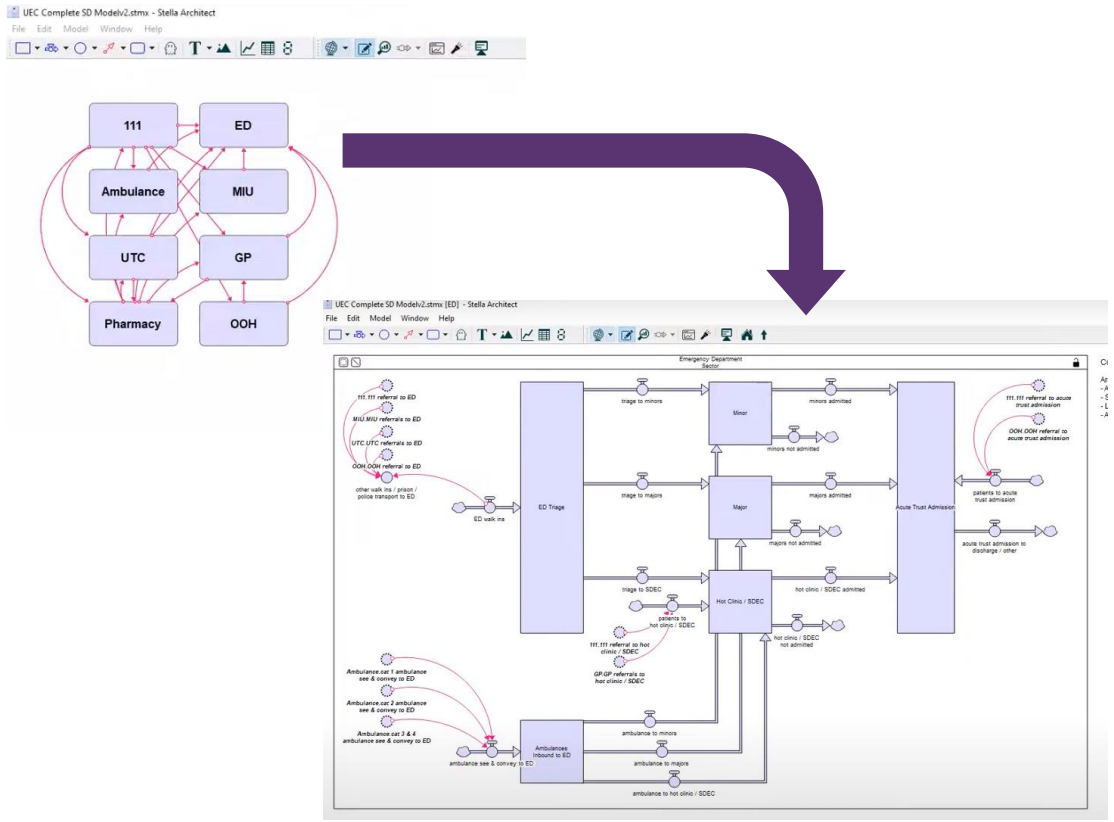
- 'Right' UTC/MIU provision (capacity / geography / operating hours)
- Community pharmacy consultation service (CPCS)
- Primary Care
- SDECA/A-tED

The What Ifs?

- What if we had a 7 day – fully staffed SCAS model?
- What if our System CAS was able to manage all our Cat 3 / 4/ activity?
- What is the impact of increasing CPCS referrals across the system?
- What is the impact of increasing redirections in ED?

Training Outcomes

- The Pilot was undertaken by a team of five from BNSSG who had no prior experience of System Dynamics modelling, although were experts in data analysis and visualisation
- The team was coached in running online stakeholder workshops with system partners to refine the model scope and explore the core structures of the model
- A single model was development was carried out collaboratively across the BNSSG team – modules were used to share development effort
- A quantitative model was developed which enabled the key questions to be explored using an interface that was shared with key decision makers.
- **Lessons learnt for future pilots:**
  - **More time needed between training sessions to allow for access to data and participants (e.g. 6 weeks notice required for workshops)**
  - **May be better to be less ambitious with the first model that is developed.**
  - **The training would have been improved if it included a day long face to face session, which would now be possible given the lifting of C19 restrictions.**



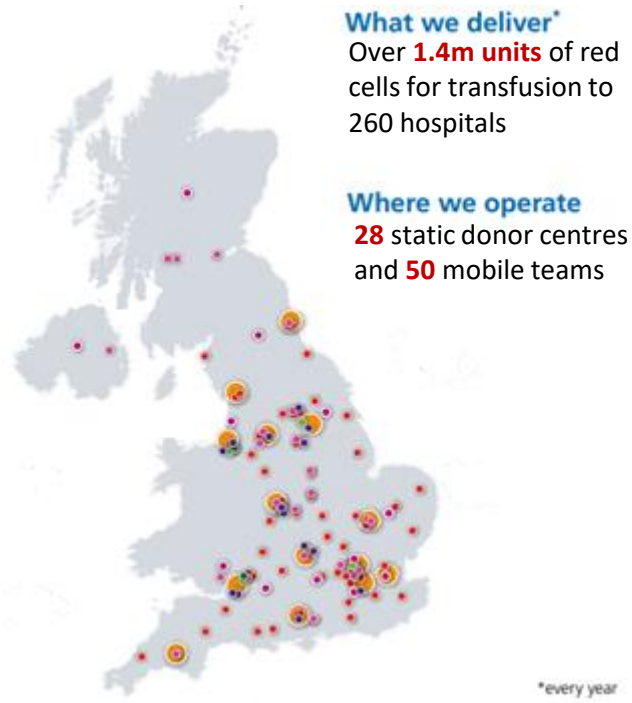
Blood and Transplant

With thanks to Emily Baldwin, NHS B&T

Aim: To optimise flow of new and regular blood donors to meet donor base and blood collection performance targets

NHS Blood and Transplant

NHSBT is responsible for the **supply of blood** to the NHS in **England**…



This article is more than 4 months old

First ever amber alert for NHS blood supplies could mean cancelled surgery

Hospitals ordered to protect stocks as they fall to critical level amid shortage of staff to take donations

Maintaining blood stocks has been a major challenge in the wake of the Covid-19 pandemic. Photograph: NHS Blood and Transplant/PA

The NHS has declared its first ever amber alert over blood supplies after they fell to a critically low level, prompting warnings that hospitals in England may be forced to cancel operations to protect their stocks.

An NHS Blood and Transplant (NHSBT) official confirmed that overall blood stocks in NHS England were at three days' worth and levels of O-type had dropped to less than two days'. The normal standard is to hold at least six days' worth of blood in stock at all times.

…NHSBT **frequently collects less blood than is needed** to meet demand, culminating the **cancellation of elective surgeries** …

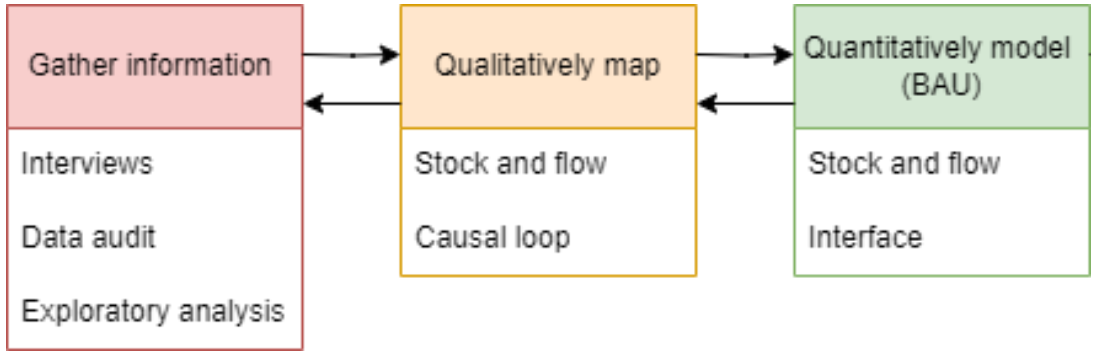
…**new donors** are minimised as they are **less productive** than regular donors.

> “ **we must recruit** the next generation of donors … to provide appropriately matched products and **reduce current health inequalities**. ”
>
> – NHSBT strategy 2022

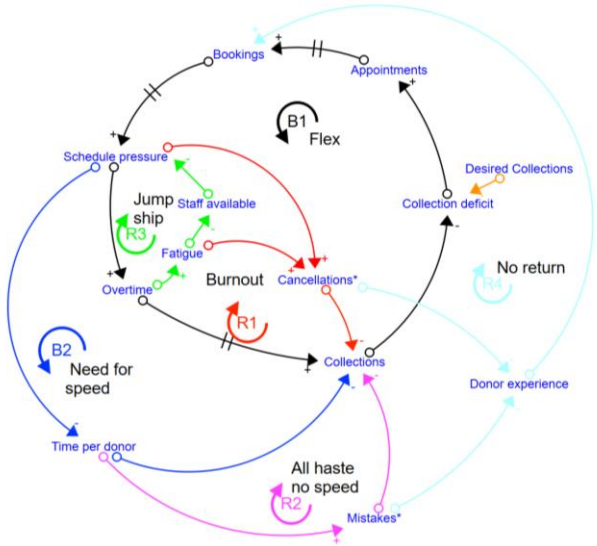
Solution: Build a scenario planning tool (A low-risk, low-cost space to test ‘what if’ questions)

Outcome: Systems dynamics enhanced organisational understanding, decision making and ambition

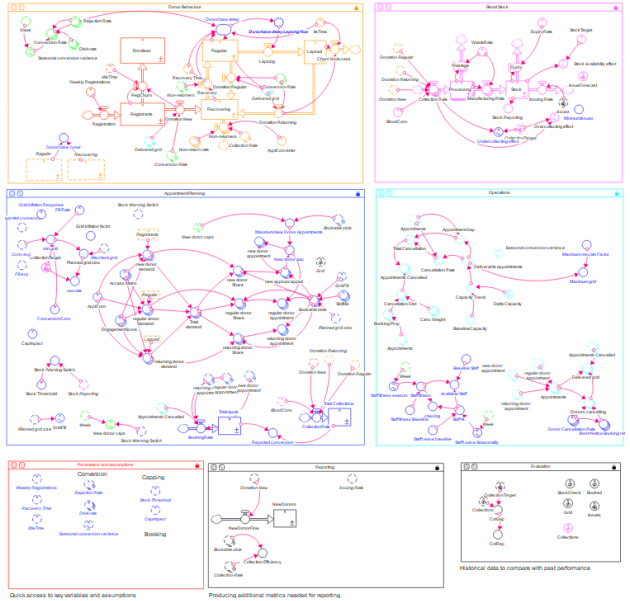
NHS Blood and Transplant



Process map



Causal loop diagram of the short and long term impact of grid oversizing



Current model of the blood collection system
modelling donor flow, blood stock, appointment planning, workforce operations and reporting

- **Senior leadership investment in SD**
- **Change in operational behaviour**
- **Internal collaboration**
- **Infrastructure development**
- **External visibility**

3

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Sheffield
Clinical Commissioning Group

Sheffield
City Council

With thanks to Chris Gibbons and Andy Eames

Objective of the Sheffield System Dynamics based analysis

Pilot aim:

How do we support patients with respiratory conditions (in particular COPD) in the community to reduce pressures in secondary care (ED attendances, hospital admissions and ambulance conveyance)

Areas for explorations

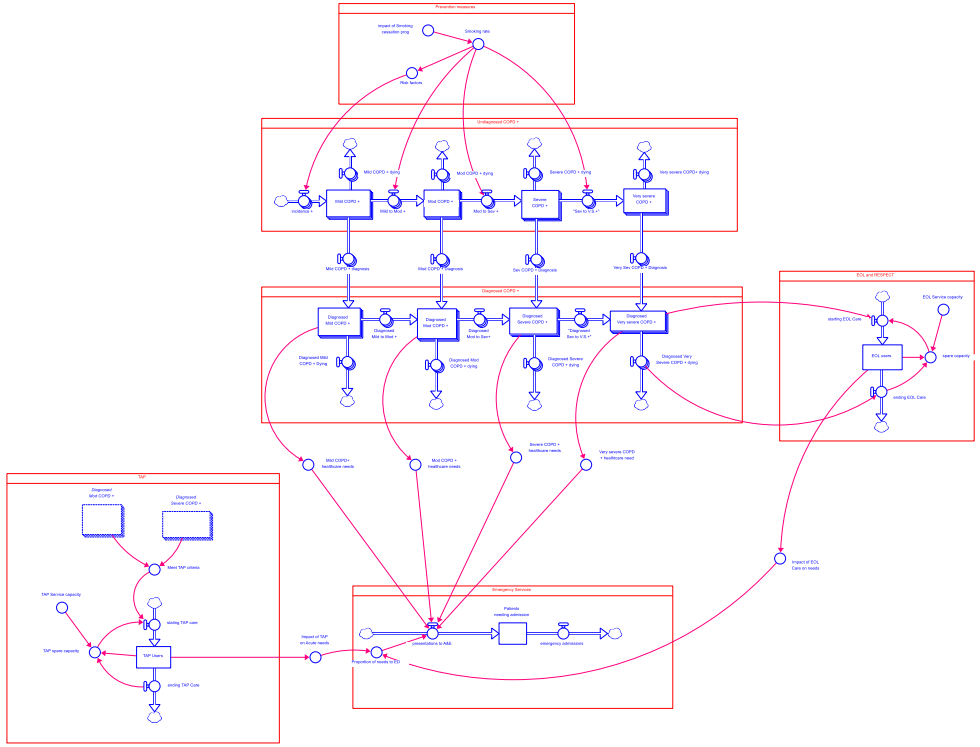
- TAP (Team around the patient): MDT support to patients with COPD + at least one other condition
- EOL (End of life Care) and RESPECT

Other variables

- Prednisolone prescriptions, home oxygen

Outcomes

- The Pilot was undertaken by a team of four people from the **Sheffield City Council Public Health Intelligence Team and NHS Sheffield integrated Care Board**.
- The focal question was well suited to a System Dynamics based analysis as it had a **long time horizon, significant delays in the system and included a set of diverse feedback loops**.
- The Sheffield team undertook **group model building sessions** to create a system map, and then proceeded to **quantify core model structures**. These were shared with decision makers in the system.
- The developed model help to show the **key interactions** within the system and the **potential intervention points**.
- It was decided that it would be more beneficial to focus on representing the system at a more near term 'individual' level rather than a long term 'aggregate' level, so the decision was taken to move onto other analytical approaches. **The conceptualisation of the SD model assisted in the new approach**.



4. Lessons Learnt

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4. Lessons Learnt

Online sessions

- Needed very careful planning with plenty of opportunities for discussion and exercises to keep engagement levels high.
- **Opens up the training to every part of England and requires less effort to attend**. Attendance rates were very high as the barrier to attendance was low.
- Made it difficult to assess how well the participants understood what was being delivered and so there needed to be plenty of opportunities to test understanding
- Makes it easier to take into account that participants have limited availability, so we could make the training sessions short and regular so participants can plan around them
- Used online collaboration tools allowed participant to rapidly build a “community of practice” and learn from each other.
- **…*BUT* Participants still relished the opportunity of any face-to-face sessions**

Making sure example were relevant and realistic

- **Use of health and care examples and case studies during the training made the benefits of the SD approach “come to life”**
- The participants with “real world” problems to model influencing real decision were more likely to make good progress between the sessions, however these projects had greater demands in terms of data acquisition and stakeholder meetings and management

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4. Lessons Learnt

Specific Challenges for NHS Participants

- The participants found it difficult to get on with the required homework between sessions – exacerbated by **"Winter Pressures"**
- **Need to plan around the challenges associated with the availability of clinical staff for workshops** – need 6 weeks notice minimum

General

- Designing the training material around regular realistic goals enabled participant feels they were making continuous progress.
- **Needed to leave sufficient time prior to the training commencing to make sure all software and data is available**, and designed the first session so that the full version of the software tool was not required
- **Needed to be ready to describe and provide support on non-SD approaches** and give a balanced assessment of the pros and cons of alternative techniques

Thank you
Any questions?

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