

Kent & Medway Mental Health beds simulation modelling report



February 2020

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1 Context

1.1 Local requirement

The Kent & Medway system is currently undertaking a range of demand and capacity modelling work supported by the Whole Systems Partnership (WSP) in the context of the NHS Long Term Plan and for Five Year Forward View for Mental Health services. Commissioners for Mental Health services wished to explore future bed capacity requirements across the system in the context of changing population health needs and service developments designed to provide improved outcomes for people with the most complex needs. They recognise, in line with national policy, that more services could be provided in community settings either through improved response to crisis and/or a more proactive approach to care.

The key question being addressed through this project, as agreed by local stakeholders, was:

To identify how many inpatient beds are required across Kent & Medway for people with specialist acute mental health needs over the medium to long term (2024 & 2029) in the context of changes in underlying population health needs taking account of recent and planned service developments that improved patient flow and evidence-based alternatives in community settings.

The project was carried out between November 2019 and January 2020 in partnership with Kent & Medway Partnership Trust (KMPT), the provider of specialist mental health services, and consisted of:

- An initial senior officer briefing to set out and agree the scope for the work;
- The gathering of relevant population health and service data to inform the building of a prototype system dynamics model that addressed the key question;
- The sharing of this prototype model with a stakeholder group so as to demonstrate initial findings and explore additional factors that needed to be taken into account;
- Further refinement of the model and the re-presentation of high-level findings to the stakeholder group;
- The preparation of this report and sharing of the systems model for the purposes of monitoring progress for the impact of service developments and therefore future bed capacity requirements.

1.2 National review of bed requirements

In November 2019 the Strategy Unit of the Midlands and Lancashire Commissioning Support Unit published a report commissioned by the Royal College of Psychiatrists entitled “*Exploring Mental Health Inpatient Capacity*”. This review looked at two indicators in particular, namely levels of bed occupancy and the frequency of out of area placements for inpatient care. It compared all 42 Sustainability and Transformation Partnerships in England, of which Kent & Medway is one. The report stressed the importance for good quality care of managing occupancy levels within reasonable limits (its recommended level being 85%), minimising if not eradicating out of area placements and the importance of investing in high quality community services as a means of realising these goals.

In its evidence for the Kent & Medway system it identified bed occupancy levels of around 90%, but with a slight downward trend, minimal out of area placements and a lower than expected rate of admissions to inpatient beds, all suggesting a good track record of developing appropriate and effective community support.

1.3 Current beds in the Kent & Medway system

At the time of undertaking this review there were 243¹ beds available across the Kent & Medway system split across 7 sites and broadly designated as either for Younger Adults (YA) or for Older Adults (designated OPMH). Note that the scope of this modelling does not include Psychiatric Intensive Care or services for children and young people. Admission to a bed in the K&M system is based on a combination of proximity and need, which gives some flexibility in the use of the bed stock. This is illustrated in Figure 1 which shows the percentage of occupied bed days for people based on their diagnosis. Because of the flexibility with which it is possible to use the current inpatient services KMPT have adopted a target of 90% occupancy rather than the 85% noted above. Our modelling, however, does explore the implications were an 85% target adopted.

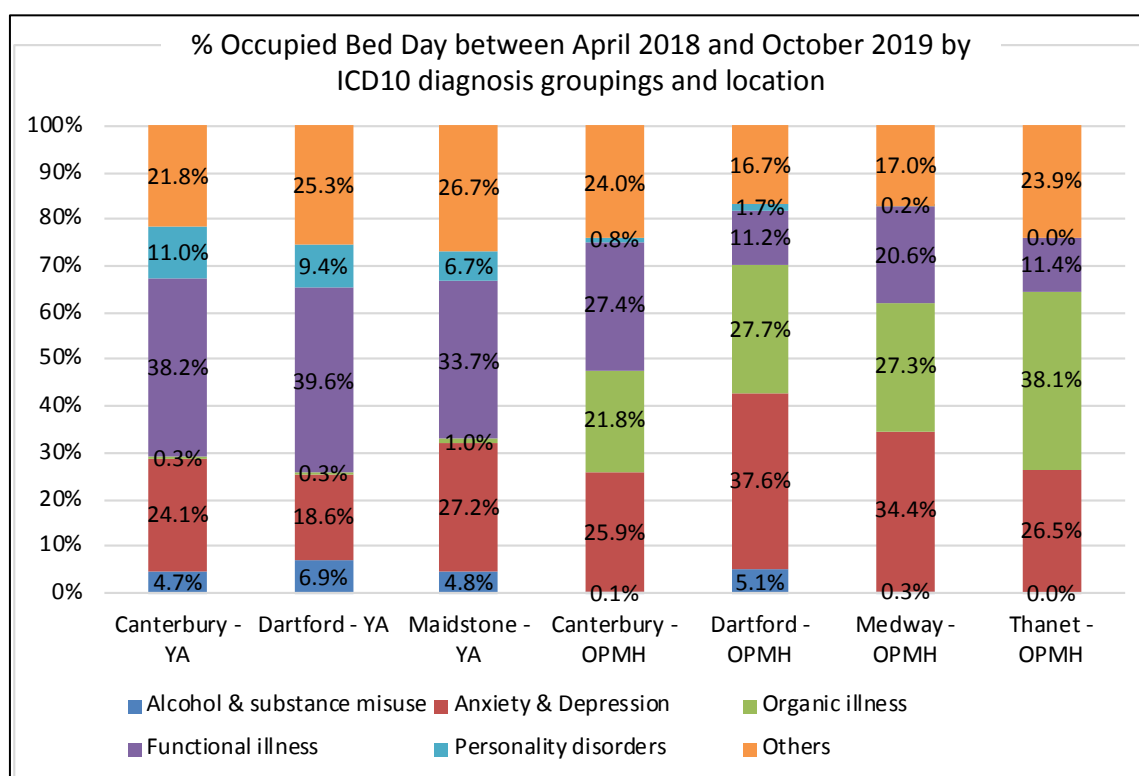


Figure 1 The percentage of occupied bed days by diagnosis group across current sites

2 Population health needs

2.1 Future needs

WSP has been working with Kent County Council in recent years to develop a whole population cohort model that generates forecasts of population health needs into the 2030's based on risk factors that are evidenced to impact on the incidence of a range of health conditions. This modelling includes estimates of the future incidence and prevalence of

¹ Bed days were calculated using Trust data for available bed days for each month and at each site and then dividing this by the days in that month. This led to a small discrepancy against the number of beds notionally available when added up by ward due to individual beds occasionally being classed as not being available for different reasons. The number of beds available using the alternative method would have been 246, which is the actual number of beds offered by the Trust when at full capacity. This makes no material difference to the findings of this report.

severe and enduring mental health needs (SEMI) and dementia, both of which are drivers of demand and therefore capacity requirements in specialist mental health beds.

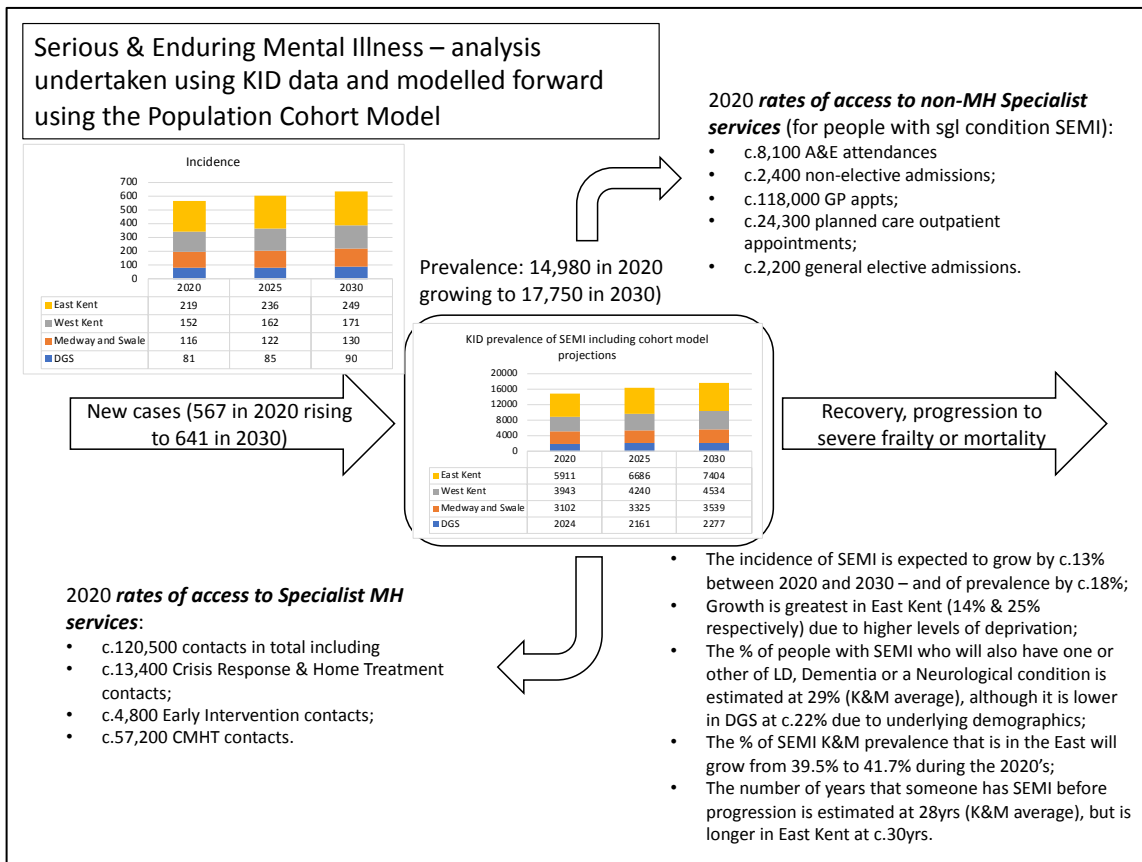


Figure 2 Summary of incidence and prevalence for SEMI across Kent & Medway

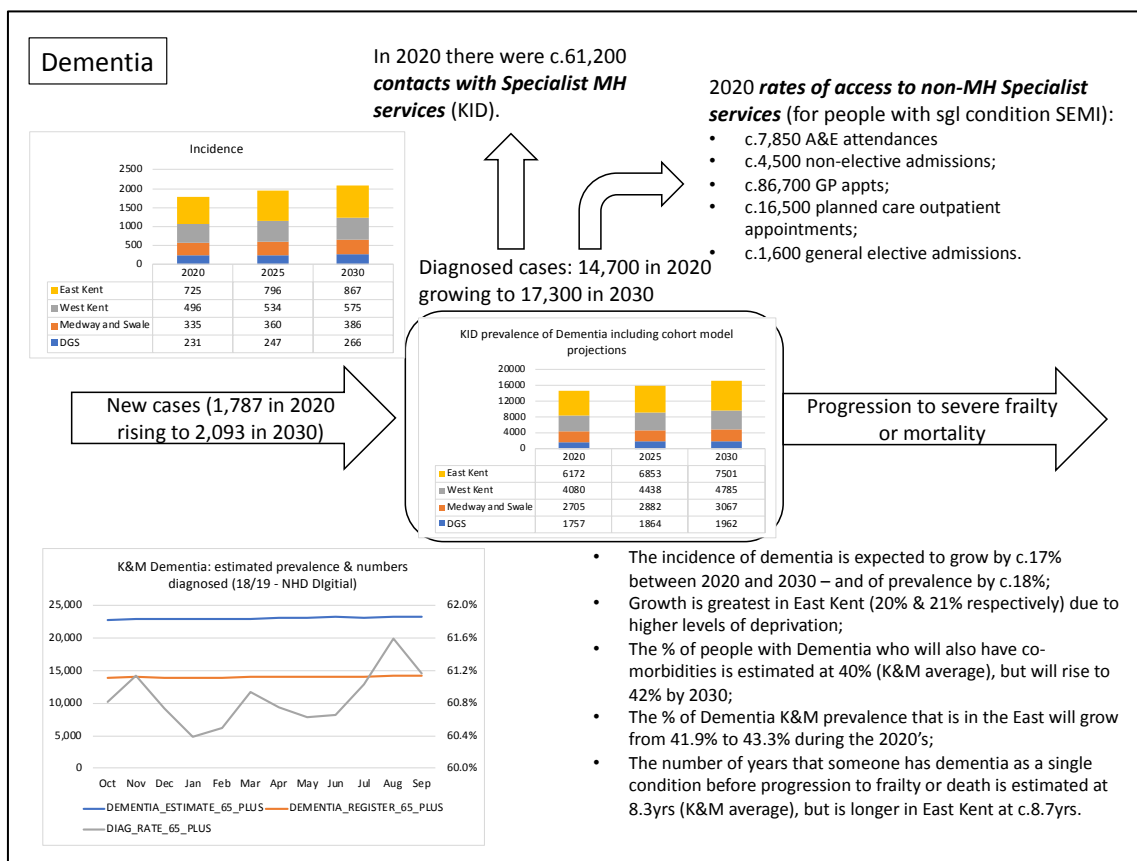


Figure 3 Summary of incidence and prevalence for Dementia across Kent & Medway

Figure 2 shows the output from our population health modelling for people with severe and enduring mental health needs. The key output from this modelling suggests an increase of 18% between 2020 and 2030 for the whole of Kent & Medway. This demand driver shows some variation between the CCGs due to a combination of underlying population changes and deprivation. Figure 3 shows the equivalent model outputs for people with dementia, which also suggests an increase in prevalence of 18% between 2020 and 2030.

For the modelling of acute specialist mental health bed capacity, the prevalence has been used as an underlying demand driver, which means that without any other service developments or new interventions the number of beds required would need to increase to meet this rising demand.

2.2 The demographic impact on bed requirements for Kent & Medway

Figure 4 shows the model output for bed requirements to the end of 2029 based on demographic changes only from mid-2019. It should be noted that:

1. Our modelling for bed requirements from January 2017 to early 2019 shows a close match to actual bed requirements (the red and the pink lines for 2017 and 2018 in Figure 1). We have generated the modelled outputs by using initial rates of access, demographic change and the implementation of the Patient Flow Team (PFT), for which see later. This gives us confidence that the model projections will be reliable if what is planned with respect to service developments occurs – note again that Figure 1 does not include any further benefits from current service developments and therefore acts as a do-nothing baseline rather than what is actually expected.
2. Without further developments to improve patient flow and community services in the short to medium term (2020-2022) bed capacity is sufficient to meet demand, but not to

achieve the 90% occupancy target – by 2023 bed capacity would not be sufficient leading to the likelihood of requiring out of areas placements.

In the next section we will explore the impact of the planned service enhancements and explore whether they are sufficient to address this underlying growth in demand for inpatient beds.

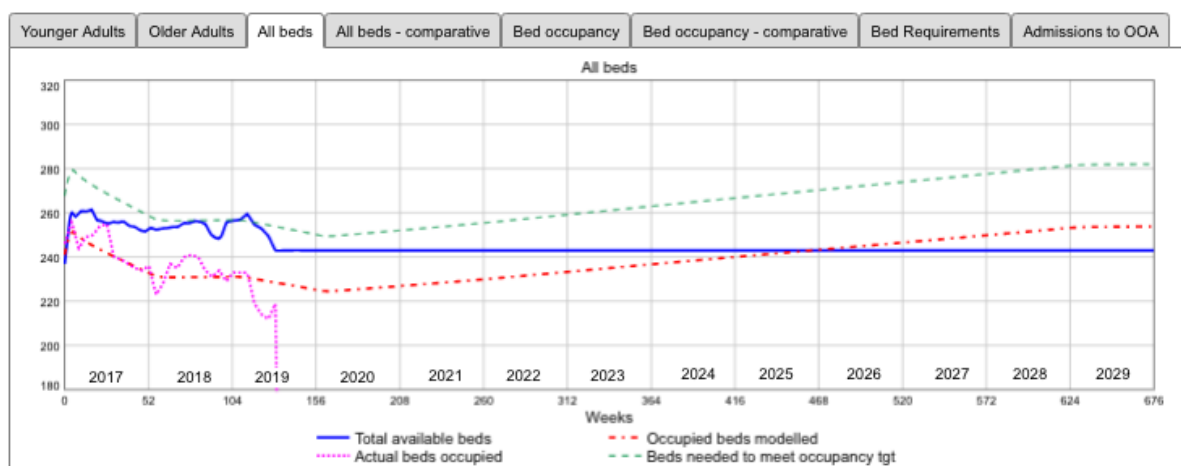


Figure 4 The projection of inpatient bed requirements based on demographic impact only (90% occupancy)

3 Service developments

The National Review of Bed Requirements report noted above identified a number of community services or interventions with proven efficacy, namely:

- Early Intervention Services;
- Cognitive-behavioural therapy;
- Family Interventions;
- Good quality primary care mental health services;
- IAPT;
- Helplines and crisis cafes;
- Enhanced Psychiatric Assessment;
- Supported housing and recovery colleges.

In addition, the NHS Mental Health Implementation Plan identified the following as having an impact on the requirements for inpatient beds:

- The development of Individual Placement and Support (IPS) enabling people with severe mental illnesses to find and retain employment;
- Access to NICE-approved care packages within 2wks for first episode psychosis;
- Crisis resolution and home treatment services;
- Acute hospital liaison services;
- Reducing/eliminating all inappropriate out of area placements.

The Kent & Medway system has invested in a number of these or equivalent service developments in recent years and continues to do so, learning from systems elsewhere and monitoring local impact through KMPTs Business Intelligence function. Through the engagement process it was agreed that three recent or currently being developed service

developments that could be quantified in terms of their impact on acute bed requirements could be modelled to identify their relative and cumulative impact on acute bed requirements. These are illustrated in Figure 5 and described in detail, along with the assumptions adopted, below.

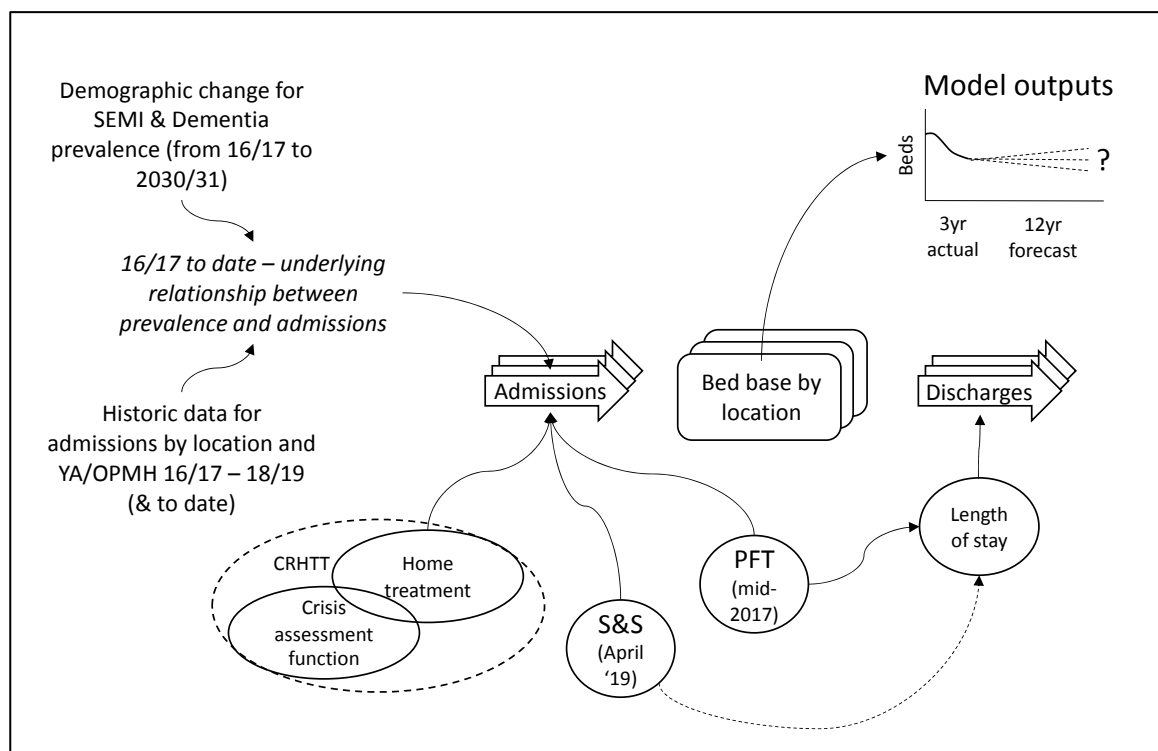


Figure 5 System model conceptualisation combining underlying demographic changes and services transformation to produce a modelled output of future bed requirements

The 'logic' and assumptions adopted in the model are as follows:

1. The Patient Flow Team (PFT) was implemented during 2017 on a test basis, with full 24/7 coverage implemented from March 2019. This team co-ordinates admission to, and discharge from the Trust's acute beds. Careful monitoring of the impact of this new service identified the extent to which it reduced the requirement for inpatient beds. It was also considered by the stakeholder group that there were further benefits to be accrued by refining this approach. We calibrated our model to replicate the impact of the PFT over the early period of implementation and simulated the impact of further refinements going forward. Our assumption from mid-2019 is that the PFT team will achieve further reductions in lengths of stay averaging 4 days, an assumption that can be modified in the light of ongoing monitoring.
2. The Urgent Care 'support & signposting' services (S&S) was introduced in April 2019. Its function is to identify those with the potential to benefit from alternative services, including Home Treatment, and therefore reduce admissions to an acute bed. Early monitoring of this service enabled us to estimate the longer-term impact on acute bed requirements arising from this service. Our assumption, based on the service model, local monitoring and professional engagement, is that 20% of referrals to the S&S service will result in a saved admission to an inpatient bed.
3. Our analysis suggested that the Crisis Resolution and Home Treatment services (CRHT) had been undertaking an increasing number of assessments as a result of pressures in the system, thus reducing its ability to undertake Home Treatment as an alternative to an acute hospital admission. The redesign of this service leading to

enhanced capacity to undertake assessments within the team, and in other places such as through Liaison Psychiatry in the acute sector, is reversing this trend and will therefore have a positive impact in reducing in-patient admissions.

These three interventions are considered to have sufficiently robust local evidence, backed up by being consistent with national policy and good practice, to warrant being included in the modelling as moderating the underlying increase in need arising from underlying demand drivers, as outlined in a previous section of this report.

4 Findings

4.1 The impact of service developments on future bed requirements

Figure 6 illustrates how the model can be used to activate the three key interventions outlined above. These interventions can be turned on separately or together – in this report we described the combined effect on bed numbers, although the model is being made available to local planners so that alternative scenarios or assumptions can be explored.

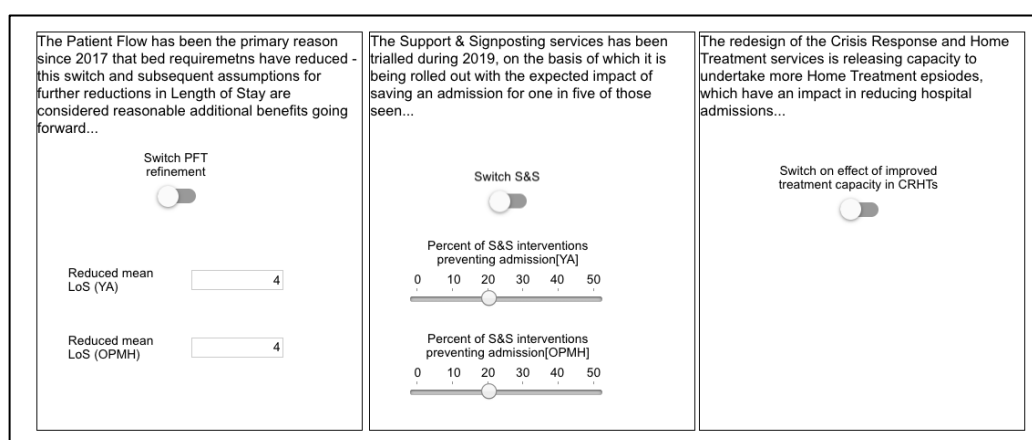


Figure 6 Model interface illustrating the ability to activate service developments in order to explore impact on bed requirements

The combined effect of these service developments on bed requirements is shown in Figure 7. It indicates that:

1. Using a target occupancy rate of 90% the number of beds required remains largely below the currently available bed stock of 243 through to 2025, although there are a small number of occasions when this is exceeded.
2. As we enter 2026 the number of beds required using 90% occupancy begins to exceed those available, and by 2029 the additional bed requirement is between c.10 to 15 beds.

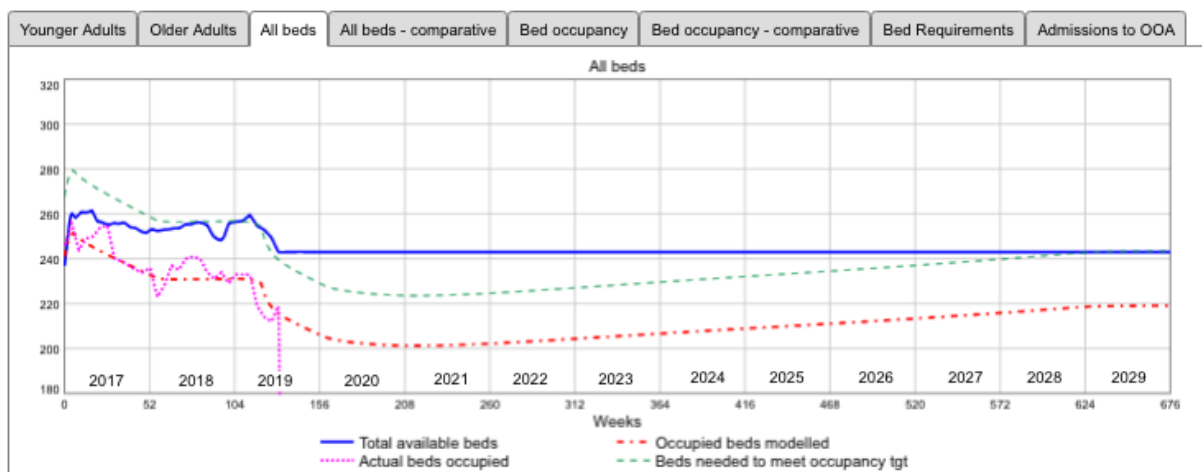


Figure 7 Bed requirements under the combined scenario of service developments

Figures 4 and 7 show a smoothed output to give the overall effect of underlying changes. However, there is in reality an element of random distribution for rates of admission to an inpatient bed. To illustrate this we have identified the natural variation from historic data and applied this to future projections, as shown in Figure 8. This suggests that bed requirements to achieve 90% occupancy when the service developments described above are activated (runs 2-10 in Figure 8) are between 220 and 240 between 2020 and 2022 but rise to between 240 and 260 by 2029. This is c.40 beds fewer than the do nothing scenario (run 1 in Figure 8).

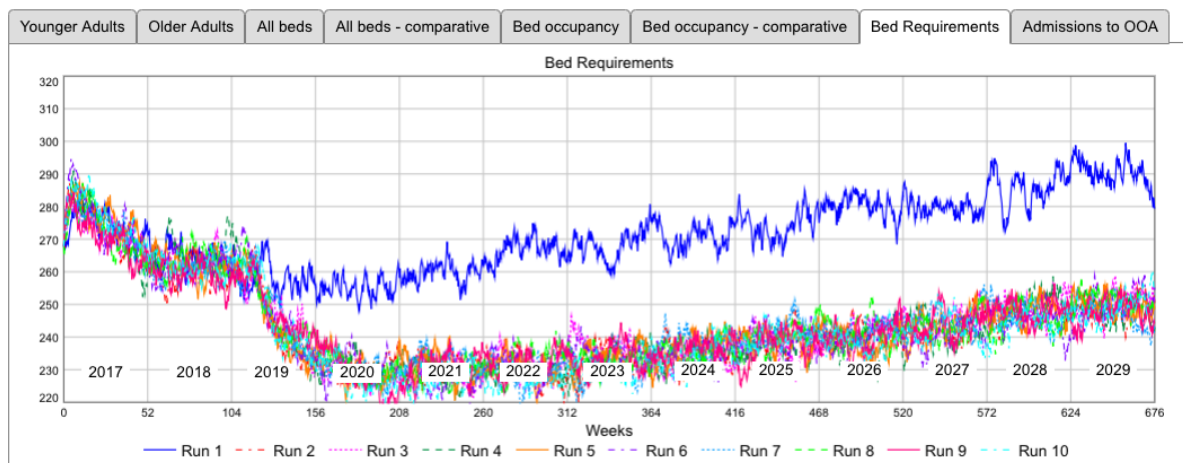


Figure 8 Range of bed requirements reflecting background variation

4.2 Out of Area Placements

Sustaining the current position with regard to minimal reliance on **out of area placements** is also important. To simulate this we have assumed that were occupancy to rise above 90% at any point in time the likelihood of there needing to be an out of area placement begins to increase, becoming certain were occupancy to hit 100%. This provides a 'buffer' where the flexibility with which beds can be used begins to reduce but does not cause out of area placements routinely. This is consistent with experience over the past 2-4 years.

Figure 9 suggests that despite the potential need for either further development of alternates to admission or additional bed capacity in the latter part of the 2020's the risk of out of area placements remains slim, although does start to emerge on a small number of occasions toward the end of the modelling period. For this exercise we have retained the underlying variation as OOA placements are most likely to occur when there are 'spikes' in demand over and above the long term trend.

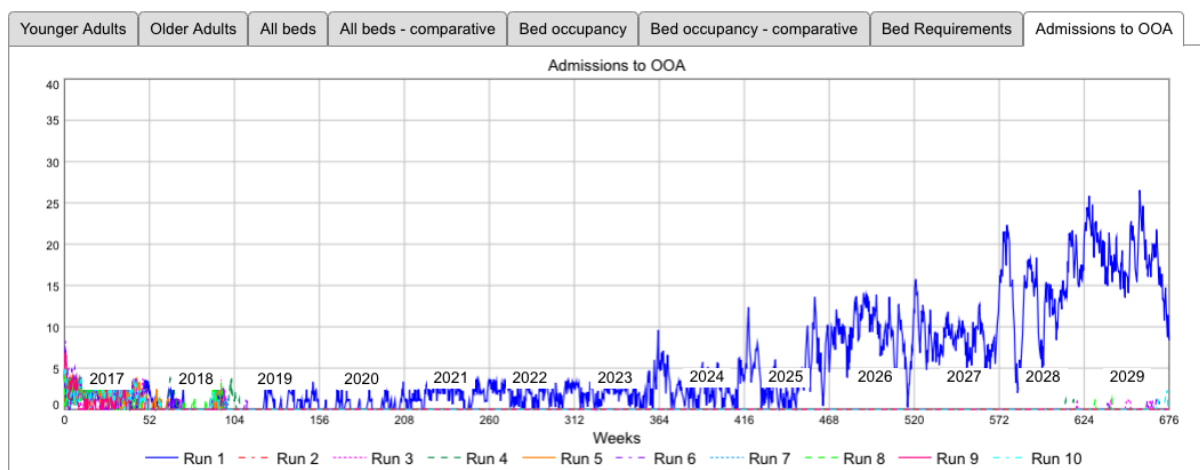


Figure 9 The likelihood of out of area placements with no further service developments (run 1) and with developments (runs 2-10)

4.3 Variations to assumptions

4.3.1 Variations in the impact of new service developments

The default assumptions for this modelling have been based on evidence from early implementation and the views of stakeholders gathered to review the modelling. However, we need to test the sensitivity of the model to alternative assumptions for impact. In this case we have reduced further reductions in average length of stay arising from the PFT from 4 to 2 days and have also reduced the percentage of Support and Signposting interventions that save an admission from 20% to 10%. Figure 10 illustrates the impact (run 3) compared with the full impact (run 2) or no impact at all (run 1). A further scenario based on reduced impact from PFT and S&S and no benefits from the enhancement of CRHTs is shown as run 4.

The latter (run 4) is clearly a worst-case scenario and would indicate the need for c.240-45 beds (at 90% occupancy) during 2020 and through to 2022, with further increases in beds to c.270 by 2029.

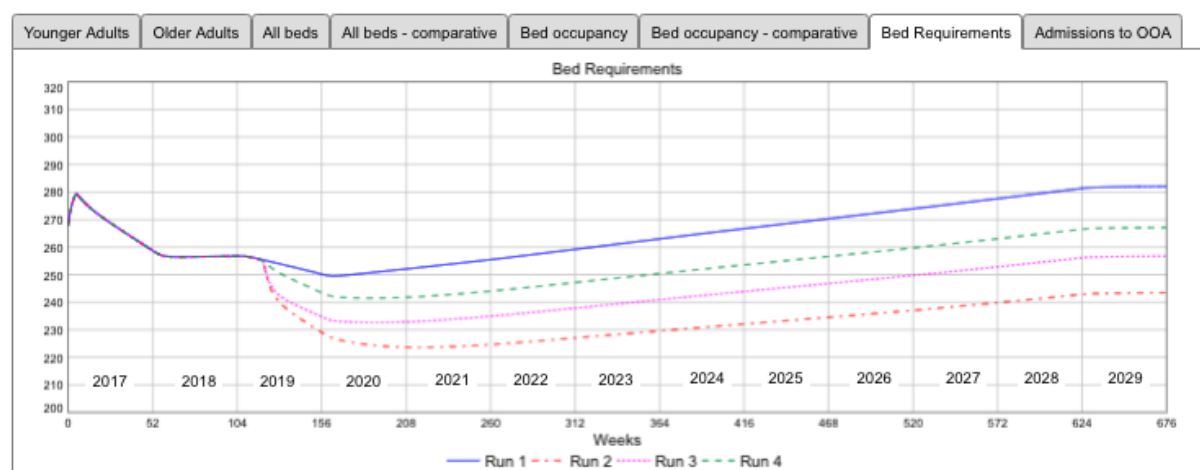


Figure 10 Bed requirements were the impact of new service developments to be reduced

4.3.2 Variations in occupancy targets

As noted previously whilst the national recommended occupancy target is 85% the flexibility with which capacity can be used across the K&M system has led to the local adoption of 90%. Figure 11 illustrates the impact of adopting the 85% target on the number of beds required (run 3) compared to the 90% target (run 2) or the 'do nothing' scenario using the 90% target (run 1). It can be seen that the number of beds required under this scenario would be in the

order of 240 in 2021 but will then begin to rise to between c.260 by the end of the decade without the development of further improvements in patient flow or alternatives to admission.

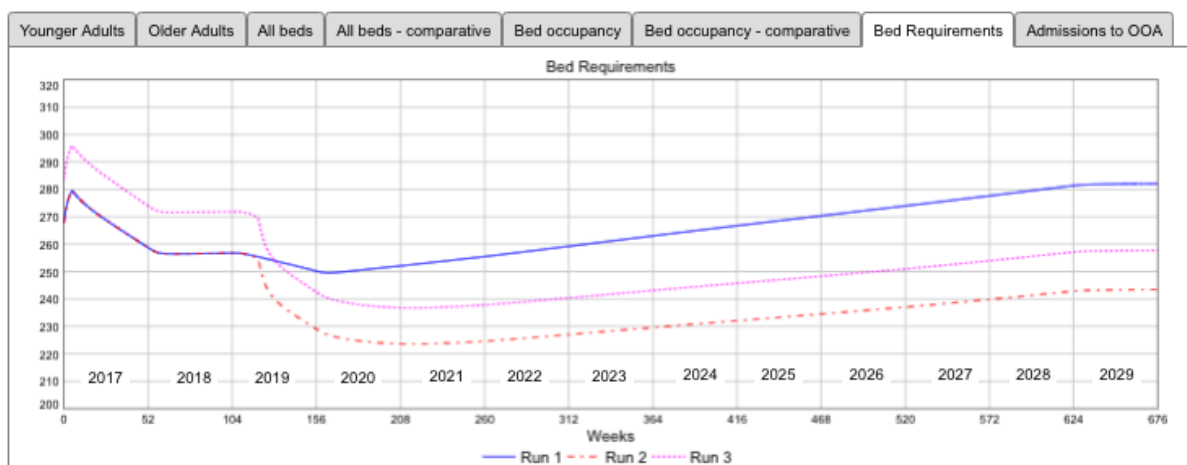


Figure 11 The impact on bed requirements under different occupancy targets

5 Conclusions

This piece of modelling work has been conducted in a way that maximises the available data and evidence locally; adopts the population health modelling that now informs the wider K&M demand and capacity work; and has ensured sufficient local engagement to arrive at a consensus on the model boundaries, level of detail and assumptions concerning the impact of service development and new interventions.

The ‘exam question’ remains ‘*how many beds do we need*’, but the answer cannot be as simple ‘42’! Local partners will need to steer their way through a number of uncertainties, which means that the continued monitoring and learning from the implementation of service changes needs to continue. The findings from this modelling are summarised in the table below. The ‘preferred\expected’ requirements are highlighted in bold.

Description of scenario:	Occ. tgt	Bed requirement	
		2024	2029
No further benefit derived from service interventions	90%	260-280	280-300
	85%	275-295	295-315
Full realisation of benefit from service interventions	90%	225-245	240-260
	85%	240-260	255-275
Reduced benefit (by 50%) of service interventions	90%	240-260	250-270
	85%	250-270	270-290

Table 1 Bed requirements under different scenarios

Whilst the availability of beds over the last two years has varied due to refurbishment and other factors, 243 were available at the time of undertaking this modelling. The outputs for the model above for 2024, assuming the realisation of the benefits from patient flow and community developments, suggest that this capacity is sufficient, but that by 2029 it is likely to be up to 17 beds short of requirements unless additional interventions or improvement in patient flow are realised. There is also a risk that were continued benefits from planned service developments not fully realised that this level of additional capacity could be required as early as 2024, hence the importance of monitoring.

Conclusion 1: That in the light of the findings summarised above that it will be important to monitor the impact of existing service changes that are aimed at improving flow and providing alternatives to admission.

During the engagement process it was clear that additional interventions and improvements to patient flow were being considered, and that the full list of evidence-based interventions noted above had not been fully maximised. Two areas of particular focus were raised as being either early in the planning phase or a recognised priority for development, these begin:

- The modelling suggested that the growth in underlying demand for **services for older people**, including those with dementia, would be a greater pressure than that for younger adults and that there were fewer potential interventions that could address this underlying growth in need. It is also the case that occupancy in the OPMH bed base has been higher with a small number of very long lengths of stay being experienced. This suggests the need to priorities additional measures, in partnership with a wider range of partners including social care and housing providers, to improve services for older people with mental health needs in the community and at home in order to reduce the pressure on these beds.
- The evidence around the impact of **improved primary care** services is growing, although it may have a longer lead time to impact on acute bed needs. There are existing projects across Kent, and elsewhere, that are developing new models of care for meeting mental health needs in primary care, with appropriate support from specialist services.

These are only two examples, although in the light of the modelling they are most likely to address the rise in bed requirements in the latter part of the 2020's. The extent of benefit that could be derived from these developments in terms of addressing the rise in expected beds has not as yet been modelled, hence not being included in this report.

Conclusion 2: That there is potential to further improve patient flow and reduce the length of stay of a cohort of older people with mental health conditions that could, when evidenced and modelled, offset and delay the impact of underlying increases in demand from demographic change.

Conclusion 3: That the modelling could also demonstrate the potential benefits in terms of bed requirements from the development of enhanced primary and community care support to people with mental health needs.