How modelling has helped in the Kent & Medway STP Long Term Plan submission

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KSS AHSN/Beautiful Information Annual Conference

26th November 2019

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How System Dynamic Modelling is supporting the system…

* The process of developing the modelling framework based on cohort need supports the current focus on better understanding and management of population health needs
* Collectively building system wide models enables system players to move to one version of the truth
* It supports 'system' working and collaboration around key health transformations in terms of collectively understanding the scale of the challenges and how to address them as systems
* SDM provides a tool to strengthen the outputs from strategy and planning processes, be they on an annual or longer term basis
* It has introduced a common language that helps to bring clarity to intended service interventions – where, when, who questions have a reference point in the models
* The modelling has generated clear delivery targets for interventions and opportunities for shared learning between systems trying to tackle similar issues
* Having a clearer and more consistent view on probable demand, activity and capacity levels within systems, helps to develop more robust key performance and financial trajectories

Questions

MNWK's modelling journey

Building on…
- The establishment of KID
- A desire to 'connect' JSNA with STP (H&WB Board)
- Growing appreciation of the value of systems modelling

Socialising…
- The establishment of the AAA CoP (HF funded)
- Governance through the Shared H&C Analytics Board
- Sharing more widely (NHSE PHI)

Population health modelling

Prototype – proof of concept

Adult model development process

C&YP model development

Single model

Applications, what-ifs, enhanced JSNA…

Increasing use of the cohort model to inform service transformation…

System transformation modelling

Community beds model (WK)
Prevention models
Mental Health (OA beds)
Primary Care led MH services

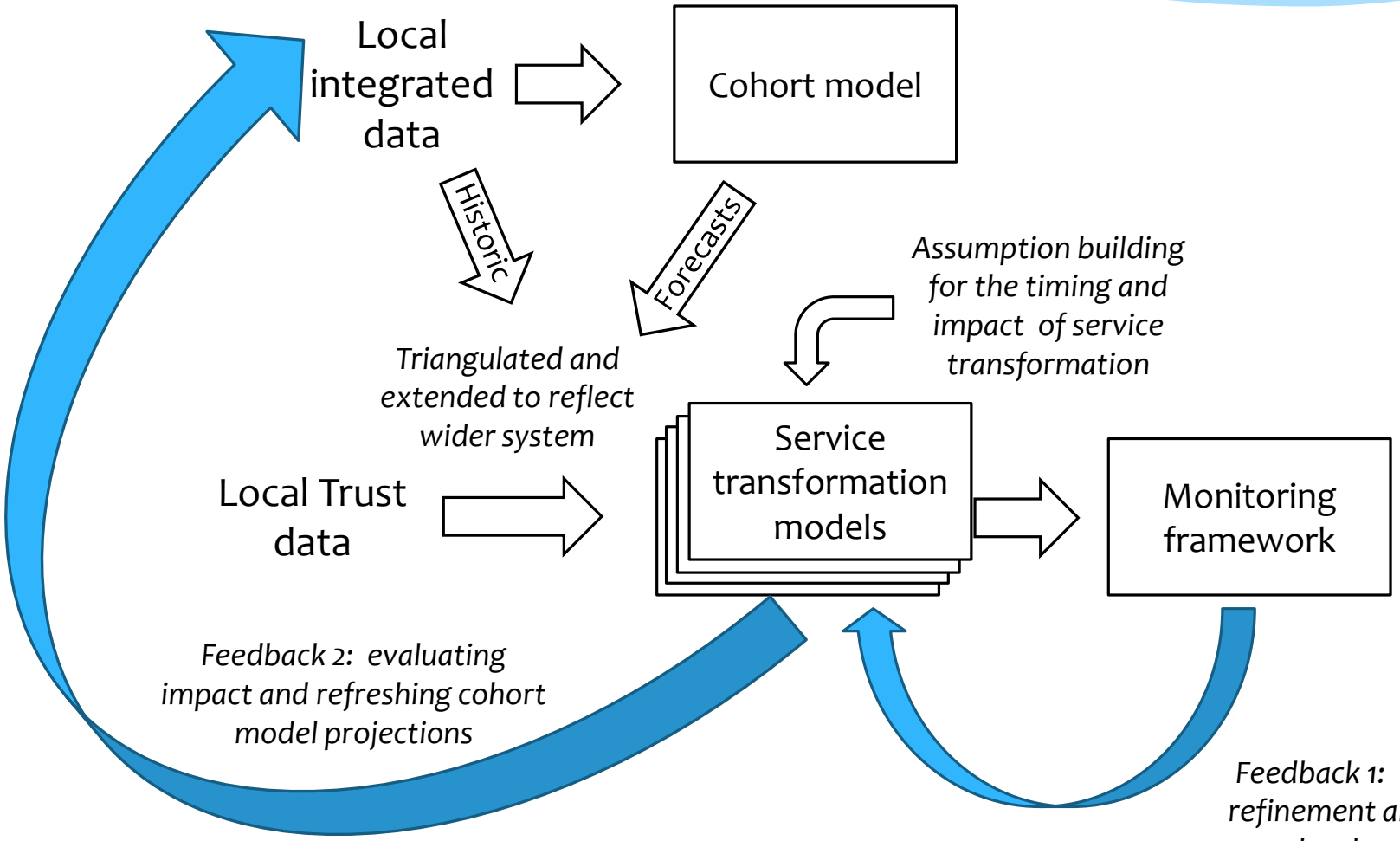
CoP modeling: frailty, intensive care, home care, CAMHS…

Encompass Vanguard

W Kent Local Care Model

DGS / M&S applications

Modelling architecture



Forecasting future capacity requirements

- **Trend analysis** – good for the very short term, because it's the 'real' here and now BUT it tends to exaggerate long term projections of need as trends are a function of existing systems in need of transformation;

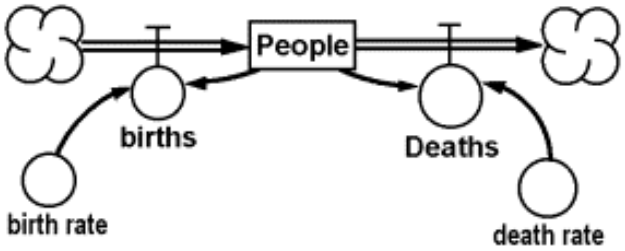
- **Age based projections** – more accurate for the medium term BUT do not account for longer term cohort effects such as increased life expectancy, and can also hide inequalities if these are not part of the assumption building;

- **Cohort modelling** – defining needs irrespective of age opens the door for more effective long term, sustainable, capacity planning – in the cohort model 'age' becomes a risk factor to progression, rather than it being the single factor.

What is the cohort model?

A prospective dynamic tool to understand, with more confidence, the change in population health and to simulate the impact of interventions and improvements over time.

- It's developed using ***Systems Dynamics (SD),*** a modelling and simulation tool for understanding, designing, and managing change across a complex system.
- It allows the modelling of relationships between elements in a system and how these relationships influence the functioning of the whole system over time



Simple SD example

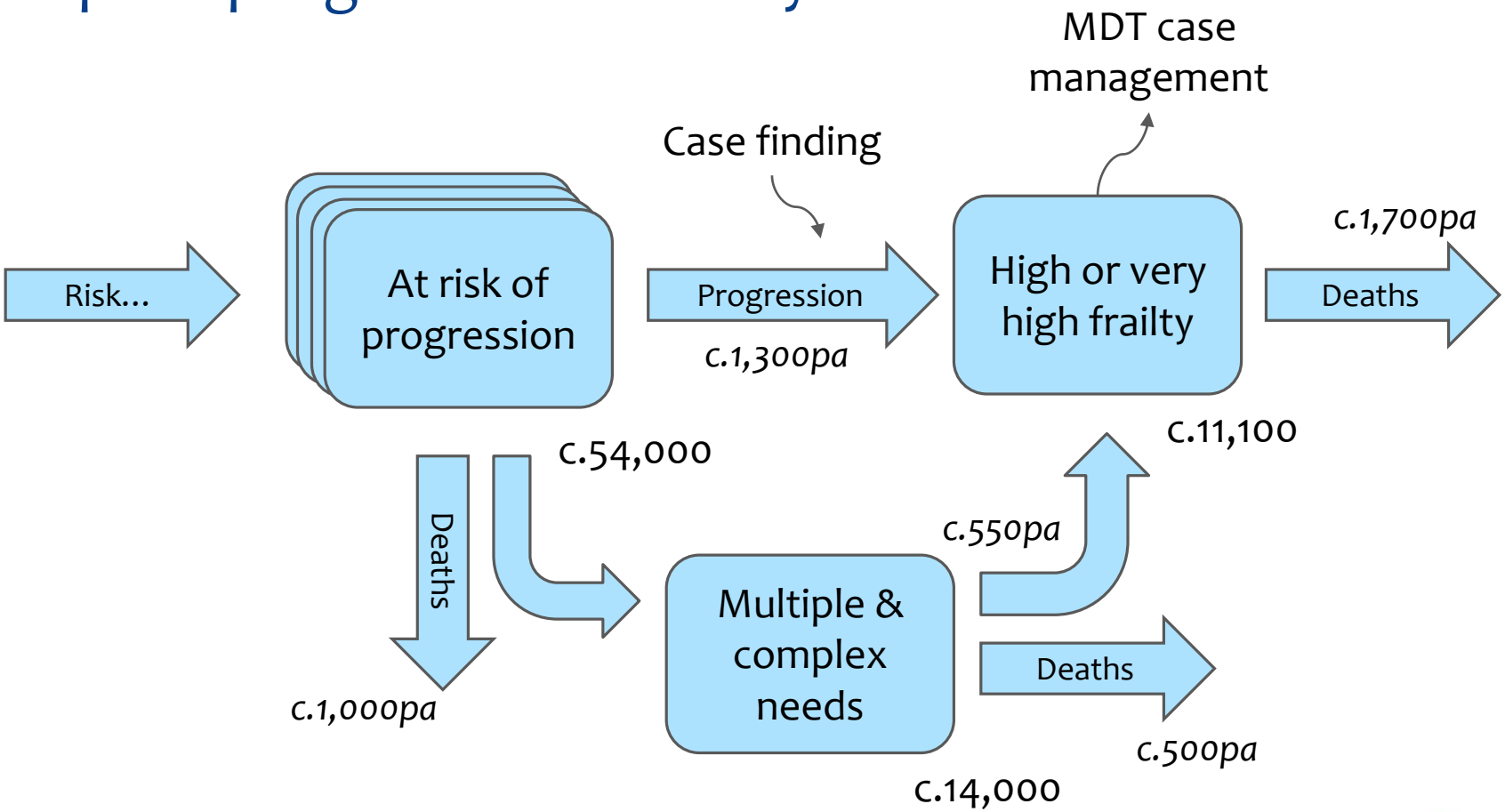
A population health led approach

- The population cohort model was created for Kent County Council in 2018 following its commission in 2017.
- Its development, in part, was to support robust health and care planning by firstly segmenting the population into health cohorts, and then using a dynamic modelling approach to create a simulation of how these cohorts change over time. The KID was then used to estimate the service utilisation of each of these cohorts.
- The approach provides the capacity requirements for local care functions, though as implementation develops we apply a capacity constraint for accurate impact prediction.
- To appropriately approximate both demand and capacity some functions only act on a certain cohorts of the population. For local care this is mostly, but not exclusively the 'frail and complex'.

Why is the cohort model important?

1. It makes explicit the prevalence and incidence/progression of need within a population – critical to understanding the impact of measures that seek to slow that progression of need alongside pathway changes
2. Avoids double counting between different conditions thus providing the context for integrated solutions
3. Provides a longer term (to 2030^{+}) perspective on underlying need
4. Provides the context in which primary prevention strategies can be modelled, i.e. reducing population risk factors for the incidence of health conditions

Example – progression to frailty



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Note: figures for 2018, source: W Kent whole population cohort model

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Prevention strategies… Better Health Kent

WSP were engaged by Kent County Council to run a workshop on the 7th January for the public health team:

- To develop a view on what a Better-Health Kent would look like in response to a comprehensive range of prevention measures using the cohort model.
- The 'Better Health Kent' exercise uses the cohort model to estimate the impacts of implementing 13 targeted primary prevention interventions on the health of the Kent population

The 13 'better health' strategies include…

1. Increase breastfeeding at 6-8 weeks
2. Reduce smoking in pregnancy
3. Reduce child obesity
4. Reduce fuel poverty in children
5. Reduce ACE in childhood
6. Improve recognition and treatment of hypertension
7. Improve recognition & treatment of CVD risk
8. Improve smoking cessation
9. Increase weight management
10. Alcohol screening
11. Alcohol treatment
12. Reduce fuel poverty for older people
13. Reduce ACE at 15 years

Work in progress

The cohort model provides the starting point for system transformation models – a population health bedrock that links us back to the overall health and wellbeing agenda

Developments over the next phase of the programme include:

1. Increasingly close alignment of assumptions, scenarios, targets and visualisation with Public Health England tools and dashboards;
2. New calibrations of the model to PCN footprints as a test of application at this 'lower' level and as a contribution to PCN development;
3. Recalibrating the baseline assumptions, using local integrated data, with the ICP footprints defined by the patient flows from practices (grouped by PCN).

Where can you find it?

https://www.kpho.org.uk/joint-strategic-needs-assessment/jsna-population-cohort-model

- Available is a 40 page technical document which describes in detail the methodology and approach.
- Also a short video of an introduction to the model and its uses
- The North Kent JSNA is an amalgamation using spreadsheet analysis of both the DGS CCG and Swale CCG cohort model.
- Each of these independent cohort models is made available through a specific web link.

Which system...?

The cohort model 'system' covers:

1. The whole population over a 24yr period.
2. Is initialised from the KID to reflect:
   a. The relative cohort sizes as at 2012.
   b. The rates at which each cohort accesses services.
3. Uses other studies to reflect rates of incidence or progression between cohorts based on risk factors, producing an estimate of cohort size over time & hence expected service use.
4. Is triangulated to the expected demographic changes locally.

A service transformation 'system' is chosen to cover:

1. A specific cohort or cohorts over a 3-5yr period.
2. Uses the outputs from the cohort model to indicate the likely service capacity and utilisation over the 3-5yr period based on population need before service transformation.
3. Explores the impact of service transformation on rates of access to services.
4. Uses validated impact on service utilisation rates based on further KID analysis to modify the cohort model assumptions for rates of access.

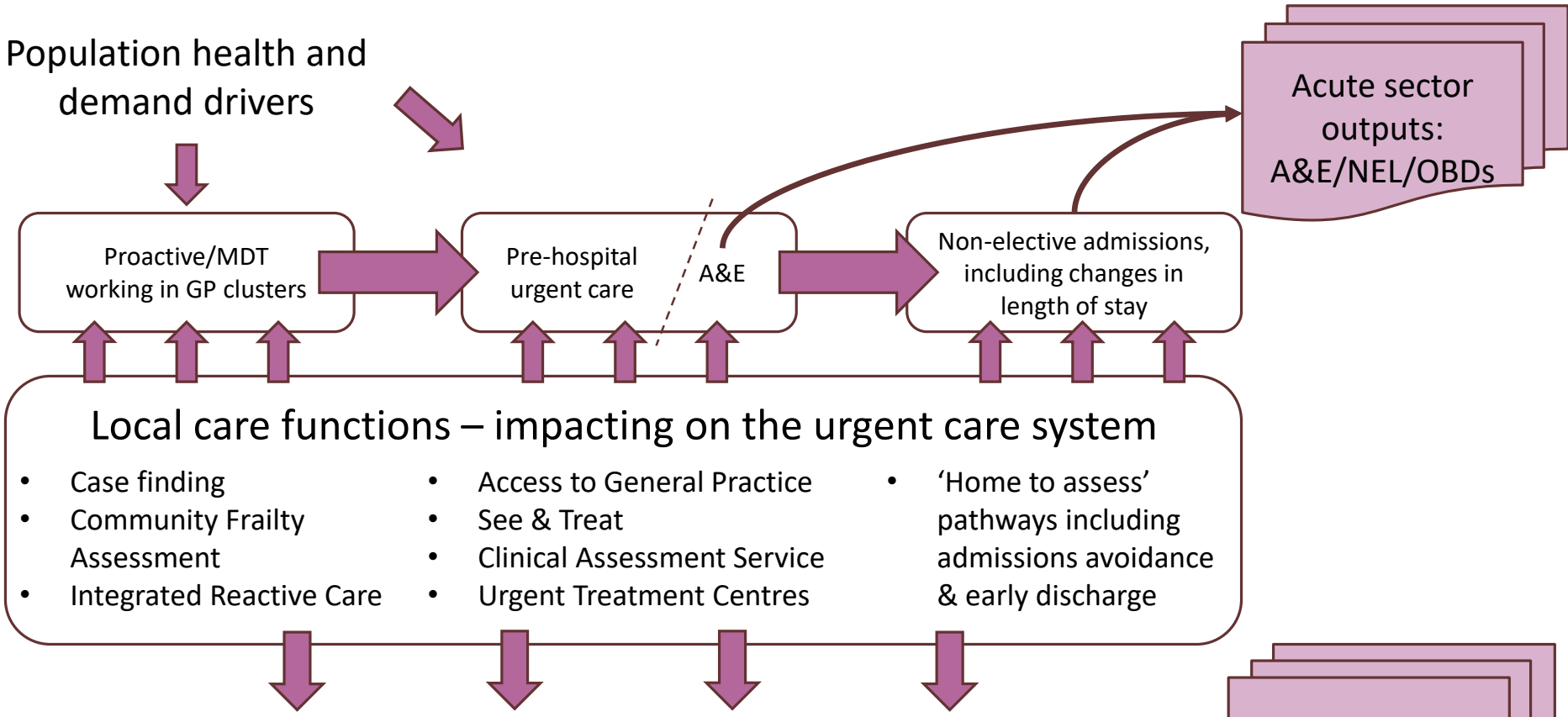
The Local Care Model

The key objective for the local care modelling was:

"To develop a system dynamics model that reflects current STP plans but applies local assumptions for the implementation of Local Care in order to inform local investment and the impact on the hospital 'front-door' in 19/20 and 20/21."

Key requirements were that the model:

1. Reflects the Local Care system being developed across DGS
2. Contextualises and calibrates the MNWK Local Care model to DGS data and assumptions, including a comparison of the demand drivers underpinning the **'do nothing'** scenario
3. Produces outputs that help scale the capacity requirements in Local Care



Model outputs can be translated into capacity, workforce and indicative costs for care functions to achieve the desired shift in care

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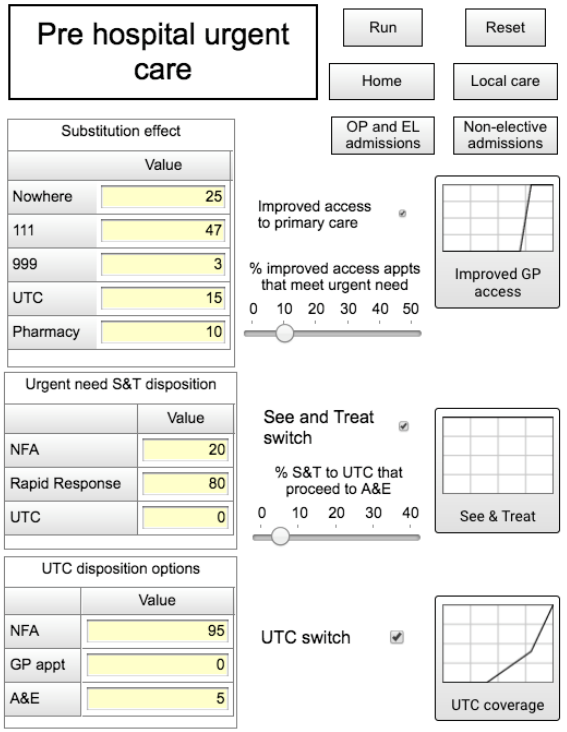
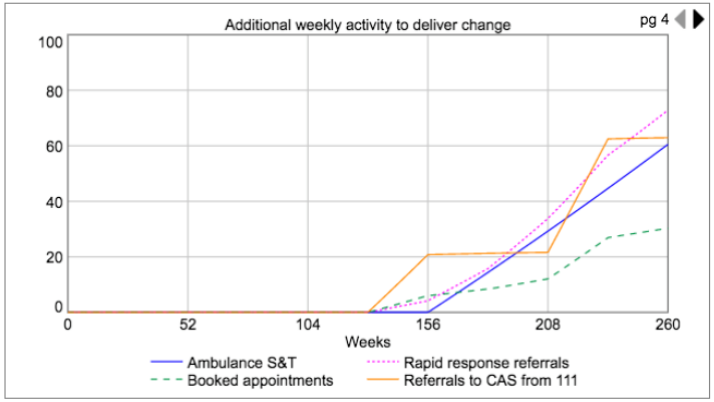
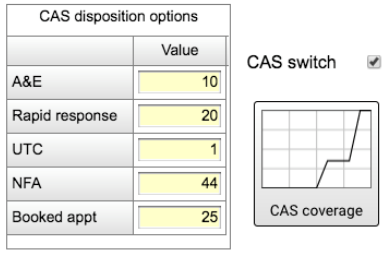
Logic of the local care modelling

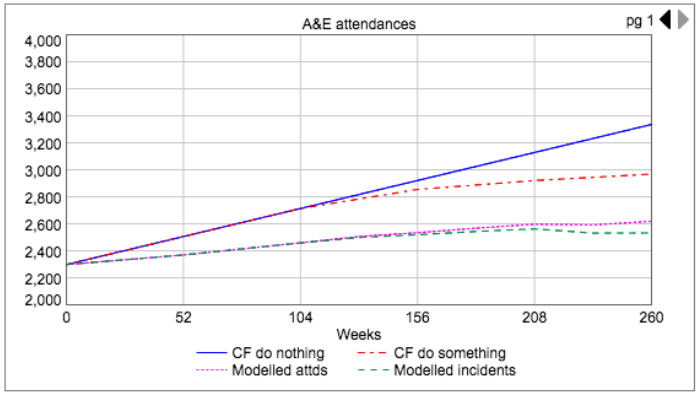
- The logic for the modelling is to combine in one system:
  - The underlying ***demand drivers*** for the Point of Delivery giving rise to a growth in activity that needs to be addressed through developments in Local Care; the agreed growth for 19/20 is applied before then …
  - ***… the care functions*** of the transformation are developed to ***impact*** on this growth, with a view to meet increased demand and meet overall STP goals; each of these…
  - … have timescales or ***implementation profiles***.







The impact of local care, were the 'opportunity fully realised, on POD activity…



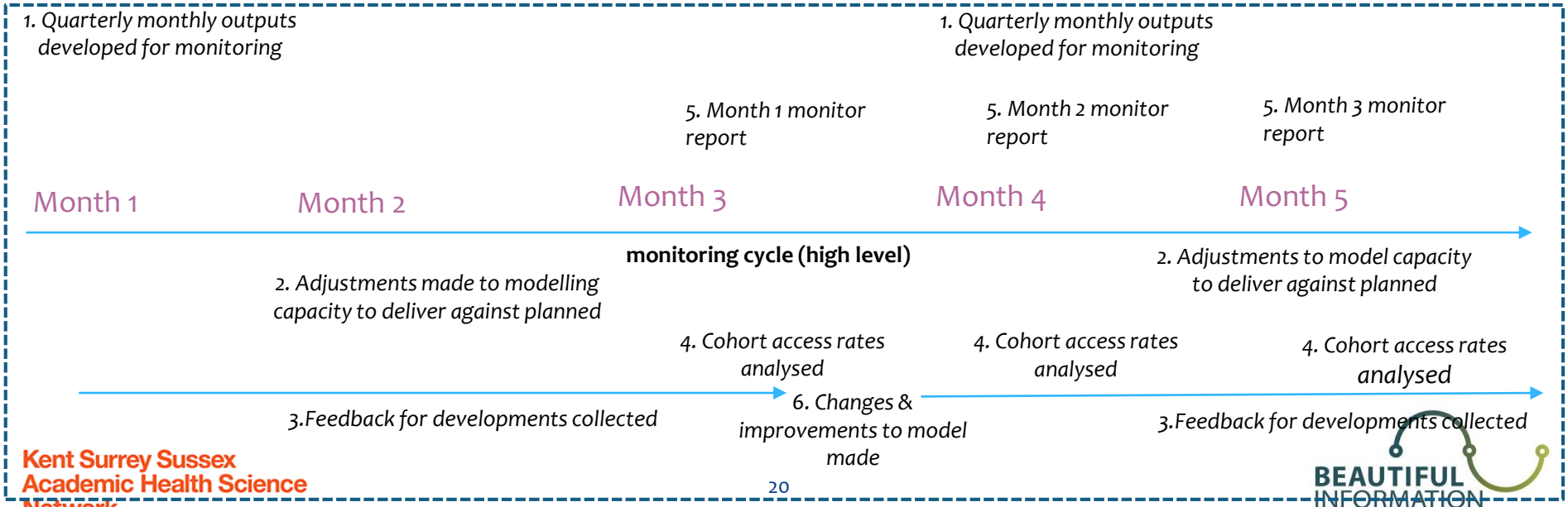
Benefits

* The local care system dynamics modelling project led to:
  * An improved understanding of underlying population health needs as a driver for increased demand;
  * The development of a consistent language and set of assumptions about the potential impact from developing local care; and
  * The implications for the acute care system from the development of local care.
* Its limitations included:
  * Whilst the model addressed whole-population health needs the key care functions included were focussed on the needs of those with high or very high frailty;
  * A relatively short timescale for impact, i.e. constrained to the timescales for the STP to 2021;
  * Limited attention to the preventative and wider factors influencing health and having a potential contribution to make.

Impact monitoring and model audit…

Short to medium term

- The local care model exports weekly outputs, which gets translated into monthly activity changes for monitoring.
- Monitoring process developed for local care QIPP with DGS and Swale
- Initially high level with impact segmented across population health, local teams delivering with light touch WSP supporting with KID analysis.
- Quarterly reconciliation and validation of model going through the five development areas to produce more accurate outputs
- Following developments monthly monitoring and reports, with adjusted yearly activity projections

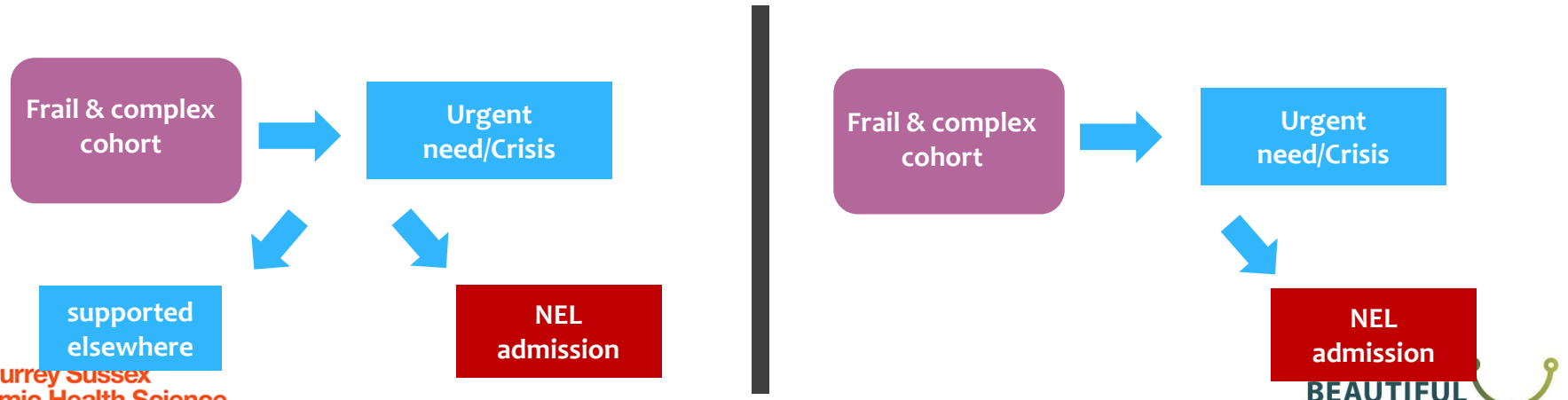


Impact monitoring and model audit…

Long term ambition

- Develop advanced applied analytics capability
- A comprehensive monitoring process that enables to monitor citizens through the system, enabled by a integrated dataset.
- Evaluation against key outcomes to be part of the monthly process (or dependant when impact would be seen), not something that occurs at the end of the financial year, or the end of the contract.
- A robust process in determining ***where impacts are attributable to AND the level of that impact***.

e.g. April 19'



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Monitoring and Evaluation

* Modelling review quarterly basis
* Assessing achievement around inputs/level of interventions (referrals, contacts, appts etc)
* Judging outputs against model (has there been movement in numbers, other metrics and proxies to assess impact in case benefits is being disguised by another system development (e.g. growth in children attending ED)
* Revisiting baseline and growth assumptions if required in year but preferably at the end of each year at the start of a new planning round (mid yr adjustments more temporary in nature to reflect an immediate requirement)
* One part of cycle….not separate

The system dynamics road-map

Development and refinement of data-mining in both the KCC and Optum KIDs to inform cohort model (e.g. changes in rates of access to services) and service transformation models (e.g. specialty to cohort acute care activity).

Cohort models developed for whole populations calibrated to K&M, CCG and ICP footprints informing JSNA production and providing demand drivers for other modelling.

Calibration of cohort model to PCNs whilst also refining age-related progression of need to complement existing methodology.

Potential development of 'dashboard' access to cohort model outputs to inform local population health, strategic planning.

The **Local Care Model**, calibrated to each MNWK ICP with local enhancements reflecting priorities and distinctives – sharing across the system & iterative process of refinement.

Additional opportunity being identified and modelled to broaden cohorts being included and working more 'upstream' to slow progression of need.

Ongoing use of the model to inform monitoring, learn from implementation and strengthen partnership working.

D&G NHS Trust are leading on the development of a combined urgent/planned medical/surgical **bed capacity model** that uses outputs from the cohort model and the impact of local care.

Medway are leading on the modelling of **OP transformation** programmes, starting with Respiratory but expanding to cover all major pathways over the next 3-6 months.

A programme of modelling to identify the impact of Long Term Plan interventions for **people with mental health needs** on both specialist MH and General Acute services is being specified.