

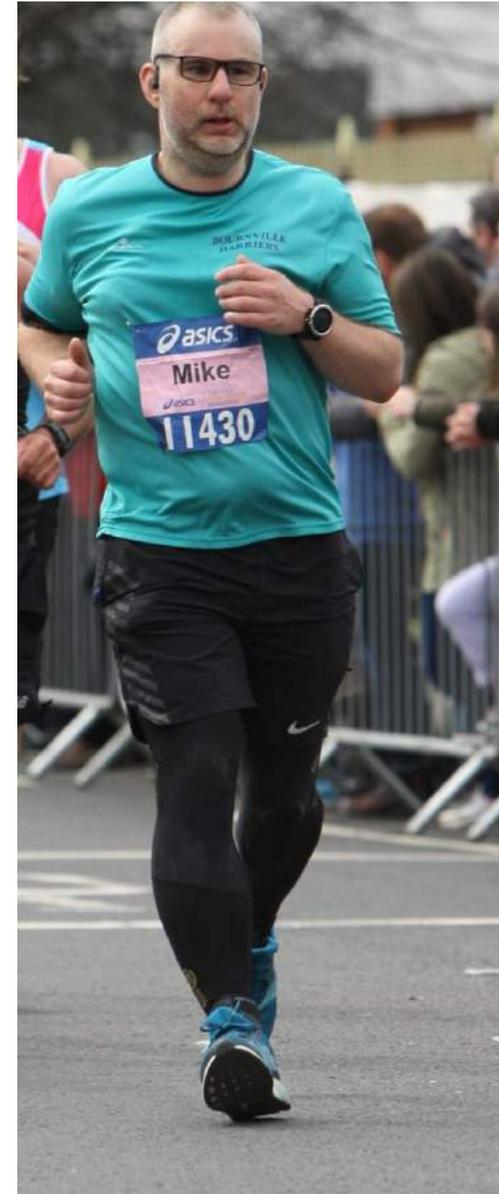
Developing a System Dynamics Model to support Waiting List Recovery

Mike Woodall

Analytics Manager

Hi, I'm Mike

- Analytics Manager at the Strategy Unit
- 25 years experience across health and care analytics
- Have been involved in modelling the impact of innovation and policy changes, including new hospital modelling
- New to System Dynamics
- See SD as a useful method to apply to health and care systems



I work for the Strategy Unit

The screenshot shows the NHS Strategy Unit website. The browser tabs include 'Newswatch Bolton Wanderers', 'Ugole: It's How Life pulled off a sh...', 'NHS waiting list post COVID v1', and 'The Strategy Unit | The Strategy Unit'. The address bar shows 'Search Google or type a URL'. The website header features the NHS logo and navigation links: 'COVID-19', 'Services', 'Publications', 'News and Views', 'About Us', 'Contact', and 'Midlands and Lancashire'. The main content area has a yellow background with the heading 'The Strategy Unit' and a sub-heading 'Leading research, analysis and change from within the NHS'. A quote from Professor Sir Bruce Keogh is displayed on the right. Below this, there is a section titled 'Featured case studies, publications and news & opinion' with a featured article about an opensource model for planning vaccine centre capacity.

The Strategy Unit

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The Strategy Unit

Leading research, analysis and change from within the NHS

Health and care services face serious and complex challenges. Addressing them requires clear thinking, innovation and applied intelligence. Our proposition is simple: better evidence, better decisions, better outcomes.

[Learn about our services](#) [Learn about us](#)

"The Strategy Unit are inspiring in their commitment, dedication to evidence and use of innovative analysis as a way to improve health and care."

Professor Sir Bruce Keogh

Featured case studies, publications and news & opinion

NEWS

Strategy Unit releases opensource model for planning vaccine centre capacity

The UK is running its largest ever vaccination programme. The stakes are enormous.

Project Background

- Project was developed to support the response to the Covid Pandemic
- Part of a wider programme of work commissioned by NHS England
- System Dynamics was a useful method to apply to waiting list modelling
- No previous experience of developing System Dynamics models
- Had a good understanding of waiting lists and waiting list data
- Kim Warren at Strategy Dynamics provided technical support and mentoring
- Silico was used to develop the model

The Problem

- Waiting lists have been increasing
- The dynamics were widely understood
- Models of future activity broadly worked
- Covid removed this certainty
 - Referrals and activity reduced significantly at the start of the pandemic
 - Behaviour changed significantly
 - Recovery was slow
 - New models of working were required to manage the Covid risk
 - New models of care were being considered to support the recovery

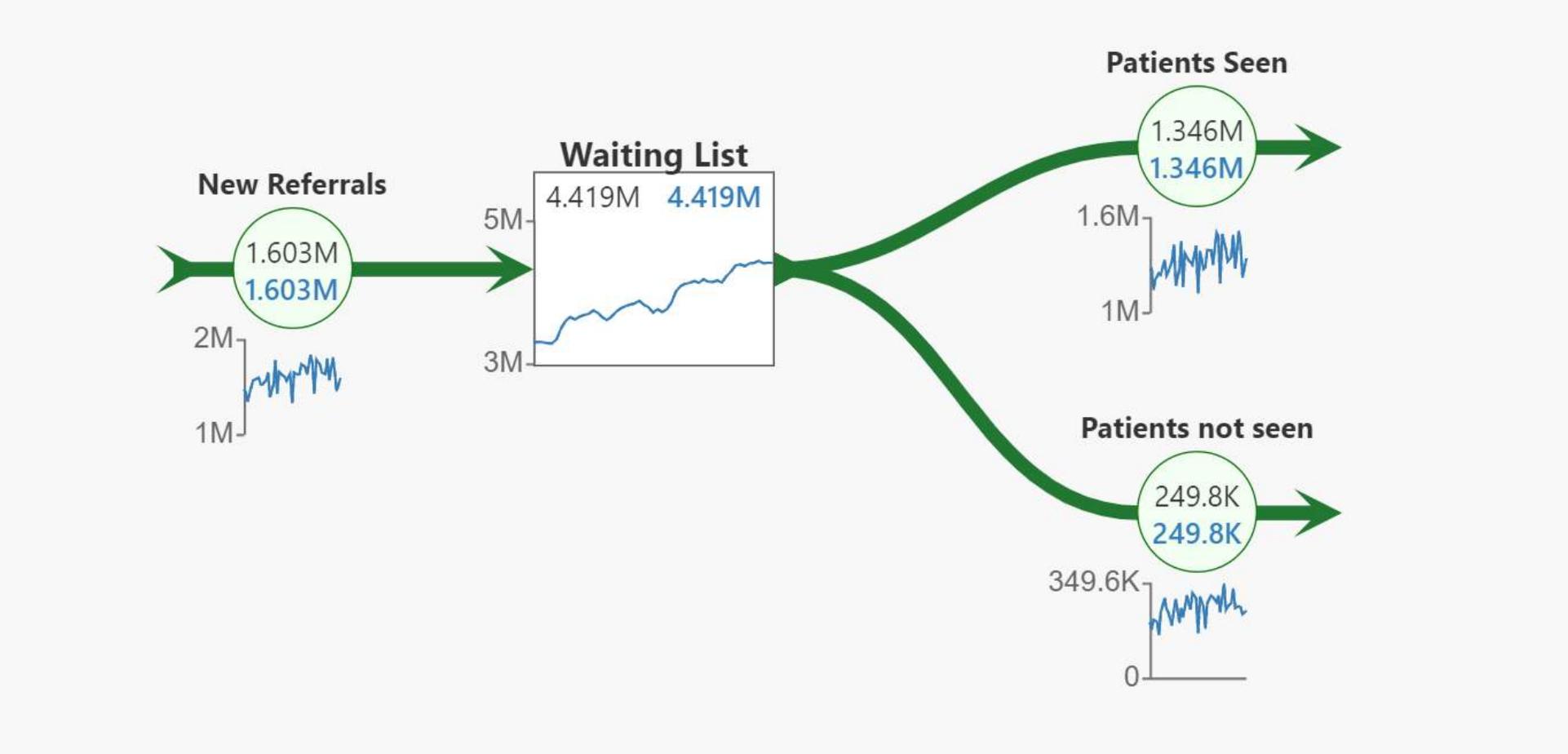
Our Approach

- Developed a simple monthly model to explain the current waiting list
- Converted the model and data to weekly
- Iterative approach in consultation with managers and analysts
- Mainly concentrated on the waiting list rather than waiting times
- Expanded the model to understand what might happen to referrals
- Added capacity constraints to impact admitted and non-admitted pathways
- Model developed to work at trust and specialty level
- Can never answer all the questions of national and local decision makers
- Developed to help others test their own assumptions
- Multiple scenarios were developed

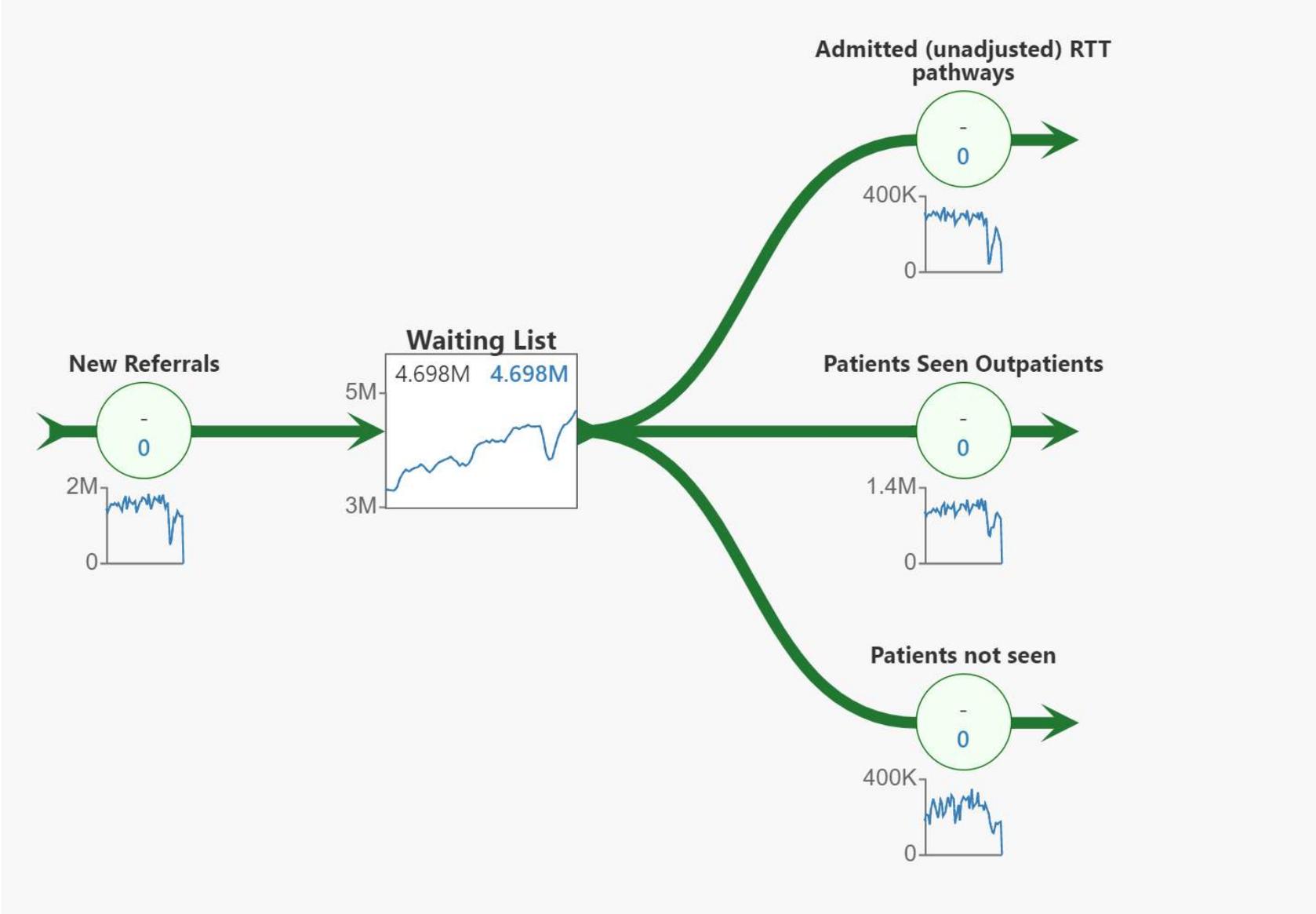
Uses for the Model

1. As a point of reference
2. As a source of assumptions
3. As a source of data (or data wrangling code)
4. To run specific scenarios supported by the model
5. As a starting point to develop a more complex model

Where we started



Where we started



Our Main Assumptions

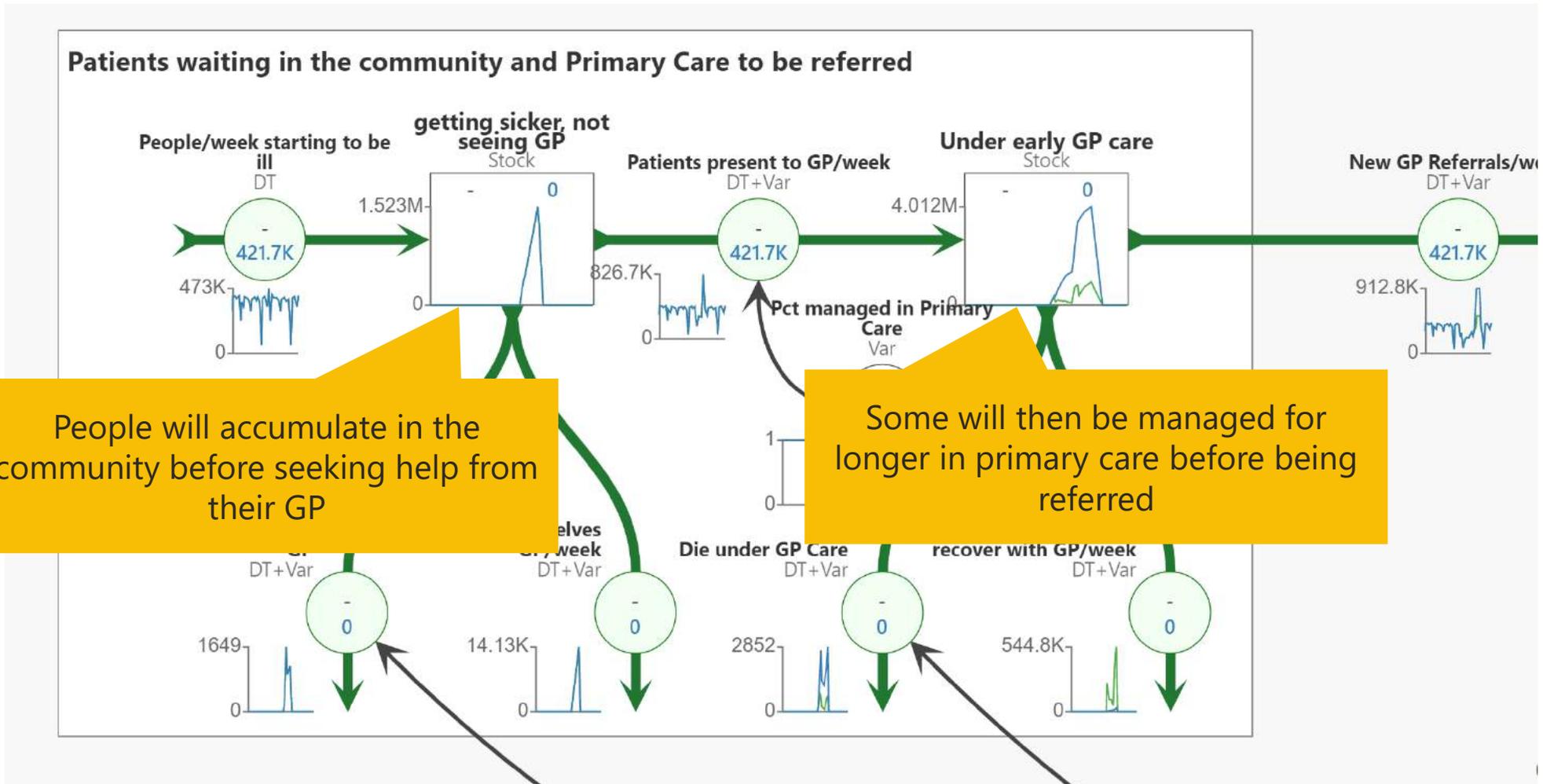
- Background need for elective care has not been changed by Covid
- Patient and GP behaviour will have changed and this will impact on the number referred
- A referral backlog will accumulate
- Not everyone will wait to be referred
- Referrals will return to historic rates by December 2020
- The referral backlog will manifest following the first wave
- Activity is constrained by the number and productivity of resources available
- Activity will return to historic rates by March 2021

Data was sourced from...

- Consultant-led Referral To Treatment (RTT) waiting times
- e-Referral System
- Secondary Uses Service (SUS)
- NHS England Bed Availability and Occupancy
- NHS Workforce data
- NHS England Supporting Services data
- NHS England Diagnostic Activity Data

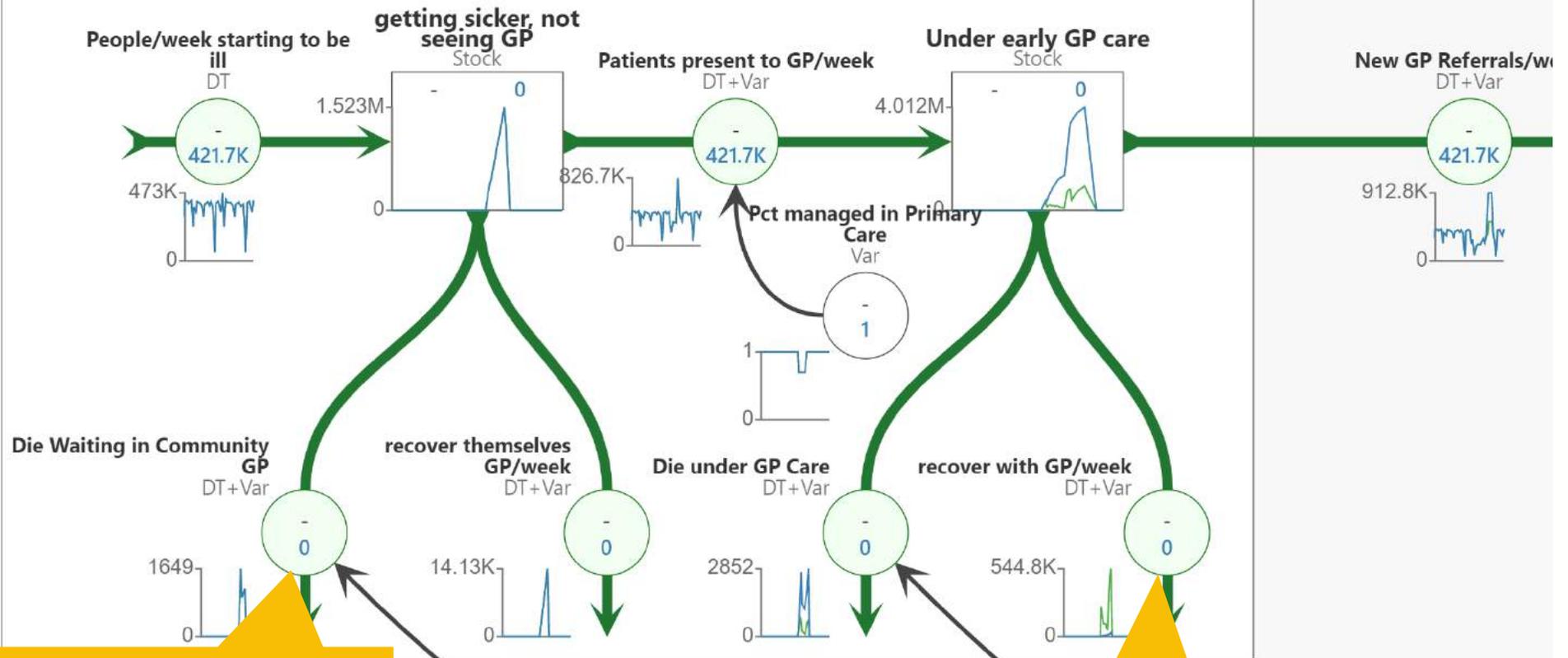
The model

Covid has created a backlog that was not previously measured



Not all the backlog will be referred

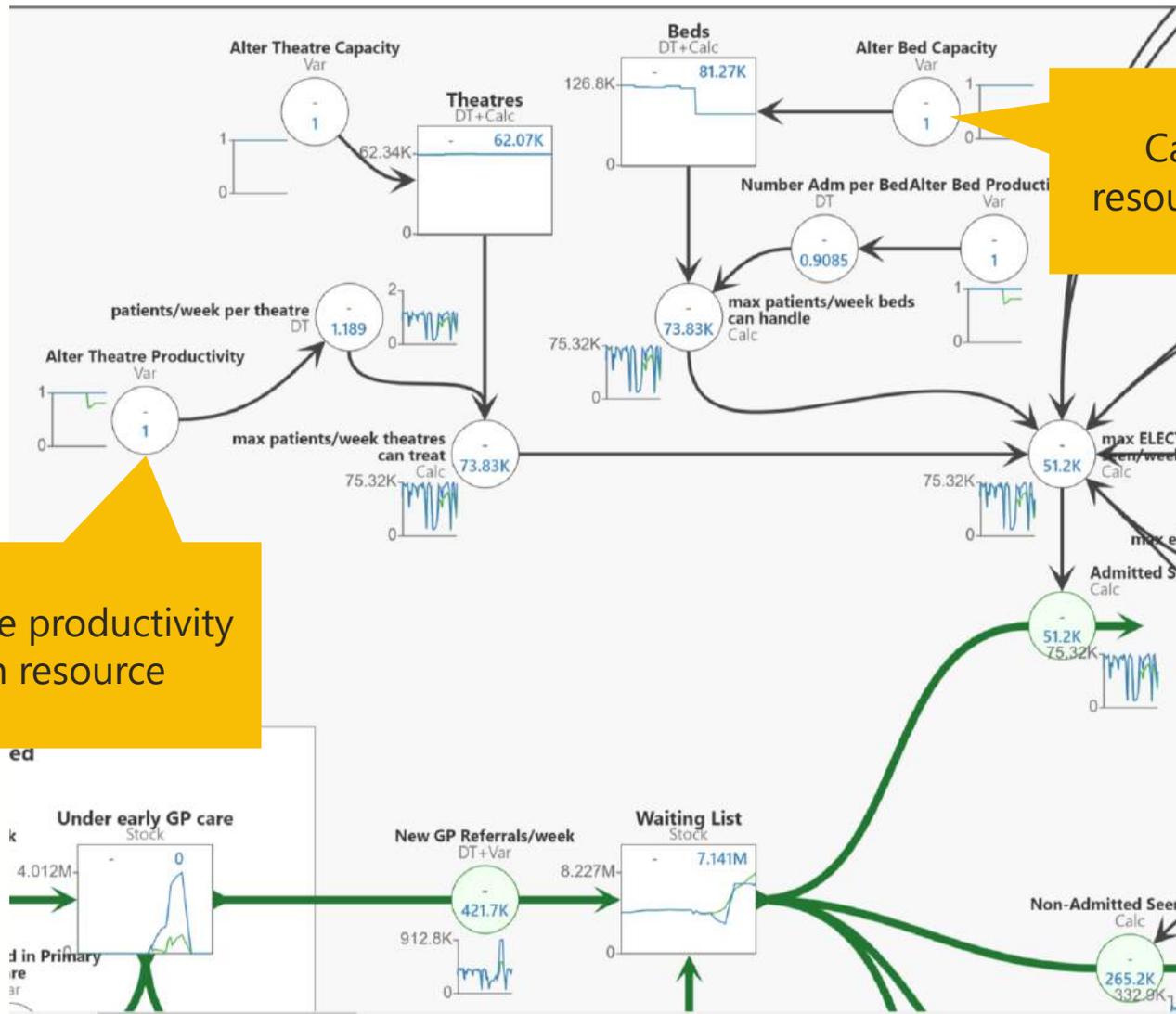
Patients waiting in the community and Primary Care to be referred



Some people will die before they are referred

Others will recover or choose to not be referred

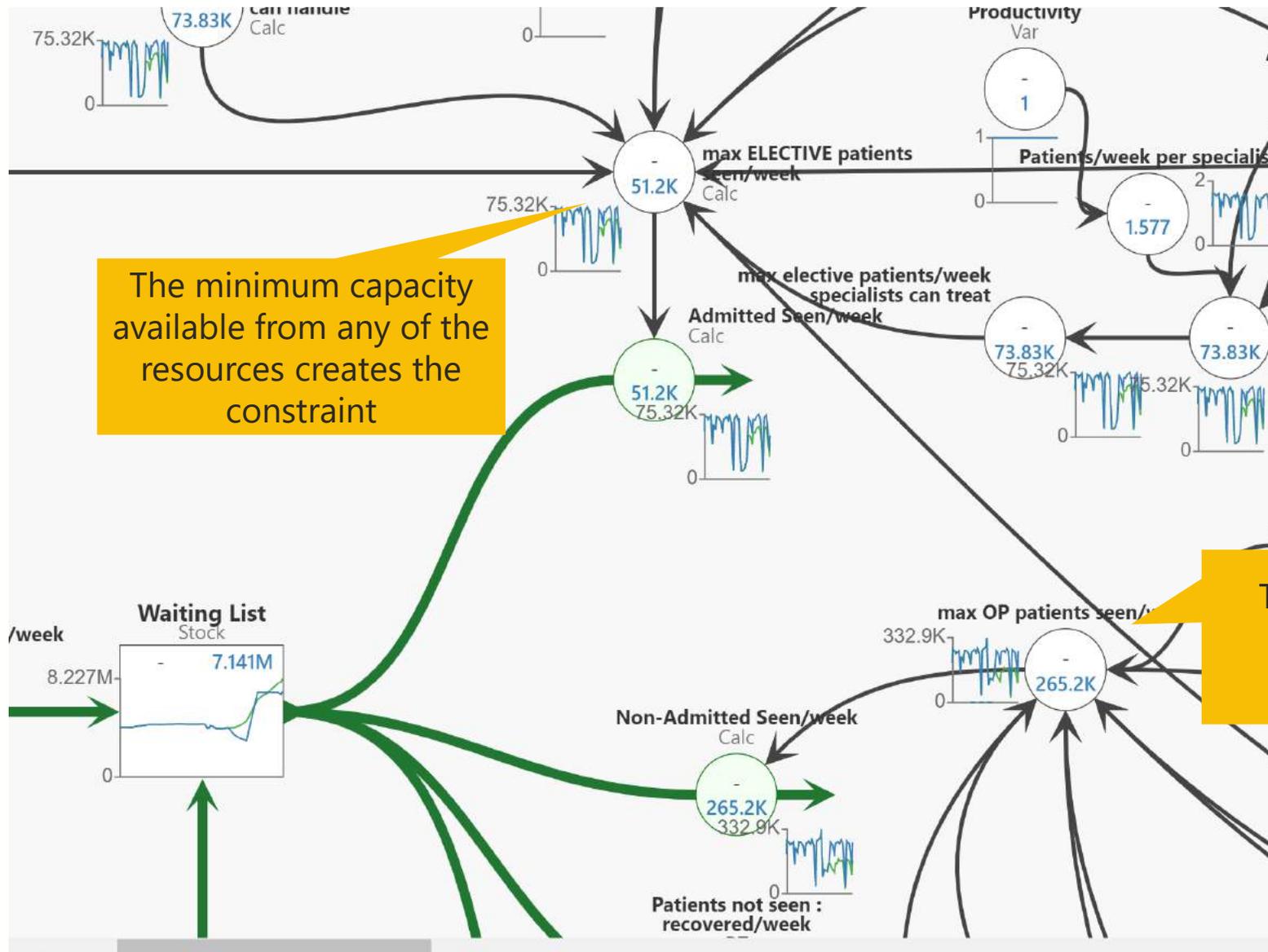
Constraints are applied to a set of resources



Capacity of each resource can be varied

...as can the productivity of each resource

The number of people seen is based on the minimum capacity available from any of the resource constraints



The resources included are...

Inpatients

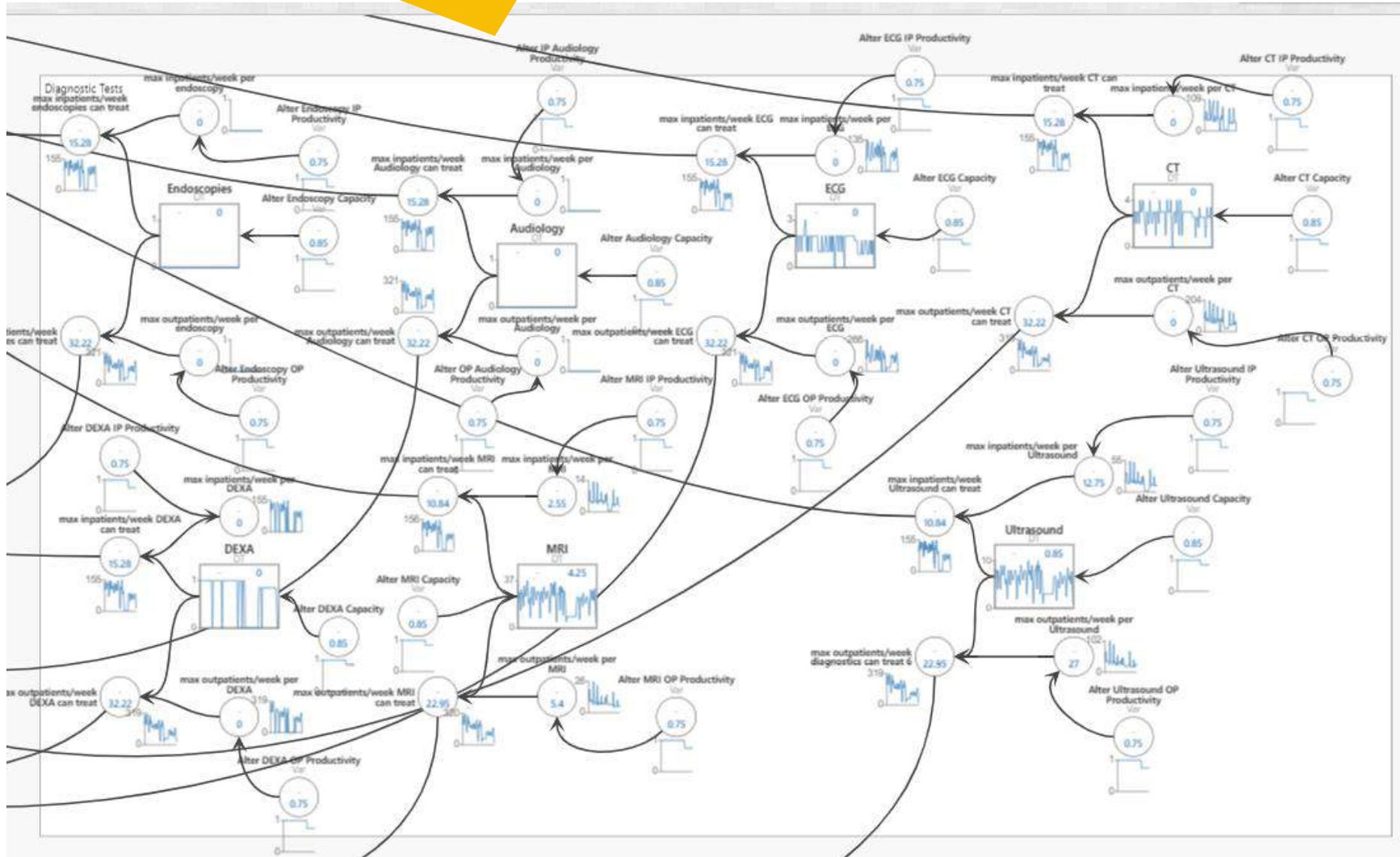
- Beds
- Theatres
- Staff
- Diagnostic Tests
 - Endoscopies
 - Audiology
 - CT Scans
 - ECG
 - Ultrasound
 - MRI
 - DEXA

Outpatients

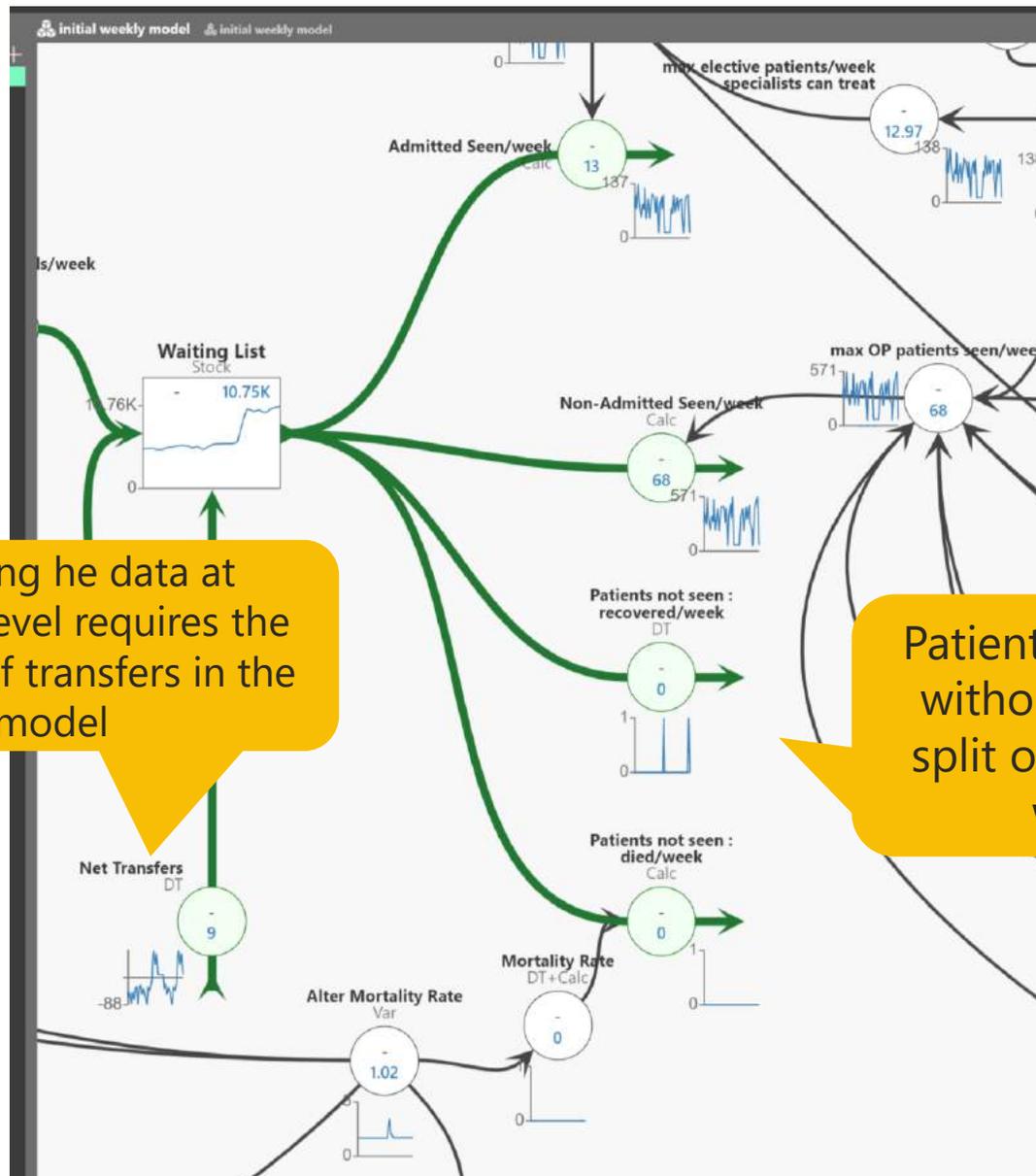
- Staff
- Diagnostic Tests
 - Endoscopies
 - Audiology
 - CT Scans
 - ECG
 - Ultrasound
 - MRI
 - DEXA

Waiting List Model – Diagnostic Constraints

Additional Constraints are applied for each of the diagnostic tests



Some patients leave the waiting list without being seen



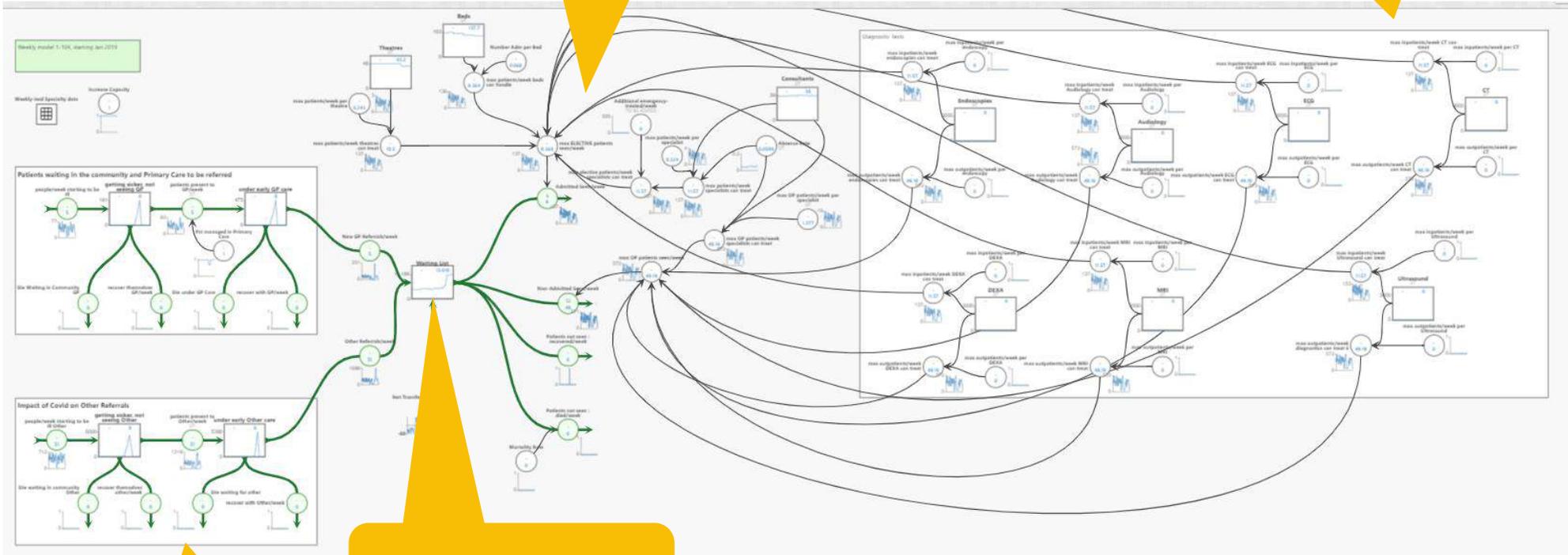
Analysing the data at specialty level requires the inclusion of transfers in the model

Patients who left the waiting list without being seen have been split out from people who died without being seen

Waiting List Model

Constraints for Theatres, Beds and Consultants

Diagnostic Constraints



Referral backlog

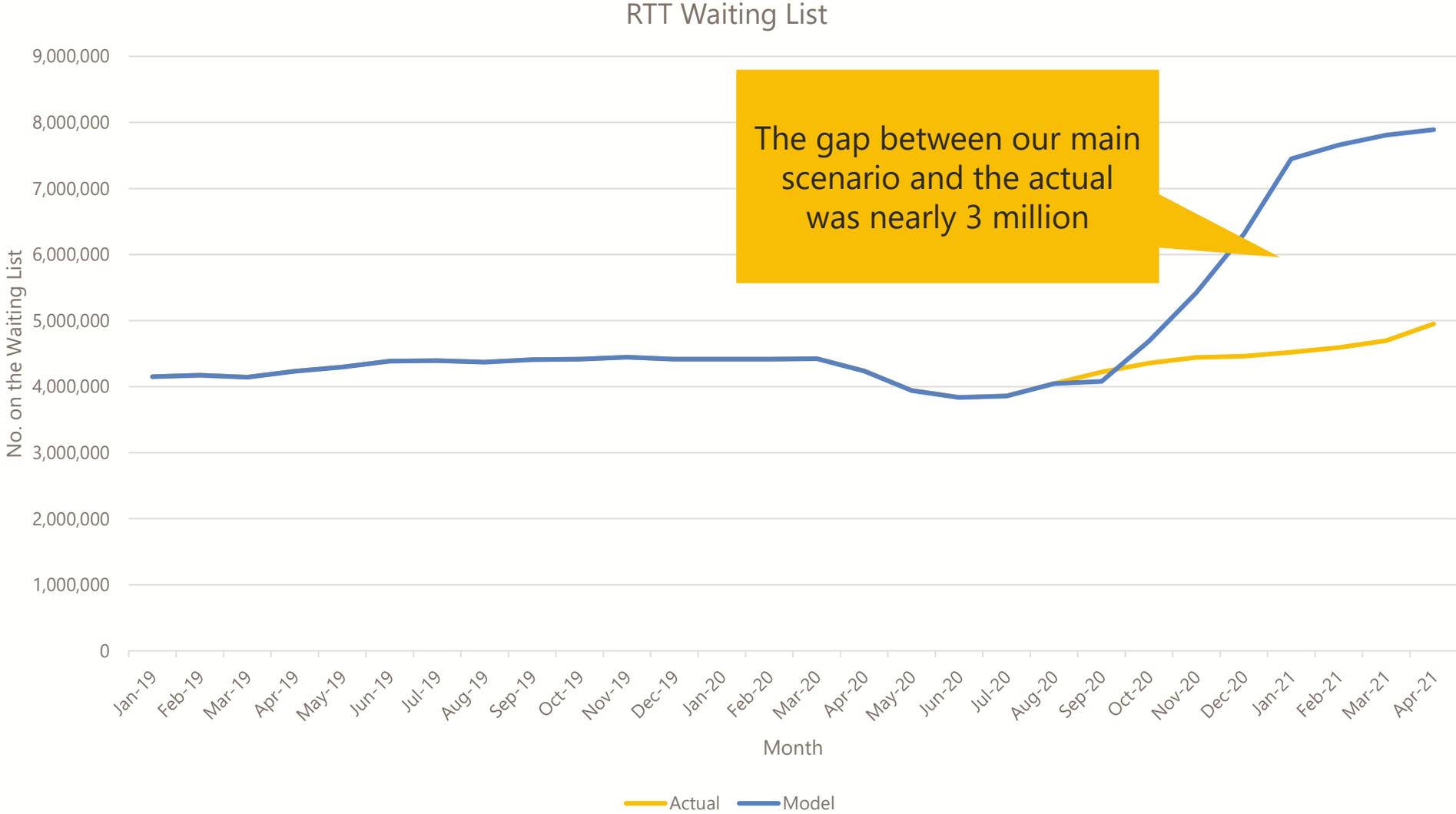
Actual waiting list

The model was made available with....

- A description of all pre-set assumptions
- Detailed guidance, including videos
- Access to the model and the code to create the dataset
- A series of webinars
- A blog describing how it can be used

How did the model perform?

The waiting list is currently much lower than we predicted



We weren't the only ones that got this wrong

FOR HEALTHCARE LEADERS
HSJ

ANDY COWPER
Cowper's Cut: Waiting for The People's Dominic

MIKE WOODALL

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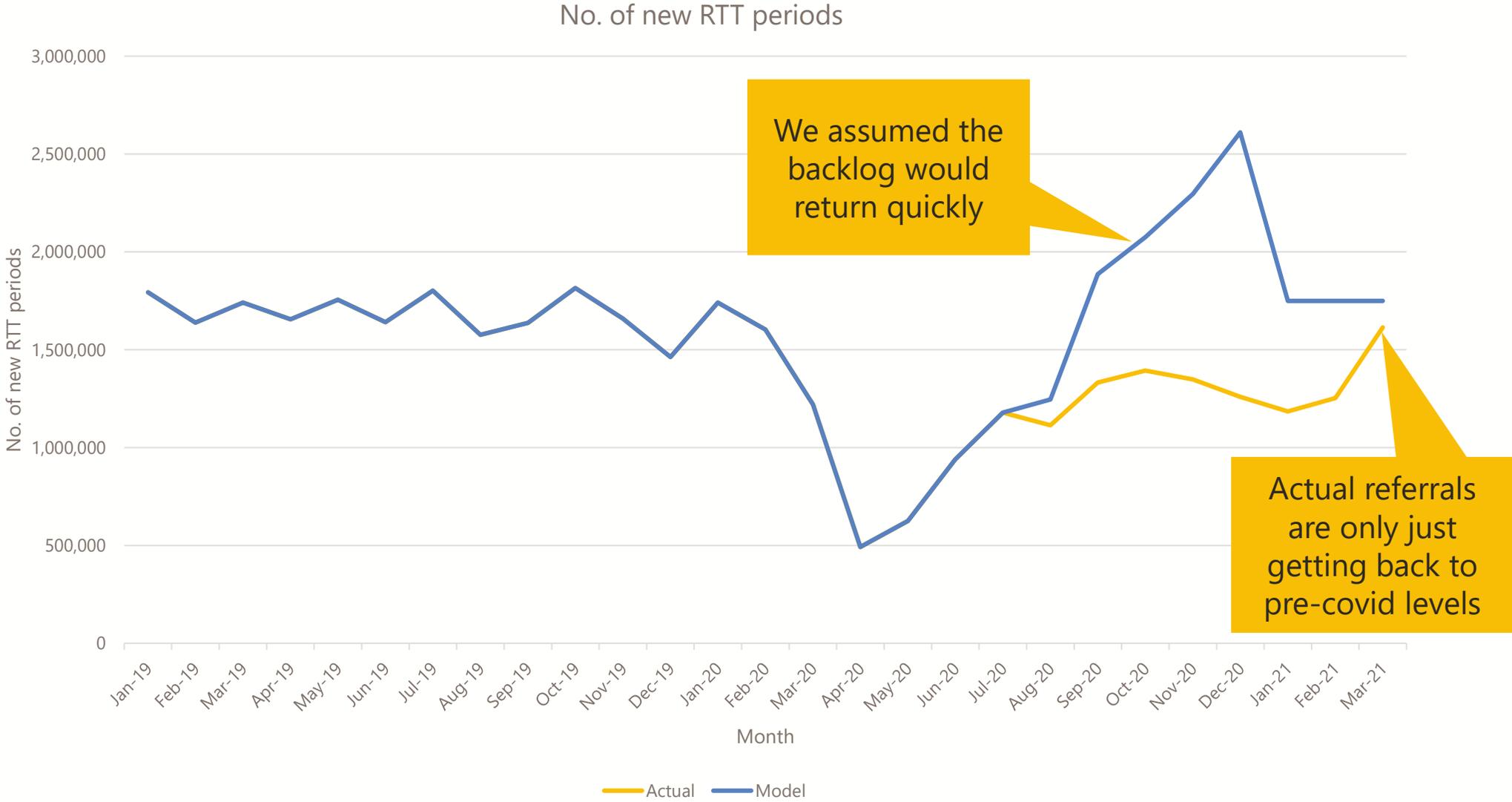
HOME CORONAVIRUS SECTORS TOPICS HSJ LOCAL COMMENT HSJ KNOWLEDGE EVENTS JOBS MORE

EXPERT BRIEFINGS

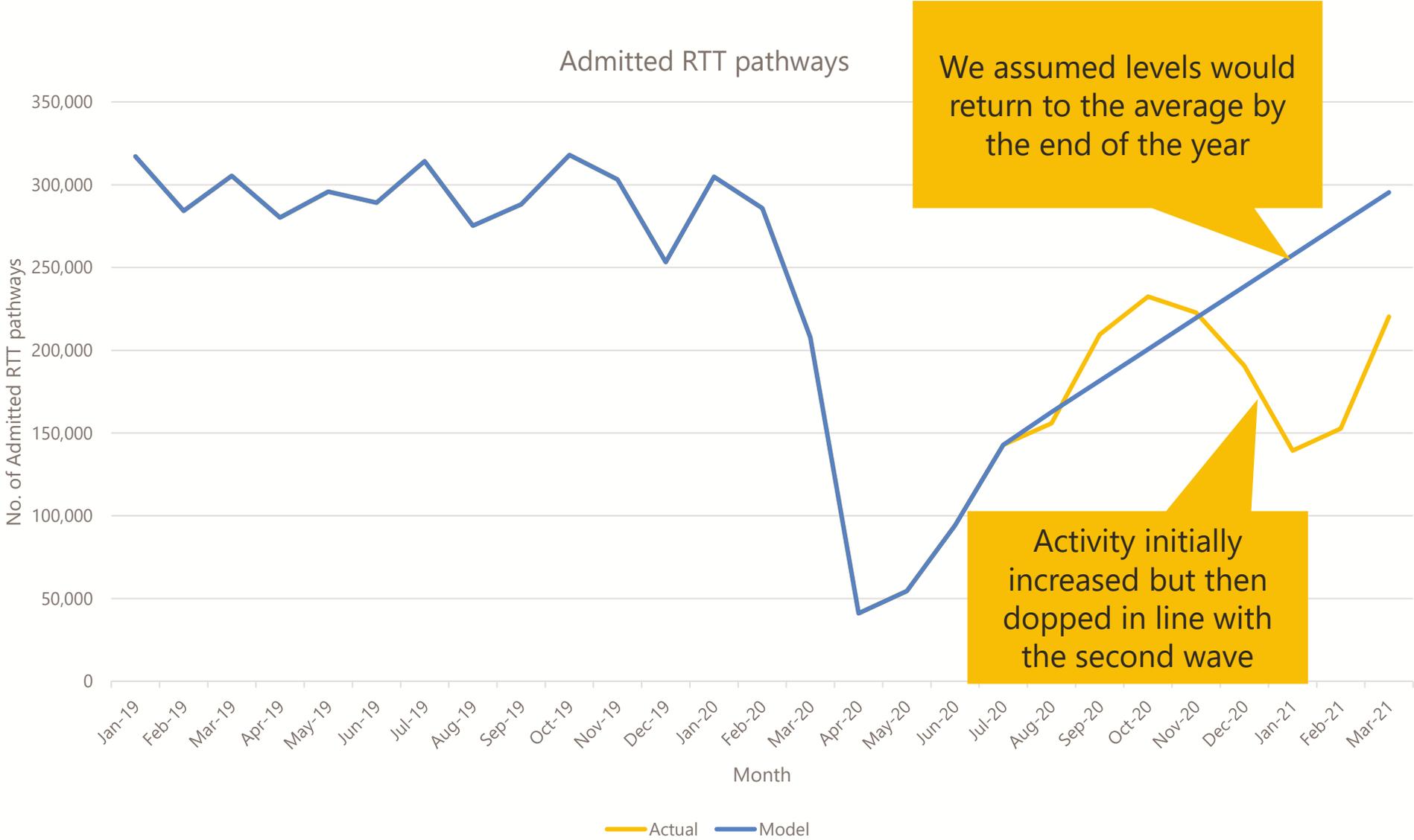
Recovery Watch: The waiting list won't be 10 million by April — but it will take years to fix

By James Illman | 17 February 2021

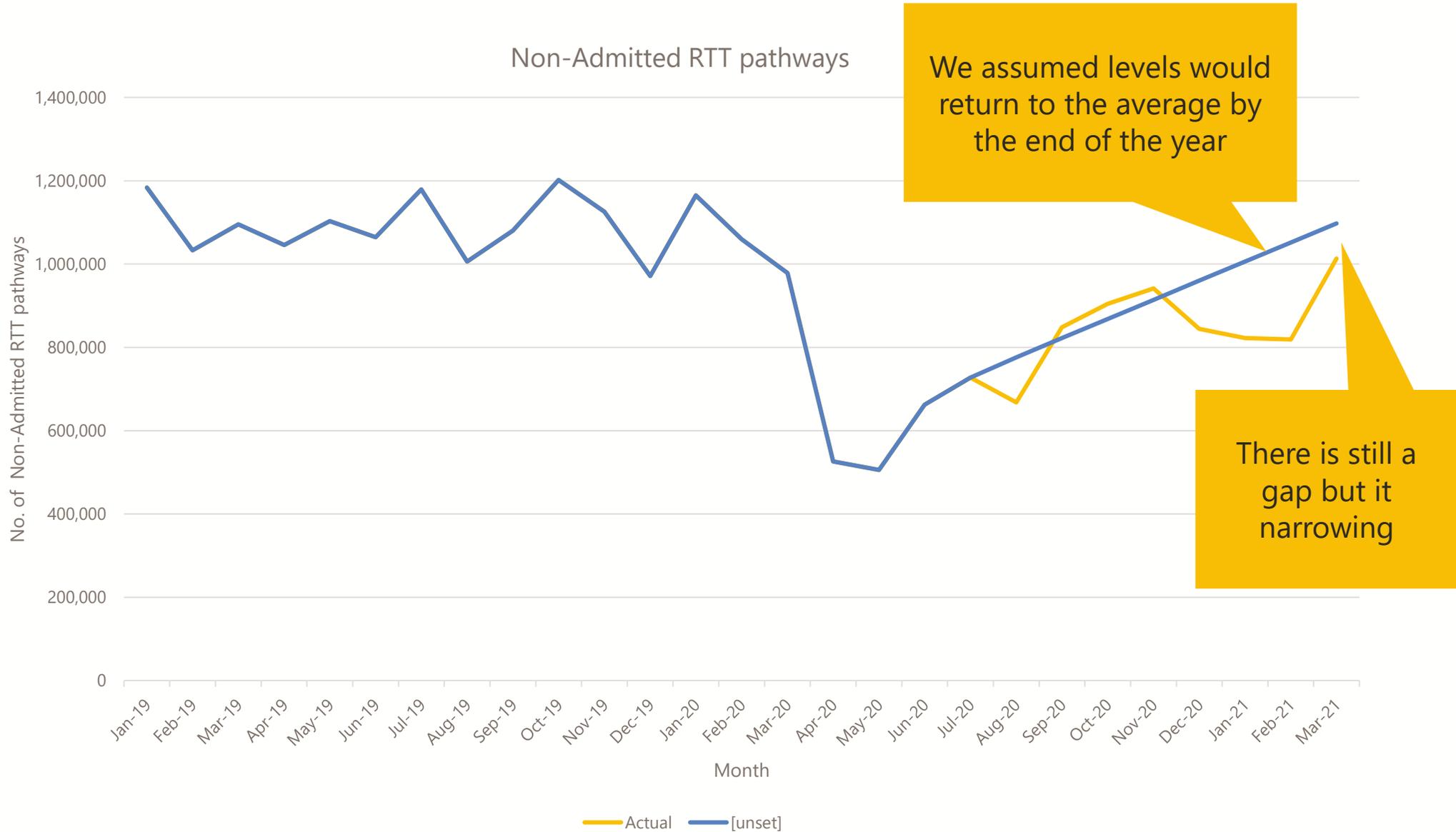
It is mainly due to referrals not returning to pre-Covid level



Our predictions of admitted care were closer...



...and closer still for non-admitted care



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What next?

What Next?

- The model assumptions can be updated
- Additional functionality can be added to split out <18 weeks, 18 to 52 weeks and 52+ weeks
- Additional research on the patient and clinician behaviour has started to develop
- Strategies to improve productivity and create system resilience are developing
- We are running an Action Learning Set to embed SD skills in the NHS

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Any questions?