

# Actuarial benchmarking of inpatient admissions within England using international comparators

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We compare NHS inpatient surgical and medical admissions to our international, evidence-based, real-world benchmarks. These benchmarks allow quantification of potentially avoidable admissions within a healthcare system to identify potential value opportunities.

Using National Health Service (NHS) Hospital Episode Statistics (HES) data, we have grouped, summarised and compared the inpatient admissions within England to our international, real-world benchmarks. In this paper we share an overview of our results.

We have analysed the data for England nationally and individually for each of the 195 clinical commissioning groups (CCGs) within England.

Our analysis spans over six years, covering financial years (FYs) 2013-14 to 2018-19, where each FY runs from 1 April to 31 March. Each FY of data is benchmarked independently to other years of experience to identify potentially avoidable admissions nationally and by CCG. As a result, we have also studied the movement and trends in levels of potentially avoidable inpatient admissions over time.

## Overview of our international best practice benchmarks (IBPBs)

Milliman's international best practice benchmarks (IBPBs) help to quantify avoidable admissions within a healthcare system to identify potential value opportunities. Our benchmarks represent real, empirical and achievable utilisation levels, rather than being theoretical benchmarks, which may not represent actual achievable utilisation levels.

The IBPBs are based on a wide range of data and represent a standard of what is possible with optimal infrastructure and strict use of evidence-based pathways to limit unwarranted variation. For example, an area with the sufficient levels of staffing and, for example, readily available step-down bed supply or community resources for discharged patients would contribute towards having an optimal infrastructure.

Through adjustments for local demographics, our benchmarks provide a meaningful comparison point for each specific population rather than a comparison to other health economies that may be operating in a constrained supply-side system. For example, the NHS often uses internal benchmarks for inpatient admissions, but if these benchmarks are derived from areas that have long waiting lists, they do not represent a fair comparison.

Our inpatient benchmarking tool uses IBPBs to create reasonable, relevant and meaningful benchmarks of inpatient admissions, to compare against actual inpatient medical and surgical admissions and to identify potentially avoidable admissions.

### DEGREE OF HEALTHCARE MANAGEMENT (DOHM)

The benchmarks discussed in the following results can be categorised by their degree of healthcare management (DoHM), as can be seen in Figure 1.

In our analysis we consider benchmarks at a 50% DoHM and a 75% DoHM to compare to actual admissions data from the NHS HES. Each figure represents the respective proportion of a well-managed healthcare system, where 100% DoHM would represent a well-managed healthcare system, and 0% DoHM would represent a loosely managed healthcare system.

Using our benchmarks, we are able to classify healthcare systems by their degrees of health management. This is often an indication of a system's:

- Compliance to evidence-based care guidelines
- Access or restrictions to services
- Use of incentives (e.g., overuse, outcome-based, not linked to cost control or perverse)

**FIGURE 1: DEGREES OF HEALTHCARE MANAGEMENT (DOHM)**



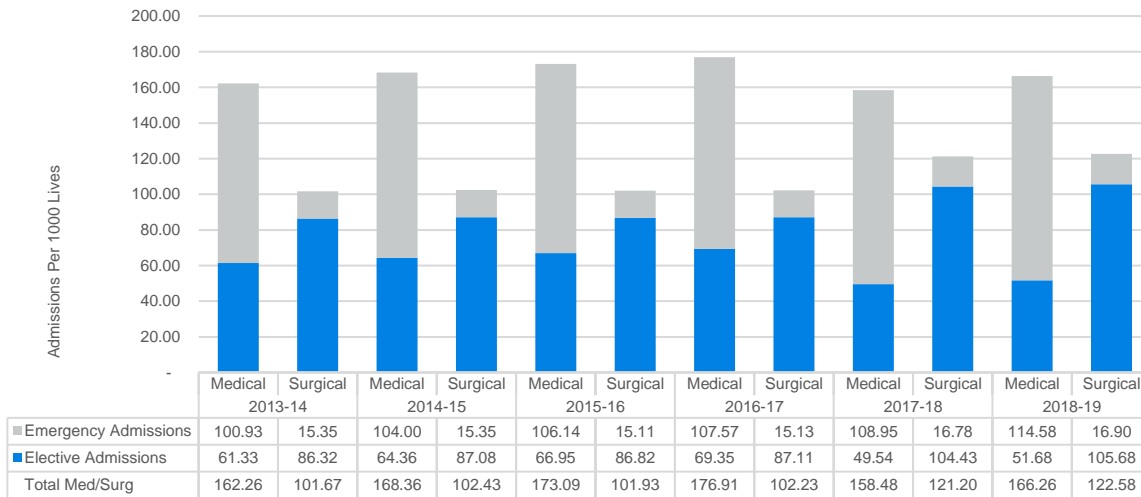
We use our Milliman Clinical Categories (MCCs) as a grouping mechanism for admissions. MCCs are based on the clinical characteristics of each individual inpatient admission, and are mapped to the respective coding classifications of the benchmarks and NHS HES data. MCC's provide a means to compare the actual and expected admissions in a clinically meaningful way across different systems that use different coding classifications.

### Admissions in England

Total admissions have increased over time within the NHS, despite research showing that the number of NHS hospital beds in England has reduced<sup>1</sup> over the same period.

Figure 2 shows the number of inpatient admissions per 1,000 lives, split by medical and surgical procedures, and elective and emergency, in England over the past six financial years.

**FIGURE 2: SURGICAL AND MEDICAL INPATIENT ADMISSIONS PER 1,000 LIVES, BY EMERGENCY AND ELECTIVE**



The HES data shows an increasing pattern in the total inpatient admissions per 1,000 lives year on year, with both total medical and total surgical admissions per 1,000 having increased in aggregate from FY 2013-14 to FY 2018-19.

Medical admissions per 1,000 lives dip in the total number per 1,000 by year from FY 2016-17 to FY 2017-18, with surgical admissions per 1,000 lives increasing between the same years. The movement is seen to impact elective admissions directly, with emergency admissions showing a continued increasing trend in admissions per 1,000 lives in both medical and surgical groups.

<sup>1</sup> The King's Fund (March 2020). NHS Hospital Bed Numbers: Past, Present, Future. Retrieved 20 November 2020 from <https://www.kingsfund.org.uk/publications/nhs-hospital-bed-numbers#:~:text=The%20total%20number%20of%20NHS,patients%20treated%20has%20increased%20significantly.>

Both medical and surgical procedures consist of elective and emergency admissions, but the majority of emergency admissions are medical procedures. Emergency admissions make up more than half of all medical inpatient admissions every year.

**ACTUAL ADMISSIONS OVER ENGLAND BY MCC IN FY 2018-19 VS. THE EXPECTED ADMISSIONS FROM A 50% DOHM BENCHMARK**

Figure 3 compares actual admissions per 1,000 lives by MCC category to the 50% DoHM benchmark, by MCC categories, in England in FY 2018-19.

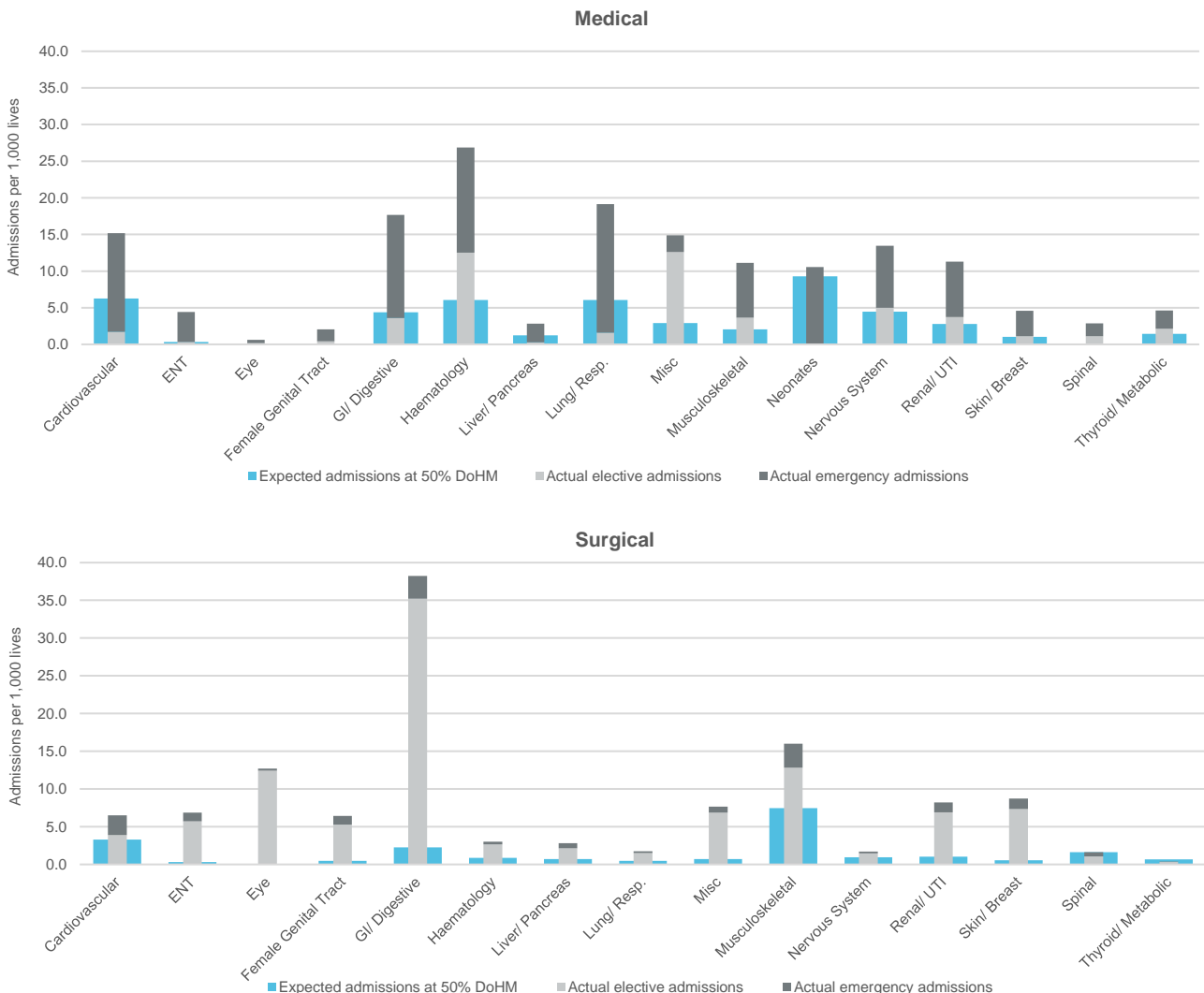
The count of actual admissions per 1,000 lives is much higher than the expected admissions at a 50% DoHM for nearly all MCC categories.

The top five MCC categories with the highest actual admissions per 1,000 lives for FY 2018-19 are:

- Surgical gastrointestinal (GI) and digestive
- Medical hematology
- Medical lung and respiratory
- Medical GI and digestive
- Surgical musculoskeletal

Higher counts of actual admission per 1,000 lives compared to the benchmark levels is a common theme also seen across a number of CCGs within England, when comparing their individual admissions to their respective benchmarks.

**FIGURE 3: ACTUAL 2018-19 ADMISSIONS PER 1,000 LIVES IN ENGLAND COMPARED TO EXPECTED ADMISSIONS AT 50% DOHM**



## Identifying potentially avoidable admissions in England

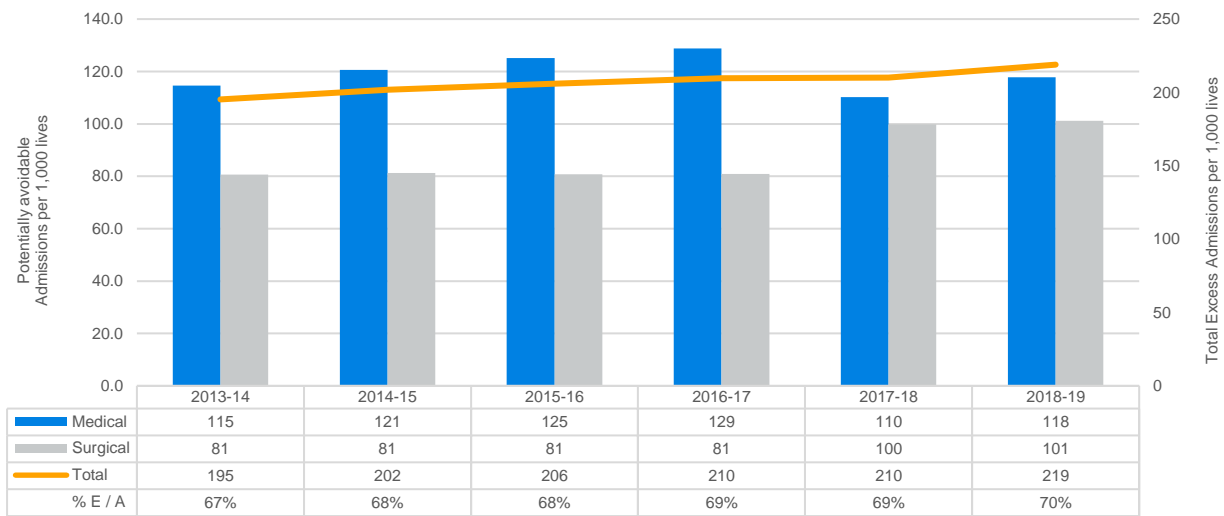
### POTENTIALLY AVOIDABLE ADMISSIONS IN ENGLAND

By analysing the differences in the actual admissions and the expected admissions using our 50% DoHM benchmark, we identify potentially avoidable admissions. It is possible to identify trends over time in potentially avoidable admissions, as well clinical categories with the greatest number of potentially avoidable admissions.

Figure 4 is an overview of the potentially avoidable admissions identified over all ages within England, by each financial year, using a 50% DoHM benchmark. Over the period of six years, potentially avoidable admissions per 1,000 lives in England have increased by just over 12%.

There is a significant increase in the total potentially avoidable admissions per 1,000 lives in FY 2018-19, largely attributed to medical admissions with surgical admissions remaining relatively stable between the two years. There is no change in the total potentially avoidable admissions per 1,000 lives in England between FY 2016-17 and FY 2017-18.

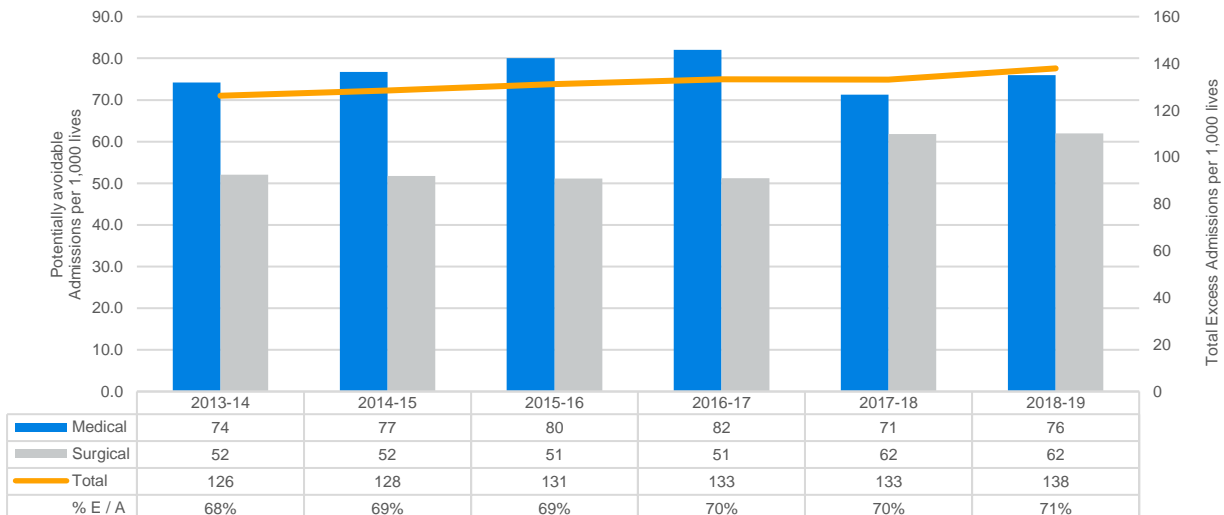
**FIGURE 4: POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES FOR ENGLAND FROM 2013-14 TO 2018-19 USING A 50% DOHM BENCHMARK**



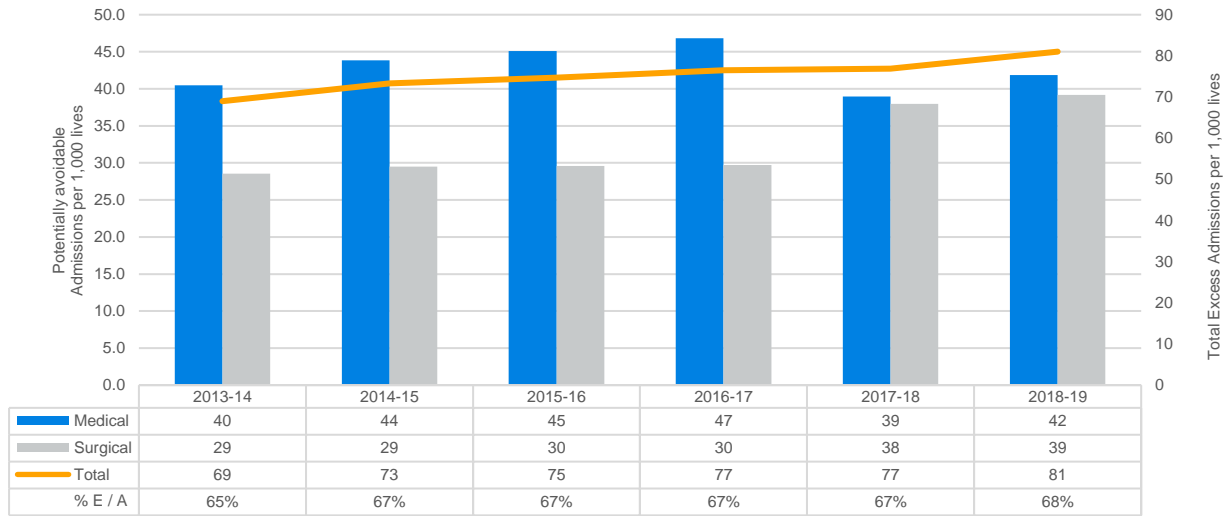
% E / A provides a view of the proportion of total actual admissions that are identified as potentially avoidable.

When splitting the above potentially avoidable admissions by those over and under age 65, as shown in Figures 5 and 6, a greater number of potentially avoidable admissions per 1,000 lives are seen for under-65s compared to over-65s. Both have similar patterns over the six-year period analysed.

**FIGURE 5: POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES FOR ENGLAND FOR UNDER-65S, FROM 2013-14 TO 2018-19 USING A 50% DOHM BENCHMARK**



**FIGURE 6: POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES FOR ENGLAND FOR OVER-65S, FROM 2013-14 TO 2018-19 USING A 50% DOHM BENCHMARK**



**AMBULATORY CARE SENSITIVE CONDITIONS**

NHS England identify emergency admissions for ambulatory care sensitive conditions (ACSCs) as conditions where effective community and primary care, together with case management, delivered in a timely manner, may potentially result in the prevention of a hospital admission. ACSCs comprise chronic long-term conditions and acute conditions which usually do not require a hospital admission, over all ages.

Analysis carried out by NHS Digital<sup>2</sup> on healthcare conditions where unplanned hospitalisations may be prevented or reduced identifies that the following seven conditions represent three-quarters of ACSCs spells:

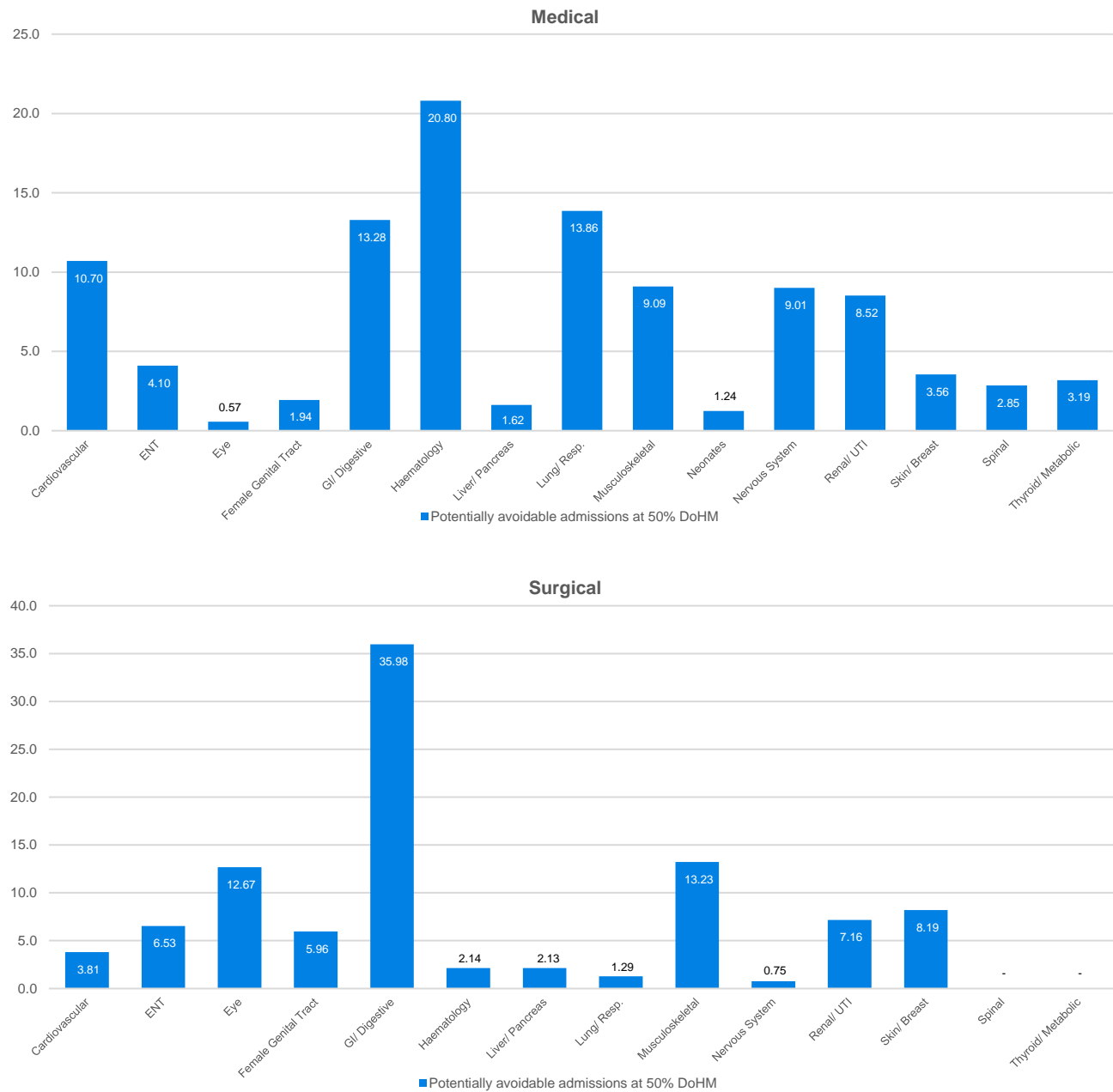
1. Influenza and pneumonia
2. Chronic obstructive pulmonary disease (COPD)
3. Ear, nose and throat infections
4. Convulsions and epilepsy
5. Diabetes complications
6. Cellulitis
7. Asthma

Figure 7 shows the potentially avoidable admissions we identified over England, against a 50% DoHM benchmark. The five MCCs with the greatest number of potentially avoidable admissions are:

- Surgical GI/digestive
- Medical hematology
- Medical lung/respiratory
- Medical GI/digestive
- Surgical musculoskeletal

<sup>2</sup> NHS Digital. Ambulatory Care Sensitive Conditions (ACSC). Retrieved 18 January 2020 from <https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/innovative-uses-of-data/demand-on-healthcare/ambulatory-care-sensitive-conditions>

FIGURE 7: POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES AT 50% DOHM BY MCC FOR 2018-19



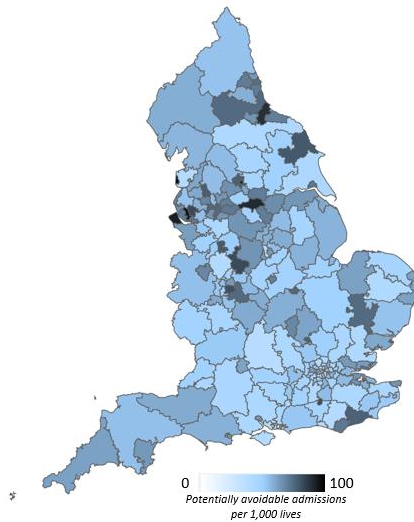
There is a reasonable degree of overlap between the seven conditions leading to ACSCs identified by NHS Digital and the top five MCCs we identified as having the greatest potentially avoidable admissions. In particular, influenza, pneumonia, asthma and COPD conditions are covered in medical lung and respiratory and diabetes related complications contribute to surgical and medical GI/digestive conditions.

## Potentially avoidable admissions by CCG

Figure 8 is a heat map showing the variation in potentially avoidable admissions per 1,000 lives identified in England using a 50% DOHM benchmark, by CCG, for FY 2018-19, with a magnified view of the CCGs in London in Figure 9.

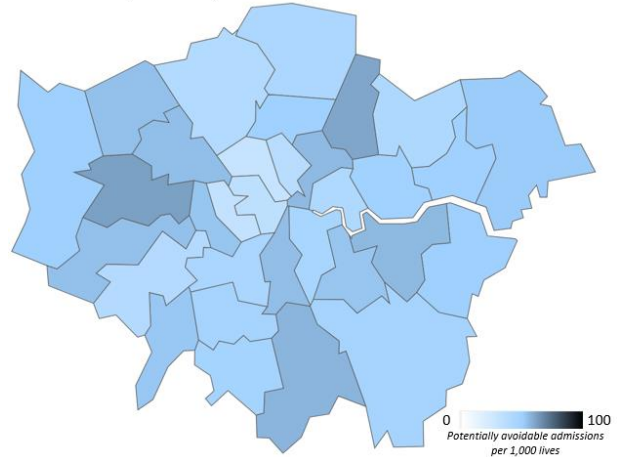
**FIGURE 8: POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES (2018-19), 50% BY CCG IN ENGLAND**

**Potentially avoidable admissions per 1,000 lives (2018-19) – 50% by CCG in England**



**FIGURE 9: POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES (2018-19), 50% BY CCG IN LONDON**

**Potentially avoidable admissions per 1,000 lives (2018-19) – 50% by CCG in London**



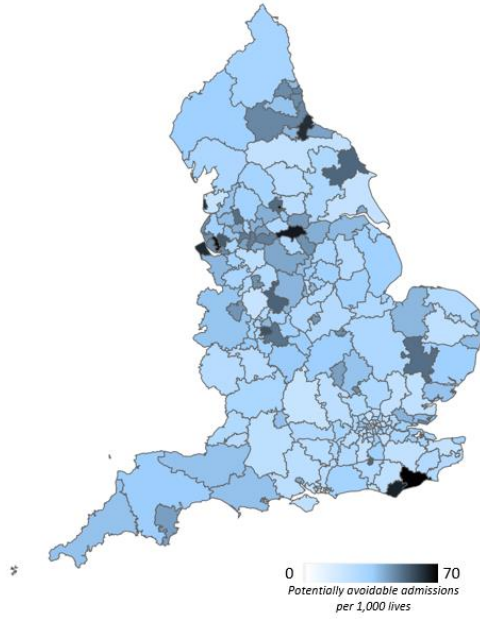
The highest levels of potentially avoidable admissions are seen in the northern part of England, with Bradford City CCG having the highest potentially avoidable admissions per 1,000 lives, followed by Blackpool CCG, Knowsley CCG and Wirral CCG.

The levels of potentially avoidable admissions per 1,000 lives are comparatively lower in all CCGs within London, with the highest being Ealing CCG. Camden CCG has the fewest potentially avoidable admissions per 1,000 lives in not only London but the whole of England.

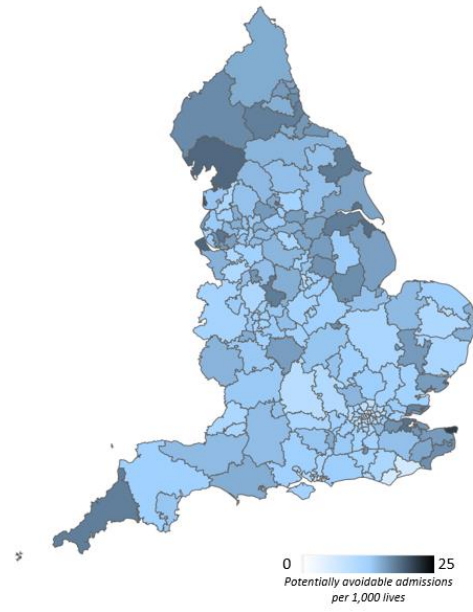
Looking at the above heat maps by medical and surgical admissions highlights differences in the variation in potentially avoidable admissions per 1,000 lives over England, with a greater proportion of potentially avoidable admissions linked to medical admissions rather than surgical. This is highlighted in the heat maps in Figure 10.

FIGURE 10: MEDICAL AND SURGICAL POTENTIALLY AVOIDABLE ADMISSIONS, ENGLAND AND LONDON

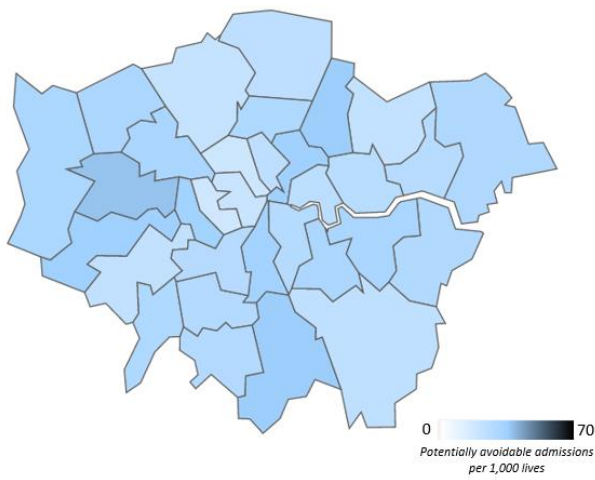
Medical potentially avoidable admissions per 1,000 lives (2018-19) – 50% by CCG in England



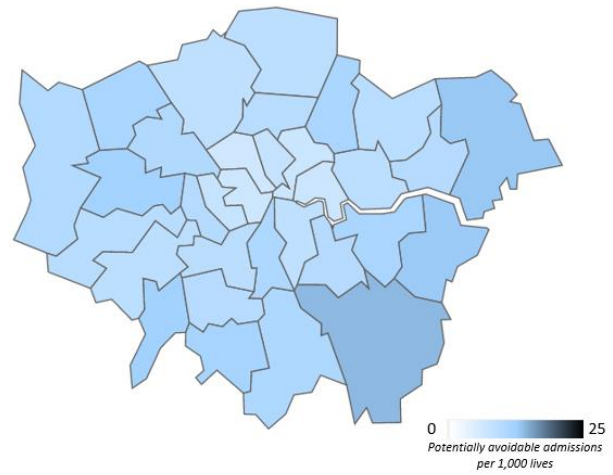
Surgical potentially avoidable admissions per 1,000 lives (2018-19) – 50% by CCG in England



Medical potentially avoidable admissions per 1,000 lives (2018-19) – 50% by CCG in London



Surgical potentially avoidable admissions per 1,000 lives (2018-19) – 50% by CCG in London



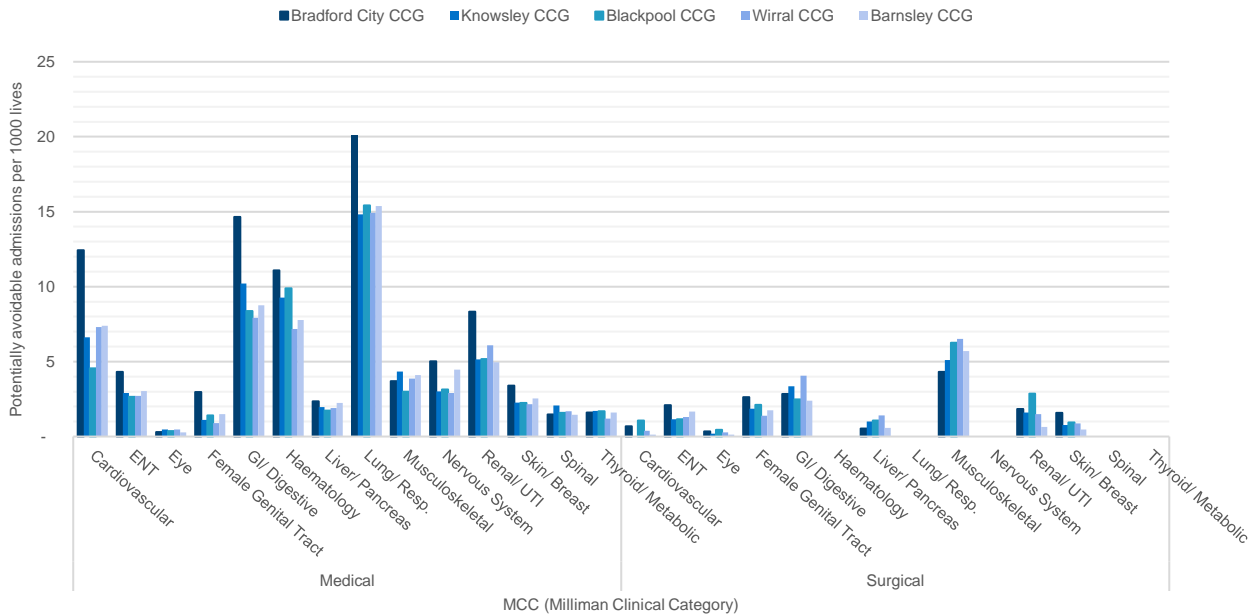


**CCGS WITH THE HIGHEST AND LOWEST NUMBERS OF POTENTIALLY AVOIDABLE ADMISSIONS**

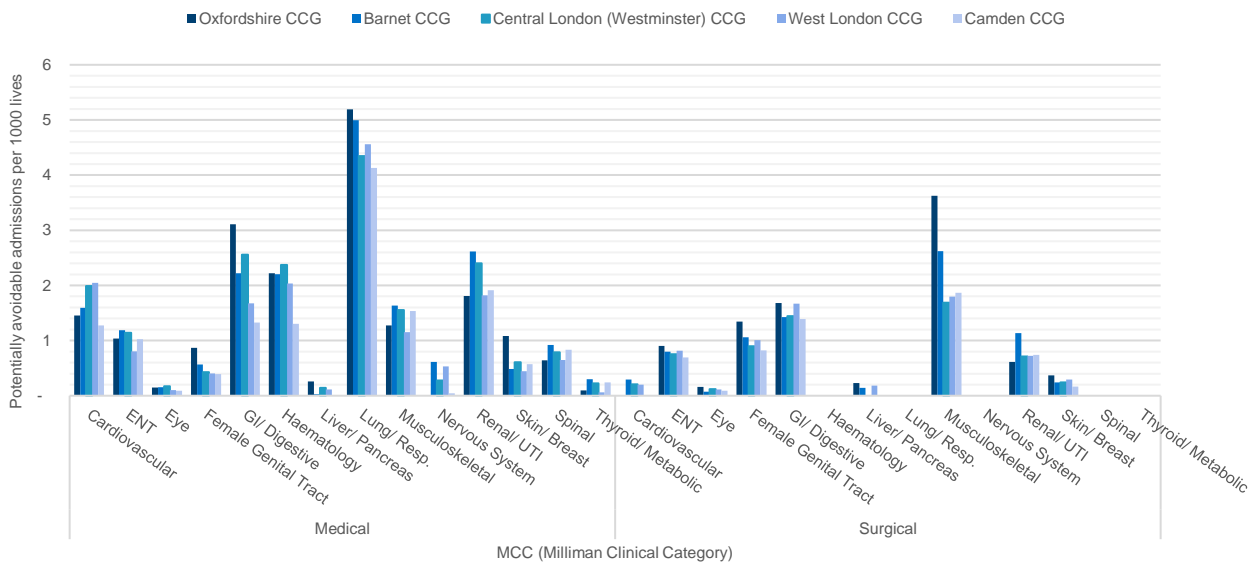
Potentially avoidable admissions have been identified by each of the 195 CCGs within England using the same methodology as the whole of England benchmarks. Using the demographics within each CCG, benchmarks are risk-adjusted for age and sex so that they are relevant and meaningful for the respective CCG.

Figures 11 and 12 provide a view of five CCGs with the highest and lowest numbers of total identified potentially avoidable admissions per 1,000 lives in FY 2018-19, by MCC categories using a 50% benchmark.

**FIGURE 11: FIVE CCGS WITH THE HIGHEST NUMBERS OF POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES IN 2018-19**



**FIGURE 12: FIVE CCGS WITH THE LOWEST NUMBERS OF POTENTIALLY AVOIDABLE ADMISSIONS PER 1,000 LIVES IN 2018-19**



Though there is variation in the relative levels of potentially avoidable admissions per 1,000 lives over the different MCC categories, the overall distribution is fairly similar, with the categories with the highest levels of potentially avoidable admissions per 1,000 lives found in similar categories.

Using the NHS RightCare tool "Similar 10 CCG Explorer Tool"<sup>3</sup> to explore CCGs similar to Bradford City CCG, which was identified as having the greatest number of potentially avoidable admissions per 1,000 lives in FY 2018-19, we see that Knowsley CCG and Blackpool CCG are two of three CCGs with the most similar deprivation within their population to Bradford CCG. Whilst the data in our model is risk-adjusted for the age and sex distribution of each CCG, it does not account for the social determinants of health or other factors such as ethnicity. This means that the benchmarks in areas with high levels of health burden due to factors other than age may potentially be understated.

## Tackling avoidable admissions

A view of actual admissions against a real-world, achievable benchmark allows an organisation to identify areas to further investigate when considering methods to reduce inefficiencies within a healthcare system. However, such analysis needs to be backed up by detailed clinical investigation to determine whether those value opportunities can be realised.

Our benchmarks allow a comparison to actual data at a more granular level since each MCC group consists of a number of subcategories, each benchmarked individually and independently. It is possible to use the subcategories to develop specific interventions that are most meaningful for a particular health system. Once implemented, these interventions can be tracked against the benchmark in the future.

Therefore, through the use of past data, and the corresponding benchmarks, it is possible to target efforts in specific geographic areas. Our MCCs provide benchmarks at a high level (e.g., all cardiovascular procedures) or a more granular and targeted level (e.g., cardiac valve procedures only), and therefore allow us to flex the analysis based on the type of intervention under consideration.

By identifying potentially avoidable admissions, CCGs and primary care professionals can work together to identify members of the population who, through community-based or other interventions, may reduce the likelihood or the clinical severity of a hospital admission in the future.

Where there may be a high number of potentially avoidable admissions, such as GI/digestive services, both medical and surgical, the use of targeted campaigns to educate the public on prevention and management, including services available within the community, could help address avoidable admissions.

Population health management (PHM) techniques are becoming the method of choice to help tackle preventable diseases through early interventions and the increased availability of a range of primary care and community services that are easily accessible to members of the public showing signs of specific conditions. Through combining the efforts of a PHM initiative and the results of this analysis, programmes can be introduced which can be measured specifically against changes in utilisation rates, and can be measured against the benchmark.

Through looking at CCGs individually in our analysis, we have seen a high level of variation in the number of potentially avoidable admissions per 1,000 lives across England. The variation also extends to the overall range of potentially avoidable admissions, by clinical description. The variation in potentially avoidable admissions highlights how greatly the requirements within each subpopulation, by CCG, vary, meaning that interventions specific to local areas are much more likely to succeed in reducing overall admissions in the country than a national-level policy.

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<sup>3</sup> NHS. Similar 10 CCG Explorer Tool. Retrieved 20 November 2020 from <https://www.england.nhs.uk/publication/similar-10-ccg-explorer-tool/>.

## Conclusion

Using our international benchmarks to compare utilisation of inpatient services within England, we have identified potentially avoidable admissions. Our analysis highlights that the clinical categories identified as having the greatest level of potentially avoidable admissions can vary across the country by CCG, though there are similarities.

We have considered methods in which CCGs can use the data, our benchmarks and the resulting analysis to not only identify the avoidable admissions but also to use as a method to track progress for any interventions employed. Through identification of cohorts that may contribute towards avoidable hospital visits, CCGs and other responsible healthcare participants can aim to provide earlier interventions, with the aim to remove the requirement for hospitalisation.

## Data limitations

We have relied on the data extraction and manipulation conducted by the NHS HES data team. Whilst we have reviewed the reasonableness and consistency of the data, our results are as accurate and complete as the data provided to us. It is possible that with additional local data our analysis can be further enhanced to provide a more reflective view of potentially avoidable admissions.



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