

Research appendix

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Methods

To look at emergency admissions for young children we used the Hospital Episode Statistics (HES) admitted patient care dataset for England. (NHS Digital, 2020) We received pseudonymised data from NHS Digital and applied suppression in our results according to the HES analysis guide. (NHS Digital, 2019) Our analysis focused on the period 2009/10 to 2018/19 and looked at the use of emergency hospital care by children up to 5 years of age. We excluded infants with an age of less than one day as it was not always possible to accurately separate an emergency admission from a hospital birth event where no emergency care for the infant was needed. We also excluded activity that was paid for privately as access to this care and the processes around it are likely to be different to NHS funded care.

As natural changes in the population over time and by area, such as increased births, can lead to differences in emergency admissions we calculated directly standardised rates. This means that any changes we presented have taken account of the population size and structure. To calculate directly standardised rates we used the Office for National Statistics mid-year population estimates with a reference population of the England age and sex structure in 2018/19. (Office for National Statistics, 2019) Rates were adjusted for age and sex using the relevant population denominators for each group. Some rates were additionally broken down by the 2015 index of multiple deprivation (IMD) deciles. (Ministry of Housing Communities and Local Government, 2015) Deprivation deciles are calculated for lower layer super output area that the child resides in. We used the population aged zero as the denominator for all HES age bands of children less than 1 year old as there are no recognised population counts for these specific age bands.

Defining short- and long-stay emergency admissions

We wanted to capture short-stays as emergency admissions lasting less than 24 hours but in the absence of a time stamp on admission and discharge, we had to define length of stay based on admission and discharge dates. We chose to define short-stay emergency admissions as when a child was admitted and then discharged

on the same day or the following day. Long stay emergency admissions were when a child was admitted and then discharged after at least two calendar days.

Modelling emergency admissions by paediatric assessment unit co-location

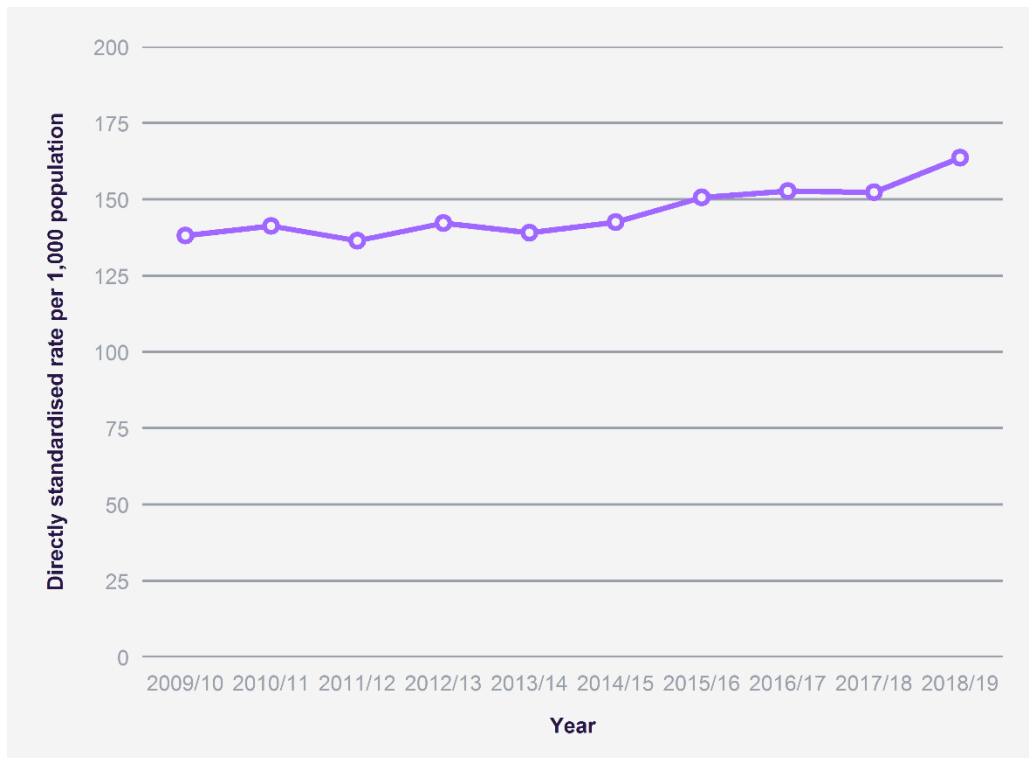
To try and understand whether paediatric assessment units (PAU) had any impact on the number of emergency admissions by hospital we used information from the Royal College of Paediatrics and Child Health 2015 Workforce Census. (Royal College of Paediatrics and Child Health, 2017) This included self-reported information on whether hospitals in England had a paediatric assessment unit in 2015 and where it was co-located: the emergency department, the inpatient ward, both, stand-alone or unknown location. We recoded units that stated they were co-located with both the ward and emergency department as co-located with the emergency department as they should reduce emergency admissions if they are active in the emergency department. Stand-alone units were coded as ward units as they would not be part of A&E data.

To calculate emergency admission rates by hospital we needed a population denominator for hospitals. We used a published hospital catchment population methodology which allocates the population based on activity from lower layer super output areas at each hospital by age and sex. (Arora and others, 2018) We took emergency admission counts and populations from 2016/17 as we felt that this year would most closely align to after the Workforce Census data was collected as we did not know when any new units might have opened across 2015. We also tested the models with the 2015/16 data and the results held.

We estimated Poisson models for count data (number of emergency admissions) adjusting for the age and sex distribution of the catchment population of each hospital using an exposure variable. We obtained robust standard errors adjusting for clustering of observations by age and sex at each hospital. We included where the PAU was collocated as an explanatory variable. The results of this model gave us average adjusted emergency admission rates by PAU co-location. We constructed the model for both short- and long-stay emergency admissions.

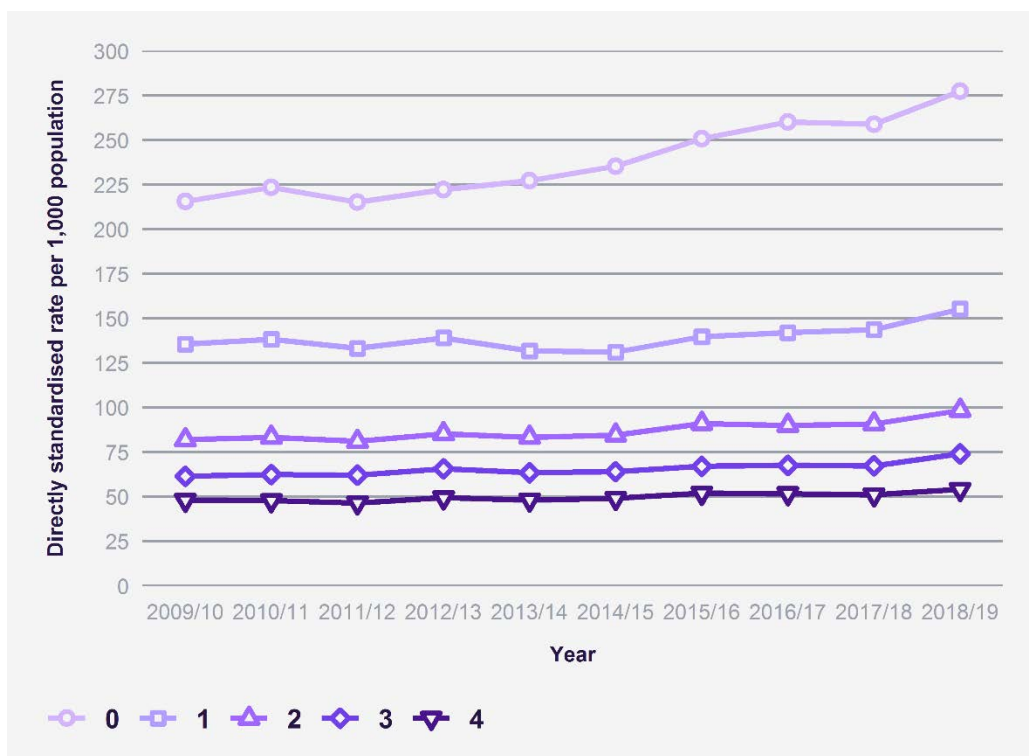
Supporting charts

Figure 1: Emergency admission rates for children aged under five, 2009/10 to 2018/19



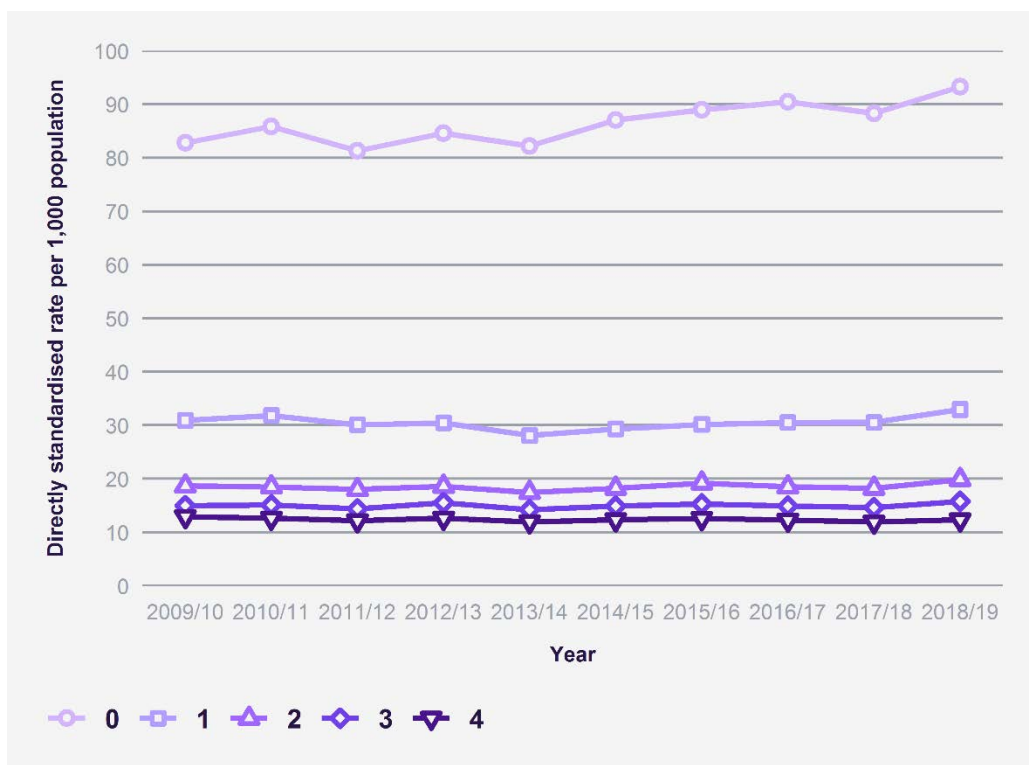
Source: NHS Digital, Office for National Statistics

Figure 2: Short-stay emergency admission rates for children aged under five, by age, 2009/10 to 2018/19



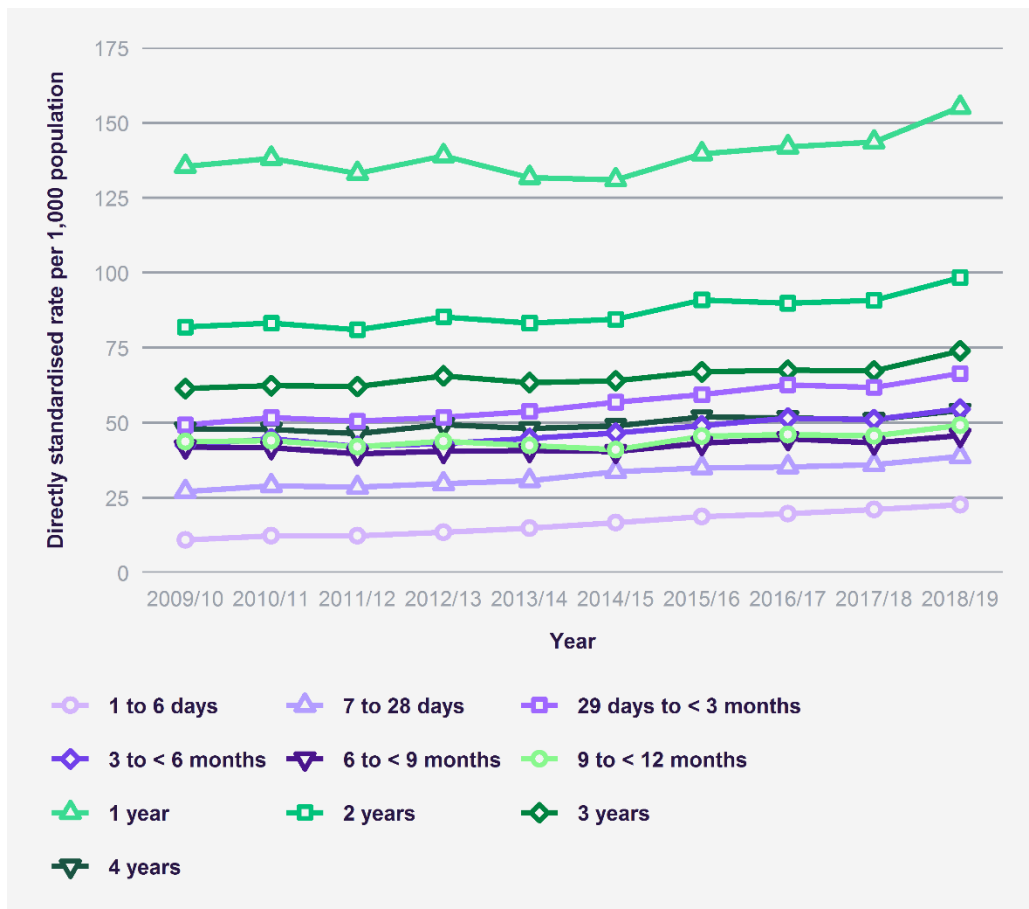
Source: NHS Digital, Office for National Statistics

Figure 3: Long-stay emergency admission rates for children aged under five, by age, 2009/10 to 2018/19



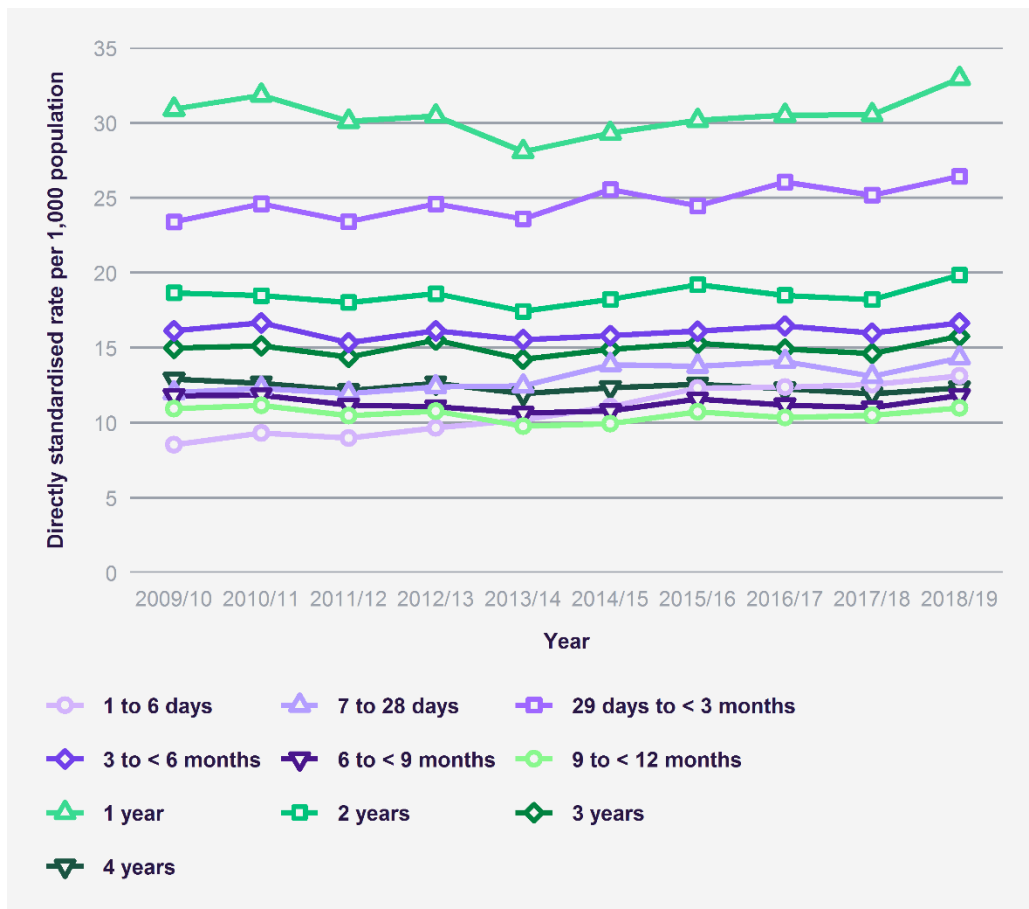
Source: NHS Digital, Office for National Statistics

Figure 4: Short-stay emergency admission rates for children aged under five, by Hospital Episode Statistics age band, 2009/10 to 2018/19



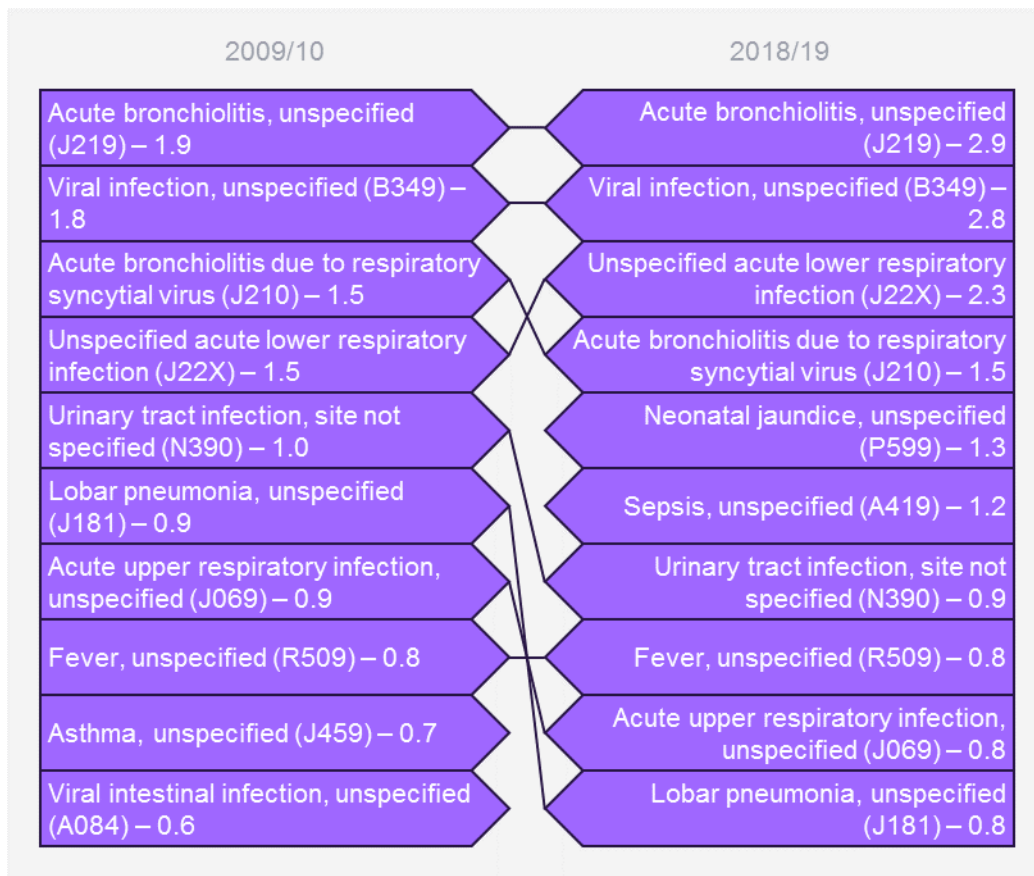
Source: NHS Digital, Office for National Statistics

Figure 5: Long-stay emergency admission rates for children aged under five, by Hospital Episode Statistics age band, 2009/10 to 2018/19



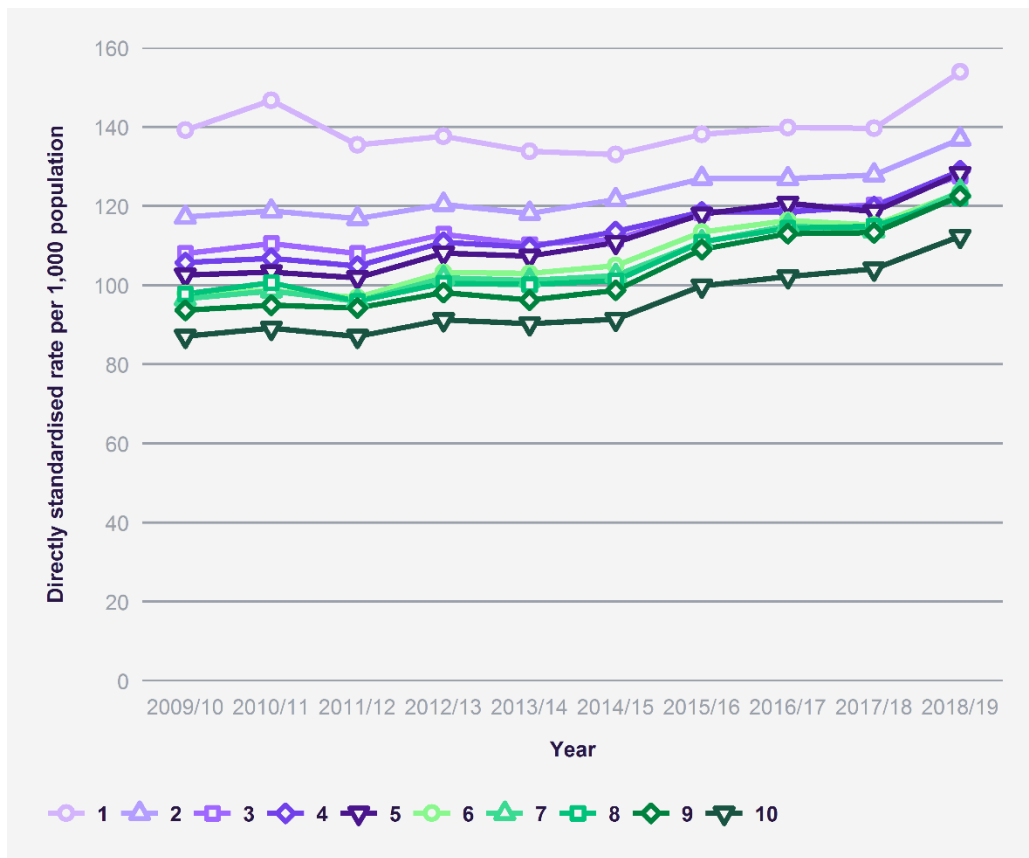
Source: NHS Digital, Office for National Statistics

Figure 6: Long-stay emergency admission rates per 1,000 population for children aged under five, by most common reasons for admission, 2009/10 and 2018/19



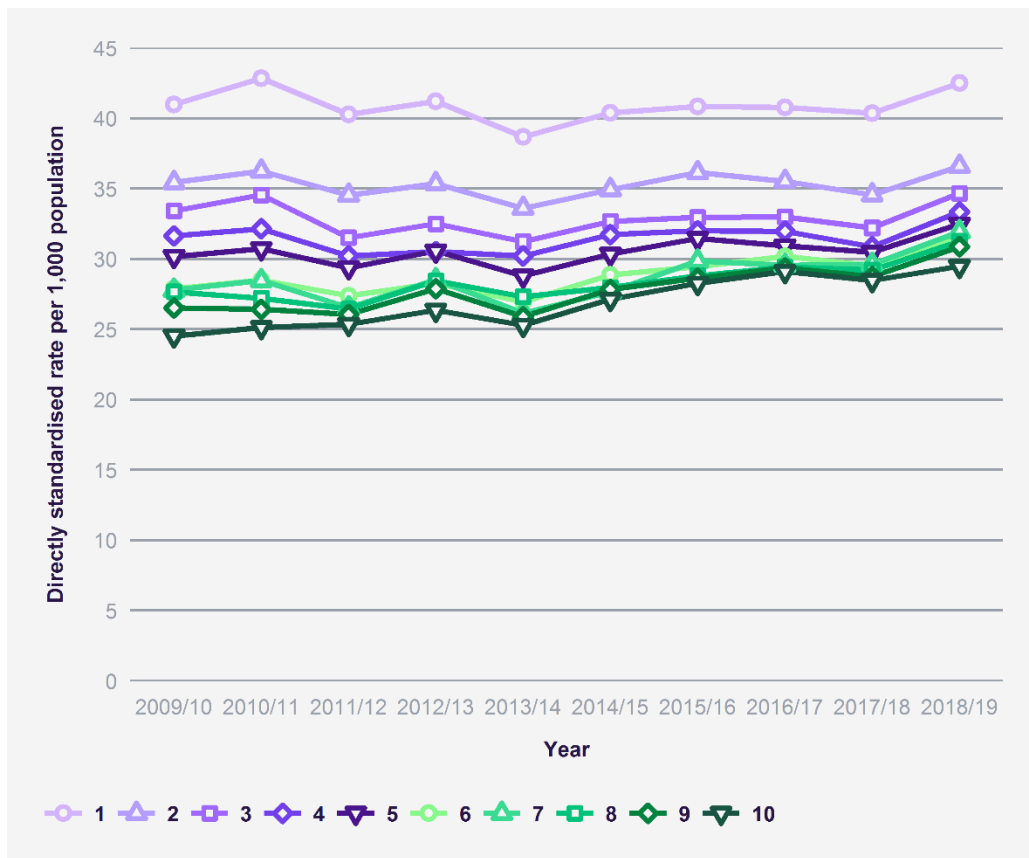
Source: NHS Digital, Office for National Statistics

Figure 7: Short-stay emergency admission rates for children aged under five, by deprivation decile (1 = most deprived), 2009/10 to 2018/19



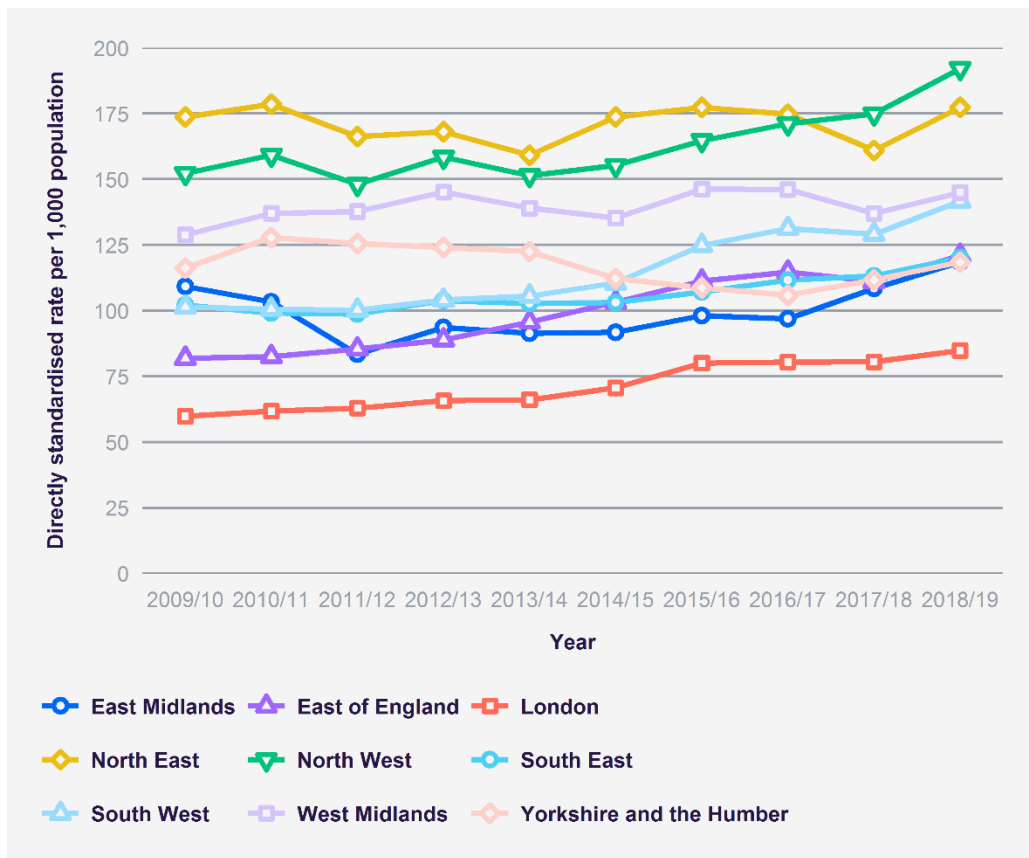
Source: Ministry of Housing, Communities and Local Government, NHS Digital, Office for National Statistics

Figure 8: Long-stay emergency admission rates for children aged under five, by deprivation decile (1 = most deprived), 2009/10 to 2018/19



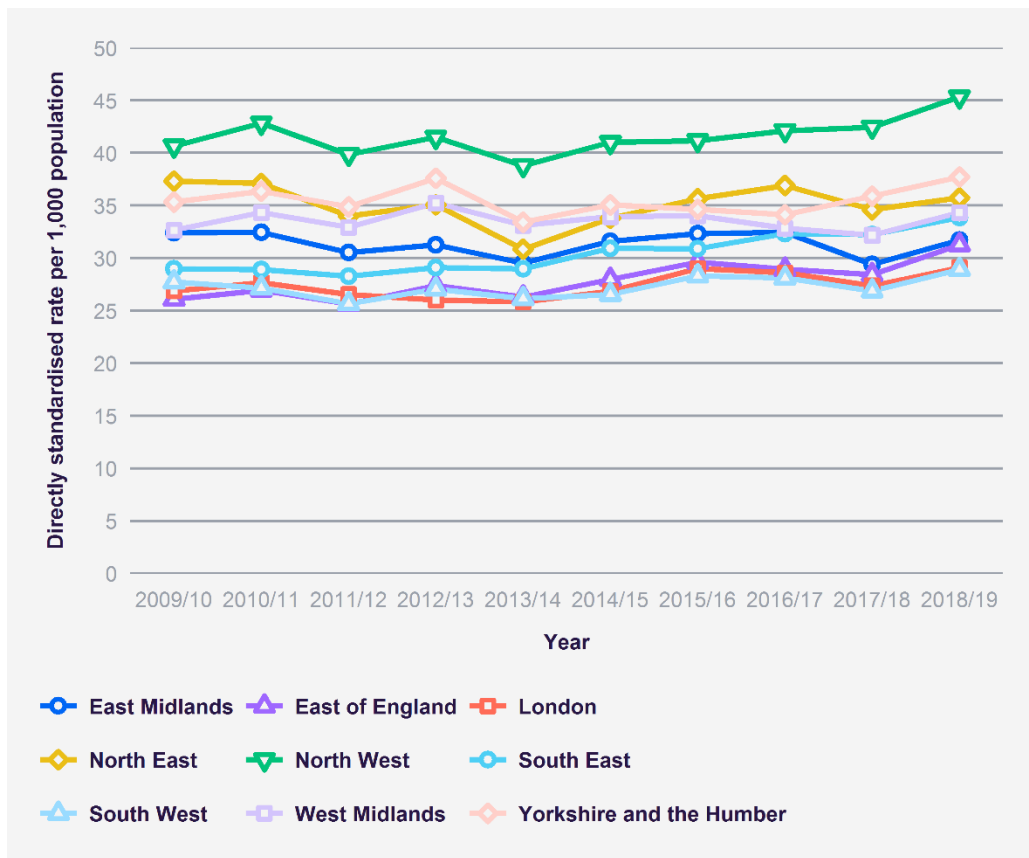
Source: Ministry of Housing, Communities and Local Government, NHS Digital, Office for National Statistics,

Figure 9: Short-stay emergency admission rates for children aged under five, by region, 2009/10 to 2018/19



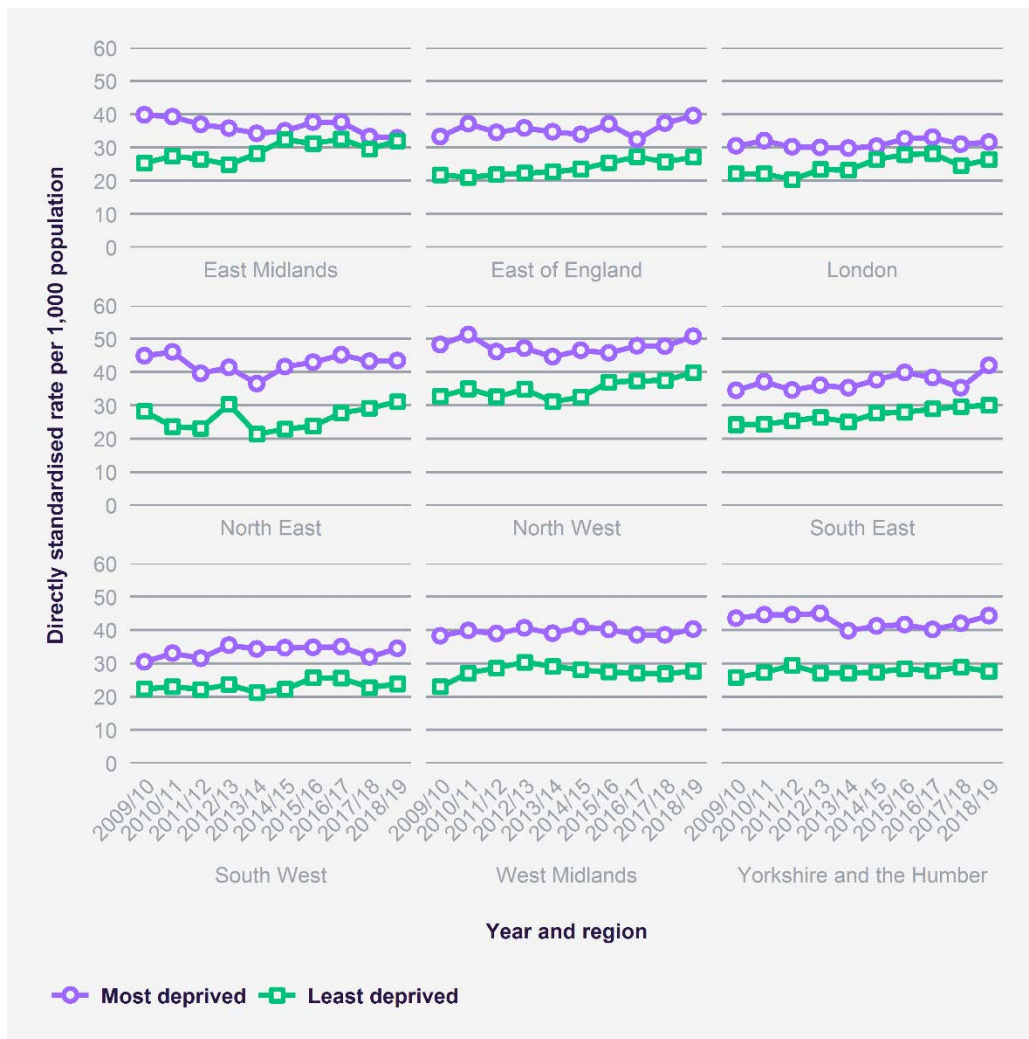
Source: NHS Digital, Office for National Statistics

Figure 10: Long-stay emergency admission rates for children aged under five, by region, 2009/10 to 2018/19



Source: NHS Digital, Office for National Statistics

Figure 11: Long-stay emergency admission rates for children aged under five from the most and least deprived areas of England, by region, 2009/10 to 2018/19



Source: Ministry of Housing, Communities and Local Government , NHS Digital, Office for National Statistics

Table 1: Poisson model output for short-stay emergency admissions adjusted for paediatric assessment unit (PAU) co-location, age and sex

Variable	Category	Estimate	Standard Error	Lower 95% confidence limit	Upper 95% confidence limit	P value
Intercept	-	-1.0832	0.0553	-1.1915	-0.9750	<0.0001
PAU co-location (reference: ward)	Emergency department	-0.2897	0.0838	-0.4540	-0.1255	0.0005
Age in years (reference: 0)	1	-0.6270	0.0322	-0.6901	-0.5639	<0.0001
	2	-1.0914	0.0342	-1.1584	-1.0244	<0.0001
	3	-1.3789	0.0349	-1.4473	-1.3105	<0.0001
	4	-1.6483	0.0342	-1.7154	-1.5812	<0.0001
Sex (reference: male)	Female	-0.2434	0.0058	-0.2548	-0.2321	<0.0001

Source: NHS Digital, Office for National Statistics, Royal College of Paediatrics and Child Health

Table 2: Poisson model output for long-stay emergency admissions adjusted for paediatric assessment unit (PAU) co-location, age and sex

Variable	Category	Estimate	Standard Error	Lower 95% confidence limit	Upper 95% confidence limit	P value
Intercept	-	-2.3070	0.0264	-2.3587	-2.2552	<0.0001
PAU co-location (reference: ward)	Emergency department	0.0081	0.0713	-0.1316	0.1479	0.9093
Age in years (reference: 0)	1	-1.0789	0.0201	-1.1183	-1.0395	<0.0001
	2	-1.5875	0.0218	-1.6301	-1.5448	<0.0001
	3	-1.8081	0.0227	-1.8526	-1.7635	<0.0001
	4	-1.9961	0.0306	-2.0560	-1.9362	<0.0001
Sex (reference: male)	Female	-0.2116	0.0089	-0.2290	-0.1941	<0.0001

Source: NHS Digital, Office for National Statistics, Royal College of Paediatrics and Child Health

Additional references

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