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Long-term probabilistic forecasts of activity mitigation in English hospitals: a national elicitation exercise providing an outside view based on judgements of experts in support of the New Hospital Programme

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ABSTRACT

Objectives The planning process for a new hospital relies on assumptions about future levels of demand. Typically, such assumptions are characterised by point estimates, the flaw-of-averages, base-rate neglect and overoptimism from an inside view. To counteract these limitations, we elicited an outside view of probabilistic forecasts based on judgements of experts about the extent to which various types of hospital activity might be mitigated over 20 years, in support of the New Hospital Programme (NHP) in the English National Health Service.

Design A prospective online elicitation exercise, over two rounds, to forecast the reduction (0% no reduction to 100% total reduction) in 77 types of hospital activity across England via five types of activity mitigation: outpatient attendance avoidance (n=8); inpatient admission avoidance (n=31); A&E attendance avoidance (n=12); outpatient delivery mode (n=4); inpatient length of stay reduction (n=22) and eight types of activity groups. Primary outcomes are the aggregated forecasts representing the percentage reduction (0%–100%) in hospital activity across England based on 'surprisingly low' (10th percentile—P10) to 'surprisingly high' (90th percentile—P90) forecasts from 17 experts.

Results We had 657 forecasts from 17 experts. The most pessimistic forecast was for inpatient avoidance of frail elderly admissions (mean 5.71%, P10=0.43%, P90=16.40%). The most optimistic forecast was for inpatient admission avoidance for vascular surgery (mean 48.27%, P10=19.82%, P90=78.57%). The overall (n=77) aggregate means ranged from a low of 5.71% to a high of 48.27% with an average width of 50.08%. Experts highlighted mainly four types of mitigation mechanisms—prevention, displacement, quality improvement and de-adoption.

Conclusion A national elicitation exercise has provided long-term aggregate forecasts across England that make explicit the wide variation and uncertainty associated with future mitigation activities from an outside perspective. These aggregate forecasts may now be incorporated into the NHP, providing a more robust foundation for planning.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Long-term forecasts of hospital activity often use point estimates leading to common pitfalls such as flaw-of-averages, base-rate neglect and overoptimism, typically stemming from an inside view that emphasises the specific details of a particular project as seen by local hospital teams.
⇒ To address these limitations, we sought to obtain an outside view by eliciting probabilistic forecasts for England, rather than focusing on any single hospital.
⇒ We adapted an evidence-based elicitation protocol to conduct a rapid online elicitation exercise involving 17 experts.
⇒ These experts provided forecasts for 77 types of hospital activities that could potentially be mitigated, which were aggregated to provide an outside view.
⇒ How stakeholders in the New Hospital Programme in England use these aggregated outside views alongside inside views needs further study.

INTRODUCTION

Hospitals are a cornerstone of healthcare systems worldwide. In the English National Health Service (NHS), there are approximately 515 hospitals,[1] many of which face structural challenges due to ageing infrastructure.[2] This has prompted the government to launch the New Hospital Programme (NHP), which aims to build 40 new hospitals across England. Additionally, seven hospitals compromised by the use of reinforced aerated autoclaved concrete have also been included in the NHP.[3]

Building a new hospital is a major investment involving substantial (public) funds. Therefore, accurately forecasting future demand for hospital services is essential. A hospital that is too small risks being

overwhelmed and unable to meet the needs of its population, while one that is too large may be underutilised. Either scenario represents poor value for money. Unfortunately, long-term forecasts of hospital activity frequently appear as point estimates, which are prone to pitfalls such as flaw-of-averages and base-rate neglect. The tendency to underweight or ignore distributional information is seen as a major source of error in forecasting.[4–6]

To support the NHP design process, the Strategy Unit's analytics team has developed an advanced demand and capacity model, known as the NHP model. This model provides probabilistic forecasts of hospital activity over a 20-year period (see online supplemental file for details). It considers various factors, including demographic shifts, innovations in healthcare delivery (such as virtual clinics and wards) and potential mitigations of hospital activity. While local administrators, clinicians and stakeholders—who are well acquainted with the specific context of each new hospital—set assumptions about future activity mitigation for a given hospital, these inside views can be prone to biases, such as optimism bias, base-rate neglect and strategic misrepresentation. To counteract this, we undertook an elicitation exercise to obtain an outside view[4–6] that was framed around England, rather than any specific hospital.

There are several approaches to forecasting future healthcare activity including statistical methods, expert judgements and scenario building.[7–9] For long-term forecasts, expert judgement is a widely used approach, which we have adopted here. Our objective was to gather outside perspectives on mitigation by eliciting probabilistic forecasts from human subject matter experts (SMEs). The elicitation process is informed by literature on cognitive biases, project planning and decision analysis as summarised by Hemming *et al*.[10] 'Expert judgement can be remarkably useful when data are absent or incomplete. However, experts can also make mistakes. This is often due to a range of cognitive biases such as anchoring, availability and representativeness, groupthink, overconfidence and difficulties associated with communicating knowledge in numbers and probabilities. Inappropriate and ill-informed methods for elicitation can amplify these biases. Well-designed, structured elicitation protocols can enhance the quality of expert judgements. These protocols treat each step of the elicitation as a process of formal data acquisition, and incorporate research from mathematics, psychology and decision theory to help reduce the influence of biases and to enhance the transparency, accuracy and defensibility of the resulting judgements'.[10]

This paper describes an elicitation exercise undertaken to obtain probabilistic forecasts about mitigation, from an outside perspective, of hospital activity across England over a 20-year time horizon. We asked SMEs to provide a probabilistic forecast for 77 types of hospital activity that might be mitigated in the future. The aggregated forecasts from SMEs represent an outside view of mitigation in the form of low to high probabilistic forecasts with an 80% degree of belief, where low and high equate to the 10th and 90th percentiles of an assumed normal distribution. We denote this as the P10–P90 prediction interval or P10–P90 interval.

METHODS

Patient and public involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Participants

We envisaged that SMEs taking part in this study (which had two rounds of data collection described later) would have some of the following characteristics.

- Clinical or non-clinical expertise in the subgroup domain.
- Expertise by experience of working in that domain.
- Typically, be NHS-based staff or academia/research or government.
- Consent to participate on a voluntary basis.
- Agree to follow the elicitation protocol.
- Have an appetite for making probabilistic forecasts.

Participants were invited to take part in the exercise via emails which were sent in Septmeber 2023 by the NHP lead for Engagement to about 700 people working in the NHS. Participation was voluntary, confidential and required consent with the option to withdraw at any time. From an initial expression of interest of 136 people, 87 consented to take part and 29 completed round 1 of the exercise (see the 'Acknowledgements') and 18 completed round 2 of the exercise. Given the tight timelines involved in this potentially demanding exercise alongside workload pressures in the NHS, it was anticipated that most SMEs would not have adequate time to complete the exercise. The main reason for drop-out was lost to follow-up or lack of time. Several (only 1 of the 18 in round 2) SMEs indicated that they were employed by an NHS hospital Trust which was part of the NHP. This was not deemed to be a conflict of interest that ruled out participation in the study especially as this elicitation exercise was at the aggregate England level and not focused on any specific hospital. Our primary analysis is based on round 2 data from 18 SMEs.

NHP activity model overview

The NHP activity model has five major input categories to predict activity over 20 years (see online supplemental file for an overview). One of these categories relates to mitigation of future activity which is the focus of this exercise and is described below.

Future activity mitigation

This elicitation exercise is focused on 'future activity mitigation', which consists of 77 parameters as summarised in table 1, which shows groups of hospital activity by five types of mitigation. The number in each cell of the table

is the count of the number of parameters that require a probabilistic forecast. 1

The specific types of activity amenable to mitigation (n=77) included in the NHP model were identified over a prolonged period within the Strategy Unit drawing on experience and knowledge of strategies and interventions that have commonly been implemented in healthcare. The interventions included were those that were intended to reduce, primarily through avoidance, prevention, displacement, quality improvement or de-adoption, the volume of a given type of activity delivered within acute hospital settings. Algorithms were developed to identify specific cohorts of patients from Hospital Episode Statistics datasets that were the focus of such interventions drawing on published evidence and other relevant documents where available.[11 12] For each type of activity, a historic trend graph was provided at the England level (not for any specific hospital), with age-sex standardisation where appropriate, with 2019 as the baseline year in a specifically designed online app for this national elicitation exercise (NEE) (see online supplemental file).

Table 1 Groups of hospital activity and types of mitigation

Hospital activity group	Type of mitigation	N
Emergency department and acute medicine activity	A&E attendance avoidance	12
	Inpatient length of stay reduction	4
Hospital activity amenable to medicines management	Inpatient admission avoidance	5
Hospital activity amenable to primary care and community	Inpatient admission avoidance	10
	Inpatient length of stay reduction	4
Hospital activity amenable to psychiatric liaison and community psychiatry	Inpatient admission avoidance	3
	Inpatient length of stay reduction	1
Hospital activity amenable to public health interventions	Inpatient admission avoidance	6
Planned medical activity (adult)	Outpatient attendance avoidance	2
	Outpatient delivery mode	1
Planned surgical activity (adult)	Inpatient admission avoidance	7
	Inpatient length of stay reduction	13
	Outpatient attendance avoidance	2
	Outpatient delivery mode	1
Planned paediatric activity	Outpatient attendance avoidance	4
	Outpatient delivery mode	2
Total		77

Elicitation protocol

We based our elicitation protocol on the Stanford Research Institute protocol which has five broad steps: motivate, structure, condition, encode and verify, as described in the Handbook of Decision Analysis[13] and the Investigate, Discuss, Estimate, Aggregate protocol as described by Hemming *et al*[10] adapted to better suit our needs. The elicitation protocol is designed to mitigate well-known cognitive biases that usually lead to overconfidence in the judgements of experts. The timelines and scale of the NHP led us to undertake an online elicitation exercise with supporting materials that did not involve interviews with SMEs.

To support SMEs in their task, we developed three short online training videos (https://vimeo.com/showcase/nhpnee), viz:

- Part 1 (~3 min) provided an overview of the NHP model and explained why we needed the support of experts to make forecasts.
- Part 2 (~9 min) provided SMEs with training on probabilistic forecasting.
- Part 3 (~4 min) showed SME how to use the online data collection.

SMEs who consented were assigned a unique code, were sent the links to the videos and given 3 weeks to complete round 1 of the elicitation exercise and then a further 2 weeks to complete round 2.

SMEs were required to use a slider to provide P10 and P90 probability interval forecasts with an 80% degree of belief. The slider was designed to go from 0% (no reduction in activity) to 100% (total reduction in activity). The concept of the P10 and P90 interval was explained by using the qualitative terms 'surprisingly low' and 'surprisingly high' to denote the P10 and P90, respectively, in the second online video. The time horizon for all judgements was 20 years from the baseline year of 2019. This ensures that the elicitation frame predates the start of the COVID-19 pandemic (31 December 2019). The online tool enabled SMEs to see the potential impact of their P10 and P90 intervals on the parameter of interest from previous activity (as shown over time) using a linear trajectory. The above steps were repeated for each parameter. SMEs could contact the study lead at any time via email.

In round 1, SMEs were given up to 2 weeks (extended by a further week because of time constraints) to complete their assignment for their selected areas of expertise. In round 2, SMEs were given up to 2 weeks to compare their forecasts with those of their peers and make any changes before the final closing date. The instructions on the home page of the app are shown in an online supplemental file.

Data processing and analysis

All SMEs were de-identified and assigned a unique code which could not be linked back to the SME. Since the default P10 and P90 value in the app were 0%–100%, respectively, we excluded all such values from the data

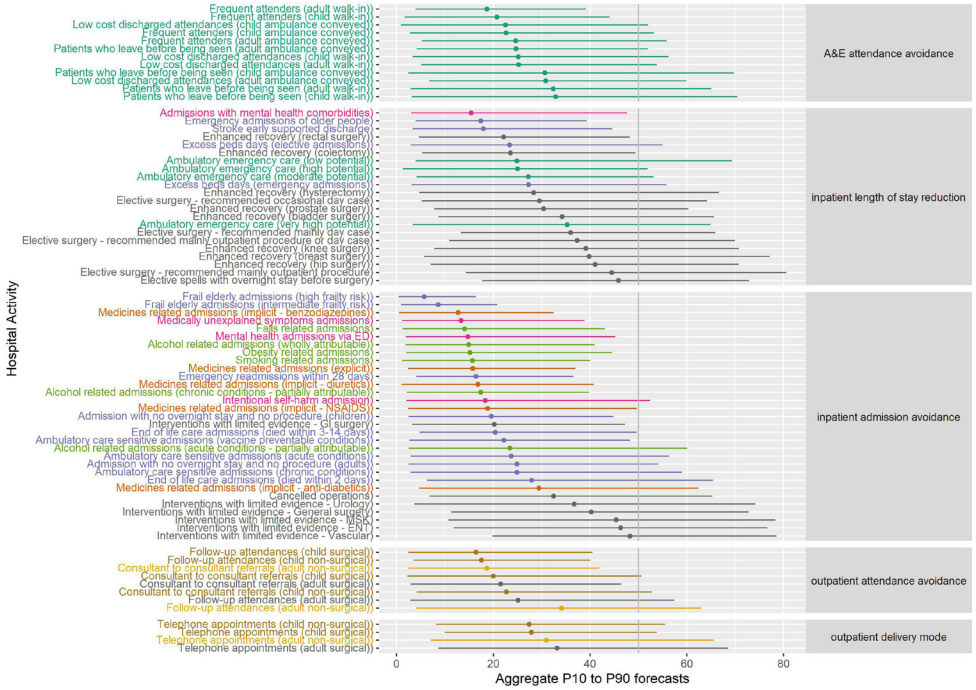

Figure 1 Overview of aggregate probabilistic forecasts, ranging from the 10th percentile to the 90th percentile, for 77 types of hospital activity in 8 strategy groups (see legend) across and 5 types of activity mitigation (last column of graphic). The black dot in each interval is the mean. The vertical grey line is a 50% reference indicator. The colours are to aid the visualisation of the eight different hospital activity groups shown in table 1.

set. We also excluded values where the P10 and P90 were equal because they were deemed to be point estimates.

We derived the mean and SD for each SME using their P10 and P90 values by assuming a parent standard normal distribution (with mu=0, and SD=1), where the SME mean (=(P10+P90)/2) and SME sigma is based on the quantile of the parent normal distribution (sigma=(P90−mean)/qnorm (0.9, mu=0, SD=1). The mean and sigma values for each SME were then input parameters into a (child) truncated normal distribution with a minimum value of 0% (no activity avoided) and maximum value of 100% (all activity avoided).

These individual truncated distributions were aggregated for each of the 77 hospital activities by bootstrapping. If n experts provided forecasts for a specific activity, then (100 000/n) values were sampled at random from each expert's truncated Normal distribution. The resulting 100 000 values described the aggregated expert view distribution with each expert's view carrying equal weight. These aggregated expert view distributions are presented as mean and percentile plots (P10–P90) in the results. The individual and aggregate forecasts under each group of hospital activity are presented in tabular and graphical format in the order indicated in table 1, with a summary of the rationales supplied by SMEs. Aggregate forecast intervals are summarised by means and P10–P90 intervals. The means reflect the optimism or pessimism of forecasters. The greater the mean the greater the optimism, the lower the mean the more pessimism. The wider the P10–P90 interval the greater the degree of uncertainty. Aggregate results are reported below. Parameter-specific results are shown in more detail in an online supplemental file.

RESULTS

Our primary analysis is based on round 2 data, where 18 SMEs provided a total of 736 P10–P90 forecasts based on their selected areas of interest. Most of the SMEs had a clinical background (see list of acknowledgements).

About 10% (=79/736) of forecasts were excluded because they had a zero range (where the P10=P90=0%, n=5) or the range was 100% (where P10=0, P90=100%, n=74). After exclusions, we had 657 P10–P90 forecasts from 17 SMEs, where the median number of forecasts per SME was 42 (min 2, lower quartile 16, upper quartile 61, max 77).

Aggregate forecasts

Figure 1 shows an overview of the aggregate forecast for each of the 77 types of hospital activity across 5 types of mitigation. SMEs highlighted mainly four types of mitigation mechanisms—prevention, displacement, quality improvement and de-adoption.

Aggregated 'surprisingly low' P10 values (n=77) ranged from 0.43% to 19.82% (mean=4.77 1%), 90% of which were below 10.27%. Aggregated 'surprisingly high' P90 values (n=77) ranged from 16.4% to 80.61% (mean=54.85%), 90% of which were above 39.61%. The average width of the forecast intervals was 50.08%.

The most pessimistic forecast was for inpatient avoidance of frail elderly admissions (5.71%, P10=0.43%,

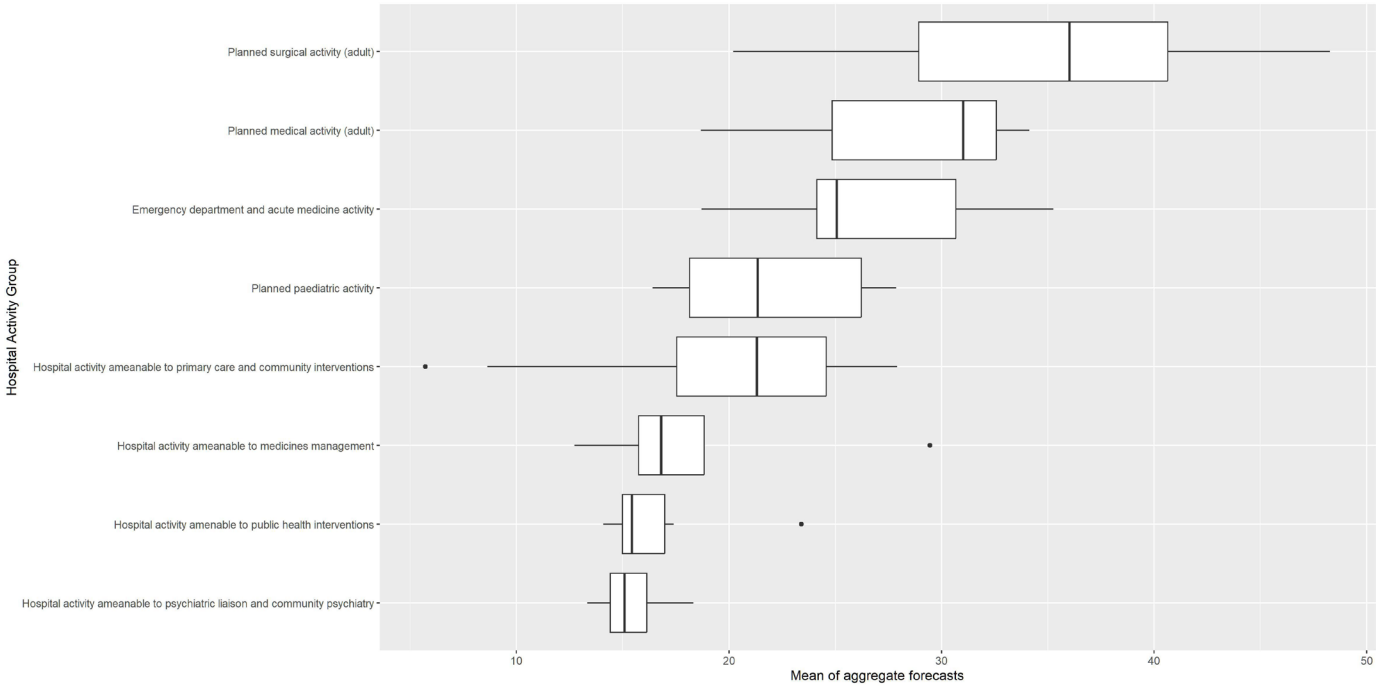

Figure 2 Boxplots of mean aggregate forecasts across groups of hospital activity.

P90=16.40%). The most optimistic forecast was for inpatient admission avoidance for vascular surgery (48.27%, P10=19.82%, P90=78.57%).

The overall (n=77) aggregate means ranged from a low of 5.71% to a high of 48.27%. The aggregate means varied by type of mitigation: outpatient attendance avoidance (from 16.42% to 34.12%, n=8); inpatient admission avoidance ranged (from 5.71% to 48.27%, n=31); Accident & Emergency A&E) A&E attendance avoidance (from 18.71% to 32.91%, n=12); outpatient delivery mode (from 16.42% to 34.13%, n=4); inpatient length of stay reduction (from 15.41% to 45.91%, n=22). The aggregate means also varied across the types of hospital activity: hospital activity amenable to psychiatric liaison and community psychiatry (from 13.33% to 18.33%, n=4); hospital activity amenable to public health interventions (from 14.09% to 23.41%, n=6); hospital activity amenable to medicines management (from 12.74% to 29.45%, n=5); hospital activity amenable to primary care and community interventions (from 5.71% to 27.91%, n=14); planned paediatric activity (from 16.42% to 27.86%, n=6); emergency department and acute medicine activity 1 (from 8.71% to 35.26%, n=16); planned medical activity (from 18.69% to 34.13%, n=3); planned surgical activity (from 20.19% to 48.27%, n=23).

Experts highlighted mainly four types of mitigation mechanisms (see online supplemental file)—prevention, displacement, quality improvement and de-adoption.

The boxplots in figure 2 show how the mean aggregate forecasts varied by type of groups of hospital activity. The most optimistic forecasts were for the mitigation of planned surgical and medical activity. The most pessimistic forecasts were hospital activity amenable to psychiatric liaison and community psychiatry and public health interventions.

The boxplots in figure 3 show the mean aggregate forecasts varied by type of type of mitigation. The most optimistic forecasts were for outpatient delivery mode and inpatient length of stay reductions (albeit with wide variation). The most pessimistic forecasts were for inpatient admission avoidance (albeit with wide variation) and outpatient attendance avoidance.

Table 2 summarises the mean aggregate forecasts by activity group and type of mitigation.

Online supplemental file shows more detailed results for each parameter including a synthesis of rationales for forecasts.

DISCUSSION

We undertook a rapid online exercise to elicit long-term probabilistic forecasts from experts on the extent to which various types of hospital activity might be mitigated in the future. The exercise has provided the NHP with an initial or preliminary set of aggregate probabilistic forecasts which make explicit the distribution of uncertainty in respect of 77 types of hospital activity which, crucially, provide an outside view for England (not a specific hospital).

The overall (n=77) aggregate means ranged from a low of 5.71% to a high of 48.27% with an average width of 50.08%. The aggregate means varied by type of hospital activity and type of mitigation. The most optimistic forecasts were for the mitigation of planned surgical and medical activity. The most pessimistic forecasts were hospital activity amenable to psychiatric liaison and

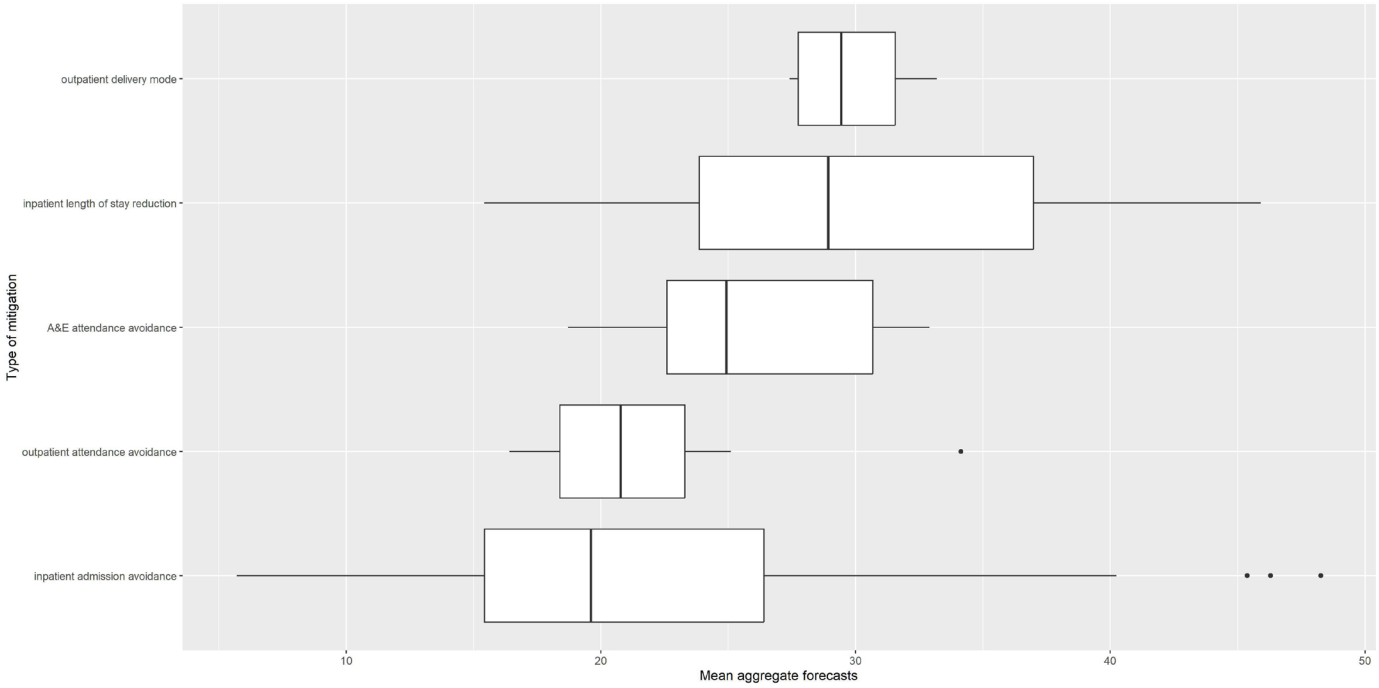

Figure 3 Boxplots of mean aggregate forecast across types of mitigation activities. (A&E is Accident & Emergency)

community psychiatry and public health interventions. The most optimistic forecasts were for outpatient delivery mode and inpatient length of stay reductions (although with wide variation). The most pessimistic forecasts were for inpatient admission avoidance (although with wide variation) and outpatient attendance avoidance.

Experts appeared to treat the P10 and P90 values as scenarios where they highlighted four types of mitigation mechanism—prevention, displacement, quality improvement and de-adoption. In most cases, the scenario at P10 included continuing low and unfocused investment in primary and community care whereas the P90 generally assumed the opposite. These insights should be recognised by planners and suggest that estimates of hospital activity mitigation should be accompanied by explicit and credible plans for how investment is planned to change in primary and community settings.

Table 2 Minimum and maximum mean aggregate forecasts by hospital activity and type of mitigation

Hospital activity group	Type of mitigation	Min to max of means (n)
Emergency department and acute medicine activity	A&E attendance avoidance	18.71%–32.91% (n=12)
	Inpatient length of stay reduction	24.87%–35.26% (n=4)
Hospital activity amenable to medicines management	Inpatient admission avoidance	12.74%–29.45% (n=5)
Hospital activity amenable to primary care and community	Inpatient admission avoidance	5.71%–27.91% (n=10)
	Inpatient length of stay reduction	17.40%–27.30% (n=4)
Hospital activity amenable to psychiatric liaison and community psychiatry	Inpatient admission avoidance	13.33%–18.33% (n=3)
	Inpatient length of stay reduction	15.41% (n=1)
Hospital activity amenable to public health interventions	Inpatient admission avoidance	14.09%–23.41% (n=6)
Planned medical activity (adult)	Outpatient attendance avoidance	18.69%–34.13% (n=2)
	Outpatient delivery mode	15.41% (n=1)
Planned surgical activity (adult)	Inpatient admission avoidance	20.19%–48.27% (n=7)
	Inpatient length of stay reduction	22.12%–45.91% (n=13)
	Outpatient attendance avoidance	21.51%–25.10% (n=2)
	Outpatient delivery mode	33.19% (n=1)
Planned paediatric activity	Outpatient attendance avoidance	16.42%–22.69% (n=4)
	Outpatient delivery mode	27.41%–27.86% (n=2)
All		5.71%–48.27% (n=77)

The primary motivation for undertaking this exercise was to avoid the use of point estimates, the flaw of averages and cognitive biases associated especially with inside views in large projects.[4–6] Moreover, the inside view, which refers to a perspective that focuses on the specific details and characteristics of a particular project, often yields an overly optimistic outlook due to a range of biases that include optimism bias, base-rate neglect and strategic misrepresentation.[6] In contrast, we sought an outside view by asking experts to make forecasts for England (not for a specific hospital). This simple reframing helps to counteract the overoptimism that can characterise the inside view by providing objective and realistic forecasts of uncertainty. This is crucial. As Flyvbjerg states, 'The comparative advantage of the outside view is most pronounced for non-routine projects, understood as projects that managers and decision-makers in a certain locale or organisation have never attempted before—like building new plants or infrastructure, or catering to new types of demand. It is in the planning of such new efforts that the biases toward optimism and strategic misrepresentation are likely to be largest'.[14]

This process for elicitation represents a formal data collection exercise which is systematic, transparent and subject to scrutiny and continual improvement. This is in marked contrast with the not uncommon 'black box' approach to assumption setting which has attracted criticism.[2 10] These national aggregate forecasts provide an outside view against which local forecasts may be evaluated. For instance, where local inside views appear to differ qualitatively from the aggregate forecasts, this may prompt a review of the credibility and plausibility of assumptions set by the local hospital team. Moreover, the use of the NHP model along with outside forecasts supports a more standardised approach to the NHP programme.

This demanding elicitation exercise was undertaken under considerable time constraints and has several limitations. We focused on the 77 mitigation factors that were presently in the current version of the NHP Model. While this is already a considerable number, there may be additional hospital activities or types of mitigation (eg, maternity care) which should be included in future exercises.

Our recruitment criteria were pragmatic and broad. They focused mainly on the appetite of participants to undertake the task by consent and choosing what to forecast, rather than any specific markers of expertise (eg, age, experience, publications, memberships and peer recommendation). The evidence, however, shows that such markers are poor indicators of someone's ability to provide good forecasts. Indeed, the best approach to selecting experts for forecasting exercises is whether the participant can understand the questions being asked. Moreover, the inability to identify the best expert means that groups of multiple experts almost always perform as well as, or better than, the best-regarded expert(s).[10] Some SMEs opted to withdraw from the exercise because of lack of time and/or inability to engage with the exercise leading to a drop in participants at each stage. Although we were expecting a high drop-out of SMEs primarily because of workload pressures the final number of participants is not inconsistent with the recommendation of 10–20 participants and evidence which also notes that only minor improvements in performance are gained by having more than 6–12 participants.[10] For 21 of the 77 parameters, the number of SMEs was less than six (range 3–5) and future studies could target recruitment of SMEs towards these parameters.

We sought to maximise the appeal of the task by opting for an online approach because this was likely to minimise the time commitment from SMEs and so maximise the number of SMEs who could participate. We supported our participants with data science tools which used a combination of interactive graphics, numbers and text to enhance understanding of this demanding exercise. This multimodal approach appears to be important in supporting more effective participation of women.[15] Nevertheless, the elicitation literature does indicate that the quality of responses is enhanced by engaging with SMEs in interviews or workshops compared with discussions facilitated via email.[10] The remote online approach meant that the research team was not in a position to interactively quality assure the contribution of SMEs in the time available. For instance, although SMEs were encouraged to provide a clear rationale for their P10 and P90 forecasts, these were not always forthcoming. A few SMEs found the lower 0% bound problematic because they wanted to show an increase in activity (which is accommodated elsewhere in the model), whereas 0% meant that mitigation was wholly unsuccessful. Some SMEs referred to ageing population despite being asked to discount this (because it is accommodated elsewhere in the model). For some SMEs, such nuances are probably best addressed via an interactive dialogue. A dialogue between SMEs may also lead to less variability in round 2 forecasts. Despite these limitations, most responses from SMEs appeared to follow the elicitation protocol with fidelity (about 10% of the responses were excluded from this analysis). Further research is needed to understand precisely how these aggregate outside views will be used in NHP.

In project planning, integrating both inside and outside views is crucial. While inside views provide detailed project insights, outside views offer valuable external perspectives that help counteract overconfidence and overly optimistic projections. We recommend that outside view elicitation exercises become a standard component of large-scale NHS project planning. This approach would necessarily involve ongoing methodological refinement to address the limitations of this exercise. Nevertheless, the principles applied in this exercise could also be used to strengthen inside views provided by local hospital teams, thereby complementing national efforts and enhancing our collective forecasting knowledge.

Ultimately, while inside views are essential for understanding project specifics, outside views offer critical

reality checks, providing a more robust foundation for planning. The aggregate judgements obtained here provide an outside perspective on the uncertainties associated with hospital activity mitigation, offering an opportunity to explore how these views interact with inside views and inform the NHP planning process.

Conclusion

A national elication exercise has produced aggregate forecasts from an outside perspective that makes explicit the variation and uncertainty related to future mitigation activities. This outside view helps to overcome the limitations of point estimates, the flaw-of-averages and the overoptimism often associated with inside views. These aggregate forecasts can now be integrated into the planning process for new hospitals within the English NHS, providing a more robust foundation for planning.

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Contributors MAM is the study lead and guarantor. TJ, JP and CB led the design and implementation of the online app and supported the execution of the study. JC analysed the free text data. SW and TJ undertook the statistical analyses. PS provided strategic guidance and support. All authors contributed to drafting the final manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and ethical approval was granted by the Chair of the Humanities, Social and Health Sciences Research Ethics Panel at the University of Bradford (EC27944) in August 2023. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available on reasonable request. The data and analyses that support the findings of this study are available on request from the corresponding author subject to approval from the funder.

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Supplementary File

The file contains the following sections listed below.

1. Overview of the NHP Activity model
2. List of 77 parameters (https://connect.strategyunitwm.nhs.uk/nhp_dev/national_elicitation/)
3. Instructions for experts
4. Individual and aggregate forecasts by specific subgroups

Overview of the NHP Activity model

The NHP Activity Model is a record level model which has five major input categories, (see Figure 1) to predict activity over 20 years. Two of the input categories ("Baseline activity based on 2019" and "Existing demand-supply imbalances") are determined using existing hospital activity datasets. The remaining three categories relate to factors which require future projections – future population changes, future technological, medical and social changes and future activity mitigation. Population changes are obtained from the Office of National Statistics population forecasts. Future technological, medical and social changes are set nationally by the NHP programme. Further details about the NHP model and mitigation can be found on the project information page –

https://connect.strategyunitwm.nhs.uk/nhp/project_information/

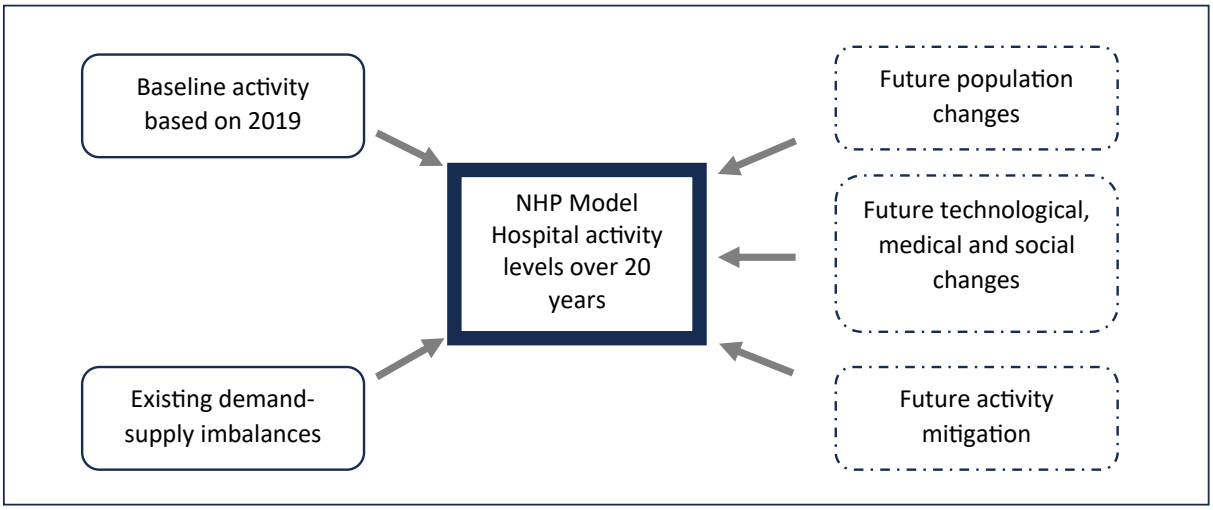

Figure 1 Overview of NHP activity model. Dotted lines indicate the use of future projections/forecasts.

List of 77 parameters

	Hospital activity group	Type of mitigation	Parameter	SMEs (n)
1	Emergency department and acute medicine activity	A&E attendance avoidance	Frequent attenders (adult ambulance conveyed)	10
2	Emergency department and acute medicine activity	A&E attendance avoidance	Frequent attenders (adult walk-in)	10
3	Emergency department and acute medicine activity	A&E attendance avoidance	Frequent attenders (child ambulance conveyed)	10
4	Emergency department and acute medicine activity	A&E attendance avoidance	Frequent attenders (child walk-in)	10
5	Emergency department and acute medicine activity	A&E attendance avoidance	Low cost discharged attendances (adult ambulance conveyed)	10
6	Emergency department and acute medicine activity	A&E attendance avoidance	Low cost discharged attendances (adult walk-in)	11
7	Emergency department and acute medicine activity	A&E attendance avoidance	Low cost discharged attendances (child ambulance conveyed)	11
8	Emergency department and acute medicine activity	A&E attendance avoidance	Low cost discharged attendances (child walk-in)	11
9	Emergency department and acute medicine activity	A&E attendance avoidance	Patients who leave before being seen (adult ambulance conveyed)	10
10	Emergency department and acute medicine activity	A&E attendance avoidance	Patients who leave before being seen (adult walk-in)	10
11	Emergency department and acute medicine activity	A&E attendance avoidance	Patients who leave before being seen (child ambulance conveyed)	10
12	Emergency department and acute medicine activity	A&E attendance avoidance	Patients who leave before being seen (child walk-in)	10
13	Emergency department and acute medicine activity	inpatient length of stay reduction	Ambulatory emergency care (high potential)	12
14	Emergency department and acute medicine activity	inpatient length of stay reduction	Ambulatory emergency care (low potential)	12
15	Emergency department and acute medicine activity	inpatient length of stay reduction	Ambulatory emergency care (moderate potential)	12
16	Emergency department and acute medicine activity	inpatient length of stay reduction	Ambulatory emergency care (very high potential)	11
17	Hospital activity amenable to medicines management	inpatient admission avoidance	Medicines related admissions (explicit)	5
18	Hospital activity amenable to medicines management	inpatient admission avoidance	Medicines related admissions (implicit - anti-diabetics)	5
19	Hospital activity amenable to medicines management	inpatient admission avoidance	Medicines related admissions (implicit - benzodiazepines)	5
20	Hospital activity amenable to medicines management	inpatient admission avoidance	Medicines related admissions (implicit - diuretics)	5
21	Hospital activity amenable to medicines management	inpatient admission avoidance	Medicines related admissions (implicit - NSAIDS)	4
22	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Admission with no overnight stay and no procedure (adults)	5
23	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Admission with no overnight stay and no procedure (children)	5
24	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Ambulatory care sensitive admissions (acute conditions)	7
25	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Ambulatory care sensitive admissions (chronic conditions)	7
26	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Ambulatory care sensitive admissions (vaccine preventable conditions)	6

27	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Emergency readmissions within 28 days	5
28	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	End of life care admissions (died within 2 days)	5
29	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	End of life care admissions (died within 3-14 days)	5
30	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Frail elderly admissions (high frailty risk)	5
31	Hospital activity amenable to primary care and community interventions	inpatient admission avoidance	Frail elderly admissions (intermediate frailty risk)	5
32	Hospital activity amenable to primary care and community interventions	inpatient length of stay reduction	Emergency admissions of older people	7
33	Hospital activity amenable to primary care and community interventions	inpatient length of stay reduction	Excess beds days (elective admissions)	6
34	Hospital activity amenable to primary care and community interventions	inpatient length of stay reduction	Excess beds days (emergency admissions)	6
35	Hospital activity amenable to primary care and community interventions	inpatient length of stay reduction	Stroke early supported discharge	5
36	Hospital activity amenable to psychiatric liaison and community psychiatry	inpatient admission avoidance	Intentional self-harm admission	4
37	Hospital activity amenable to psychiatric liaison and community psychiatry	inpatient admission avoidance	Medically unexplained symptoms admissions	4
38	Hospital activity amenable to psychiatric liaison and community psychiatry	inpatient admission avoidance	Mental health admissions via ED	3
39	Hospital activity amenable to psychiatric liaison and community psychiatry	inpatient length of stay reduction	Admissions with mental health comorbidities	4
40	Hospital activity amenable to public health interventions	inpatient admission avoidance	Alcohol related admissions (acute conditions - partially attributable)	6
41	Hospital activity amenable to public health interventions	inpatient admission avoidance	Alcohol related admissions (chronic conditions - partially attributable)	6
42	Hospital activity amenable to public health interventions	inpatient admission avoidance	Alcohol related admissions (wholly attributable)	5
43	Hospital activity amenable to public health interventions	inpatient admission avoidance	Falls related admissions	4
44	Hospital activity amenable to public health interventions	inpatient admission avoidance	Obesity related admissions	3
45	Hospital activity amenable to public health interventions	inpatient admission avoidance	Smoking related admissions	4
46	Planned medical activity (adult)	outpatient attendance avoidance	Consultant to consultant referrals (adult non-surgical)	11
47	Planned medical activity (adult)	outpatient attendance avoidance	Follow-up attendances (adult non-surgical)	12
48	Planned medical activity (adult)	outpatient delivery mode	Telephone appointments (adult non-surgical)	12
49	Planned paediatric activity	outpatient attendance avoidance	Consultant to consultant referrals (child non-surgical)	7
50	Planned paediatric activity	outpatient attendance avoidance	Consultant to consultant referrals (child surgical)	7
51	Planned paediatric activity	outpatient attendance avoidance	Follow-up attendances (child non-surgical)	8

52	Planned paediatric activity	outpatient attendance avoidance	Follow-up attendances (child surgical)	8
53	Planned paediatric activity	outpatient delivery mode	Telephone appointments (child non-surgical)	7
54	Planned paediatric activity	outpatient delivery mode	Telephone appointments (child surgical)	8
55	Planned surgical activity (adult)	inpatient admission avoidance	Cancelled operations	11
56	Planned surgical activity (adult)	inpatient admission avoidance	Interventions with limited evidence - ENT	11
57	Planned surgical activity (adult)	inpatient admission avoidance	Interventions with limited evidence - General surgery	10
58	Planned surgical activity (adult)	inpatient admission avoidance	Interventions with limited evidence - GI surgery	10
59	Planned surgical activity (adult)	inpatient admission avoidance	Interventions with limited evidence - MSK	10
60	Planned surgical activity (adult)	inpatient admission avoidance	Interventions with limited evidence - Urology	10
61	Planned surgical activity (adult)	inpatient admission avoidance	Interventions with limited evidence - Vascular	11
62	Planned surgical activity (adult)	inpatient length of stay reduction	Elective spells with overnight stay before surgery	12
63	Planned surgical activity (adult)	inpatient length of stay reduction	Elective surgery - recommended mainly day case	13
64	Planned surgical activity (adult)	inpatient length of stay reduction	Elective surgery - recommended mainly outpatient procedure	12
65	Planned surgical activity (adult)	inpatient length of stay reduction	Elective surgery - recommended mainly outpatient procedure or day case	12
66	Planned surgical activity (adult)	inpatient length of stay reduction	Elective surgery - recommended occasional day case	12
67	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (bladder surgery)	12
68	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (breast surgery)	13
69	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (colectomy)	13
70	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (hip surgery)	13
71	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (hysterectomy)	13
72	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (knee surgery)	13
73	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (prostate surgery)	12
74	Planned surgical activity (adult)	inpatient length of stay reduction	Enhanced recovery (rectal surgery)	12
75	Planned surgical activity (adult)	outpatient attendance avoidance	Consultant to consultant referrals (adult surgical)	8
76	Planned surgical activity (adult)	outpatient attendance avoidance	Follow-up attendances (adult surgical)	9
77	Planned surgical activity (adult)	outpatient delivery mode	Telephone appointments (adult surgical)	9

Instructions for experts

You are required to provide forecast intervals for the percentage reduction in certain types of hospital activity at the England level over a twenty-year time horizon. The focus here is exclusively on hospital activity which may be mitigated. You must not incorporate factors which increase hospital activity into your judgements because such factors are accommodated elsewhere in the model.

In total there are 77 parameters to forecast. The app will only offer you those parameters which you opted to select in the consent form (if you selected all options then you will have 77 parameters to forecast). All the parameters are presented at the England level. Below is an example screenshot from the app.

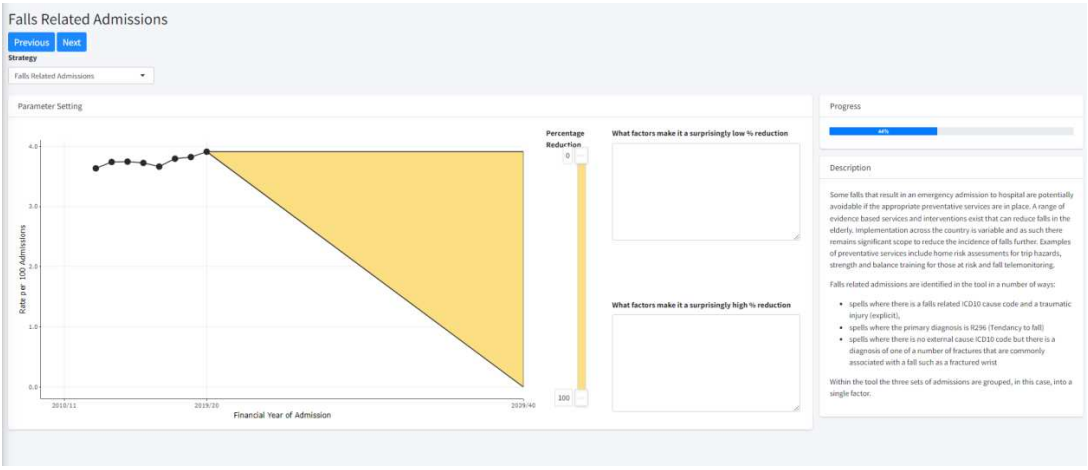

Figure 2 Screen shot of app showing the historic trend for falls related admissions (age-sex standardised) for England with additional supporting information and two free text data entry boxes. https://connect.strategyunitwm.nhs.uk/nhp_dev/national_elicitation/

The app will automatically close on Tue 24 October (midnight). Please try and complete your assignment before then. If you do not complete all the assignment, we will still endeavour to use what we can.

For each parameter:, there is a descriptive text box that provides an outline of why reducing the type of activity is desired along with some information about how the type of activity is identified There is a plot of historical trends across England. These plots show data based on routinely collected Hospital Episode Statistics (HES) data. The trends are provided for information only.

Please pay close attention to the vertical axis on each chart as this will tell you the type of change you are forecasting, in many cases it will be the rate of admissions or attendances, but some parameters require different assumptions, for example, about how inpatient length of stay might reduce or how the proportion of cases that are undertaken in a particular setting might reduce.

In some instances, the plots may show an unusual change or pattern. This is likely to reflect data quality issues and/or a change in the clinical coding process. Please discount these unusual patterns.

Your task

To review the description and plot for each parameter. If you see an unusual pattern on the timeseries plots, please ignore these patterns as they are most likely to be data/coding issues.

To thoughtfully list out the factors which you think will lead to a surprising (low or high) value. We want realistic, plausible, surprising values. We don't want unrealistic, implausible, extremely surprising values.

In listing factors which might mitigate certain types of hospital activity we want you to consider those things that could be done to prevent, reduce or divert (away from the hospital) such activity. In general, such factors will relate to enhanced provision of primary and community care, novel models of care, changes to existing services or public health interventions. The impact of the population ageing and healthy life expectancy are accommodated elsewhere in the model and so should not be incorporated in your judgments.

For example, in 2019, about 4 out of 100 hospital admissions were falls related admissions. You might consider that these could be reduced by factors such as enhanced falls prevention services in the community, increased provision of home care, increased provision of telehealth monitoring, public health campaigns and social prescribing. The impact of the population ageing and healthy life expectancy should not be considered. You should not modify your prediction about falls admissions on the basis that there will be more older people in the population because this is accommodated elsewhere in the model.

Use the slider to select the lower and upper % values for your forecast based on the factors you have listed. The percentage reductions can only go from 0% (no reduction) to 100% (total reduction).

Upon completion you will see the final "completed" screen.

Your work is automatically saved and the app will remember your progress.

If you have any queries, please email strategy.unit@nhs.net

Individual and aggregate forecasts by specific subgroups

The individual and aggregate forecasts under each group of hospital activity are presented in tabular and graphical format overleaf in the order indicated in table 1.1 in the manuscript. For each parameter we provide three graphical visualisations - (1) the interval view which shows P10, P90 and means for individual SMEs and aggregate values, (2) a probability density function (PDF) plot for the aggregate values and (3) an empirical cumulative density plot for the aggregate values.

Forecasts for emergency department and acute medicine activity that might be mitigated by avoiding attendance to A&E.

The table below lists the types of activity that might be mitigated and along with three accompanying plots.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Frequent attenders (adult ambulance conveyed)	10	24.64	20.32	5.20	55.83
Frequent attenders (adult walk-in)	10	18.71	14.77	3.95	39.12
Frequent attenders (child ambulance conveyed)	10	22.62	20.39	2.77	53.18
Frequent attenders (child walk-in)	10	20.73	17.46	1.69	44.01
Low cost discharged attendances (adult ambulance conveyed)	10	30.80	20.39	6.75	59.89
Low cost discharged attendances (adult walk-in)	11	25.26	19.06	5.07	53.76
Low cost discharged attendances (child ambulance conveyed)	11	22.54	20.30	0.88	52.00
Low cost discharged attendances (child walk-in)	11	25.16	21.02	3.35	56.18
Patients who leave before being seen (adult ambulance conveyed)	10	24.70	19.43	4.19	51.98
Patients who leave before being seen (adult walk-in)	10	32.42	22.54	2.90	65.06
Patients who leave before being seen (child ambulance conveyed)	10	30.64	25.52	2.40	69.72
Patients who leave before being seen (child walk-in)	10	32.91	25.43	3.12	70.46

Table 1 Aggregate forecasts (mean, sd, P10, P90) for emergency department and acute medicine activity that might be mitigated by avoiding attendance to A&E.

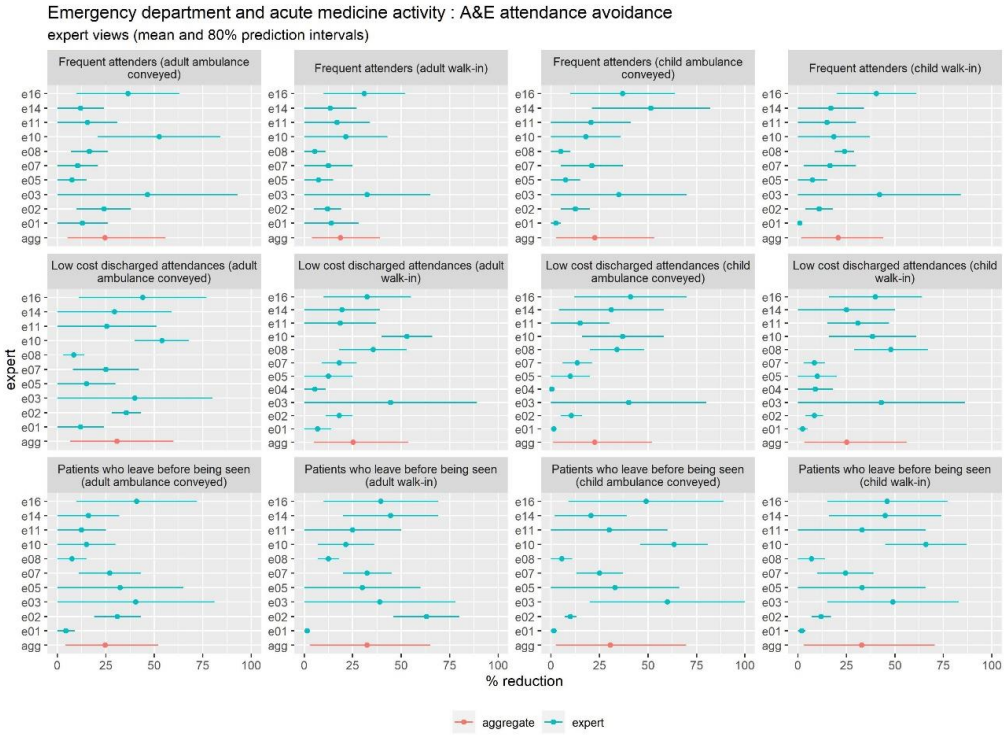

Figure 3 Individual and aggregate forecasts (mean, P10, P90) for emergency department and acute medicine activity that might be mitigated by avoiding attendance to A&E.

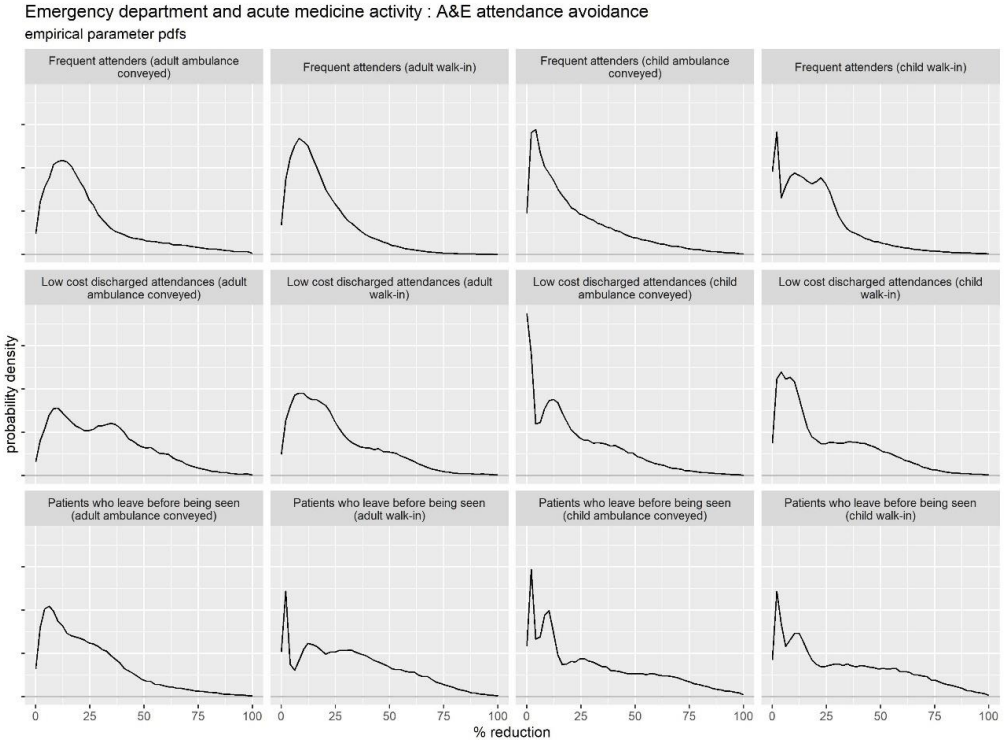

Figure 4 Probability density function (PDFs) of aggregate forecasts for emergency department and acute medicine activity that might be mitigated by avoiding attendance to A&E.

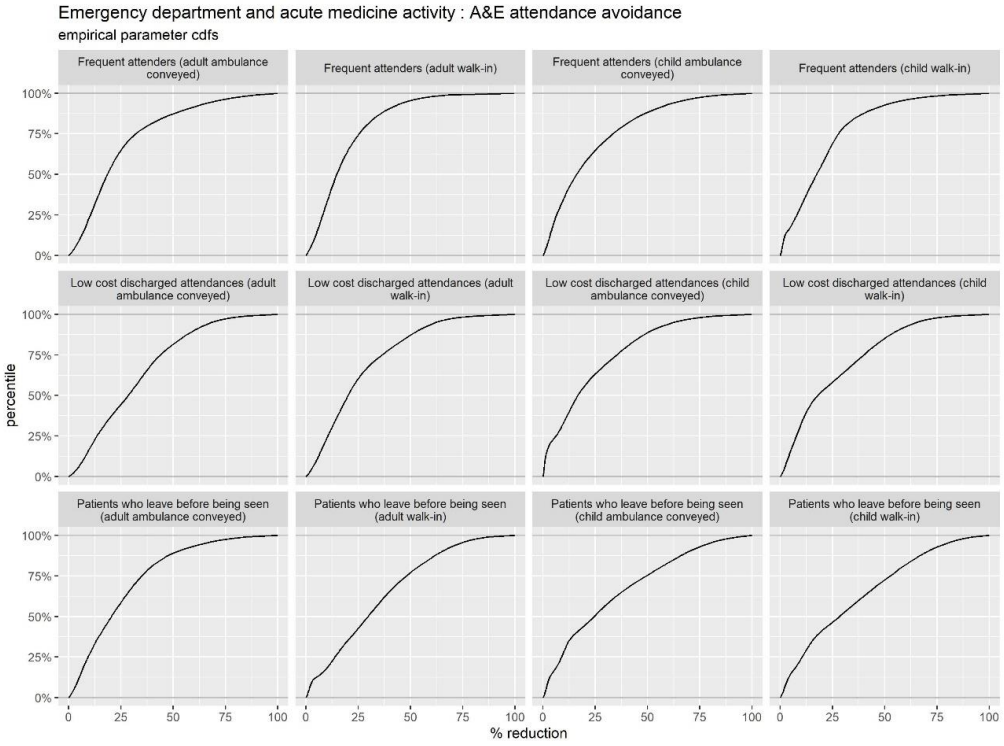

Figure 5 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for emergency department and acute medicine activity that might be mitigated by avoiding attendance to A&E.

Rationale for P10 values

Rationales given for low mitigation forecasts tended to focus on the absence of preventative interventions. SMEs cited a deterioration in the access to primary care and poor mental health services, as well as a general lack of investment in out of hospital services. In addition, SMEs described poor education regarding the appropriate usage of A&E services and a paucity of alternative options for service users as other limiting factors. Other factors which could be considered inefficiencies in the current care delivered included poor system joint working, long waiting lists (operative & outpatient) and delays to therapeutic interventions.

Rationale for P90 values

Most of the rationales provided by SMEs were related to prevention and public health initiatives as a mechanism of mitigation. SMEs described significant investment in primary care, successful patient education campaigns, improved vaccination uptake, improved NHS dental service and an expansion in community and mental health services. Some SMEs also referred to alternative locations for care where traditional hospital-based care is effectively relocated. For instance, the effective roll out of urgent care or walk-in facilities, investment in winter infection hubs, legislative changes to allow expanded care roles for allied health professionals, greater levels of telemedicine take up to enable consultation without attendance. Factors related to improved diversion of care (eg improved triage) and increased efficiency were also cited.

Forecasts for emergency department and acute medicine activity that might be mitigated by reductions in inpatient length of stay.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggrgeate P10	Aggregate P90
Ambulatory emergency care (high potential)	12	24.99	19.32	1.31	51.95
Ambulatory emergency care (low potential)	12	24.87	24.19	3.95	69.35
Ambulatory emergency care (moderate potential)	12	27.27	19.57	4.15	53.13
Ambulatory emergency care (very high potential)	11	35.26	23.44	3.41	64.90

Table 2 Aggregate forecasts (mean, sd, P10, P90) for emergency department and acute medicine activity that might be mitigated by reductions in inpatient length of stay.

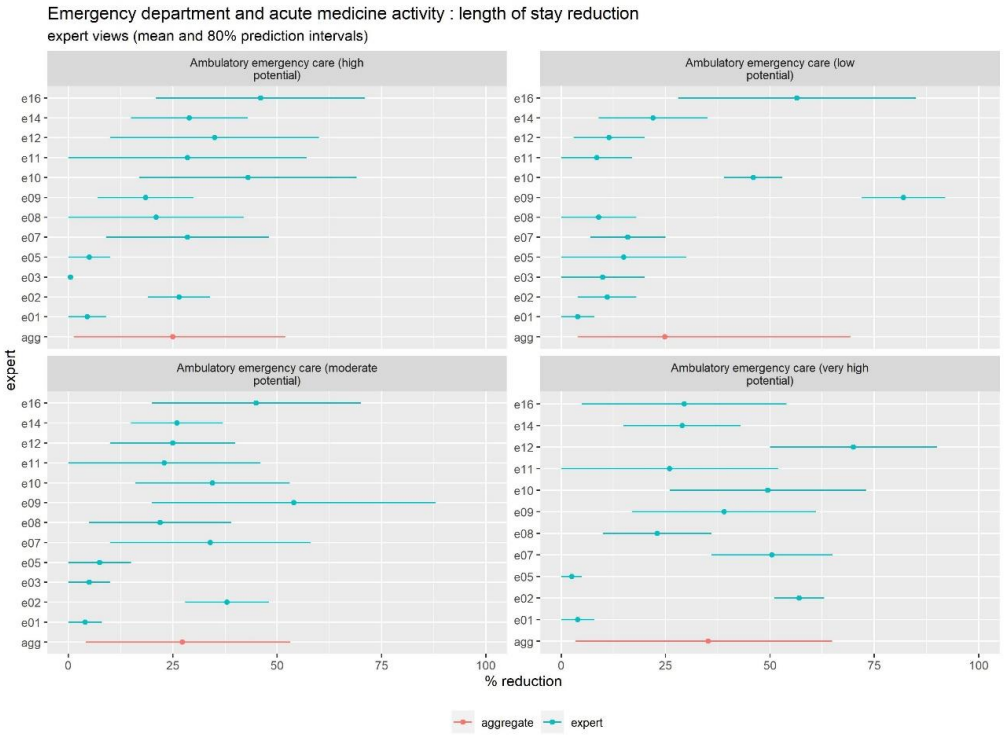

Figure 6 Individual and aggregate forecasts (mean, P10, P90) for emergency department and acute medicine activity that might be mitigated by reductions in inpatient length of stay.

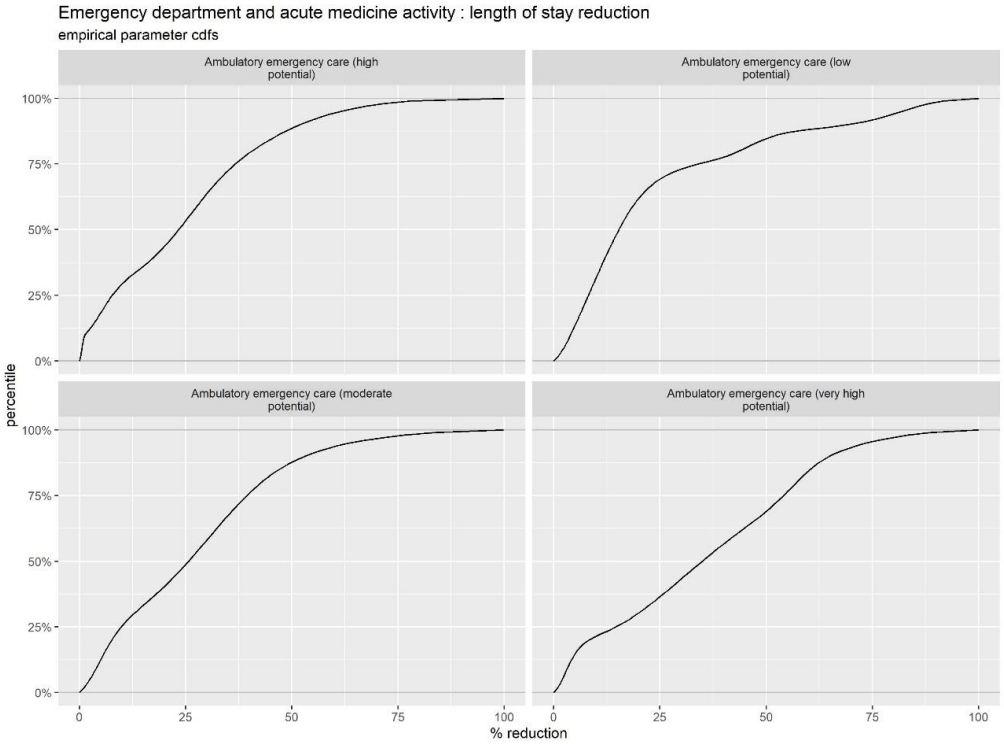

Figure 7 Probability density function (PDFs) of aggregate forecasts for emergency department and acute medicine activity that might be mitigated by avoiding attendance to A&E.

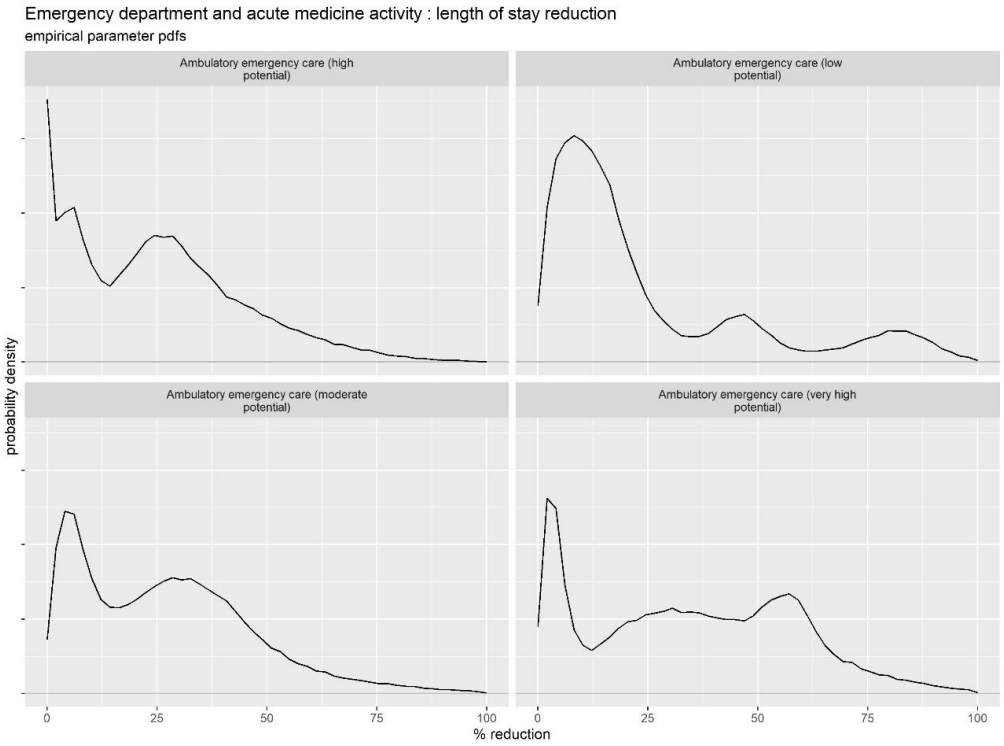

Figure 8 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for emergency department and acute medicine activity that might be mitigated by avoiding attendance to A&E.

Rationale for P10 values

Rationales for low mitigation forecasts centred on insufficient prevention, redirection and efficiency mechanisms. Inefficiencies were highlighted, due in particular to a lack of staffing in hospital A&E, poor use of technology and a lack of investment in waiting list reduction. Examples of low preventive factors were the lack of public education on the appropriate use of emergency care services, as well as the poor levels of community and primary care provision. Some SMEs also noted that it is 'current policy' or 'preferable' to increase ambulatory emergency care as a way of reducing pressure on ED and avoiding inpatient admission.

Rationale for P90 values

Some of the comments for high mitigation forecasts focussed on a potential increase in efficiency such as the use of technology. There were also examples of preventive and relocation mechanisms such as significant expansion in community services, digital innovations that support patients to manage their own care more effectively, virtual monitoring, increased role of community pharmacy, and increased utilisation of community diagnostic centres to appropriately divert ambulatory patients. Other comments such as 'robust divert communications to other services' were examples of redirection mechanisms of activity mitigation.

Forecasts for hospital activity amenable to medicines management that might be mitigated by avoiding inpatient admission.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Medicines related admissions (explicit)	5	15.75	14.73	2.36	36.95
Medicines related admissions (implicit - anti-diabetics)	5	29.45	22.60	4.63	62.42
Medicines related admissions (implicit - benzodiazepines)	5	12.74	13.72	0.53	32.47
Medicines related admissions (implicit - diuretics)	5	16.81	16.35	1.04	40.78
Medicines related admissions (implicit - NSAIDS)	4	18.84	20.09	2.37	49.69

Table 3 Aggregate forecasts (mean, sd, P10, P90) for hospital activity amenable to medicines management that might be mitigated by avoiding inpatient admission.

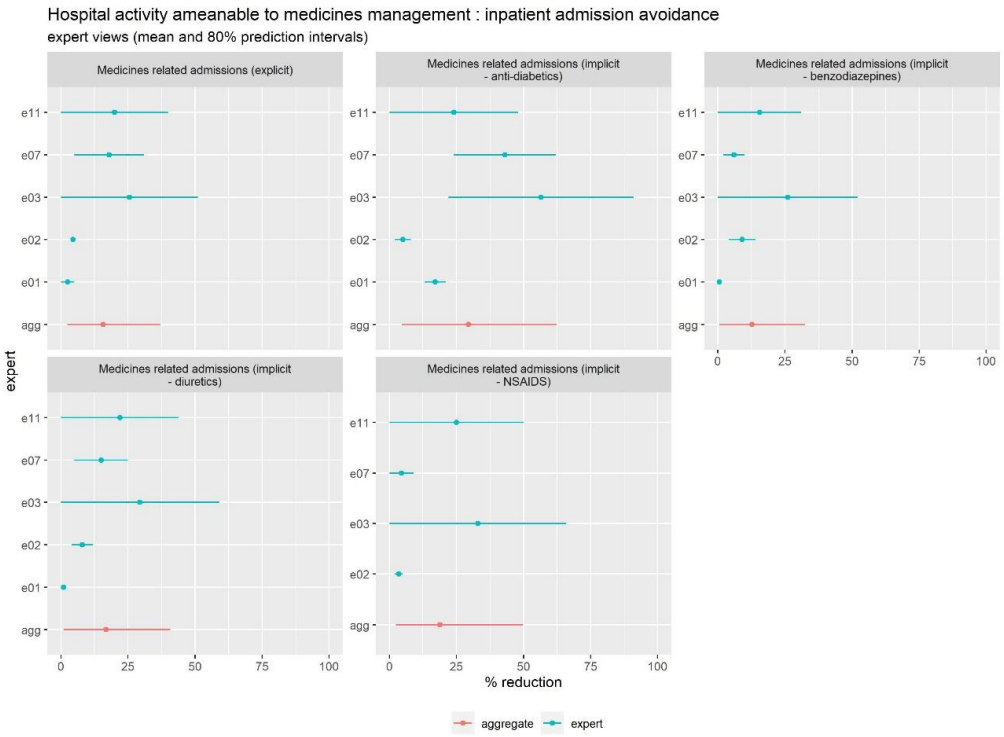

Figure 9 Individual and aggregate forecasts (mean, P10, P90) for hospital activity amenable to medicines management that might be mitigated by avoiding inpatient admission.

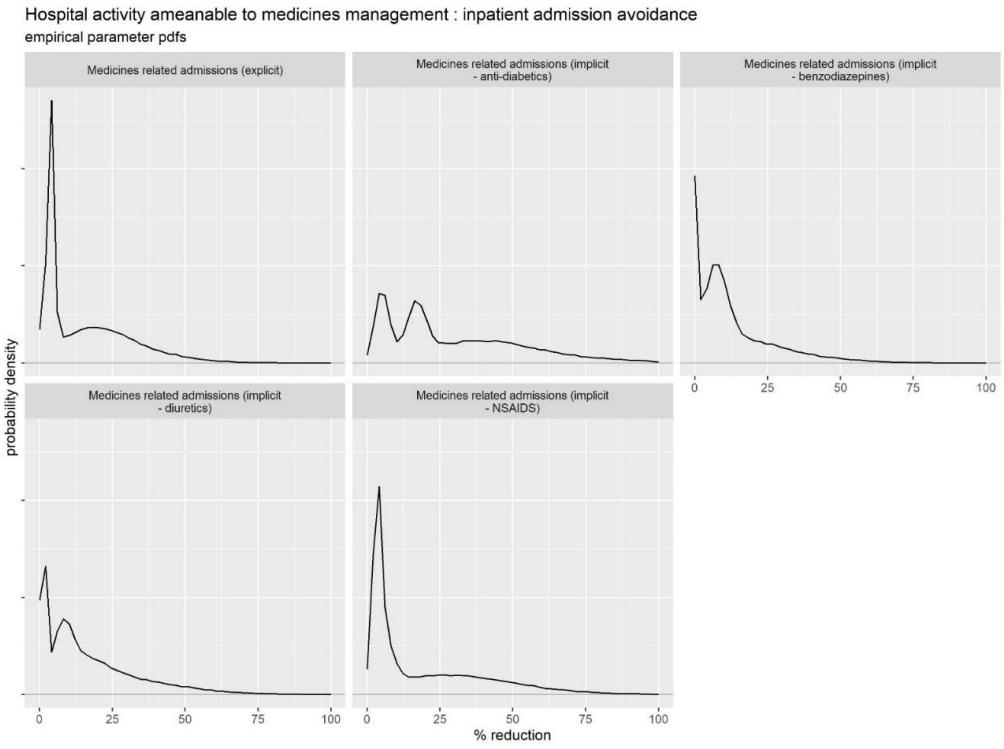

Figure 10 Probability density function (PDFs) of aggregate forecasts for hospital activity amenable to medicines management that might be mitigated by avoiding inpatient admission.

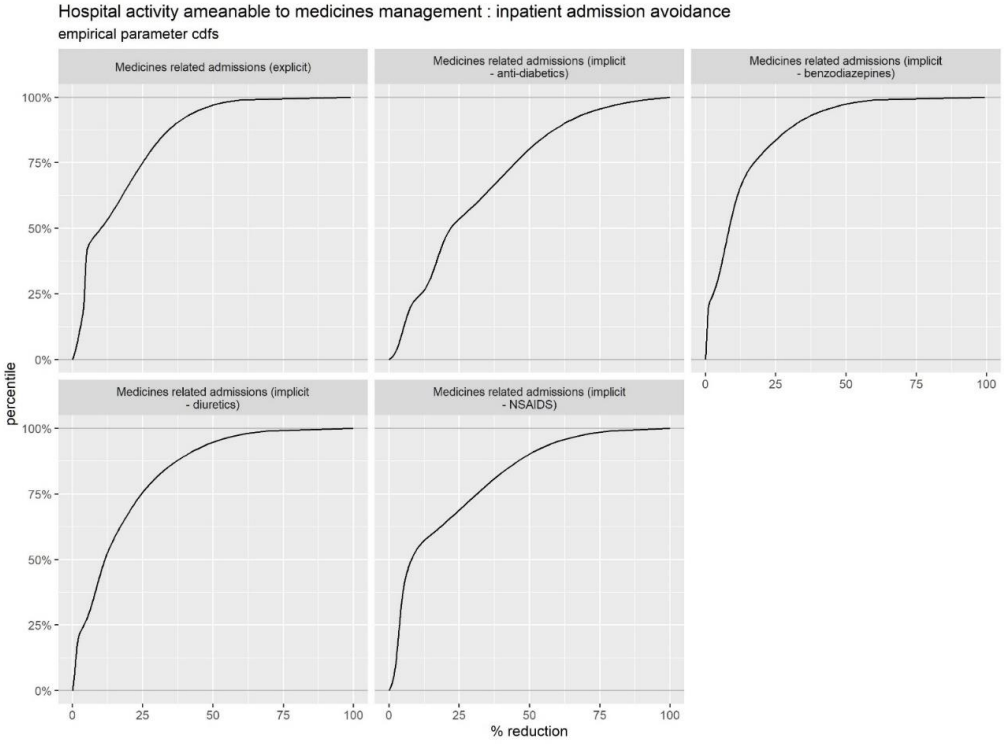

Figure 11 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for hospital activity amenable to medicines management that might be mitigated by avoiding inpatient admission.

Rationale for P10 values

Most comments were either related to the absence of preventive mechanisms or inefficiencies. Poor staff and patient education relating to medicines, limited access to primary care and mental health services as well as increasing polypharmacy for patients with multiple co-morbidities. Some SMEs emphasised a lack of information sharing with concerns of poor interoperability of electronic health records, and staff shortages limiting time spent on reviewing medication resulting in a lack of medicine reconciliation.

Rationale for P90 values

Rationales for high mitigation forecasts described increased prevention, increased efficiency and the relocation of related care. SMEs cited increased capacity in primary care for prospective medicines reviews, improved access to mental health services, reduction in waiting lists, and greater information sharing through improved access to electronic health records across clinical pathways. SMEs also described improved public education on the use of certain medicines, increased chronic condition support, and innovation in the use of digital solutions such as artificial intelligence for medicine reconciliation and remote monitoring of conditions. Some SMEs also listed factors which could be considered as de-adoption mechanisms. For instance, one SME had commented, “Policy change and prioritisation of stopping benzos”.

Forecasts for hospital activity amenable to primary care and community interventions that might be mitigated by avoiding inpatient admission.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Admission with no overnight stay and no procedure (adults)	5	24.85	20.62	2.47	54.15
Admission with no overnight stay and no procedure (children)	5	19.61	17.03	2.47	44.86
Ambulatory care sensitive admissions (acute conditions)	7	23.75	21.36	2.93	56.38
Ambulatory care sensitive admissions (chronic conditions)	7	24.89	22.20	2.90	59.01
Ambulatory care sensitive admissions (vaccine preventable conditions)	6	22.21	19.28	2.66	48.33
Emergency readmissions within 28 days	5	16.41	14.58	4.05	36.57
End of life care admissions (died within 2 days)	5	27.91	23.13	6.29	65.45
End of life care admissions (died within 3-14 days)	5	20.42	18.62	4.71	49.65
Frail elderly admissions (high frailty risk)	5	5.71	7.52	0.43	16.40
Frail elderly admissions (intermediate frailty risk)	5	8.64	8.53	0.89	20.80

Table 4 Aggregate forecasts (mean, sd, P10, P90) for hospital activity amenable to primary care and community interventions that might be mitigated by avoiding inpatient admission.

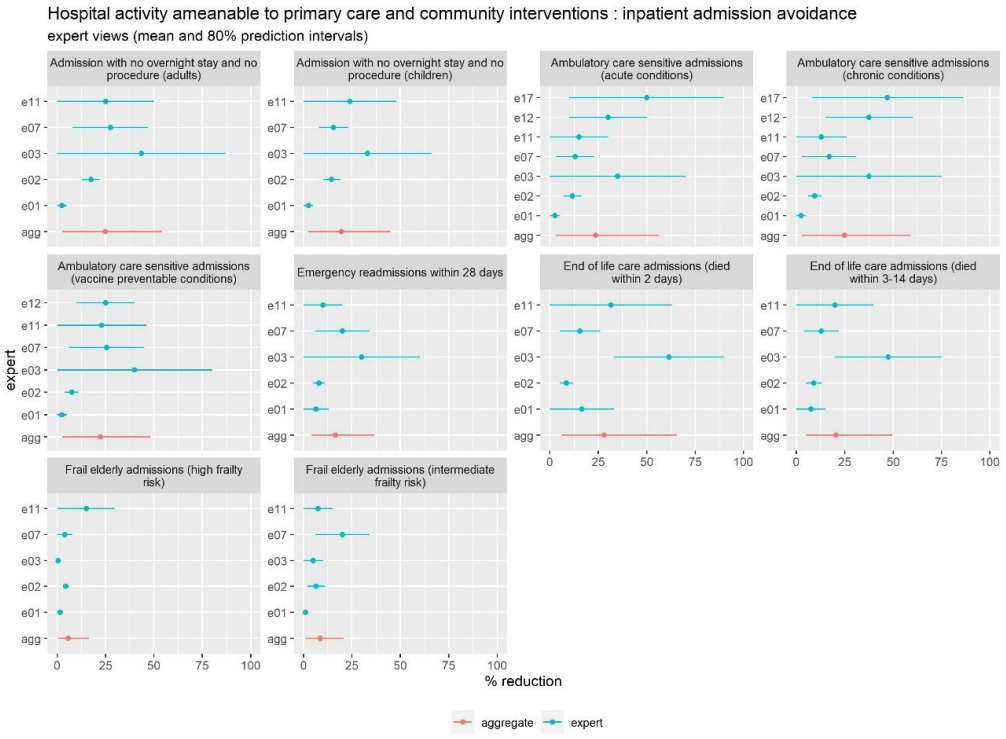

Figure 12 Individual and aggregate forecasts (mean, P10, P90) for hospital activity amenable to primary care and community interventions that might be mitigated by avoiding inpatient admission.

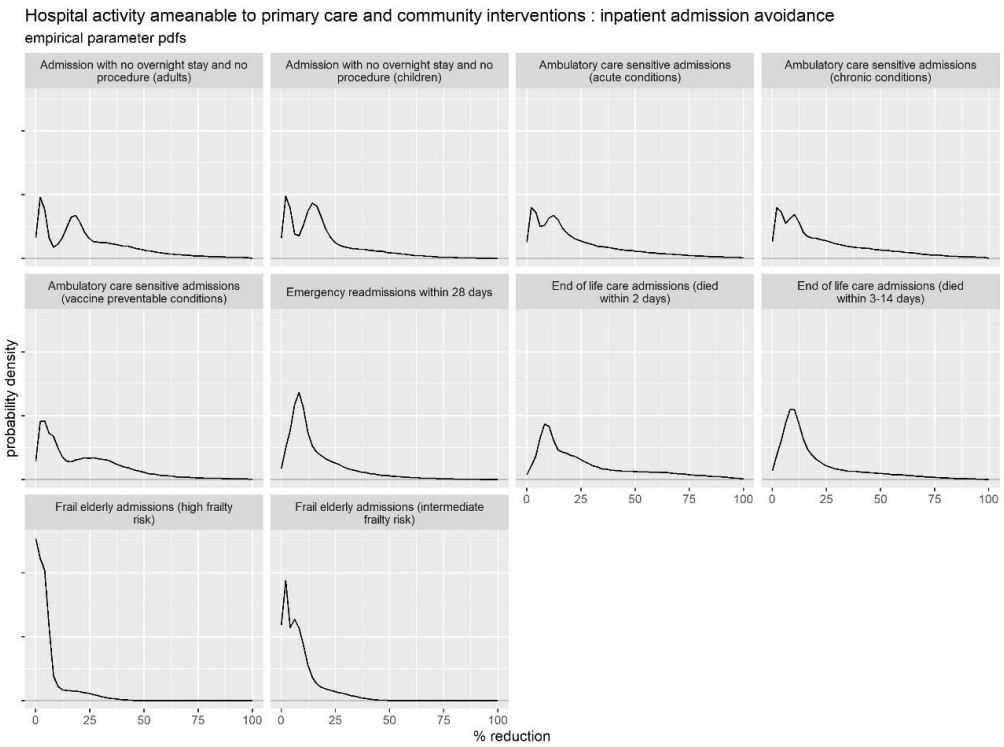

Figure 13 Probability density function (PDFs) of aggregate forecasts for hospital activity amenable to primary care and community interventions that might be mitigated by avoiding inpatient admission.

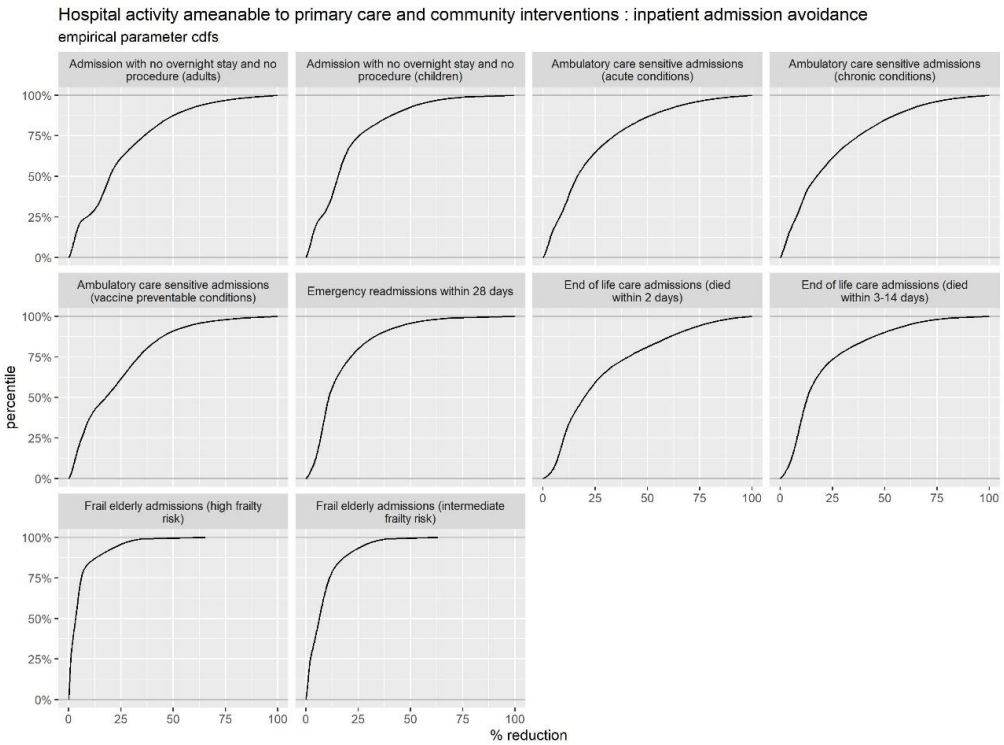

Figure 14 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for hospital activity amenable to primary care and community interventions that might be mitigated by avoiding inpatient admission.

Rationale for P10 values

Some of the common themes within the rationales described by SMEs related to a lack of preventive mechanisms. Examples were poor access to primary care, lack of education, and insufficient community and social care resource. Other comments were citing a lack of alternatives to substitute or relocate care to out of hospital settings, inefficiencies in current care practices and the challenges of redirecting care. For instance, SMEs highlighted insufficient investment in digital technology to support monitoring and remote consultations in the management of long-term conditions as well as the inadequate staffing of frailty multidisciplinary teams.

Rationale for P90 values

A broad range of factors were described by SMEs across these parameters. Some of the key themes related to preventive measures such as future government policy and public health management initiatives resulting in improvements to housing, heating, nutrition, and transport as well as measures to reduce obesity, loneliness, alcohol consumption and smoking. Other common factors for preventive mechanisms included improved access to primary and dental care, significant investment in community services and social care and improved chronic disease management. Relocation of care was also a mechanism here with SMEs citing effective remote monitoring and the use of virtual wards. Improvements in the efficiency of care tended to relate to enhanced processes for medicine reconciliation, more effective advanced planning and information sharing, and better staffing of frailty clinics and palliative care provision.

Forecasts for hospital activity amenable to primary care and community interventions that might be mitigated by reduction in inpatient length of stay.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Emergency admissions of older people	7	17.40	16.76	3.96	39.27
Excess beds days (elective admissions)	6	23.38	20.80	2.98	55.01
Excess beds days (emergency admissions)	6	27.30	20.63	3.09	55.80
Stroke early supported discharge	5	17.97	18.80	3.34	44.62

Table 5 Aggregate forecasts (mean, sd, P10, P90) for hospital activity amenable to primary care and community interventions that might be mitigated by reduction in inpatient length of stay.

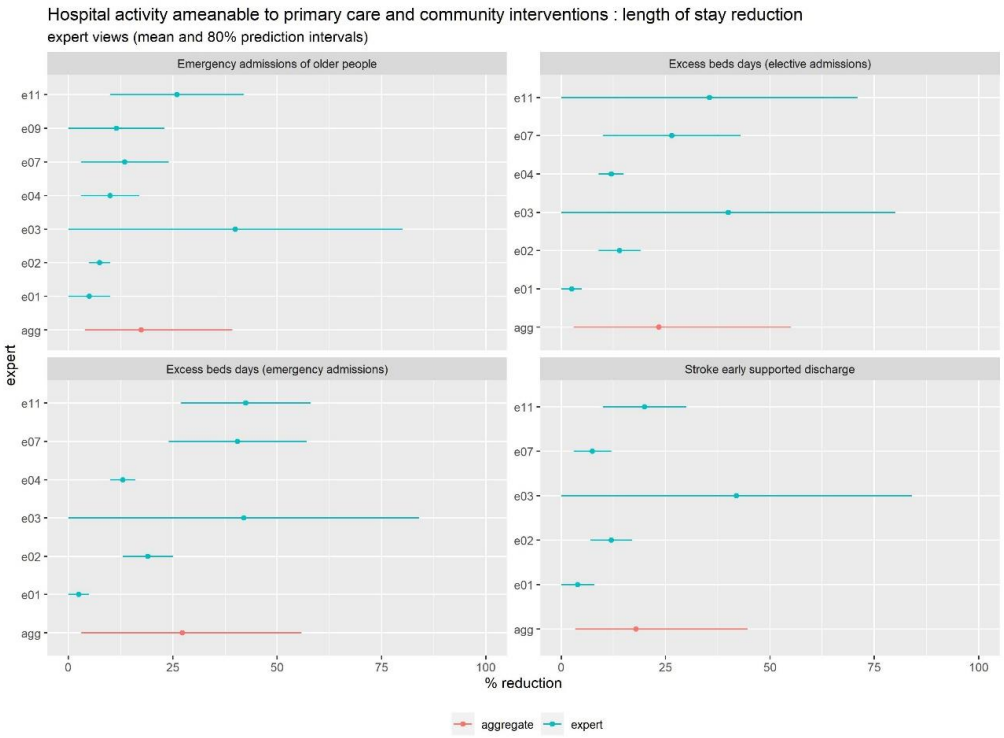

Figure 15 Individual and aggregate forecasts (mean, P10, P90) for hospital activity amenable to primary care and community interventions that might be mitigated by reduction in inpatient length of stay.

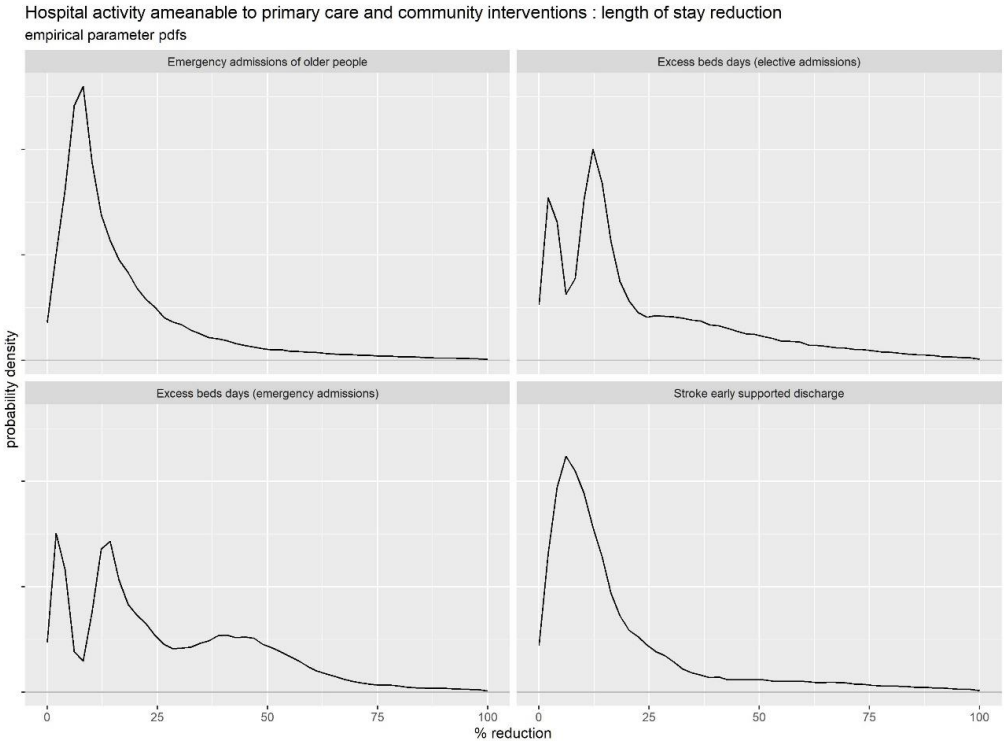

Figure 16 Probability density function (PDFs) of aggregate forecasts for hospital activity amenable to primary care and community interventions that might be mitigated by reduction in inpatient length of stay.

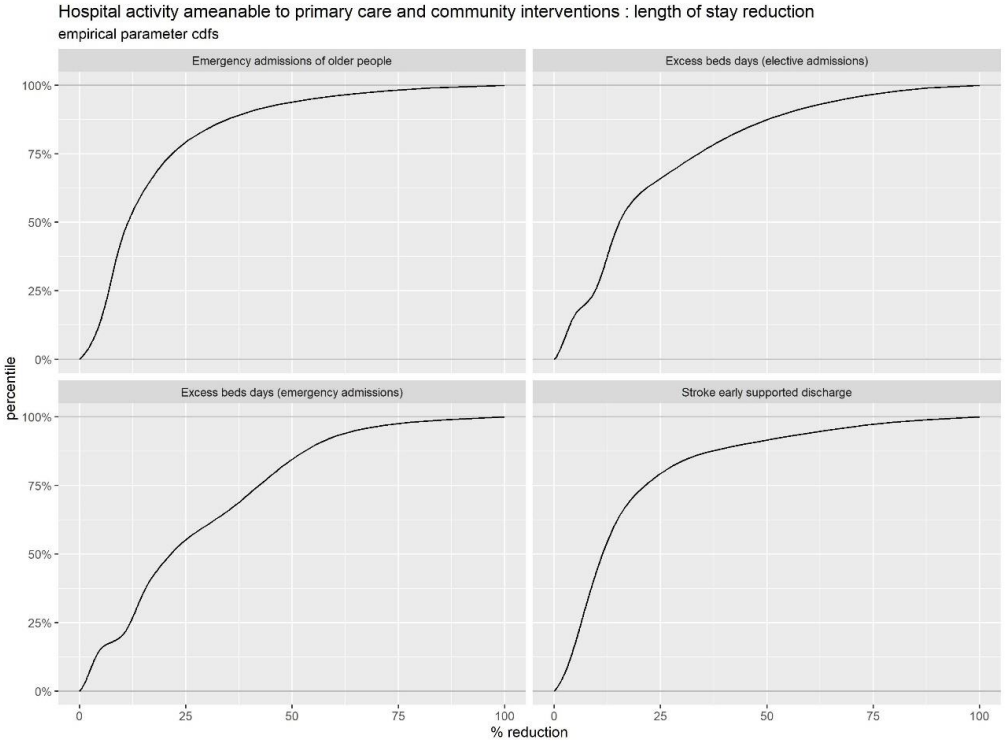

Figure 17 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for hospital activity amenable to primary care and community interventions that might be mitigated by reduction in inpatient length of stay.

Rationale for P10 values

Rationales for low mitigation mostly noted factors relating to a lack of preventive measures and inefficiencies in the delivery of care. SMEs listed factors such as a lack of social care and community funding, lack of investment in out of hospital services resulting in inadequate services to prevent admission as well as contributing to poor patient flow, and disjointed working between primary, community and acute care service provision. Some SME described a lack of rehabilitation facilities, or insufficient numbers of allied health professional in community settings which would otherwise substitute some of the in-hospital care.

Rationale for P90 values

A wide range of factors were listed by SMEs. Many of these related to preventive measures, relocations of care and increased efficiency in the care provided. Some SMEs also cited factors that were redirections of care. Examples of some of the factors described were significant investment in social care and community services with more effective local system working to both prevent emergency admission and improve patient discharge. Earlier intervention and access to frailty assessment, enhanced MDT capacity, improved discharge liaison services and social care packages to prevent delayed discharge and the resulting deconditioning, and earlier informed decisions relating to palliative care were all cited. Additionally, the increased use of virtual wards and new build specialty DTOC (delayed transfer of care) centres were among some of the other factors provided.

Forecasts for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by avoiding inpatient admission.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Intentional self-harm admission	4	18.33	21.10	2.07	52.36
Medically unexplained symptoms admissions	4	13.33	16.82	1.17	38.82
Mental health admissions via ED	3	14.77	18.53	1.93	45.23

Table 6 Aggregate forecasts (mean, sd, P10, P90) for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by avoiding inpatient admission.

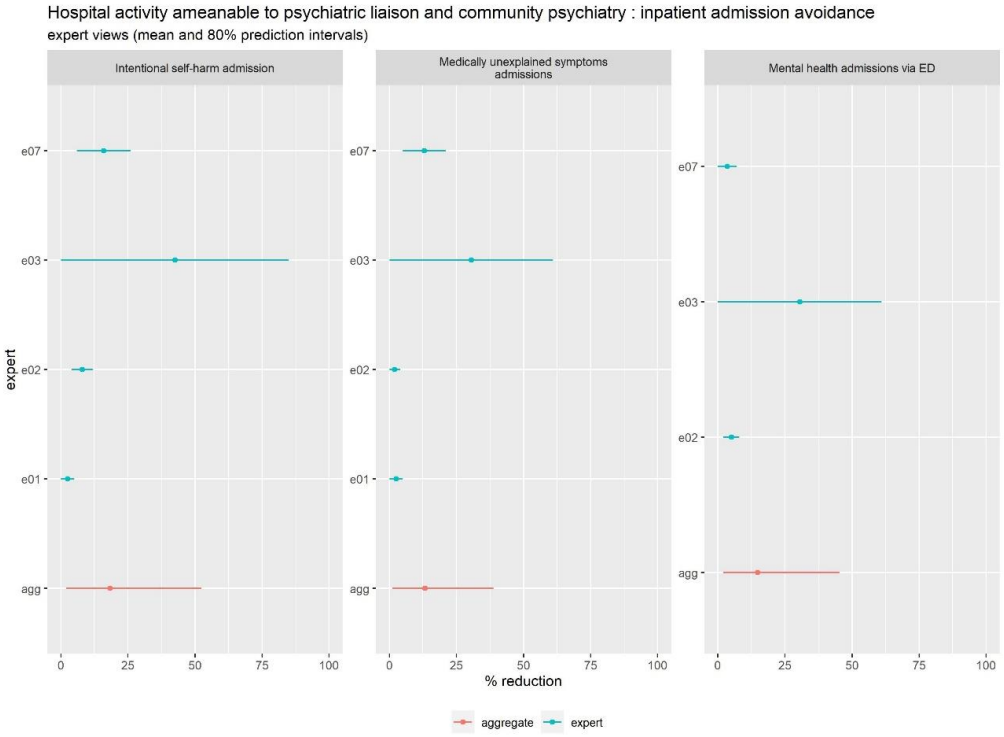

Figure 18 Individual and aggregate forecasts (mean, P10, P90) for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by avoiding inpatient admission.

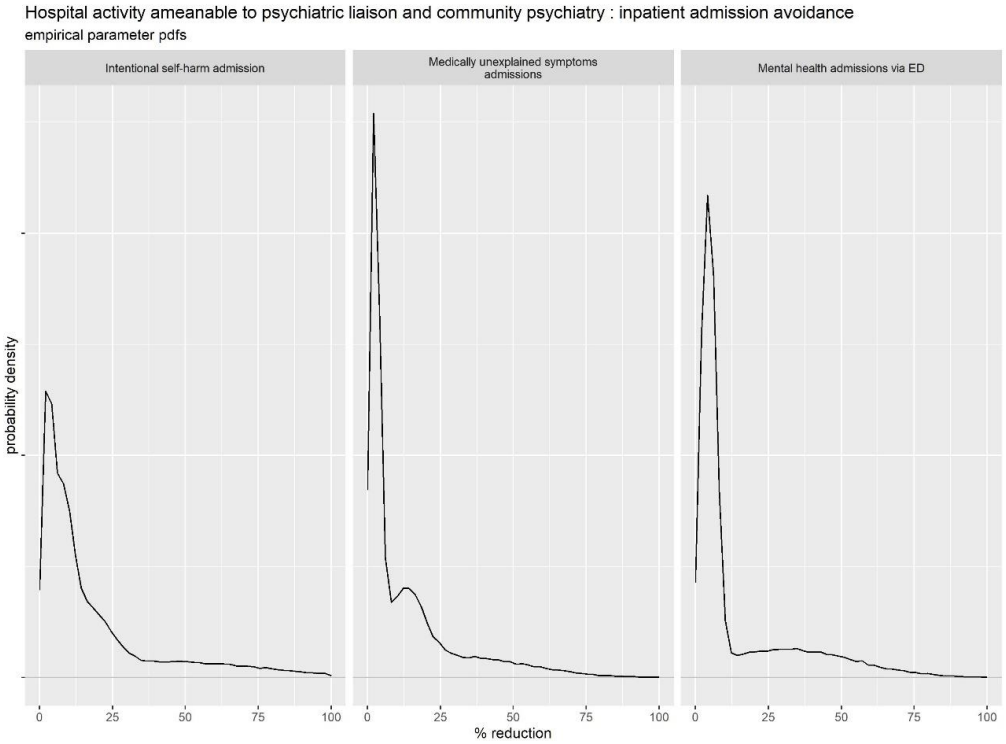

Figure 19 Probability density function (PDFs) of aggregate forecasts for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by avoiding inpatient admission.

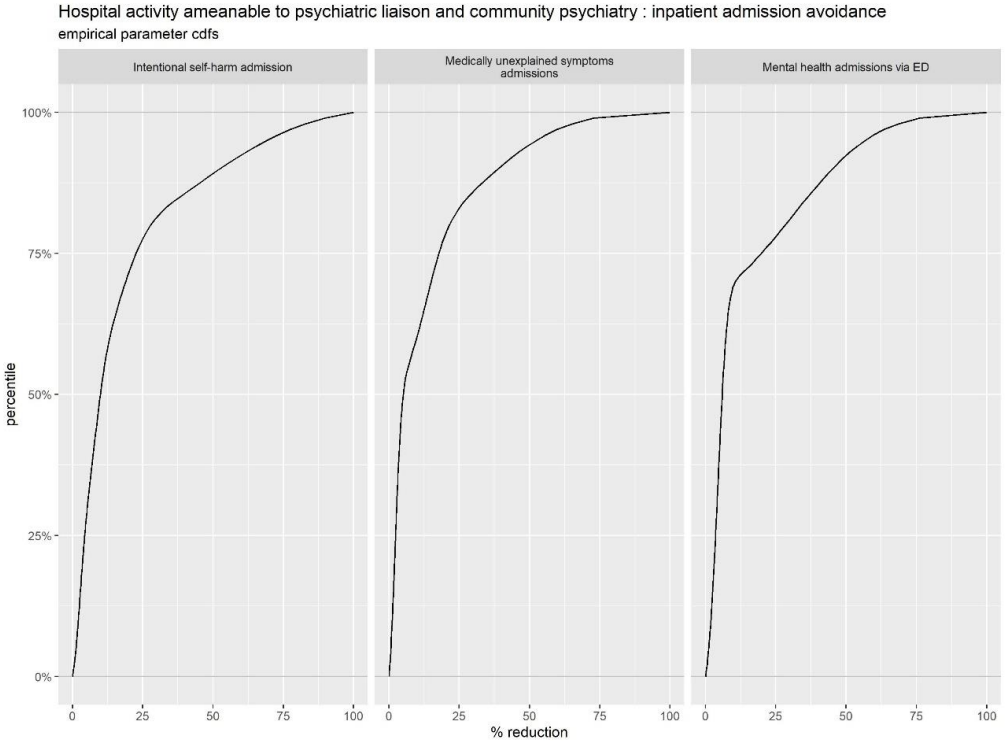

Figure 20 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by avoiding inpatient admission.

Rationale for P10 values

Most SME comments described the absence of preventive mechanisms for activity mitigation. SMEs described a lack of community support and limited mental health provision. Additionally, some SMEs described an anticipated increase in the prevalence of mental illness, noting the impact of social media, health inequalities and deprivation.

Rationale for P90 values

Factors supporting high activity mitigation forecasts were related to preventive measures or improvements in care. These included greater investment in mental health and public health services, more support in schools for promotion of mental health issues, earlier assessment and treatment, as well as better GP access. Pharmacy support was also noted which could be seen as a substitution for hospital-based care.

Forecasts for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by reductions in inpatient length of stay.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Admissions with mental health comorbidities	4	15.41	18.48	3.05	47.66

Table 7 Aggregate forecasts (mean, sd, P10, P90) for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by reductions in inpatient length of stay.

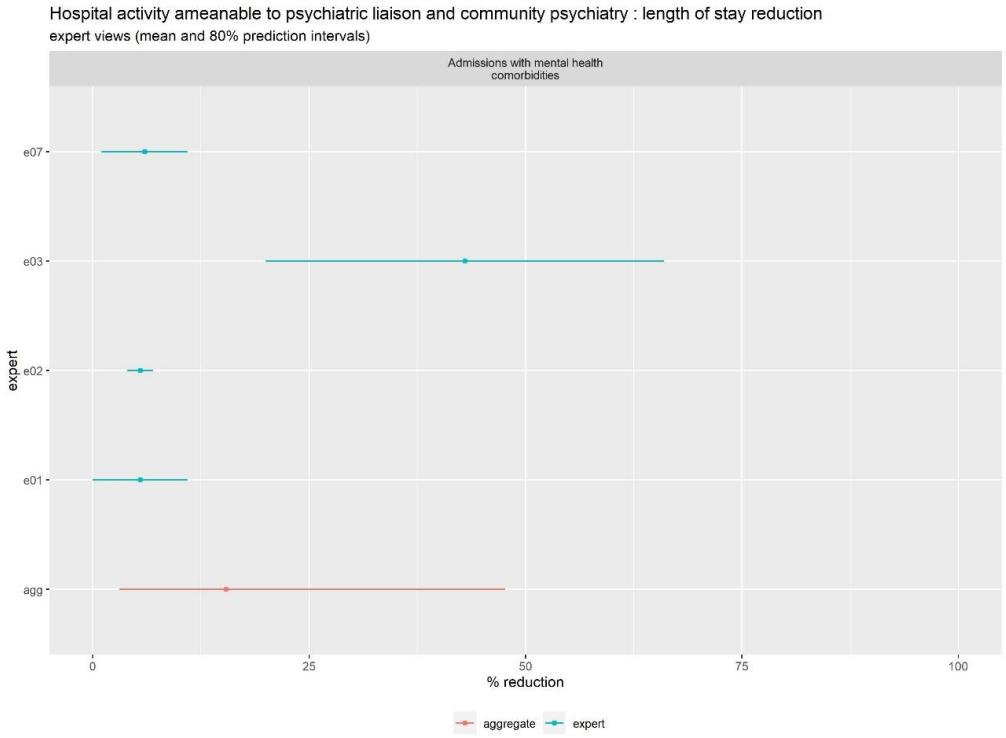

Figure 21 Individual and aggregate forecasts (mean, P10, P90) for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by reductions in inpatient length of stay.

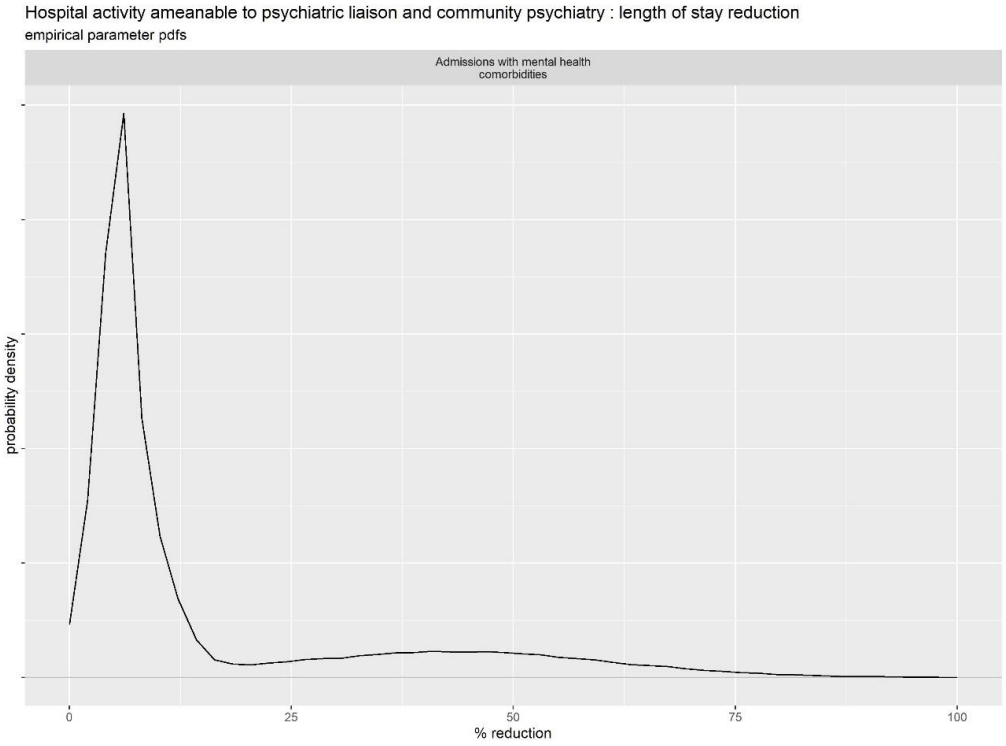

Figure 22 Probability density function (PDFs) of aggregate forecasts for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by reductions in inpatient length of stay.

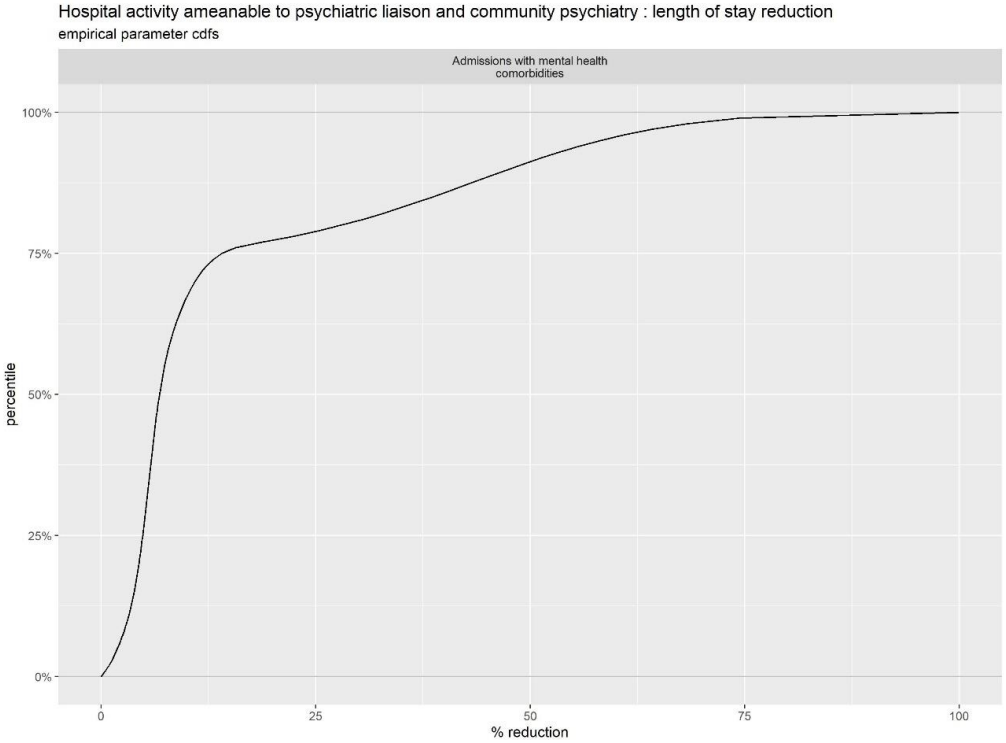

Figure 23 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for hospital activity amenable to psychiatric liaison and community psychiatry that might be mitigated by reductions in inpatient length of stay.

Rationale for P10 values

SMEs described limited preventive mechanism for activity mitigation. Comments focussed on the lack of mental health services, resource limitations and a lack of prioritisation as factors for low levels of activity mitigation.

Rationale for P90 values

Rationales for high levels of activity mitigation focussed on prevention and relocation of care. Significant investment in mental health services and public health interventions were described. Some SMEs also noted possible increases in the number of clinical psychologists available to provide support to patients with chronic conditions and the increased use of virtual ward monitoring.

Forecasts for hospital activity amenable to public health interventions that might be mitigated by avoiding inpatient admission.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Alcohol related admissions (acute conditions - partially attributable)	6	23.41	23.53	2.48	60.08
Alcohol related admissions (chronic conditions - partially attributable)	6	17.41	16.36	2.10	39.84
Alcohol related admissions (wholly attributable)	5	14.93	18.52	1.85	40.96
Falls related admissions	4	14.09	18.21	1.29	43.07
Obesity related admissions	3	15.17	18.01	1.98	44.62
Smoking related admissions	4	15.69	17.30	1.13	40.02

Table 8 Aggregate forecasts (mean, sd, P10, P90) for hospital activity amenable to public health interventions that might be mitigated by avoiding inpatient admission.

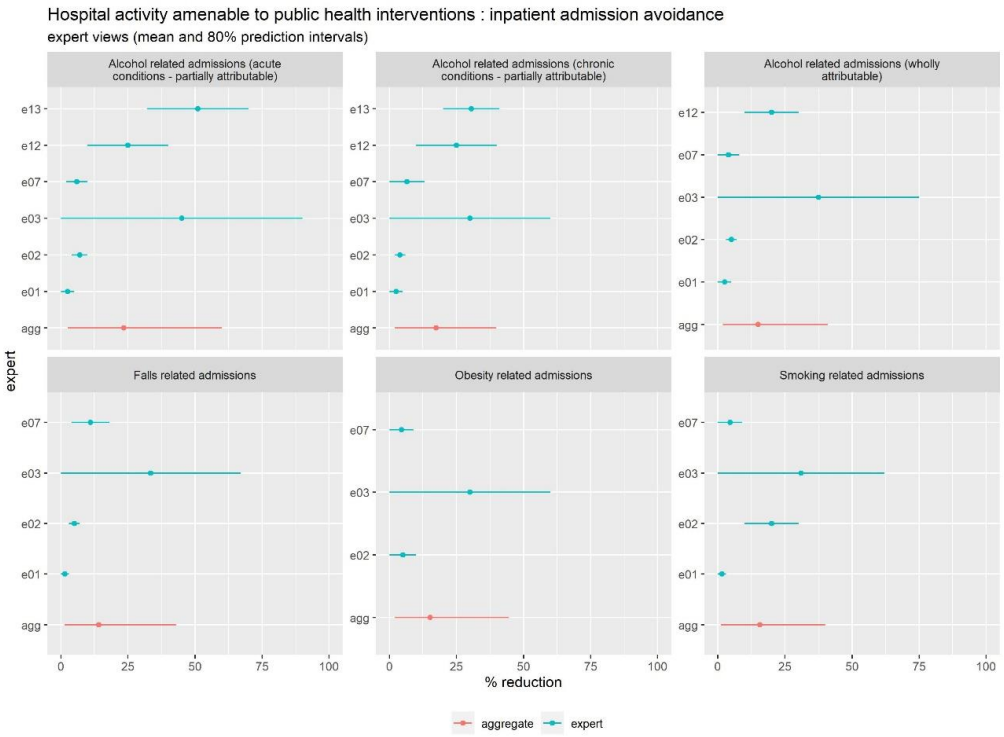

Figure 24 Individual and aggregate forecasts (mean, P10, P90) for hospital activity amenable to public health interventions that might be mitigated by avoiding inpatient admission.

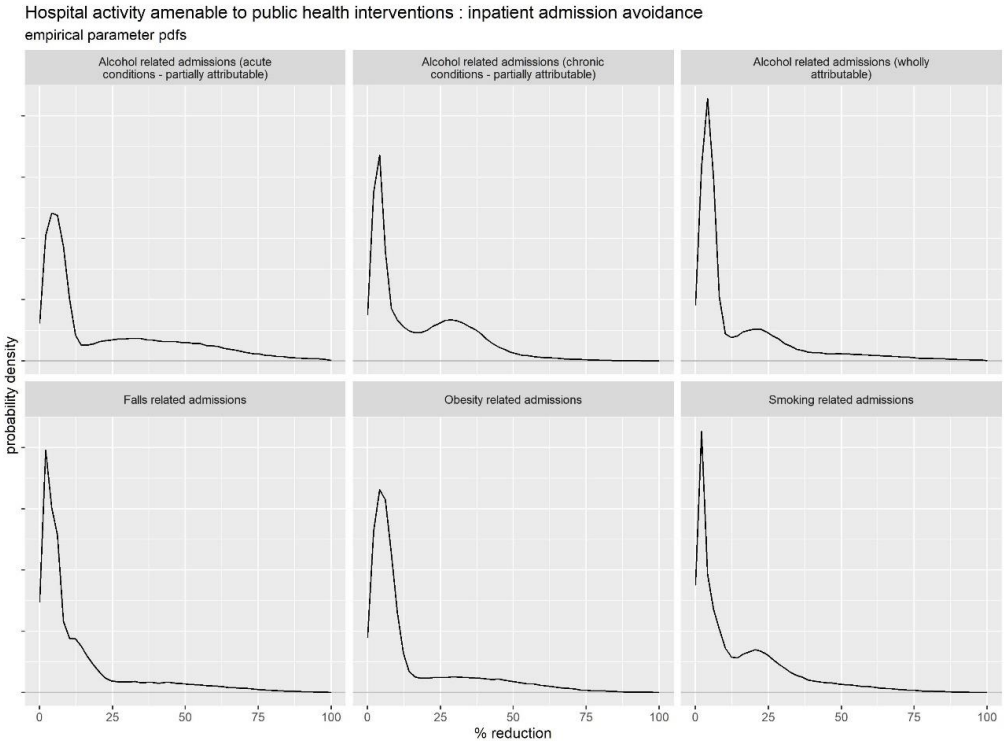

Figure 25 Probability density function (PDFs) of aggregate forecasts for hospital activity amenable to public health interventions that might be mitigated by avoiding inpatient admission.

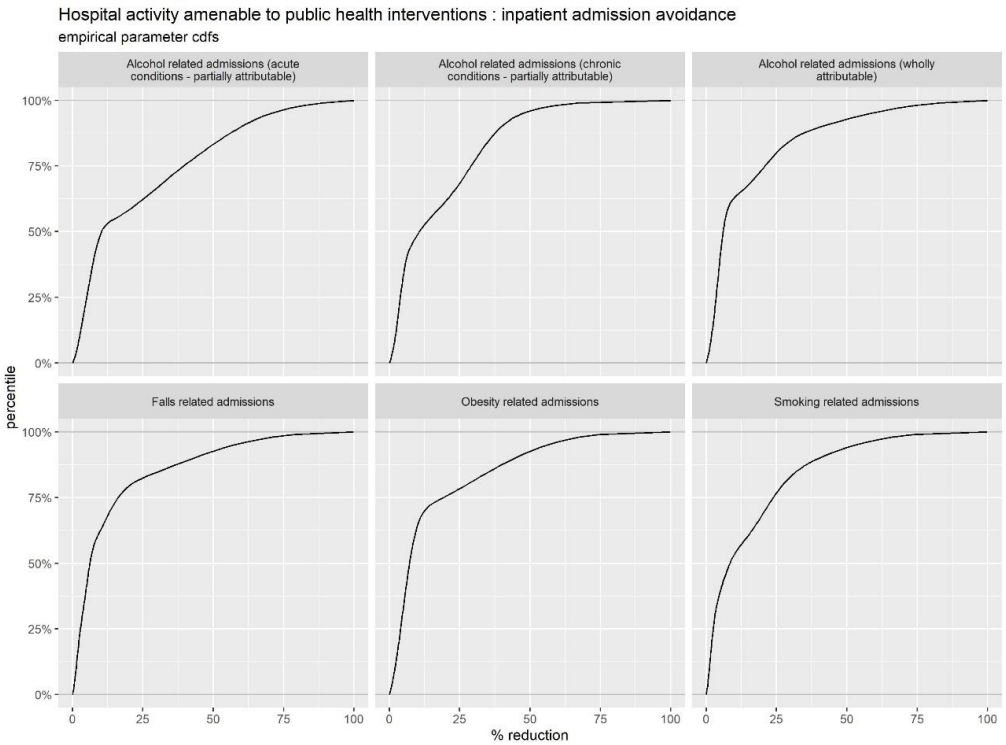

Figure 26 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for hospital activity amenable to public health interventions that might be mitigated by avoiding inpatient admission.

Rationale for P10 values

In listing factors for low levels of activity mitigation, SMEs cited a lack of preventive mechanisms. Examples were limited mental health services, the impact of cost of living, homelessness, poverty, and ineffective interventions which fail to change population behaviour.

Rationale for P90 values

Rationales focussed on preventive measures. SMEs described public health interventions such as increased alcohol taxation, potential bans on some alcohol, effective investment in smoking cessation, better patient education, as well as improved mental health and well-being services.

Forecasts for planned medical activity for adults that might be mitigated by avoiding outpatient attendance.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Consultant to consultant referrals (adult non-surgical)	11	18.69	15.54	2.39	41.85
Follow-up attendances (adult non-surgical)	12	34.13	22.00	4.04	62.94

Table 9 Aggregate forecasts (mean, sd, P10, P90) for planned medical activity for adults that might be mitigated by avoiding outpatient attendance.

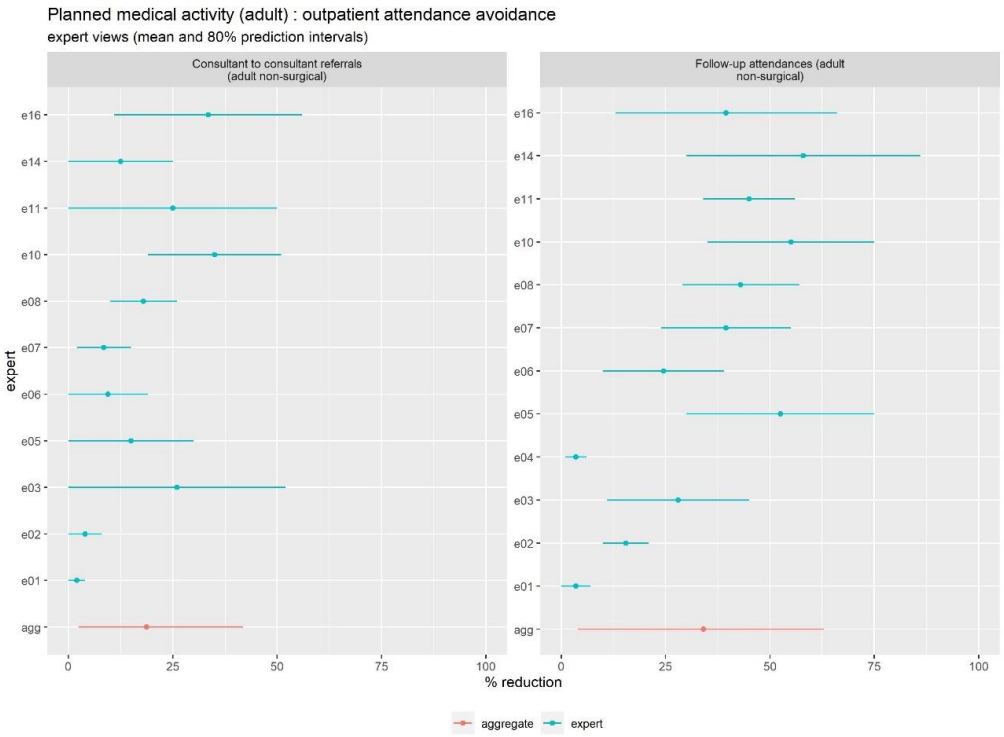

Figure 27 Individual and aggregate forecasts (mean, P10, P90) for planned medical activity for adults that might be mitigated by avoiding outpatient attendance.

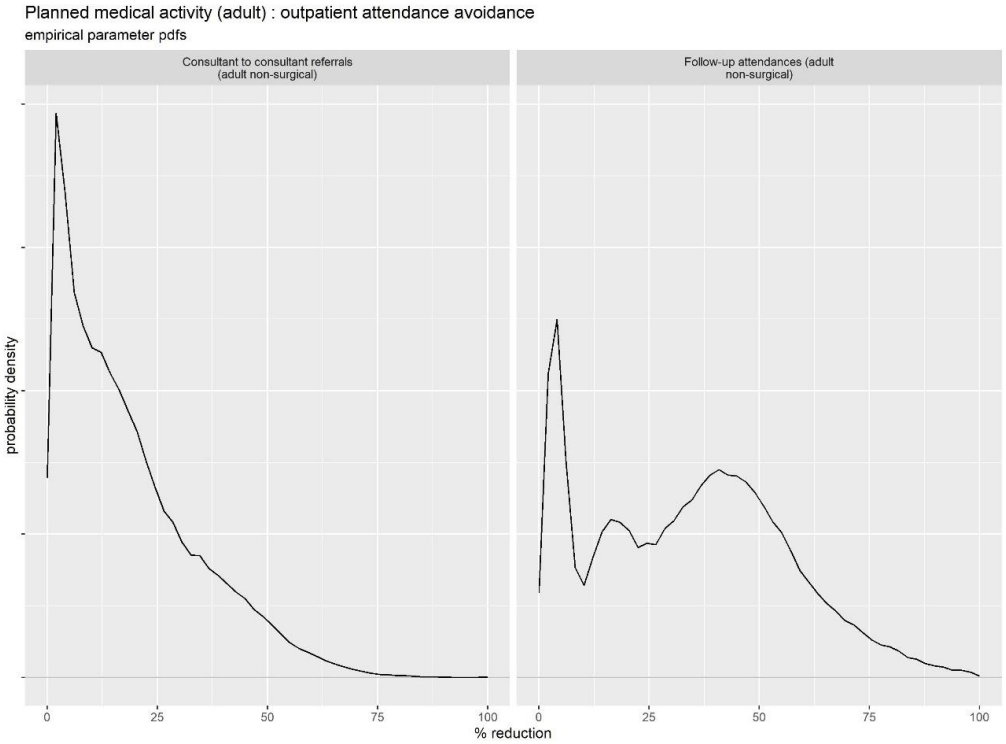

Figure 28 Probability density function (PDFs) of aggregate forecasts for planned medical activity for adults that might be mitigated by avoiding outpatient attendance.

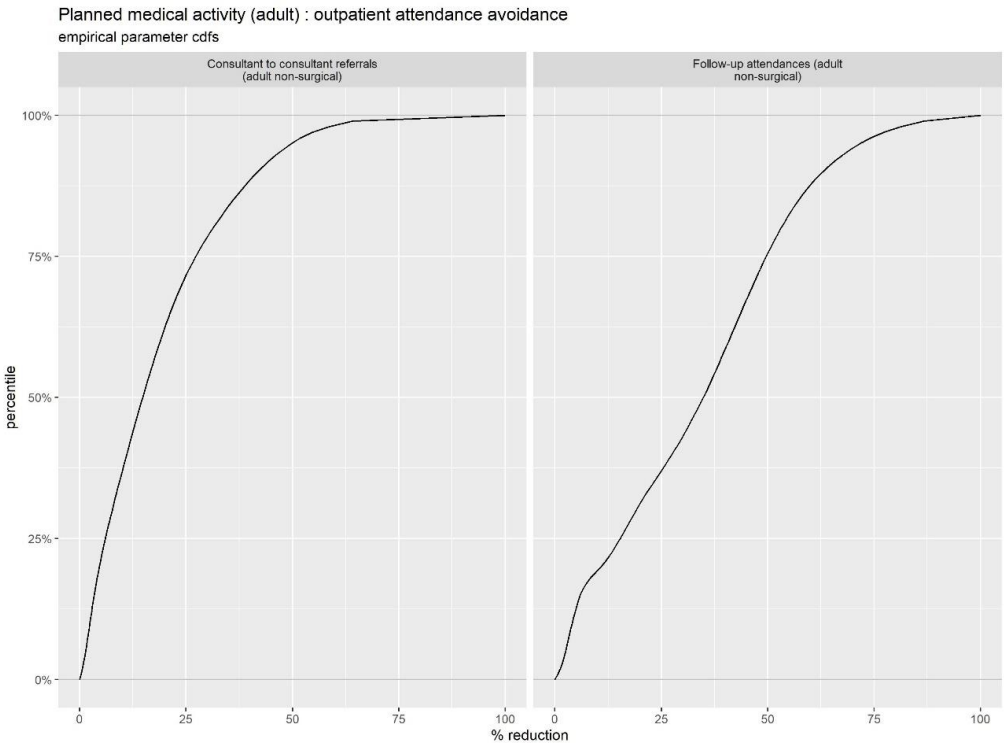

Figure 29 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned medical activity for adults that might be mitigated by avoiding outpatient attendance.

Rationale for P10 values

For consultant-to-consultant referrals, some SMEs described inefficiencies in the delivery of care. For instance, increasing sub-specialisation and delays in primary care were listed as factors.

For follow-up attendances, some SMEs described other inefficiencies and insufficient options to relocate care. A lack of IT investment, limited availability of virtual clinical environment, and a general lack of investment in out of hospital services resulting in no viable alternatives, particularly for those with long term conditions, were all cited.

Rationale for P90 values

For consultant-to-consultant referrals, factors mostly related to the improved care and the availability of alternative options to relocate care. Comments included a more holistic approach to care, consultants becoming more general, more robust pathways, strong policies relating to referrals, clinical decision support software for diagnostic tests and greater availability of both diagnostic tests and treatment options in community settings. For follow-up attendances, SMEs again listed factors which increased efficiencies or provided other options to relocate care outside of hospital settings. Examples were investment in new models of care such as women's health hubs, investment in virtual clinics where appropriate, more effective remote monitoring, improved patient education and significant IT investment such as the use of AI for patients to access for queries.

Forecasts for planned medical activity for adults that might be mitigated by the mode of outpatient delivery.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Telephone appointments (adult non-surgical)	12	31.02	22.31	7.10	65.61

Table 10 Aggregate forecasts (mean, sd, P10, P90) for planned medical activity for adults that might be mitigated by the mode of outpatient delivery.

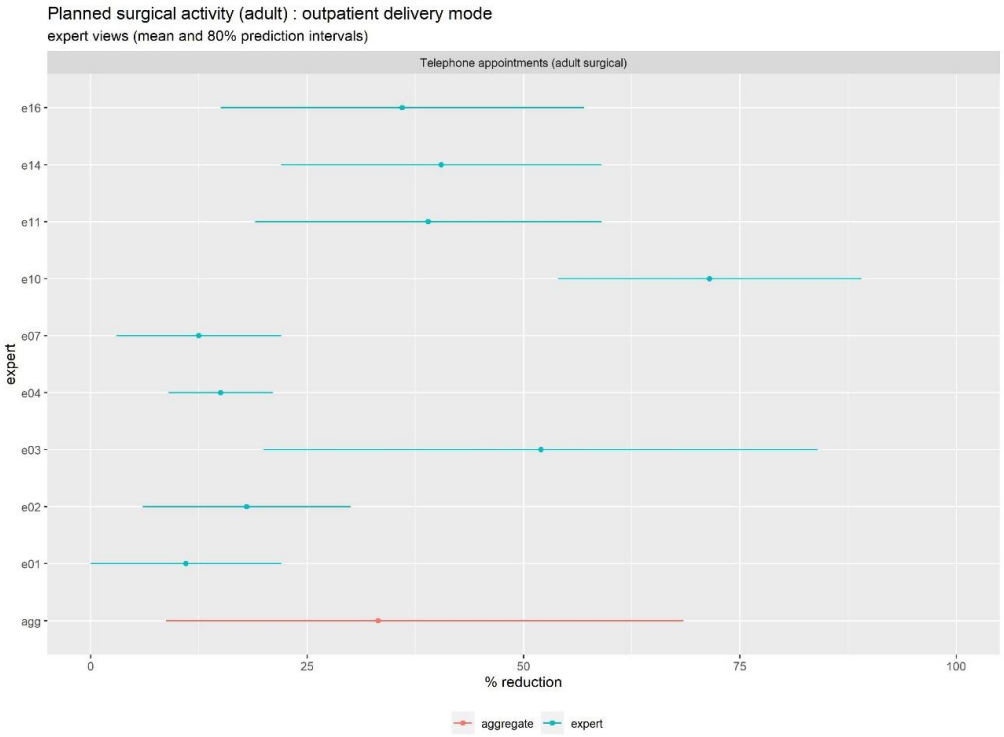

Figure 30 Individual and aggregate forecasts (mean, P10, P90) for planned medical activity for adults that might be mitigated by the mode of outpatient delivery.

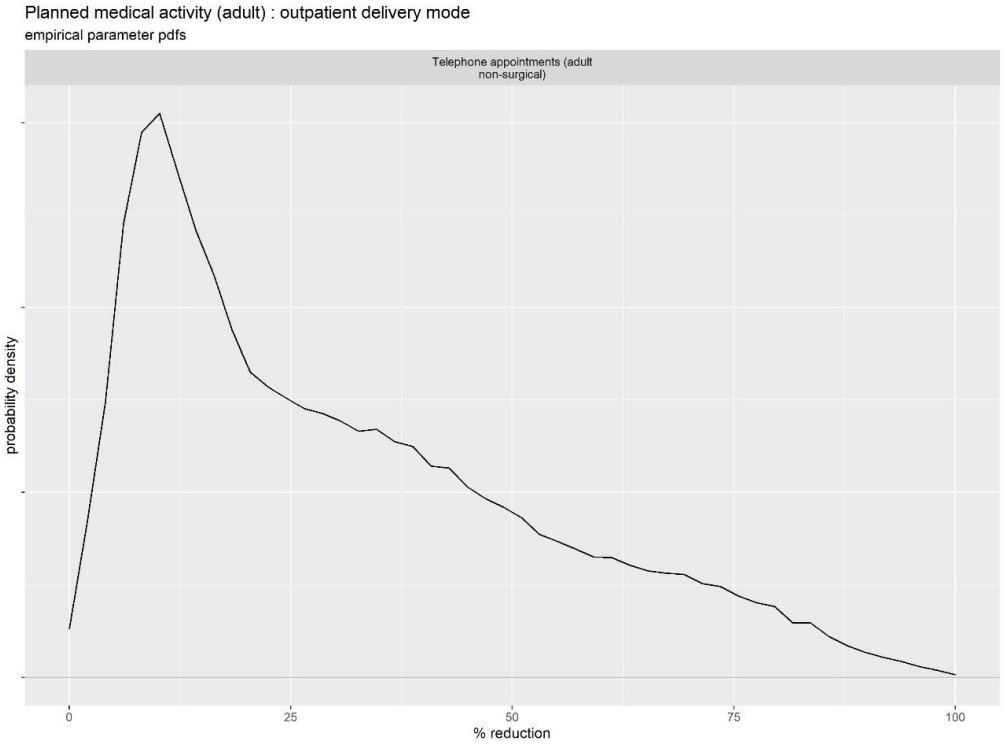

Figure 31 Probability density function (PDFs) of aggregate forecasts for planned medical activity for adults that might be mitigated by the mode of outpatient delivery.

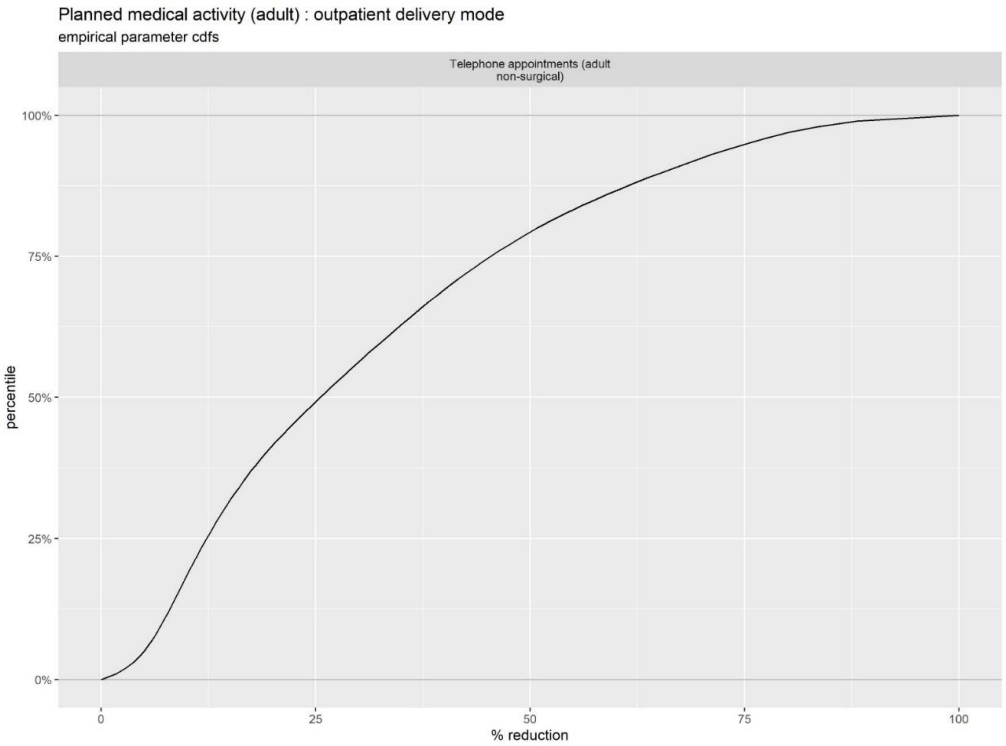

Figure 32 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned medical activity for adults that might be mitigated by the mode of outpatient delivery.

Rationale for P10 values

SMEs described factors which related to inefficiencies in care such as the poor uptake of digital technology, lack of clinical buy-in and delays in primary care.

Rationale for P90 values

SMEs described efficiencies which facilitated a substitution of face-to-face consultations to tele or virtual consultations. Examples included increased use of digital technology and electronic patient records as factors for high mitigation.

Forecasts for planned surgical activity for adults which might be mitigated by avoiding inpatient admission.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Cancelled operations	11	32.49	21.33	6.77	65.33
Interventions with limited evidence - ENT	11	46.29	23.84	11.82	76.66
Interventions with limited evidence - General surgery	10	40.24	23.14	11.28	72.78
Interventions with limited evidence - GI surgery	10	20.19	17.86	3.22	47.22
Interventions with limited evidence - MSK	10	45.37	24.27	10.73	78.37
Interventions with limited evidence - Urology	10	36.72	25.56	3.71	74.16
Interventions with limited evidence - Vascular	11	48.27	22.07	19.82	78.57

Table 11 Aggregate forecasts (mean, sd, P10, P90) for planned surgical activity for adults which might be mitigated by avoiding inpatient admission.

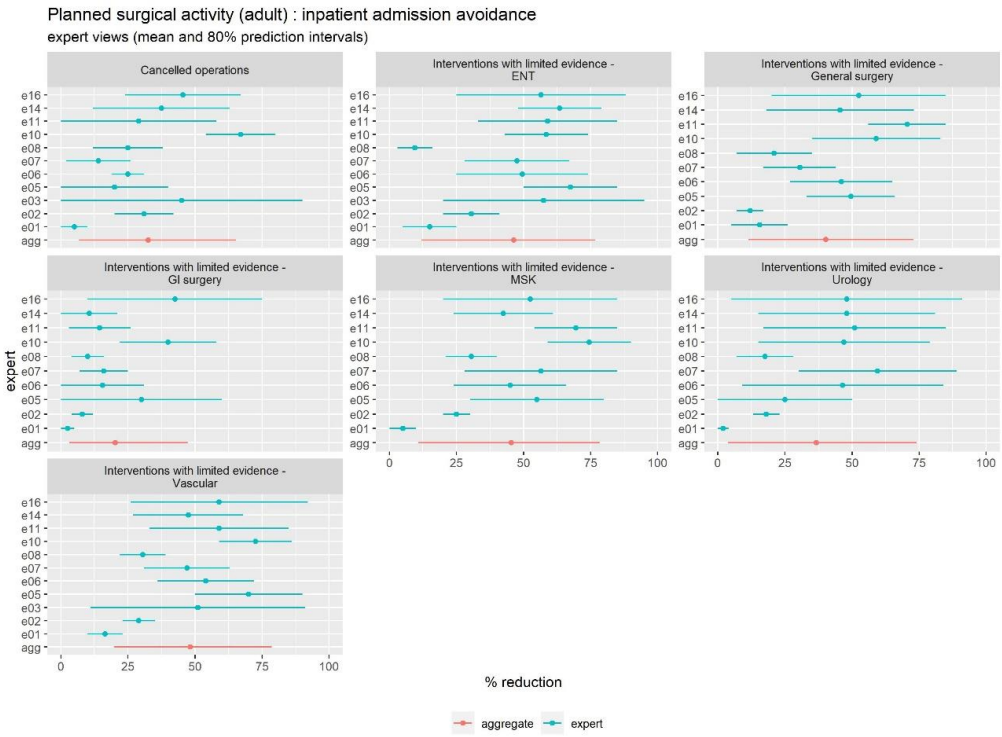

Figure 33 Individual and aggregate forecasts (mean, P10, P90) for planned surgical activity for adults which might be mitigated by avoiding inpatient admission.

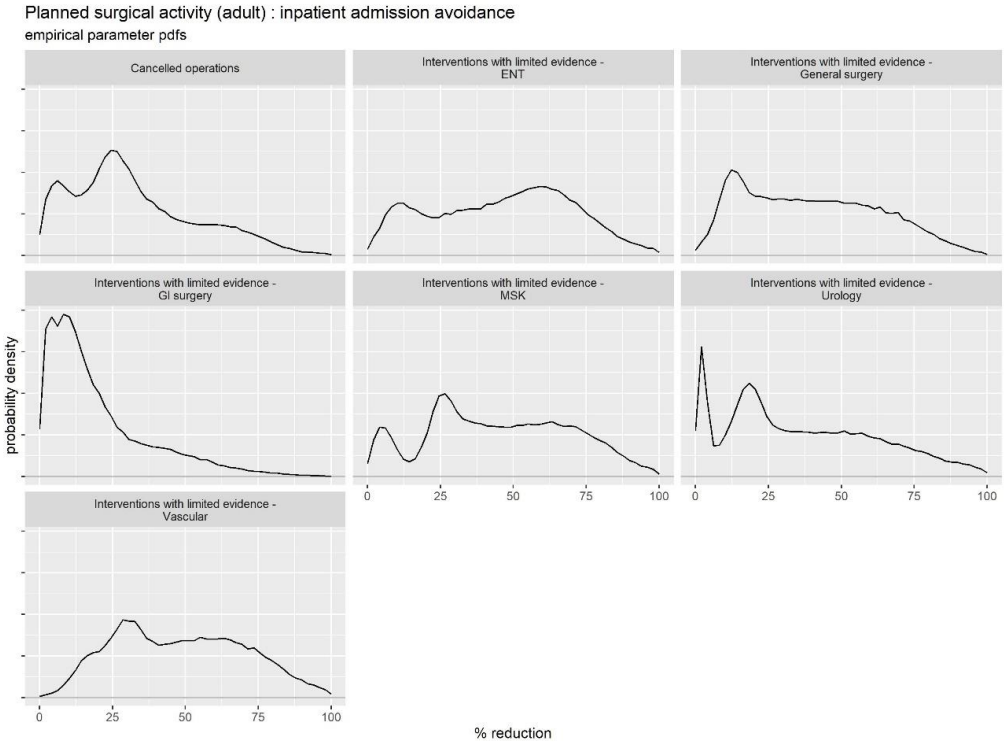

Figure 34 Probability density function (PDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by avoiding inpatient admission.

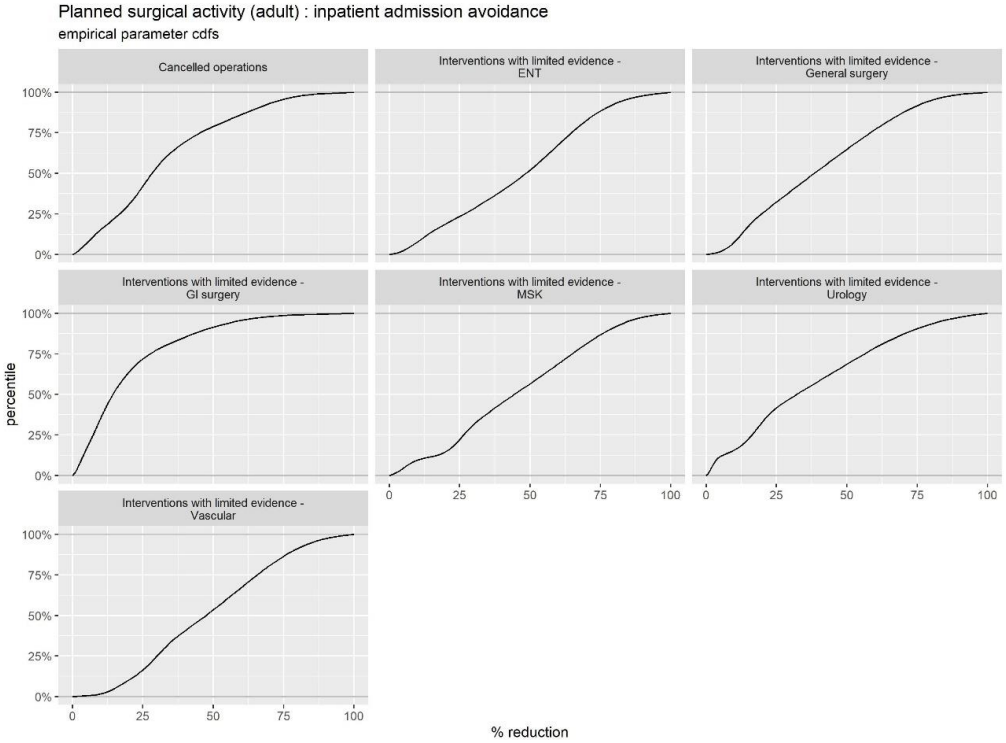

Figure 35 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by avoiding inpatient admission.

Rationale for P10 values

For cancelled operations, a broad range of factors were listed by SMEs. They mostly focussed on inefficiencies and a lack of preventive measures. Some SME described staffing shortages, ineffective booking systems and admin procedures, poor communication with patients, ineffective preassessment, failure to increase day case rates and poor separation of elective and acute work. In addition, inadequate primary, social or community care support and patient transport issues were also cited as key factors.

Rationale for P90 values

For cancelled operations, SMEs described preventive measures, the substitution of care and greater efficiencies. Factors listed included advances in electronic booking systems, better IT systems, improved patient communication, ring-fencing of elective beds or increases in off-site surgical centres, greater shift to day case procedures, improvements in pre-operative pathway management and better prehab. For interventions with limited evidence, SMEs largely cited factors that were preventive, increased efficiencies and de-adoption of the procedures. Examples of the factors provided were investments in public health campaigns, improvements in non-surgical treatment options and improved alternative pathways, better prevention strategies and patient access to self-management. Additionally, some SMEs described a future where NHS providers simply no longer offer these procedures by de-adoption.

Forecasts for planned surgical activity for adults which might be mitigated by reducing inpatient length of stay.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Elective spells with overnight stay before surgery	12	45.91	20.74	17.72	72.90
Elective surgery - recommended mainly day case	13	36.01	20.17	13.26	65.94
Elective surgery - recommended mainly outpatient procedure	12	44.51	25.08	14.34	80.61
Elective surgery - recommended mainly outpatient procedure or day case	12	37.31	22.02	10.91	69.94
Elective surgery - recommended occasional day case	12	29.54	23.51	5.20	64.16
Enhanced recovery (bladder surgery)	12	34.20	21.32	8.67	65.59
Enhanced recovery (breast surgery)	13	39.81	26.28	5.71	77.17
Enhanced recovery (colectomy)	13	23.53	18.21	5.27	49.40
Enhanced recovery (hip surgery)	13	41.04	22.83	7.07	70.73
Enhanced recovery (hysterectomy)	13	28.31	23.55	4.67	66.66
Enhanced recovery (knee surgery)	13	39.15	22.45	7.85	70.76
Enhanced recovery (prostate surgery)	12	30.43	20.77	7.78	60.32
Enhanced recovery (rectal surgery)	12	22.12	18.47	4.60	48.21

Table 12 Aggregate forecasts (mean, sd, P10, P90) for planned surgical activity for adults which might be mitigated by reducing inpatient length of stay.

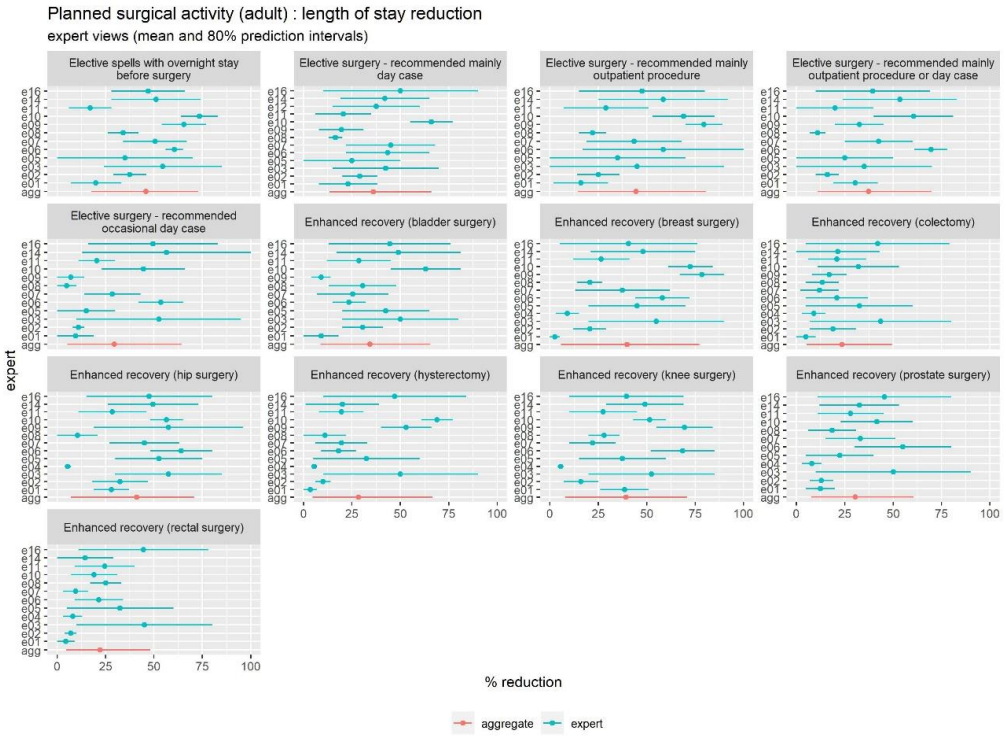

Figure 36 Individual and aggregate forecasts (mean, P10, P90) for planned surgical activity for adults which might be mitigated by reducing inpatient length of stay.

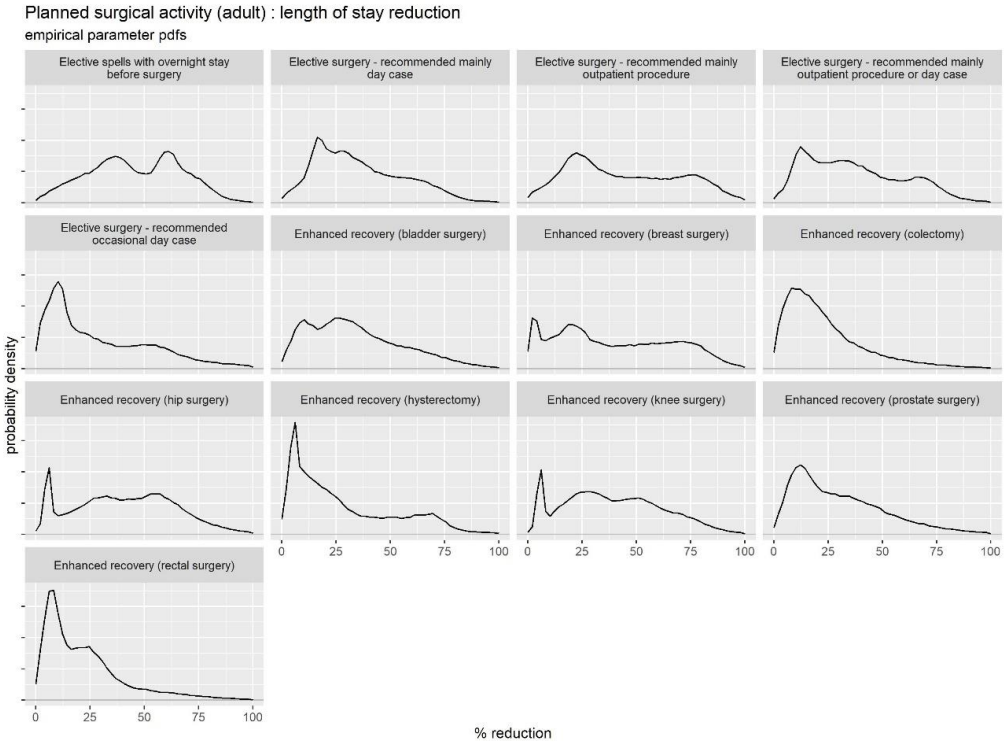

Figure 37 Probability density function (PDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by reducing inpatient length of stay.

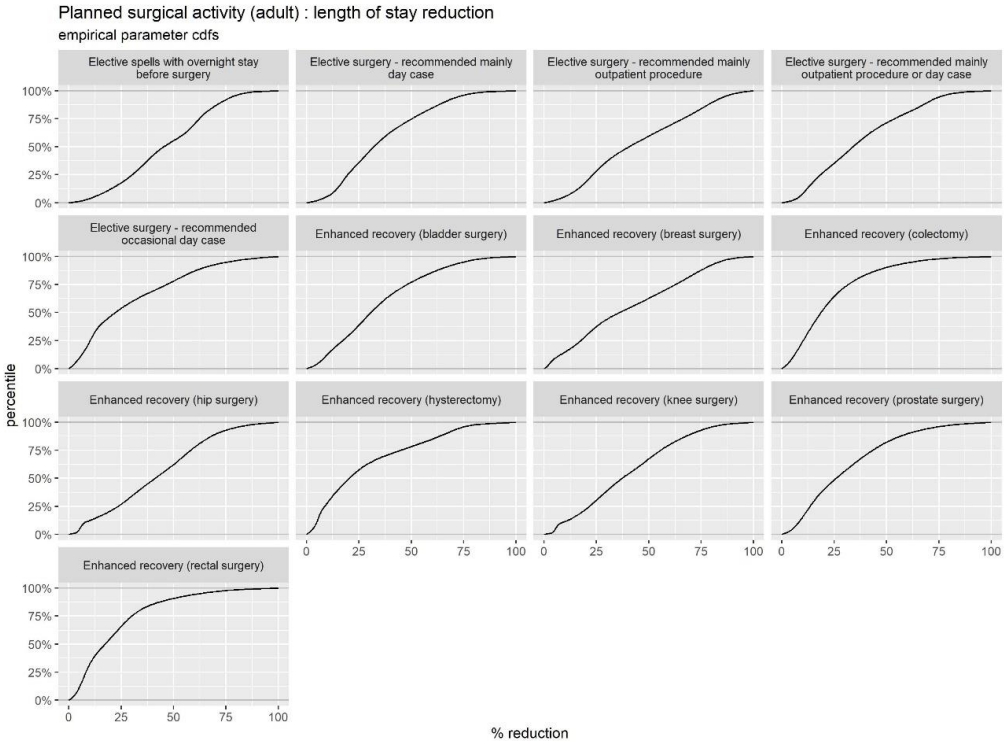

Figure 38 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by reducing inpatient length of stay.

Rationale for P10 values

SMEs highlighted the lack of preventive measures, inefficiencies and limited availability of alternative options such as for 'optimisation' prior to surgery as well as the management of patients' recovery. Some SMEs described the impact of inadequate social care capacity in prohibiting the timely discharge of patients as well as travel and social barriers. Additionally, a lack of community services for patient recovery was cited with SMEs noting staff shortages of AHPs.

Rationale for P90 values

Factors listed by SMEs to explain high mitigation of activity mostly related to improvements in efficiency of the care delivered. However, preventive measures and the access to out of hospital alternatives were also commonly cited. Examples of the factors listed were screening programmes, better pre-operative assessment, future surgical advances resulting in less invasive procedures, better management of anaesthetics and increased remote monitoring. SMEs also described increased provision of elective surgical sites, greater joined-up working with community services, investments to enhance community support for patient prehab and recovery as well as greater funding for AHPs to help enable faster discharge.

Forecasts for planned surgical activity for adults which might be mitigated by avoiding outpatient attendance.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Consultant to consultant referrals (adult surgical)	8	21.52	17.00	2.89	46.44
Follow-up attendances (adult surgical)	9	25.10	21.16	2.85	57.43

Table 13 Aggregate forecasts (mean, sd, P10, P90) for planned surgical activity for adults which might be mitigated by avoiding outpatient attendance.

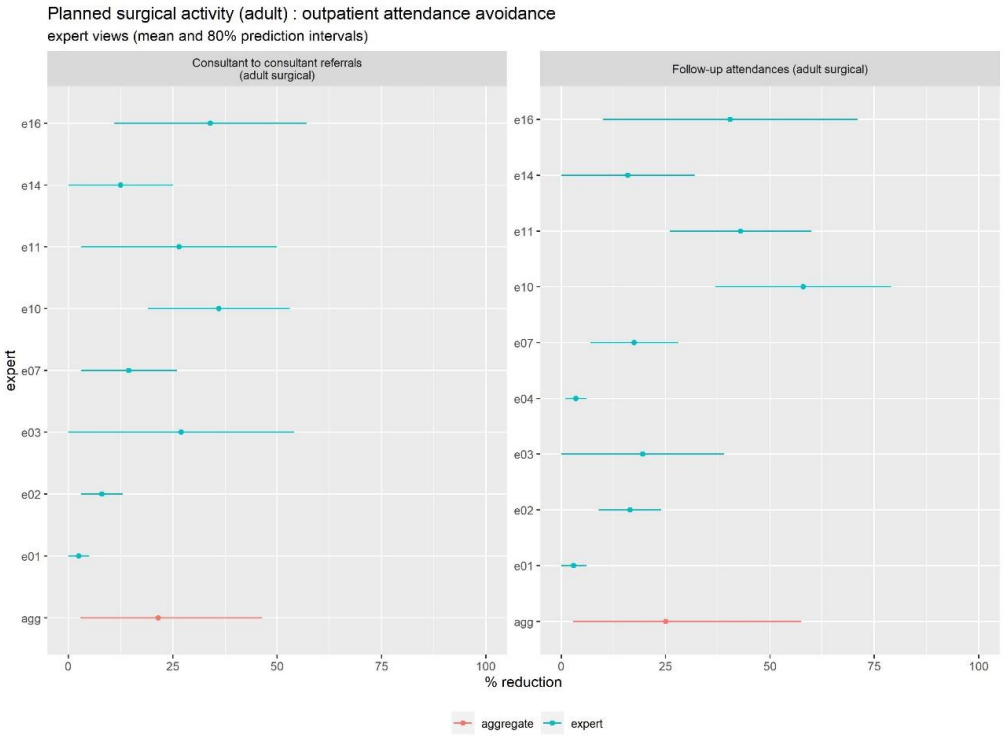

Figure 39 Individual and aggregate forecasts (mean, P10, P90) for planned surgical activity for adults which might be mitigated by avoiding outpatient attendance.

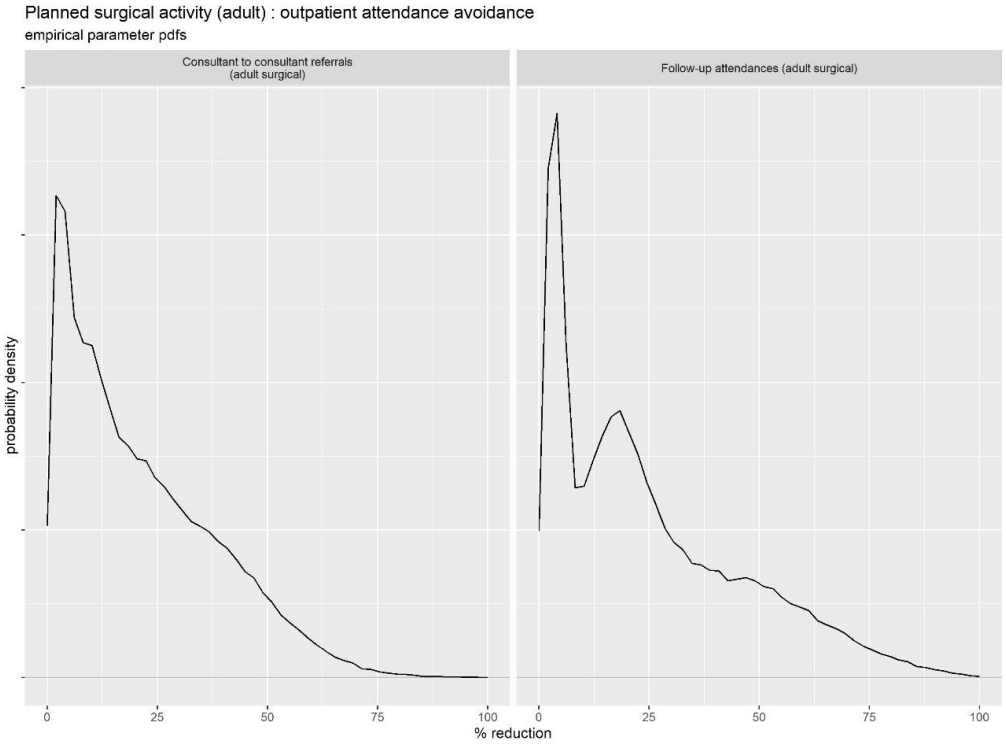

Figure 40 Probability density function (PDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by avoiding outpatient attendance.

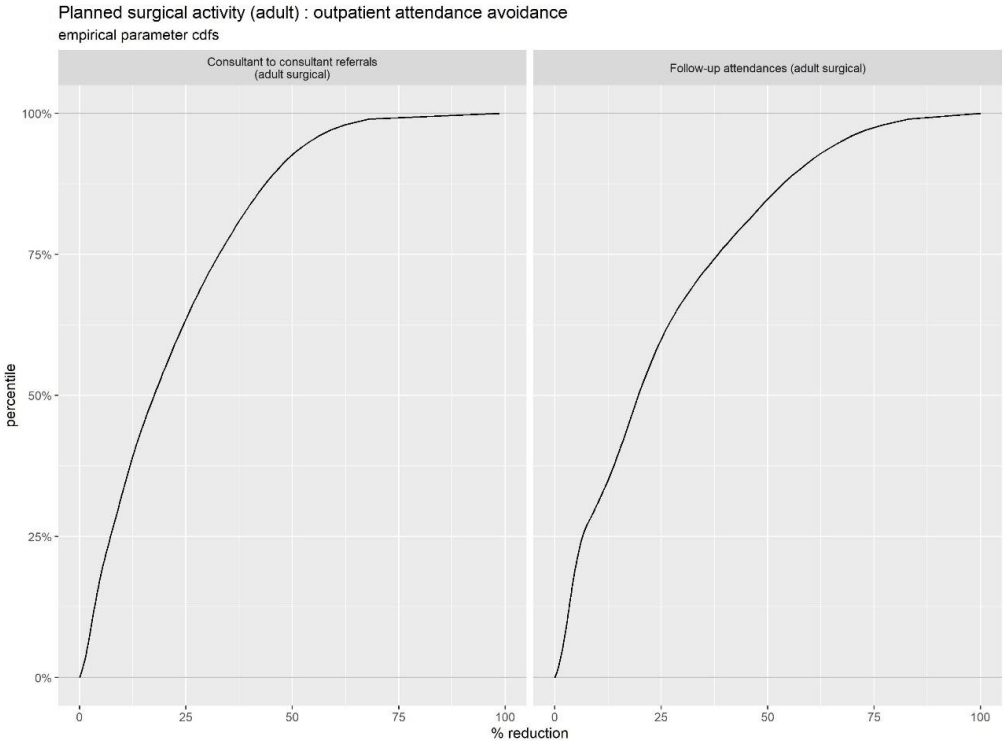

Figure 41 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by avoiding outpatient attendance.

Rationale for P10 values

For consultant-to-consultant referrals, SMEs tended to highlight inefficiencies. Some SMEs stated that increasing sub-specialisation and the specialisation of care at tertiary centres, is a limiting factor. Other low mitigation factors included delays in primary care, primary care resistance to making onward referrals and a failure to digitise. For follow-up attendances, some SMEs described inefficiencies in the delivery of care. Examples here were lack of IT investment and limited availability of virtual clinical environment.

Rationale for P90 values

For consultant-to-consultant referrals, SMEs described greater efficiencies, the effective redirection and relocation of care. Examples included improved triage, a more holistic approach to care, a reversal in the trend towards specialisation, more robust pathways, strong policies relating to referrals, clinical decision support software for diagnostic tests and greater availability of both diagnostic tests and treatment options in community settings.

Similarly, for follow-up attendances, SMEs listed factors which mostly related to improving care, redirecting, and relocating care as mechanisms of mitigating activity. De-adoption was also a mechanism highlighted here. Some SMEs described investment in new models of care, investment in virtual clinics where appropriate, more effective remote monitoring, improved patient education and significant investment in IT systems as well as stopping (ie de-adopting) the offer of 'low value' follow up.

Forecasts for planned surgical activity for adults which might be mitigated by the model of outpatient delivery.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Telephone appointments (adult surgical)	9	33.19	22.97	8.66	68.50

Table 14 Aggregate forecasts (mean, sd, P10, P90) for planned surgical activity for adults which might be mitigated by the model of outpatient delivery.

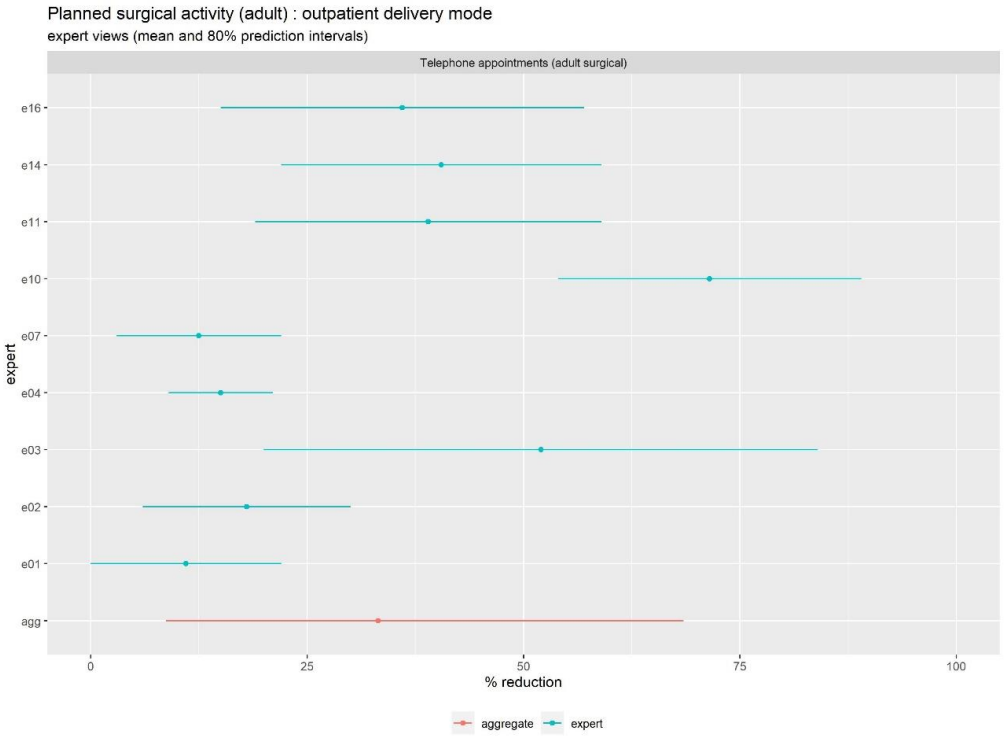

Figure 42 Individual and aggregate forecasts (mean,P10, P90) for planned surgical activity for adults which might be mitigated by the model of outpatient delivery.

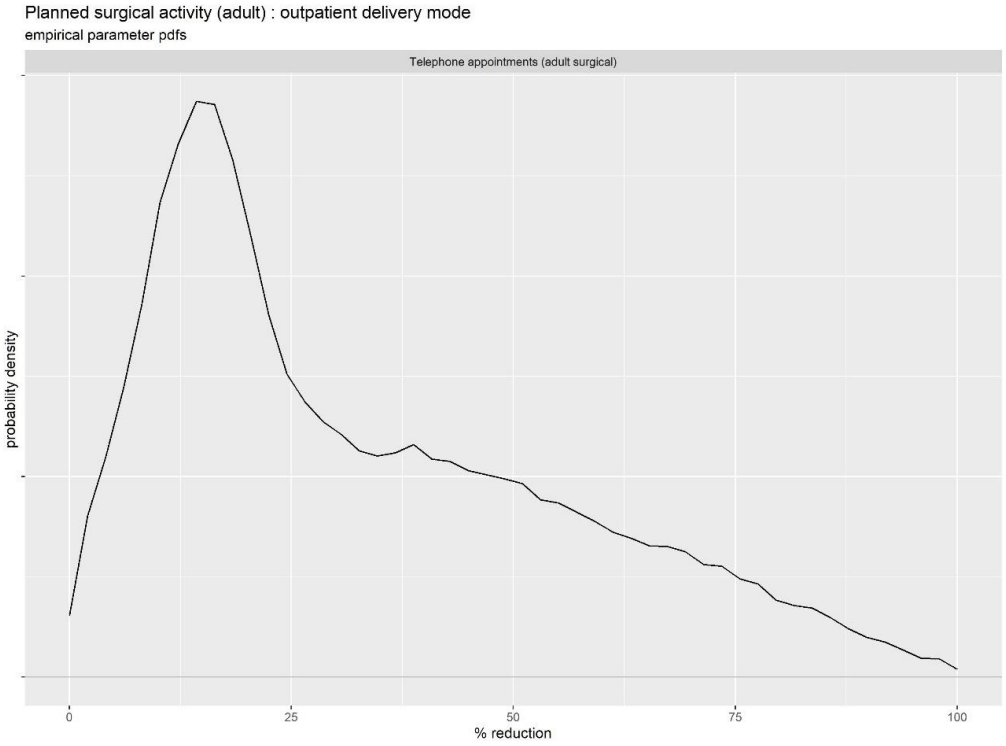

Figure 43 Probability density function (PDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by the model of outpatient delivery.

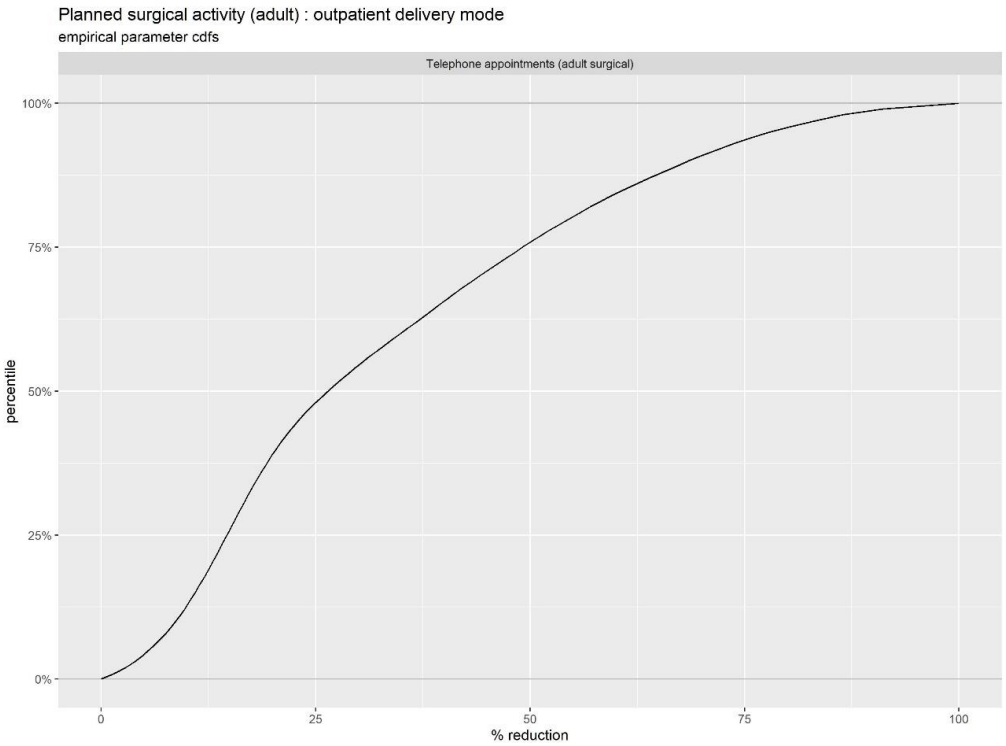

Figure 44 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned surgical activity for adults which might be mitigated by the model of outpatient delivery.

Rationale for P10 values

SMEs listed factors relating to inefficiencies such as a lack of IT investment, low levels of clinical and operational buy-in, poor uptake of digital technology, problems with network speed, insufficient admin support as well as insufficient physical space for virtual clinic appointments to take place. Political pressure to prioritise in-person attendance, clinical concerns regarding the risk of missing abnormal physical findings in surgical patients were also cited.

Rationale for P90 values

SMEs described improvements in delivery of care and the effective substitution of face-to-face consultations to tele or virtual consultations. SMEs referred to significant IT investment, good uptake of digital technology, high levels of clinical buy-in, sufficient admin support and physical space for virtual appointments. One SME described professional bodies leading a transition to tele-medicine becoming the standard outpatient appointment.

Forecasts for planned paediatric activity that might be mitigated by avoiding attendance to outpatients.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Consultant to consultant referrals (child non-surgical)	7	22.69	19.29	4.20	52.74
Consultant to consultant referrals (child surgical)	7	20.03	19.52	2.25	50.62
Follow-up attendances (child non-surgical)	8	17.52	14.74	3.56	40.02
Follow-up attendances (child surgical)	8	16.42	15.54	2.42	40.47

Table 15 Aggregate forecasts (mean, sd, P10, P90) for planned paediatric activity that might be mitigated by avoiding attendance to outpatients.

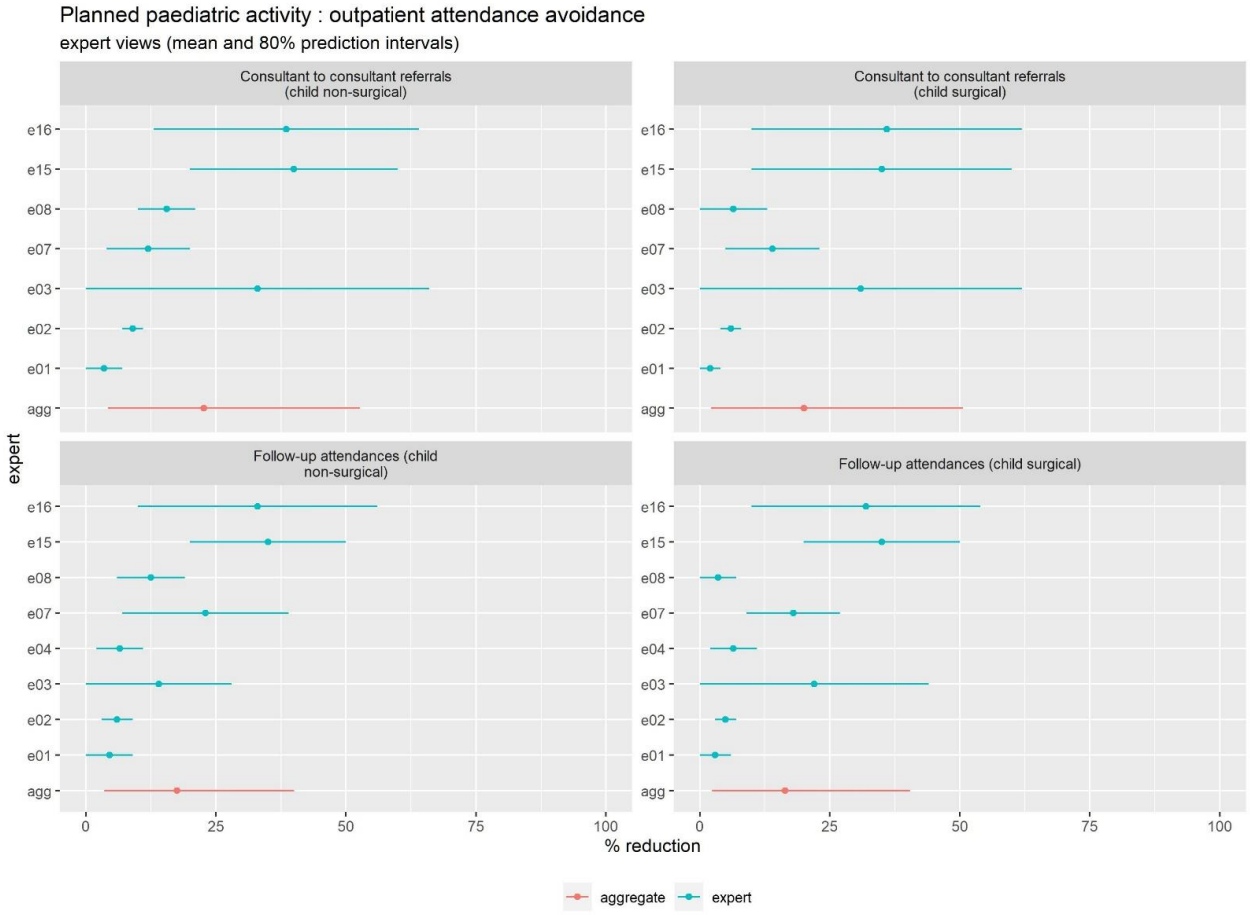

Figure 45 Individual and aggregate forecasts (mean, P10, P90) for planned paediatric activity that might be mitigated by avoiding attendance to outpatients.

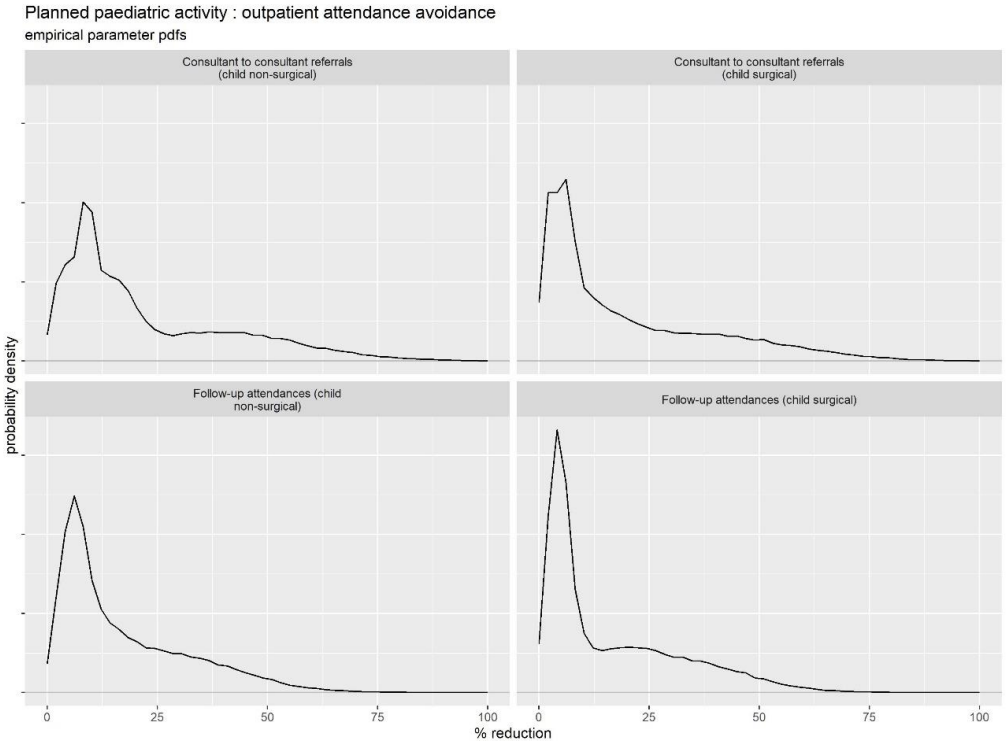

Figure 46 Probability density function (PDFs) of aggregate forecasts for planned paediatric activity that might be mitigated by avoiding attendance to outpatients.

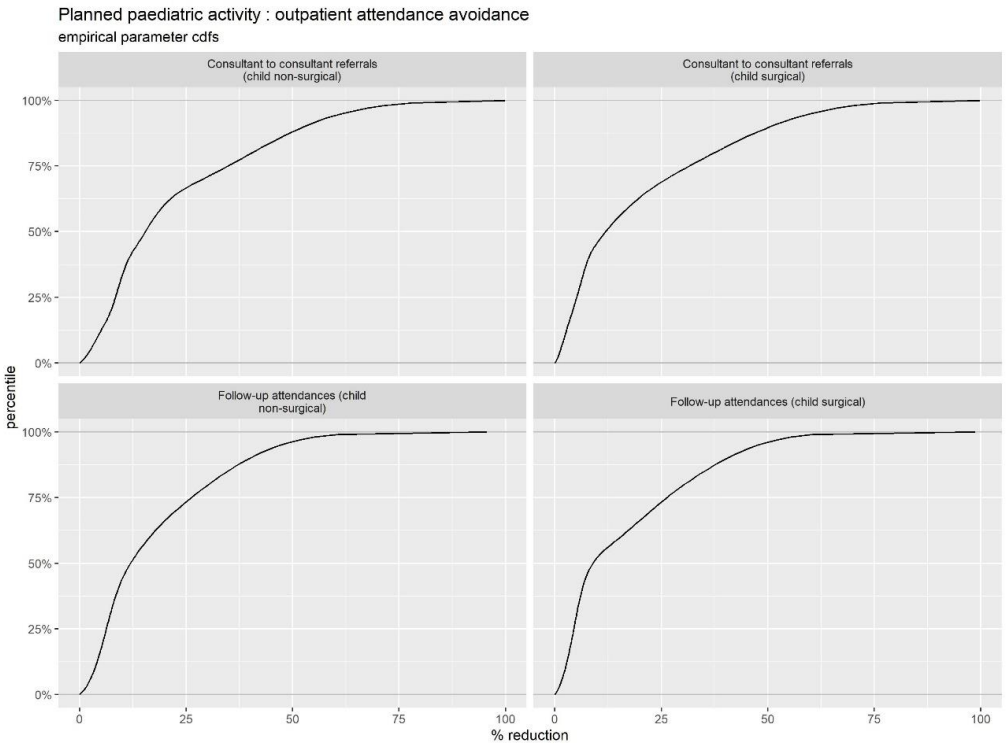

Figure 47 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned paediatric activity that might be mitigated by avoiding attendance to outpatients.

Rationale for P10 values

SMEs mostly highlighted the inefficiencies in the delivery of care resulting from the low experience of workforce, the risk averse culture in the management of children's health and increasing sub-specialisation. Some SMEs also cited high levels of parental demand for their child to be seen by a specialist as limiting factors for activity mitigation.

Rationale for P90 values

SMEs described the effective redirection and relocation of activity as well as efficiency improvements. SMEs listed investment in IT infrastructure with appropriate video consultation facilities, a cultural shift to towards patient-initiated follow-ups as the default follow-up after curative procedures, job planned time for clinicians to review submitted information, effective remote monitoring, and the availability of AHP services and diagnostic tests in a community setting. Some SMEs also referenced that an increased tolerance of risk, stronger MDT discussions, and the removal of variation for referral criteria would contribute to mitigating this activity. The adoption of patient initiated follow up as the default type of follow up described by some SMEs may be considered a type of de-adoption mechanism.

Forecasts for planned paediatric activity that might be mitigated by the mode of outpatient delivery.

The table below lists the types of activity that might be mitigated, and the accompanying figure shows the individual forecasts from SMEs and aggregate values.

Description	N	Aggregate Mean	Aggregate SD	Aggregate P10	Aggregate P90
Telephone appointments (child non-surgical)	7	27.41	18.61	8.21	55.46
Telephone appointments (child surgical)	8	27.86	17.80	9.96	53.80

Table 16 Aggregate forecasts (mean, sd, P10, P90) for planned paediatric activity that might be mitigated by the mode of outpatient delivery.

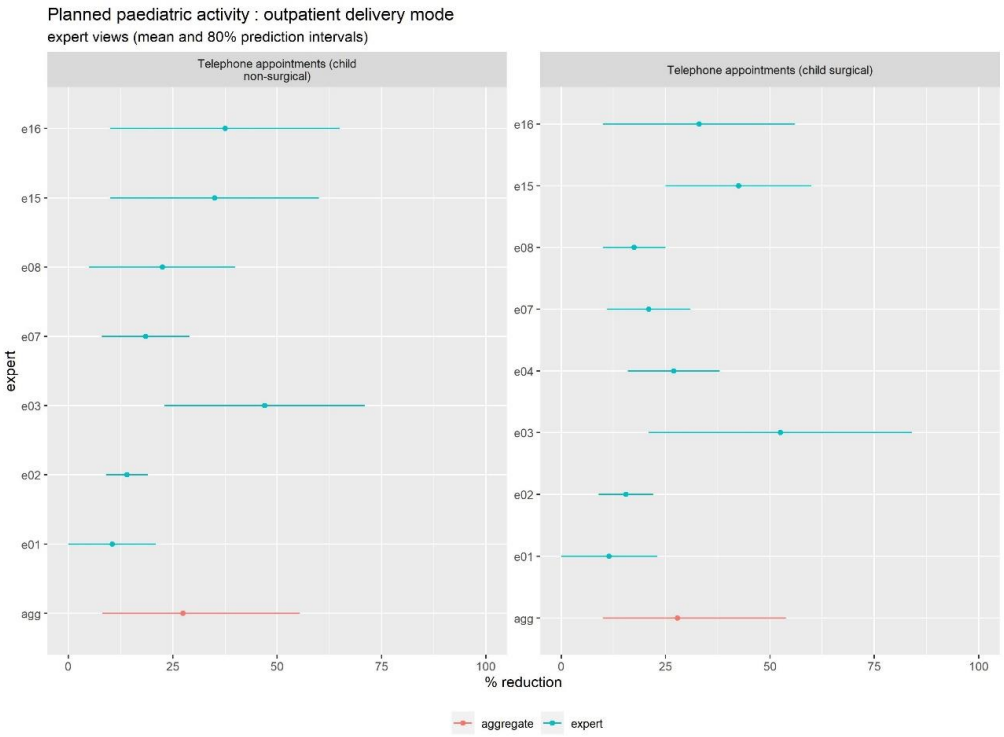

Figure 48 Individual and aggregate forecasts (mean, P10, P90) for planned paediatric activity that might be mitigated by the mode of outpatient delivery.

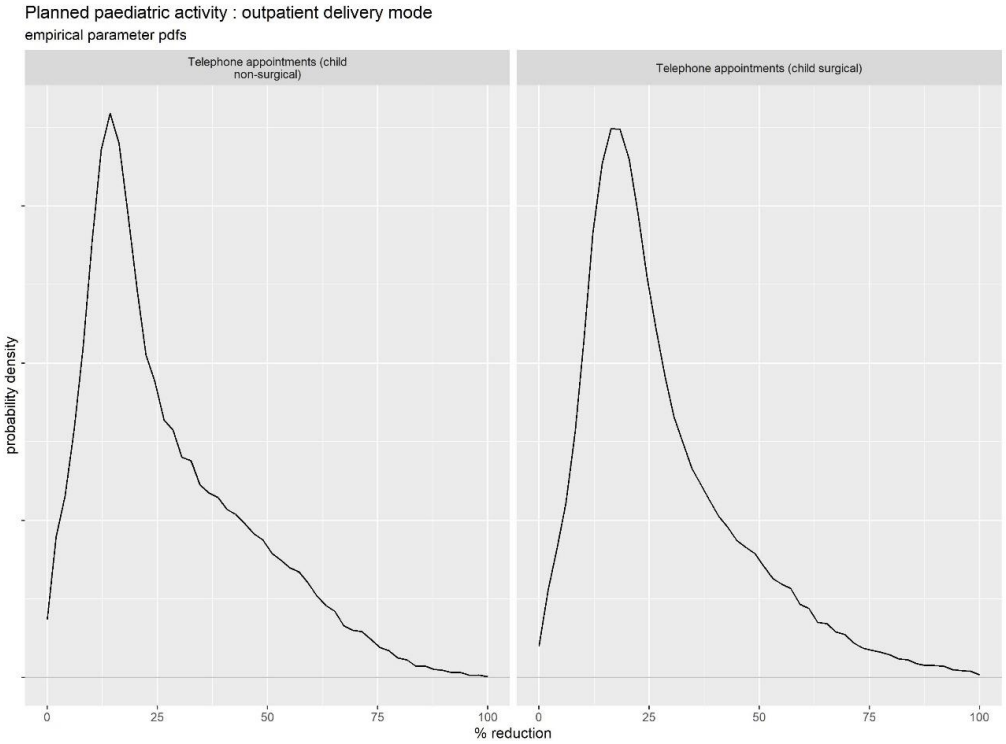

Figure 49 Probability density function (PDFs) of aggregate forecasts for planned paediatric activity that might be mitigated by the mode of outpatient delivery.

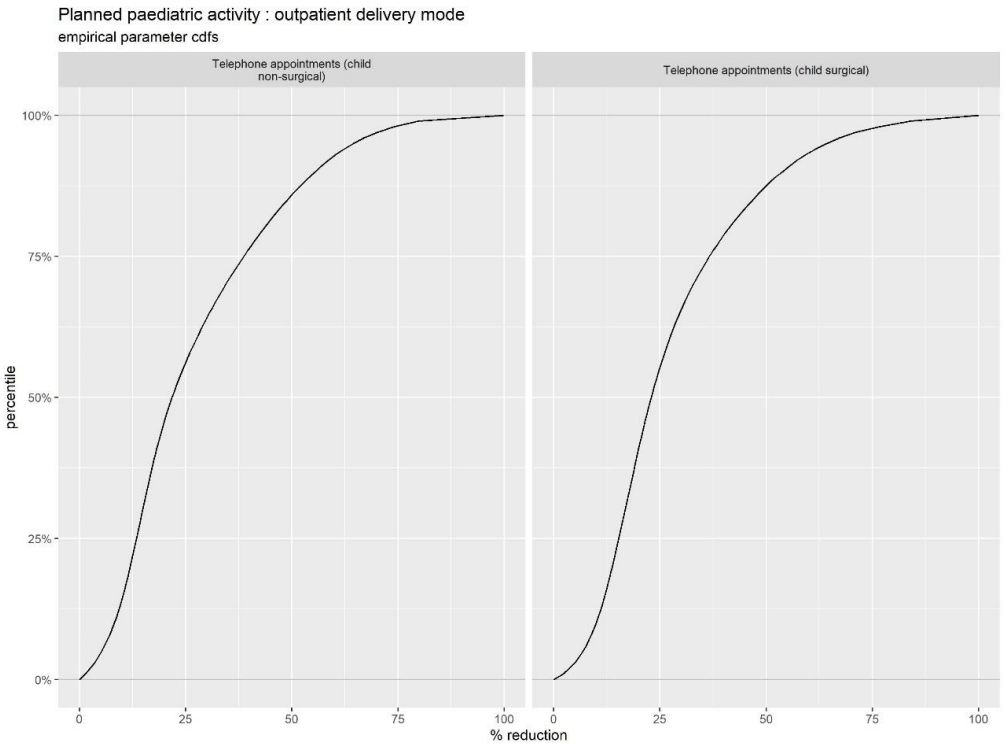

Figure 50 Empirical cumulative distribution functions (ECDFs) of aggregate forecasts for planned paediatric activity that might be mitigated by the mode of outpatient delivery.

Rationale for P10 values

Most SMEs described a lack of improvements in the delivery in care. Rationales included descriptions of increased risk aversion in children's virtual health care management and a lack of clinical buy-in. SMEs referenced the challenge of virtually assessing the safety of children and a workforce with insufficient paediatric skills. Other factors cited by SMEs included poor uptake of digital technology, challenges with IT infrastructure or network speeds (applicable to clinicians as well patient families), poor quality referrals with limited information, insufficient admin support and insufficient physical space for virtual appointments.

Rationale for P90 values

SMEs cited improvements and the effective relocation of care. SMEs described better use of digital technology, investment in community diagnostic hubs, advances in remote monitoring, a focus on remote consultation as part of medical education or training and clear referral standards with enhanced quality of clinical information from referrers. SMEs also suggested that mitigation of activity would be dependent on clinical buy-in, sufficient admin support, access to electronic patient records for effective decision making, and sufficient physical space for virtual appointments. In addition, SMEs mentioned better communication with families to understand the preferences of children and young people and their families, as well as presenting information regarding carbon footprint and financial costs associated with face-to-face consultations.