Health Education England – Large Speciality Programme, simulation of new commissions for Emergency Meedicine

Briefing paper – April 2016

DRAFT

Whole Systems Partnership

Contents:

Executive summary

The modelling reflected in this report is the product of several years of engagement and model development as part of the LETB Workforce Modelling Collaborative. It commenced in 2012/13 in Yorkshire & Humberside, at which point the model addressed the trainee needs for Emergency Medicine and Anaesthetics due to the interdependence of the initial training pathway as part of the Acute Common Core Stem (ACCS). During 2014 a separate model was developed for Anaesthetics as run-through training became more common, which meant that when it was adopted into the HEE Large Specialty Programme Emergency Medicine was also modelled on a run-through basis.

Over the past 6-9 months the work to arrive at this point has included engagement with senior clinicians both nationally and within LETBs. We have gathered national data and had this validated by LETB planners. Our 'exam question' has been to identify the number of ST1 and HST (ST4) trainee starts in Emergency Medicine from 2017 in the context of future needs for consultants and the overall shape of the medical workforce.

Our modelling has been based on the development of a System Dynamics simulation tool that is populated at a LETB level. The outputs from these individual models are aggregated to arrive at an all-England picture, an approach that has ensured local buy-in and sensitivity to local factors, which are reflected in our recommendations. In calibrating the model we have used national objectives or targets but have also considered future projections of need that can again be sensitive to local LETB needs.

Because of the changes in core training for Emergency Medicine the assumptions about progression at significant points in the training pathway are less understood and therefore more prone to estimation and potential error, which is reflected in the note of caution in our recommendations. In addition, the 'lag' in the system due to the length of training for all medical specialties poses particular challenges and has the risk of producing 'boom and bust' behaviour unless it is carefully managed.

The number of trainees, and therefore the number of Consultants, has been growing historically. In addition there will have been further increases of 238 in the number of new core trainees starting between 2014 and 2016. However, demand for Emergency Medicine has also grown significantly and whilst there is some indication that this growth may be moderating, as well as there being significant efforts through the Five Year Forward View to transform urgent care services, care needs to be taken.

The full effect of these changes is difficult to forecast with any degree of precision so the challenge is to balance the respective risks of over-supply were service transformation to be effective in stemming the growth in urgent care needs, with the opposite risk of under-supply were training numbers to reduce and the wider system efforts to moderate increases in demand were not to materialise.

In addition, our decisions today about new trainee commissions in 2017 will ony impact on consultant capacity from the mid-2020's, and will continue to be reflected in the capacity available to meet Emergency Medicine needs for a number of decades. Our recommendations therefore also need to balance short and long term goals.

Our modelling has used a number of assumptions to arrive at a baseline scenario. Each LETB has validated their initial conditions in terms of trainee and workforce numbers, and in addition we have assumed that up to 2019 there will be a 2%pa increase in demand, followed by demand increases that reflect underlying demography. In addition, we have assumed a target that 50% of the medical workforce (consisting of consultants, non-consutlants/non-trainees plus HST trainees) should be consultants. This reflects the current position where providers are reporting significant gaps in consultant numbers of just over 200wte.

When applied to each LETB starting position and aggregated to an all-England total our modelling suggests that the 2016 expected level of new core trainee starts of 342 would

only need to rise marginally to 349, although it would need to remain at that level for c.6 years if the underlying assumptions remain valid. The number of HST trainee starts, which are at c.160 in 2016, would however, need to increase to c.190 by 2019 and remain there for 2 or 3 years before being moderated.

Within this overall position we have identified three LETBs where there is a case for increasing trainee numbers, namely East of England, East Midlands and Thames Valley. This would need to be balanced by reductions, and the most likely areas for reductions would be London, the North East and the South West.

Taking the East Midlands we have also explored the impact of alternative scenarios and model sensitivities to consider whether, and if so under what conditions, any increase in trainee numbers might be moderated. We have explored reduced demand growth (1% pa to 2019), a lower target % of consultants in the medical workforce (45%) and reduced attrition from core training (18% instead of 27%). When these are combined for just the East Midlands LETB the number of new core trainee starts required is reduced by 6, or c.20%. For HST trainee starts the reduction under this combined scenario would be 3, again, about 20%.

Our recommendations for Emergency Medicine trainee commissions for 2017 are therefore:

1. To maintain core trainee starts at the 2016 level, but to explore whether the distribution across England should be modified.
2. To consider a small increase in HST trainee starts from 161 to c178 in 2017 and 185 in 2018, in line with any LETB distribution identified above.
3. To keep the recommendations above under review on an annual basis in the light of close monitoring for:
    a. Core trainee attrition;
    b. Underlying demand pressures.
4. To undertake work to explore appropriate skill-mix across medical and other professional groups for emergency and urgent care pathways in the light of the Five Year Forward View, and thereby taking a more holistic approach to staffing these key care functions.

1 Introduction

1.1 Context

Figure 1 below shows the growth in Emergency Medicine Consultant staffing levels, compared to all consultants, medical and dental consultants and all Emergency Medicine staffing, since 1997. The growth in consultant and other Emergency Medicine staff above the average for other medical professions is clear. However, it is also true that both expectations and demand associated with Emergency Medicine has also been significant. At the time of writing the 'provider gap', meaning the number of consultant posts that would be filled today given sufficient supply, was over 200wte on a total current medical workforce of just over 1,500wte.

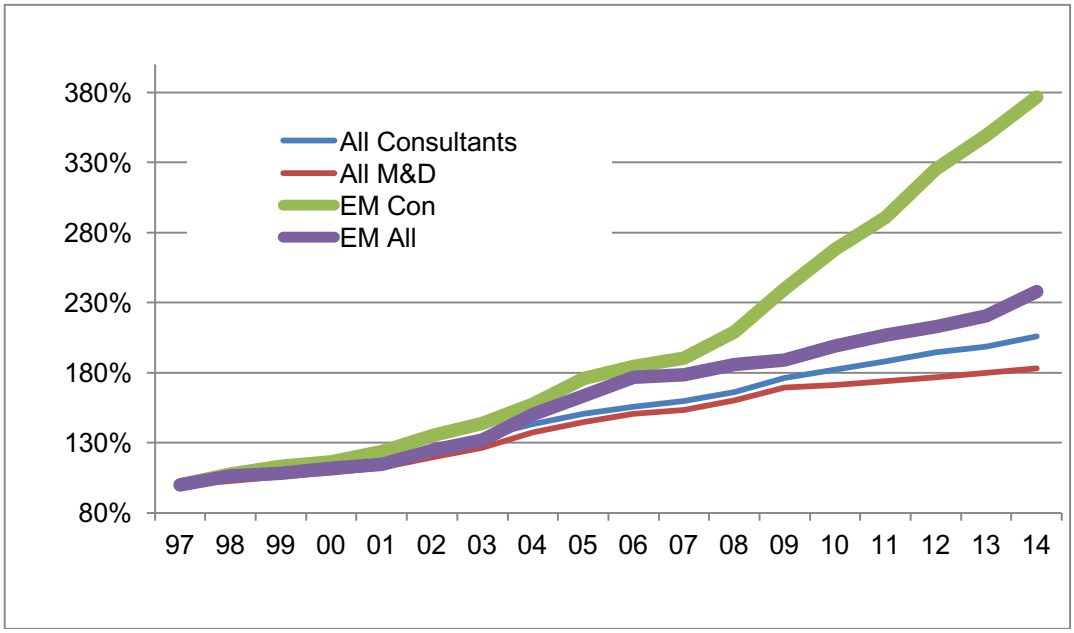

Figure 1 Growth in consultant capacity

The recognised pressures within Emergency Departments is further reflected in the College of Emergency Medicine document '*Medical and Practitioner Staffing in Emergency Departments*' (February 2015). In this document the College outlines acute staff shortages in the light of rapidly growing demand and challenging working conditions. However, it is also true that increases in the number of medical trainees across the Health Service during the 2000's are yet to fully work their way through into the established consultant workforce.

In addition, increased A&E attendances and Emergency Admissions between 2011 and 2015 has shown an average 1.1% and 3.1% average annual increase, suggesting that A&E attendances are perhaps simply keeping track with underlying demographic changes but with a higher 'conversion rate' to admissions. This is shown in Table 1.

Finally, there is a recognition that the 'answer' to Emergency Medicine staffing does not lie solely with the number of consultants but that a 'visionary and creative approach' is required across the staff groups providing this critical area of service[1]. Against the backdrop of increasing pressure Health Education England increased the number of training posts in Emergency Medicine by 95 posts in 2014, by a further 95 in 2015 and by

[1] Medical and Practitioner Staffing in Emergency Departments, College of Emergency Medicine (Feb 2015)

58 in 2016. The change in training pathways can also be expected to produce less attrition as it becomes 'run-through'.

Year	A&E attendances – Type 1 A&E	Emergency Admissions via Type 1 A&E
2011	13,986,462	3,575,591
2012	14,353,673	3,727,595
2013	14,219,878	3,769,572
2014	14,672,118	3,965,823
2015	14,597,712	4,018,650
Average change pa	1.1% pa	3.1% pa

Table 1 Type 1 A&E attendances and emergency admissions 2011-2015[2]

1.2 The challenge

Understanding and having confidence in the consequence of decisions and actions today on the future supply of the Emergency Medicine medical workforce is recognised as a challenging undertaking. 'Now-casting' over the short term has benefit and can provide an initial platform from which to explore medium term scenarios. This approach typically captures the current position and makes assumptions on a year by year basis about progression and attrition. However, as with any modelling, each year you move forward introduces additional uncertainty.

No modelling tool can remove this uncertainty totally, but using System Dynamics does significantly reduce the complexity of making 'what-if' assessments for the medium to long term, as well as providing an environment in which there is much greater potential for engagement with a wide set of stakeholders. This report reflects both approaches, but uses System Dynamics to answer the more strategic question being addressed, i.e. ***how many new trainees should be commissioned to meet future service requirements?***

The simulation model on which this report is based has been used as a learning tool since 2012 when the Yorkshire & Humberside LETB undertook to model the training pathway as part of a collaborative approach that was emerging across the LETBs. After being adopted into the HEE Large Specialty Programme, a review meeting was held involving senior HEE and LETB planners and clinicians in July 2015.

This engagement led to a modified specification for the systems model. The analysis, model development and testing are therefore all embedded in an iterative engagement process that ensures clarity, transparency and ownership of the end product. This document therefore sets out the approach and assumptions for the large specialty programme review of the Emergency Medicine modelling tool.

[2] Source: Data report provided by the Royal College of Emergency Medicine.

1.3 Modelling approach

The approach adopted in developing a modelling tool that is 'fit for purpose' for both the issue and the context within which it has been developed has followed the 'good practice' guide published by the Whole Systems Partnership[3]. This has built on over 20 years of experience in using these tools. Using system dynamics modelling supports the development of understanding and decision support in a number of ways:

- It looks at flows through the system enabling identification of key drivers or components of the system;
- By being focused on the question to be answered, it enables boundaries to be drawn, and prevents drift into non critical topics;
- It encourages clinical and data expert engagement, and the owning of models by those making the decisions;
- Through examination of 'what if' questions, practical and political constraints can be used to override model parameters, thereby enabling the full range of determining factors to be taken into account;
- Using consistent modelling across local areas enables efficient calibration and benchmarking for enhanced understanding of regional variations.

2 The baseline position

2.1 People commencing training

New trainee commissions are still identified at years 1 and 4 of specialist training, which reflects the historic ACCS/Specialist pathway. Figure 2 shows the number of new Core trainee starts in 2014 and 2015, and Figure 3 the number of new HST/ST4 starts in 2014 and 2015 for each LETB. The England totals were 254 in 2014 and 325 in 2015 for Core and 133 in 2014 and 120 in 2015 for HST/ST4.

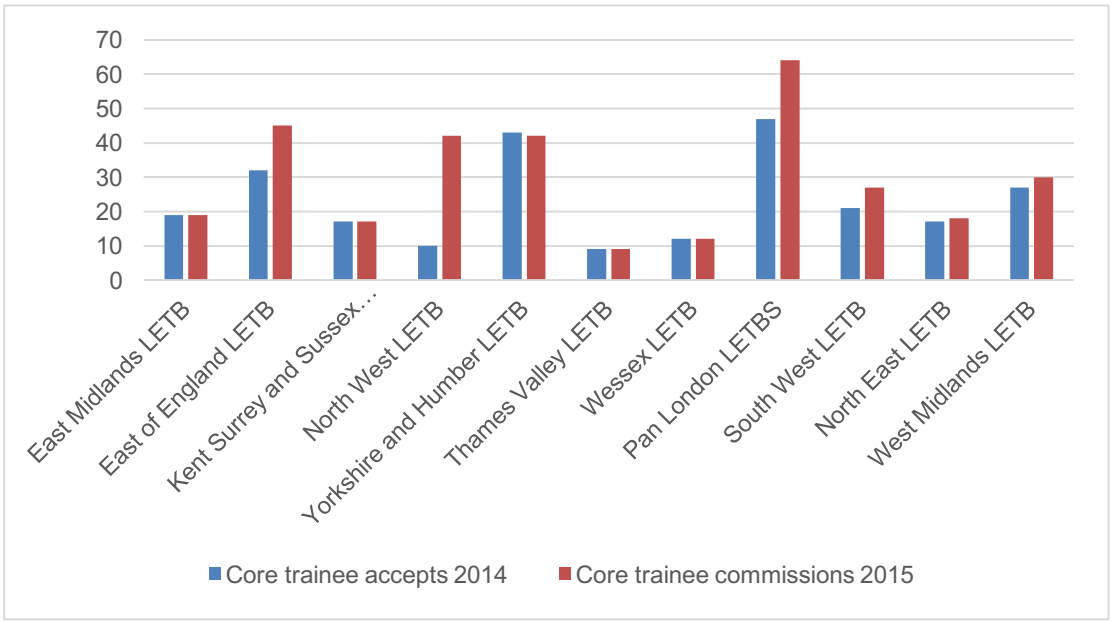

Figure 2 New core trainee starts for 2014 and 2015 by LETB

[3] The Whole Systems partnership has provided strategic consultancy services to a range of health and social care partners for over 20 years. Its good practice guide in the selection and use of systems thinking and system dynamics modelling can be downloaded here.

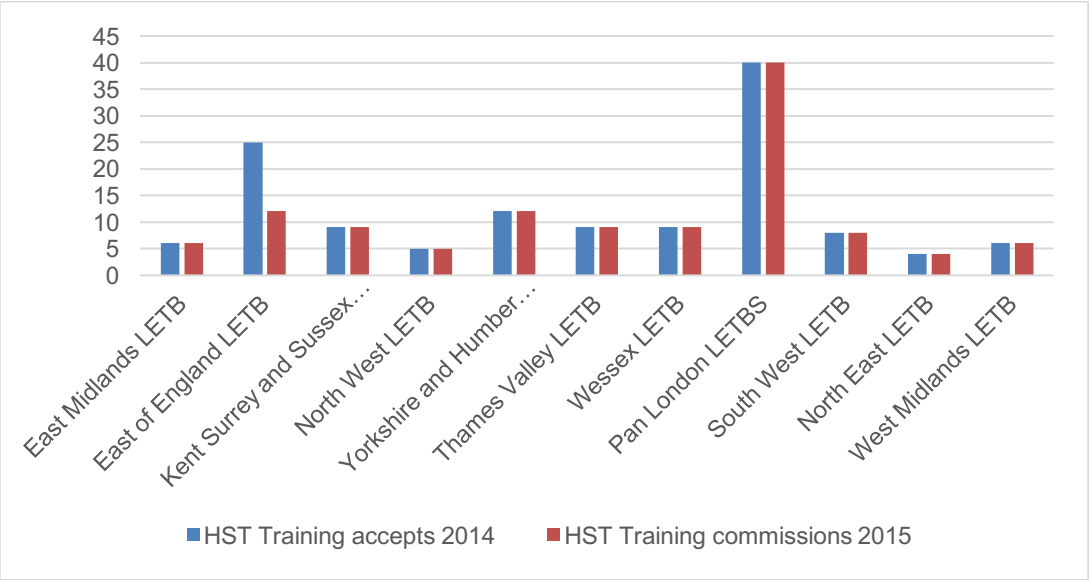

Figure 3 New HST/ST4 trainee starts for 2014 and 2015 by LETB

2.2 Total in training

The number of people in each year of training, and the attrition from training, has been identified from HEE September 2015 trainee data. The data has been built up from LETB by LETB intelligence. The numbers in training is shown in Table 2 at an all-England level in order to feed in to our subsequent 'now-cast' analysis. An average attrition from training for ST1-ST3 has been identified as 26% and for ST4 to ST6 as 7%.

	ST1	ST2	ST3	ST4	ST5	ST6
Total in training	285	194	230	160	122	245

Table 2 Initial numbers in training (Sept 2015) across England

The model is sensitive to gender mix and to the age on starting training as these both have an impact on subsequent capacity and length of service. The data used to initialise the models is at a LETB level, but as an England average we have identified:

- The average age on commencing core training is 28.9yrs for men and 28.7yrs for women;
- The gender mix at the start of training is now 53% male and 47% female;
- The gender mix of those in training is 51% men and 49% female.

Within the consultant workforce the gender mix is 68% men and 32% female, with participation rates on average being 6% lower amongst women under the age of 50 (93% compared to 99% for men). We have also identified the likelihood that women will either retire or cease working as a Consutlant in Emergency Medicine on average 2 years before their male colleagues. The gradual shift toward a higher proportion of the medical workforce being female has therefore been taken into account in the model outputs.

2.3 Completion of training

On completion of training two factors have been modelled:

1. That there is migration between LETBs, affecting local commissioning numbers but broadly consisting of a 'zero-sum' across England.
2. That there is a temporary 'buffer stock' of consultants that will delay their progression to a consultant appointment either through the need to undergo a

competitive process for consultant appointments and/or in the context of possible short term local imbalances between supply and demand of/for CCT holders.

In view of the current pressures we have assumed that this is fairly brief, but it's potential to play in to future supply and demand scenarios merits it being included in the modelling.

2.4 Non-training and non-consultant posts

Emergency Medicine is currently a specialty that relies heavily on this group of staff. In our baseline analysis we identified 1,654 posts across England (compared to the 1,236 trainee posts, of whom 527 are ST4 and above, and 1,512 wte Consultants). During our engagement and consultation it became clear that this group were often substituting for consultant posts due to the current inability to fill them with CCT holders. The latest HEE intelligence on the 'provider gap', i.e. the vacancies for consutlants that could and would be appointed tomorrow given suitable candidates, suggests a gap in consultant numbers of 228.

To reflect this in our modelling we have identified the percentage of the medical workforce (defined as consultants, higher level trainees and non-consultant/non-trianing medical posts) and made it possible to set a target for the percentage of the workforce that are consultants. The initial position is that 41% of the medical workforce are currently consultants, but that in order to reflect the provider gap of 228 across England it would be necessary to increase this to 50%, which is our default assumption in the modelling. Coupled with the assumptions about increases in underlying demand described earlier in this report these constitute the main drivers for short to medium term trainee commissions.

2.5 Consultant wte capacity

As noted above we have identified 1,512 wte Emergency Medicine consultants in England at September 2015. Figure 4 shows the distribution across LETBs by gender and under/over 50. Table 3 shows the England total/average for headcount and participation rates, each of which has also been identified for LETBs in order to initialise each of the models.

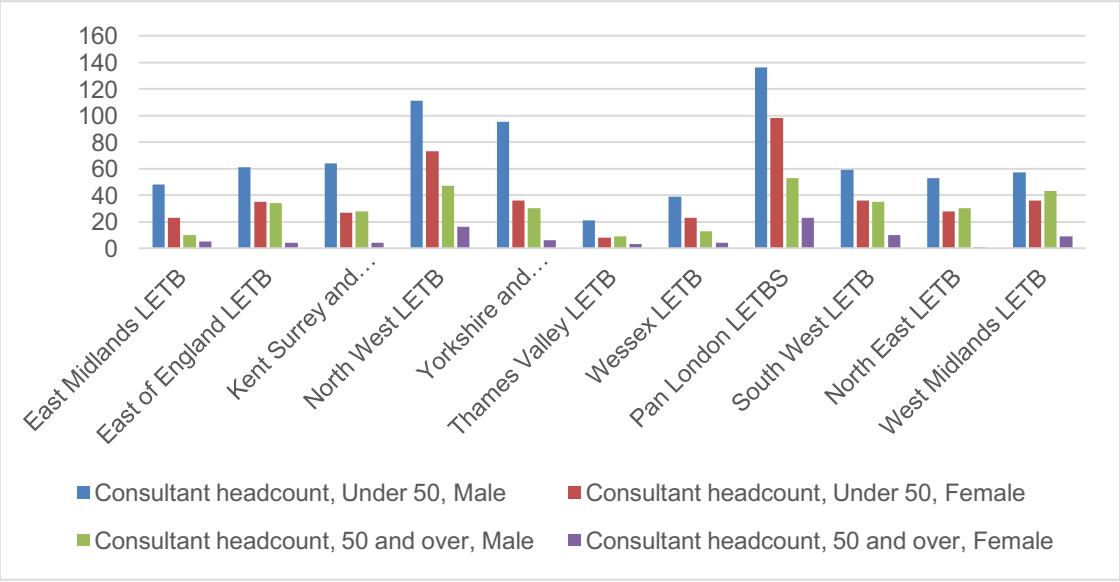

Figure 4 Consultant wte by age band and gender

	<50 Male	<50 Female	>50 Male	>50 Female
Headcount	744	423	332	85
Participation rate	99%	93%	93%	92%
wte	734	392	308	78

Table 3 Consultant headcount, participation rate and wte for England (Sept 2015)

3 Modelling future demand for consultant wte capacity

3.1 The model architecture

The modelling tool simulates the flow through training by gender, on a year by year basis, taking account of attrition from training. Levels of recruitment to new training posts therefore take 6 years as a minimum to achieve CCT status, although competition for progress to ST4 is simulated using a temporary 'buffer' between ST3 and ST4.

On completion of training CCT holders are available for appointment to consultant posts according to the replacement and growth assumptions within the model. A further temporary 'buffer' is included at this stage of the model. Short term delays through competition for consultant posts are accommodated in this buffer, although their capacity for delivering service as a non-consultant post-holder is assumed.

Non-consultant/non-training posts are assumed to be filled from the trainee attrition, although a route to consultant appointment through CESR is also possible. In addition, there is a net flow in or out of non-consultant/non-trainee posts dependant on assumptions in regard to the shape of the medical workforce.

The wte consultant capacity is modelled as a flow from the under 50 to over 50 consultant workforce by gender. The loss from the consultant capacity is simulated by calculating the average years of service post-50, which will be a combination of retirement and people moving out of front-line care delivery. At the same time an absolute requirement for consultant wte capacity for each year of the model is calculated based on underlying demand growth and the desirable shape of the medical workforce expressed as a % of the medical workforce that should be at a consultant level. The logic of the model at this critical stage is:

1. To calculate the difference between the total medical workforce at a point in time with the demand for this workforce at the same point in time, calculated using a multiplier of the intitial conditions. Based on recent trends the multiplier used is 2% pa up to 2019, and then an increase that tracks total population. The 2% pa can be altered to create alternative scenarios, as is demonstrated later in this report.
2. The simulated demand for the medical workforce is then multiplied by the percentage of that workforce that it is deemed should be at a consultant level. Seciton 2.3 above explains the basis for the assumption that this should equate to 50%, although once again this assumption can be varied.
3. This provides an expected level of consultant wte at a point in time, which is compared with the actual level to calculate a gap. This gap, plus replacement for consultants leaving, is what is recruited from CCT holders.
4. The number of CCT holders appointed to a consultant post, plus attrition from ST4 to ST6 training, is used to inform the required number of new starts at ST4.
5. The number of new starts at ST4 plus attrition from ST1 to ST3 is used to inform the required number of new starts at ST1.
6. The number of non-consultant/non-training posts at a point of time in the model is calculated from the residual of total medical workforce required less the number of

consultants, less the number of ST4 to ST6 trainees necessary to maintain the supply of consultant appointments – were, at any time, there to be too many of these posts the model allows for a reduction.

3.2 Model outputs – consultant wte and trainee starts

The required consultant workforce shown in Figure 5 reflects the assumptions outlined above, with growth in overall demand of 2% a year to 2019 and 50% of the total capacity being filled by consultants. The latter is reflected in the initial inflated position or 'provider gap', due to the current consultant % being only 41%. Noting that 2014 and 2015 are effectively historic figures, the growth in consultant numbers up to 2023 cannot be affected by increasing the number of new ST1 trainees as new starts in 2017 (the first year that this review will impact on) will not complete training before at least that year. Changes in attrition rates or in assumptions about demand growth can modify progress toward increasing consultant capacity, which will be demonstrated in the next section of the report.

Figure 6 shows the model outputs for the number of new ST1 and ST4 starts required to produce the outcome shown in Figure 5. Once again 2014 and 2015 are historic figures and reflect the growth in new trainee starts already described earlier in this report. What the model then reflects is that to achieve the growth required to address both current under-supply of consultants and a 2% pa growth in demand to 2019 requires only a modest increase in ST1 starts from 325 in 2015 to 342 in 2016, with this being sustained until the early 2020's. However, were run-through training to have the effect of reducing attrition, or demand growth to moderate earlier, then this increase could be challenged. Recruitment at ST4 shows a gradual rise from the 2014 position of 133 to just under 200 by 2020, but thereafter reducing back to c.150 in the longer term. Whilst attrition during HST training is already lower any reductions here, or in underlying demand growth, could moderate the required increase suggested at ST4.

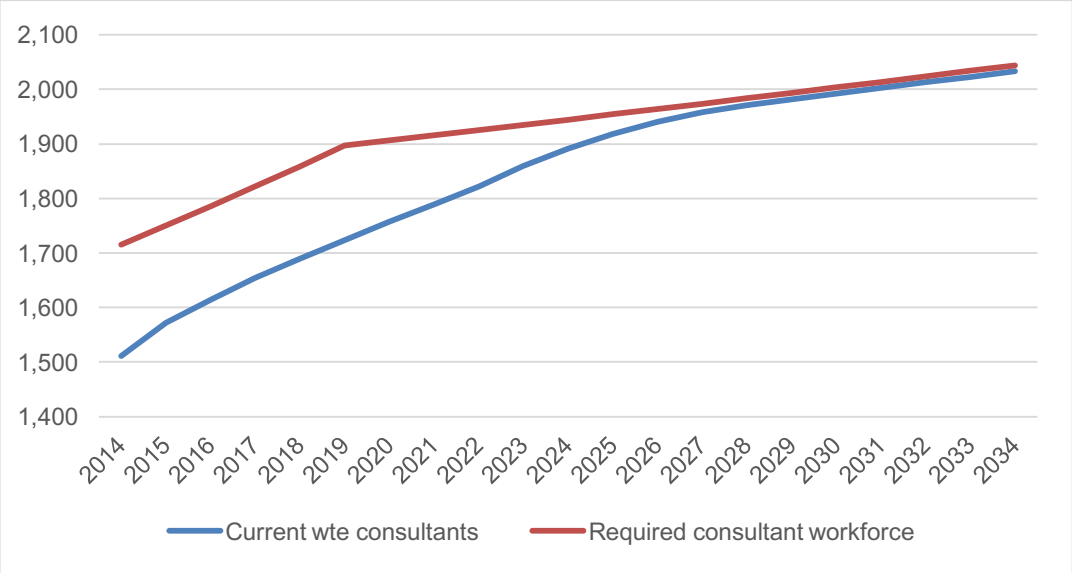

Figure 5 All-England simulation of the growth in consultant wte capacity

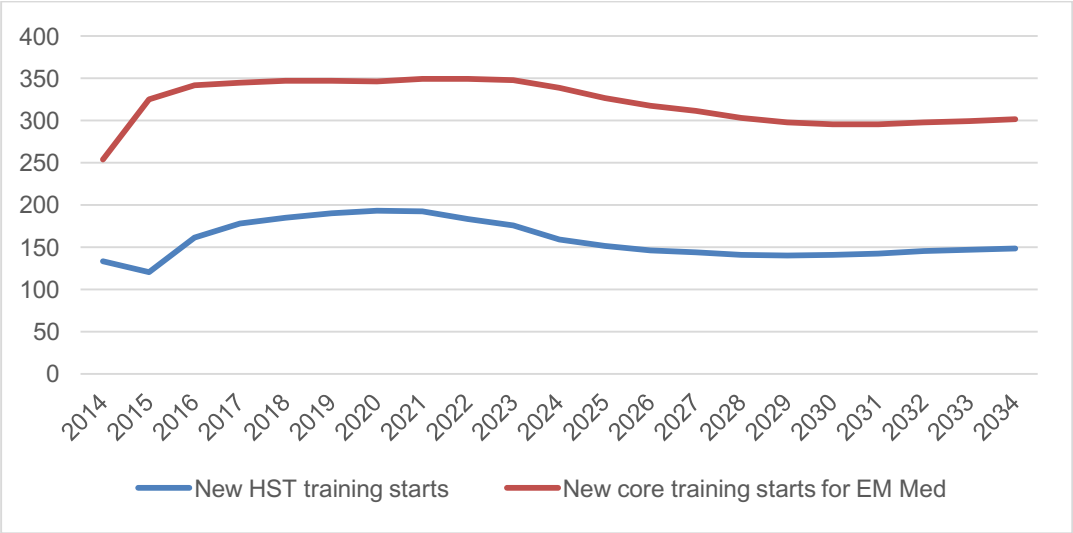

Figure 6 All-England trainee starts at ST1 and ST4 required to achieve consultant wte capacity

3.3 Model outputs – other parameters

Figure 7 shows the number of Core (ST1-ST3) and HST (ST4-ST6) trainees within the system as a result of the baseline scenario for the increase in consultant wte in Figure 5. Figure 8 shows the required NCCG workforce. Of note in Figure 8 is that there remains a need for similar levels of non-consultant/non-trainee posts into the future. In the short term this is due to the growth in total medical workforce not being fully satisfied by increases in consultants, and in the longer term by the reduced number of HST trainees required to sustain consultant numbers, with that capacity being made-up by a gradual increase in non-consultant/non-trainee capacity.

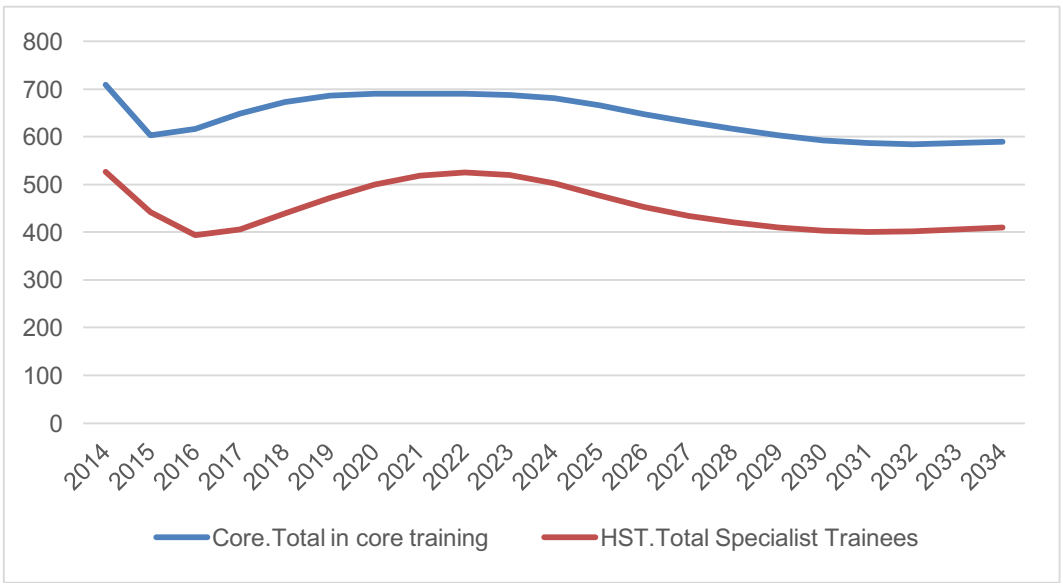

Figure 7 All-England numbers in training

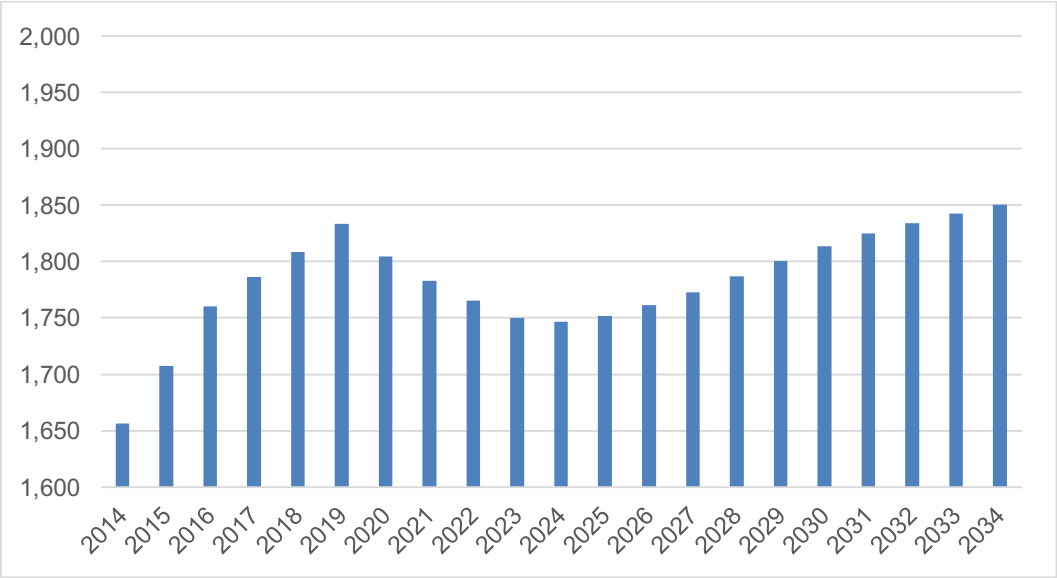

Figure 8 Required level of non-training/non-consultant medical workforce

3.4 LETB variation

As noted earlier the modelling tool is calibrated at a LETB level and then aggregated to an all-England total. The starting position in each LETB therefore varies and progress toward achieving the growth in consultant numbers differs. Table 3 identifies a number of key starting conditions and the consequent progress toward matching actual to required consultant workforce. Figure 8 also provides a visual representation of some of the data within Table 3 and illustrating the mix within the medical workforce between consultants, HST trainees and non-consultant/non-trainee.

This LETB analysis provides an indication of some of the decisions and variation that is possible when translating any decision on the number of new trainee commissions to each LETB. On the basis of this analysis, and ensuring that any variation remains within the overall envelope of suggested training commissions across England, these starting positions indicate whether, and where, there is a case for some degree of redistribution between LETBs.

LETB	Total medical workforce per 1,000,000 pop	Total consultant wte per 1,000,000 pop (% share)	Simulated date to achieve 50% Consultants	% increase in wte consultants when 50% is achieved
EM	57.3	17.6 (31%)	2027	73%
EoE	57.5	20.0 (35%)	2025	53%
KSS	64.7	25.5 (39%)	2026	39%
London	84.9	31.8 (38%)	2024	38%
NE	78.0	39.2 (50%)	2024	4%
NW	57.3	31.5 (55%)	2026	-4%
SW	71.8	28.4 (40%)	2025	33%
TV	46.1	16.2 (35%)	2018	35%
W Mids	61.7	23.4 (38%)	2030	45%
Wessex	55.8	25.2 (45%)	2020	13%
Y&H	63.3	28.5 (45%)	2021	11%
TOTAL	65.1	26.6 (41%)	N/A	N/A

Table 4 Variation in starting conditions and progress to goal in the individual LETB models

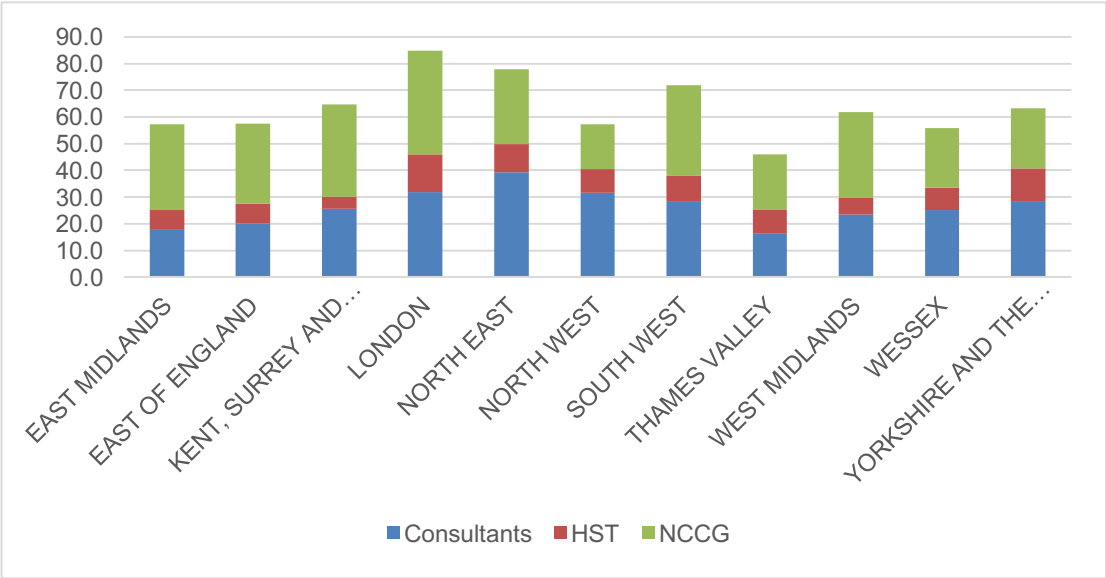

Figure 9 Variation in initial conditions for the mix of the medical workforce

Table 4 and Figure 9 identify three LETBs where the starting position is relatively low, and therefore the progress to target could take longer, namely East Midlands, East of England and Thames Valley. It could be argued that these LETBs should be prioritised in any additional trainee commissions, or protected if a decision were made to reduce them. Compensating LETBs where reductions in training numbers would not signifgicantly disadvantage them compared to other LETBs would be London, the North East and the South West.

3.5 Demonstrating model sensitivities and scenarios using one LETB model

The East Midlands is a LETB where there is the case for an increase in trainee commissions on the basis that it starts with a relatively low level of medical workforce per 1,000,000 population (57.3 compared to 65.1 for all-England) and has a lower than average percentage of this workforce as consultants (31% compared to an all-England average of 41%). Figure 10 show the growth in consultant numbers necessary in the context of the initial gap to 50% and the underlying 2% growth in need up to 2019.

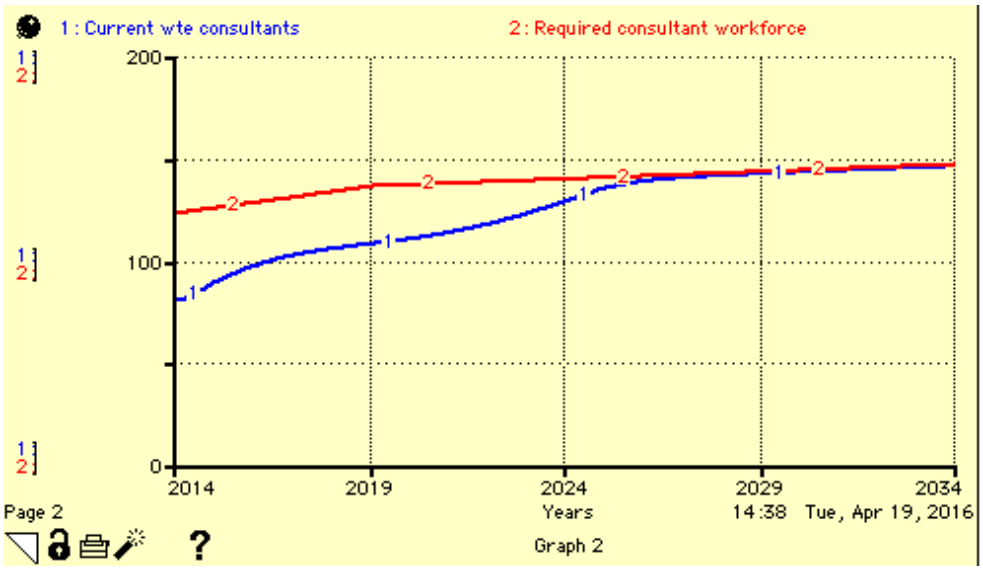

Figure 10 East Midlands consultant growth under the baseline scenario

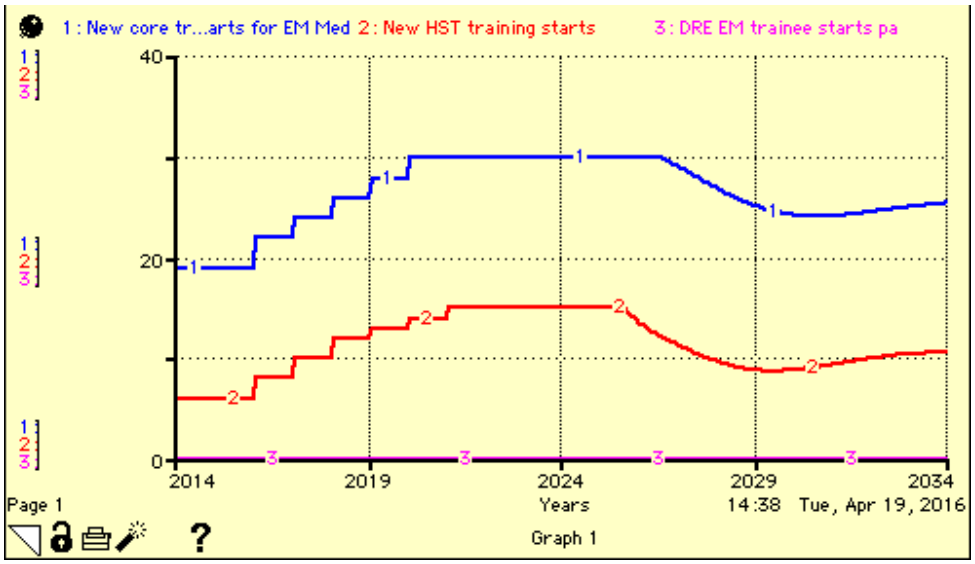

Figure 11 East Midlands trainee starts required to achieve growth

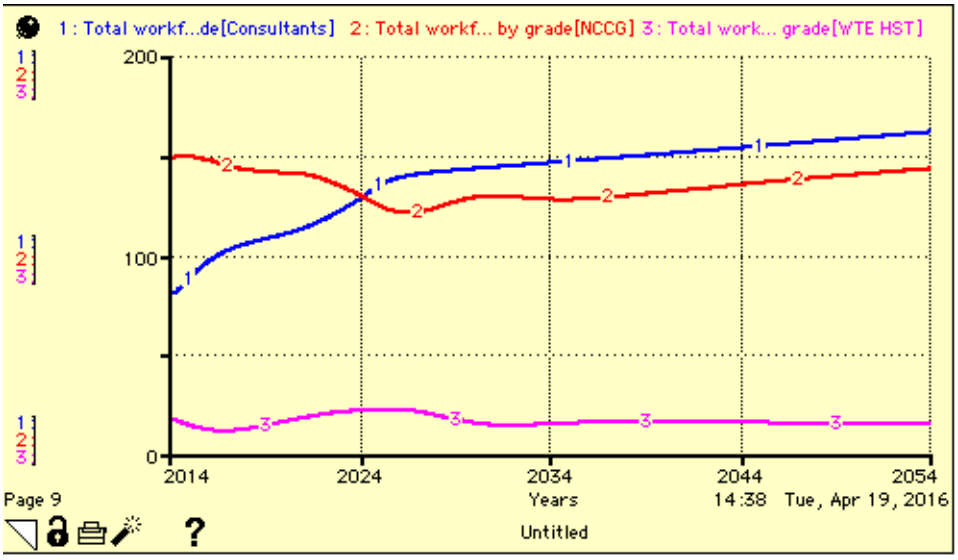

Figure 12 East Midlands medical workforce over time

The model suggests that in the case of East Midlands new core trainee starts could rise from 19 to 30, and HST starts from 6 to 15, as a result of which consultant numbers would achieve the expected joint target of matching expected growth in demand and achieving 50% of the medical workforce by 2026. This is the baseline scenario. Model sensitivities can be illustrated by varying these assumptions as follows:

Scenario 2: where growth in demand is restricted to 1% rather than 2% up to 2019;

Scenario 3: where the percentage of the medical workforce at consultant level is targeted at 45% rather than 50%.

Scenario 4: where attrition from core training is reduced by one third (18% rather than 27%).

Scenario 5: where all of these are the case.

In each scenario above the number of wte consultants is achieved, although that number is clearly fewer under scenarios 2, 3 and 5. Figure 13 shows the resultant Core Trainee starts necessary in each scenario, assuming that the initial increase from 19 to 30 is retained. Other outputs from the model suggest that scenario 5 achieves target consultant wte by 2021 rather than 2027 but that the risk of over-supply is brought forward by about 4 years to c.2025.

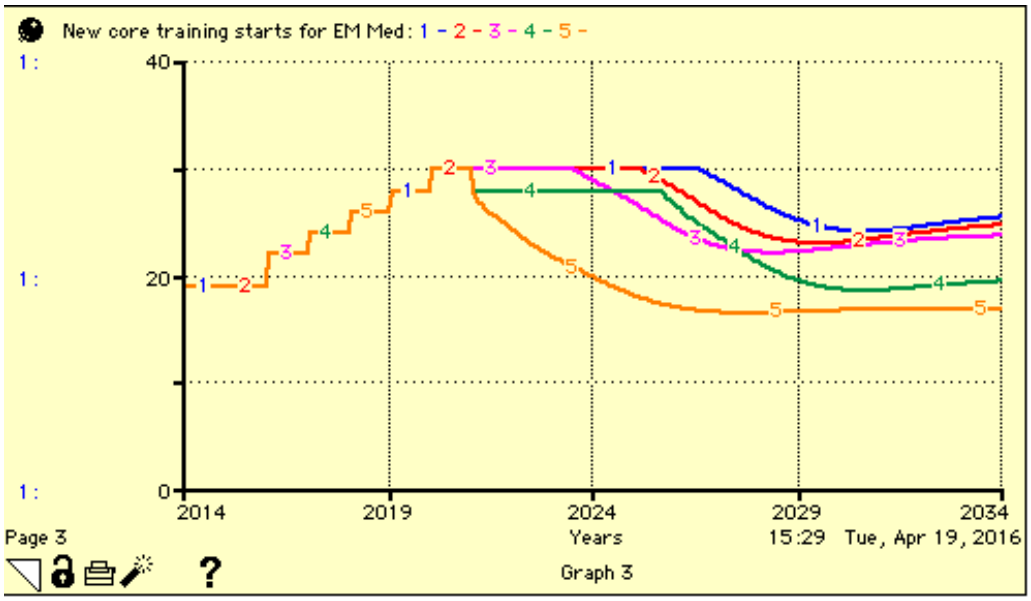

Figure 13 Core trainee starts under the 5 scenarios

Scenario 5 suggests that the increase in core trainees can be moderated whilst still realising the alternative target consultant wte. Using the modelling tool it is possible to arrive at an alternative, lower number of trainee starts under scenario 5 such that:

- Core trainee starts would rise from 19 to 24 in the medium term, but then return to a long term average of 17;
- HST trainee starts would rise from 6 to 12 and then return to a long term average of 9.

These outputs are illustrated in Figures 14 to 16. Given that the East Midlands is a LETB where there is a case for a larger increase in trainee commissions, then applying the same logic to all the LETBs could result in a case being made for a slight reduction in overall trainee commissions. However, this is sensitive to achieving reduced attrition from core training, realising a slow-down in Emergency Medicine demand and arriving at a skill mix within the medical workforce where 45% consultant input is appropriate and delivers good quality care.

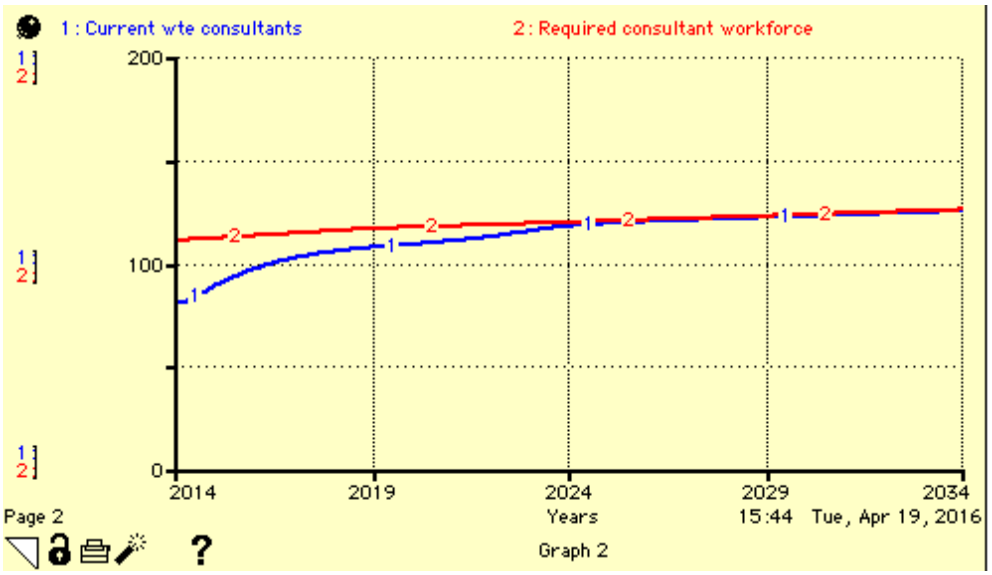

Figure 14 East Midlands consultant growth under the alternative combined scenario

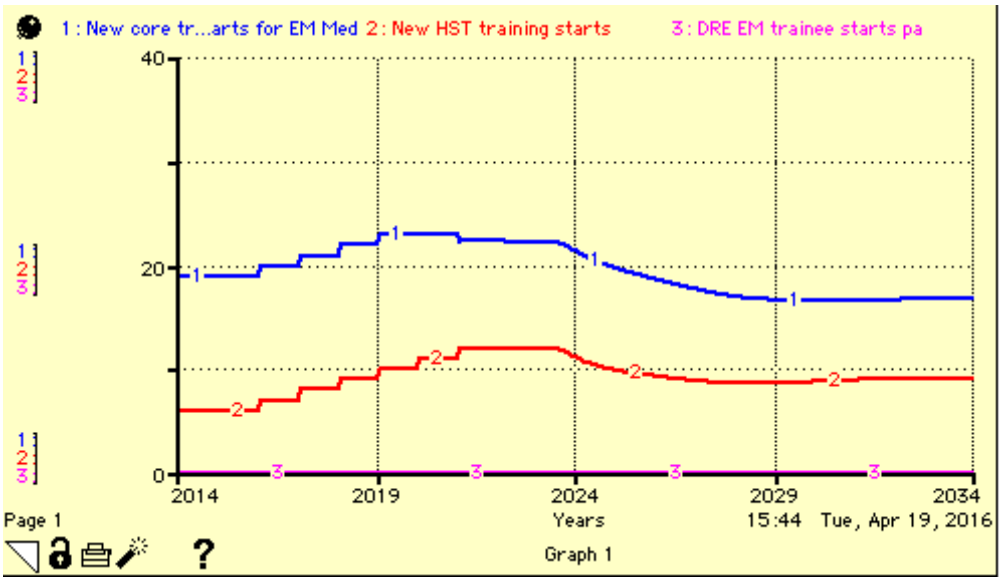

Figure 15 East Midlands trainee starts required to achieve alternative combined scenario

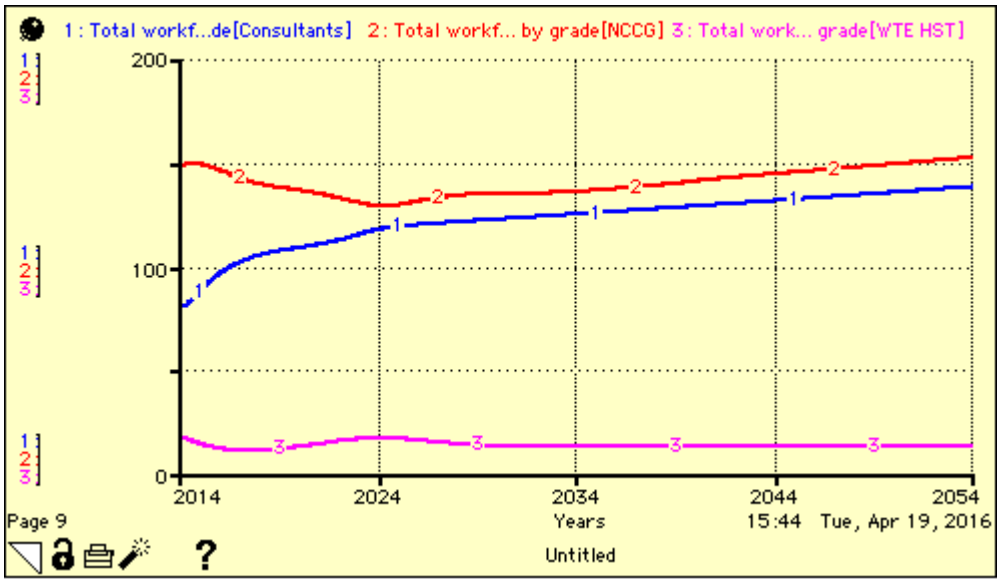

Figure 16 East Midlands medical workforce over time under combined scenario