

MENINGOCOCCAL DISEASE IN ENGLAND FROM 2014 TO 2019: A FIVE-YEAR HEALTHCARE RESOURCE USE STUDY USING AN ADMINISTRATIVE ELECTRONIC DATASET

Adrian Paul J. Rabe,^{1,2,3} John Were,¹ Gulum Alamgir,¹ James Clark-Wright,⁴ Stuart Carroll,⁴ Iqbal Minhas⁴

¹Health iQ Ltd., London, UK; ²Imperial College London, UK; ³Global Health Focus, London, UK; ⁴Sanofi Pasteur, Reading, UK

INTRODUCTION

- Meningococcal disease, caused by *Neisseria meningitidis*, is a potentially fatal (5%–10%) disease, and can lead to death if not treated^{1,2}
- Of the 13 meningococcal strains reported, only six (A, B, C, W, X and Y) are known to be endemic worldwide. Young children, teenagers and young adults are most at risk of developing meningococcal disease^{3,4}
- Its incidence is highest in the sub-Saharan African region.⁵ Disease rates in the US, Europe, Australia and South America range from 0.12–3 cases per year per 100,000 population.⁵
- Routine vaccination has effectively reduced cases over time.⁶ Despite that, meningococcal disease outbreaks continue to occur in several regions⁶
- Although the UK became the first country to routinely vaccinate against meningococci (Men) B and C, the incidence and cost burden of meningococcal disease across all age groups is still considerable.^{6,7} Even in England, the incidence of meningococcal disease (April to June 2019) has been endemic where MenB accounted for 55%, MenW, 27%, MenY, 10% and MenC, 8% of all meningococcal cases (n=120).⁷ However, long-term trends in hospital admissions in England have not been reported to gauge the disease burden
- Currently, there is an unmet need in addressing the true burden of hospital admissions due to meningococcal disease, such knowledge could help improve the future research in prevention through vaccination and healthcare cost-effectiveness⁸
- Thus, this study aimed to assess the healthcare resource burden (HCRU) of meningococcal disease in England's secondary care setting

METHODS

Study design

This was a 5-year descriptive retrospective study which utilised the Hospital Episode Statistics (HES) dataset that included all episodes of care occurring in secondary care in England's National Health Service (NHS), to identify the HCRU of patients diagnosed with meningococcal disease through ICD-10 coding (A39) in any diagnosis position. Costs were estimated using Healthcare Resource Groups (HRGs) linked to costs from the UK National tariff. The index period was set at the first documented diagnosis during the study period of 1 April 2014 to 31 March 2019

Key eligibility criteria

Inclusion

- Patient diagnosed with an ICD-10 diagnosis code of A39 (meningococcal infection) in any diagnosis position
- Diagnosis as part of a non-elective admission

Exclusion

- Patients with ante-/peri-/post-natal activity

Statistical analyses

- Descriptive statistics were used to summarise the data

Study endpoints

- Patient characteristics and descriptive statistics results
- Inpatient burden with meningococcal disease as primary diagnosis (restricted to non-elective admissions)
 - Mean number of admissions per patient
 - Mean length of stay (days) per admission
 - Total HRG tariff (£, defined as the HRG tariff tagged in each spell)
- Accident and emergency (A&E) burden (restricted to non-elective admissions)
 - Mean number of A&E attendances per patient
 - Mean HRG tariff per patient (£)

RESULTS

- The study included 3922 patients with a slight male predominance (51.3%), covering 615,167 patient-days of follow-up, with a mean age of 29.51 years (**Table 1**)
- Mean (median) age on inclusion was seen to increase from the year 2014 with 19.40 (4) years to 37.29 (27) years by 2019 (**Table 1**) indicating variation in the age of meningococcal incidence over the 5-year period
- There was a total of 220 inpatient mortalities, with the annual rate increasing from 4.0% to 6.6% (**Table 1**)
- Total number of all inpatient non-elective admissions decreased from 2014 (1127) to 2019 (858). The initial peak of disease incidence was <2 years in 2014/15, which was seen to evolve over time (**Figure 1**)
- Mean length of stay increased from 6 days to 8 days, possibly signalling increased severity of these cases (**Figure 2**)
- The overall cost burden of non-elective admissions for meningococcal disease was £13,466,784.26 over the 5-year period (**Figure 3**)
- The overall number of A&E attendances recorded was 4905 (**Figure 4**), costing £519,063 over the period of 5 years (**Figure 5**)

Table 1. Overall descriptive statistics results

Characteristics	2014–15	2015–16	2016–17	2017–18	2018–19	Total
Total patients, n	968	824	823	718	589	3922
Mean age, years	19.40	23.79	30.75	31.69	37.29	29.51
Male, %	50.83	52.55	50.67	54.74	46.86	51.27
Total time in cohort (patient-days)	-	-	-	-	-	615,167
Mean follow up, months	21.50	21.88	20.83	18.38	12.48	18.97
Total inpatient admissions, n	1293	1400	1364	1241	1087	6385
Total length of stay, days	8893	9507	10217	9533	9689	47839
Total A&E appointments, total, n	532	1098	1175	1144	956	4905
Total HRG tariff, £	3,457,401.07	2,809,410.27	3,186,462.56	3,774,971.72	3,678,523.12	16,906,768.73
Co-morbidity score*						
0–4	1470	882	661	488	299	3800
5–9	59	33	11	10	2	115
10–14	5	1	1	0	0	7
Deaths, n	39	43	54	45	39	220
Mortality rate, %	4.03	5.22	6.56	6.27	6.62	5.61

*Charlson Co-Morbidity Score distribution measures the risk for mortality in a patient admission, based on the presence of conditions including cardiovascular disease, cancer, stroke, and liver disease. It has been validated for use on Hospital Episode Statistics and other datasets in multiple studies.
A&E, accident and emergency; HRG, Healthcare Resource Group

LIMITATIONS

- This dataset was not linked with vaccination status
- Activity was not linked to any specific serogroup

CONCLUSIONS

- The mean age on inclusion was seen to increase from 2014 to 2019, indicating variation in the incidence of meningococcal disease across different age distributions through the years
- It was noted that the number of non-elective admissions decreased over the period of 2014 to 2019 with vaccination programmes. However, length of stay increased with decreased disease incidence from 2014 to 2019, possibly signalling increased severity of these cases
- Overall, the cost burden associated with meningococcal disease remained high throughout the study period of 5 years. This may be due to factors such as severity of cases and length of stay
- These findings suggest that meningococcal disease still poses a significant burden (cost and healthcare resources) on the NHS, strengthening prevention through optimisation of vaccination programmes may assist in reducing this burden
- We recommend further analysis using linkable data, and sensitivity analysis on paediatric and at-risk populations

ACKNOWLEDGMENTS

Medical writing and editorial assistance for this poster was provided by Rhutika Dessai of Prescript Communications, Letchworth Garden City, UK. Support for this assistance was funded by Health iQ Ltd. Funding for this study was provided by Sanofi Pasteur



AUTHOR DISCLOSURES

Adrian Rabe, Head of Research at Health iQ Ltd., Honorary Research Fellow at Imperial College London, Director at Global Health Focus; Gulum Alamgir, Employee of Health iQ Ltd.; James Clark-Wright, Stuart Carroll and Iqbal Minhas, Employees of Sanofi Pasteur

Figure 1. Mean number of non-elective admissions per patient

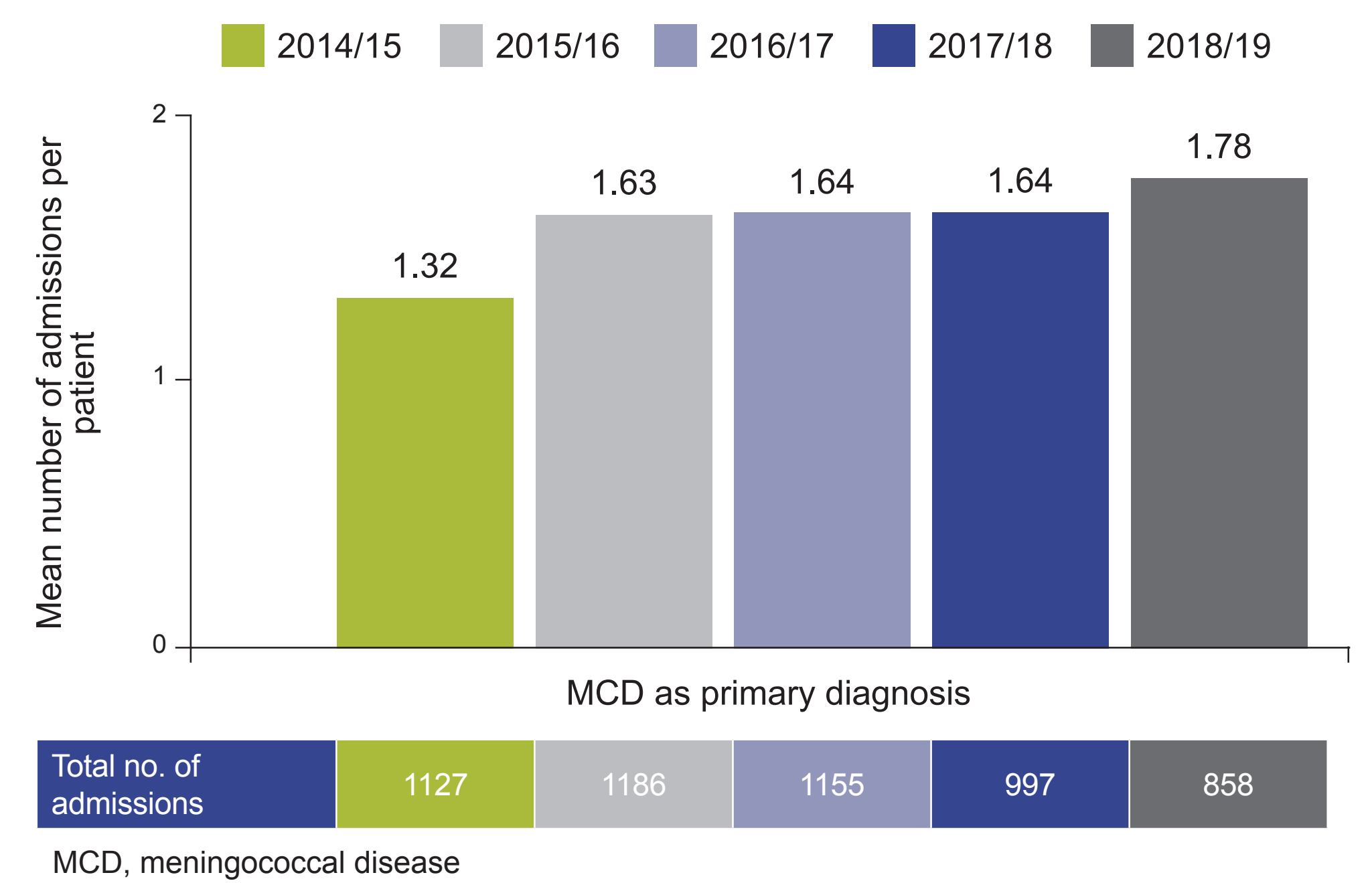


Figure 2. Mean length of stay per non-elective admission

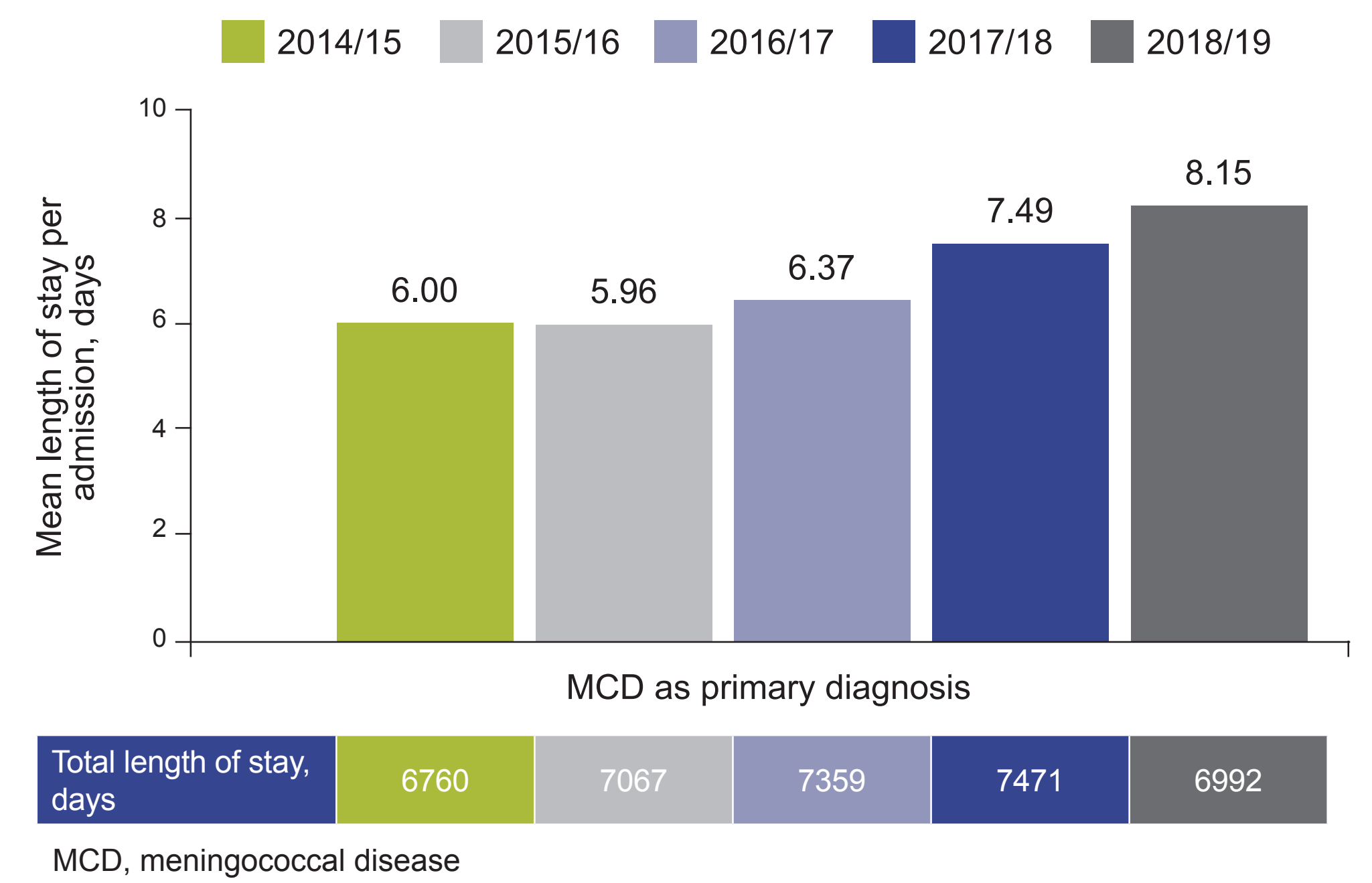


Figure 3. Mean HRG tariffs per non-elective admission

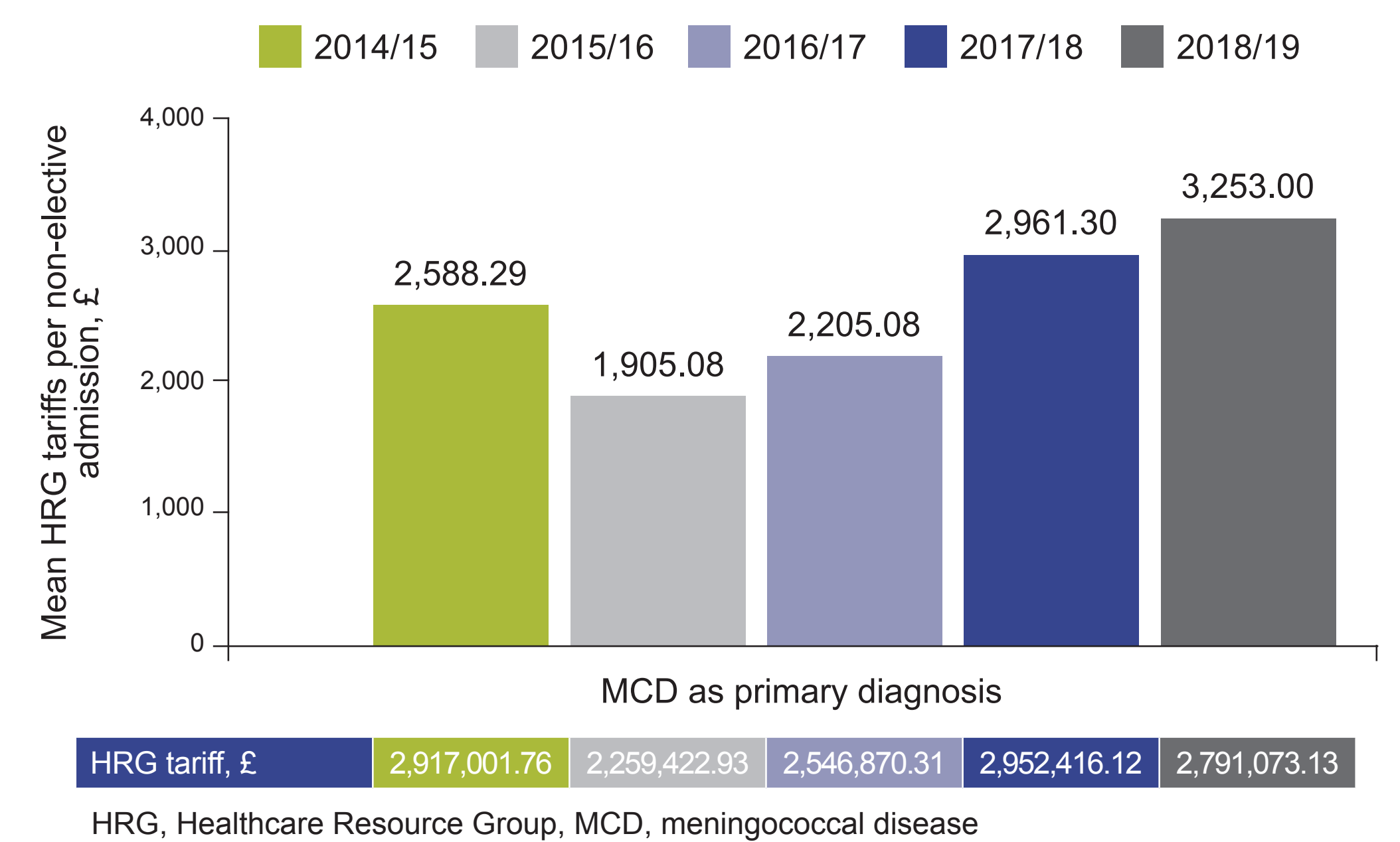


Figure 4. Mean A&E attendances per patient

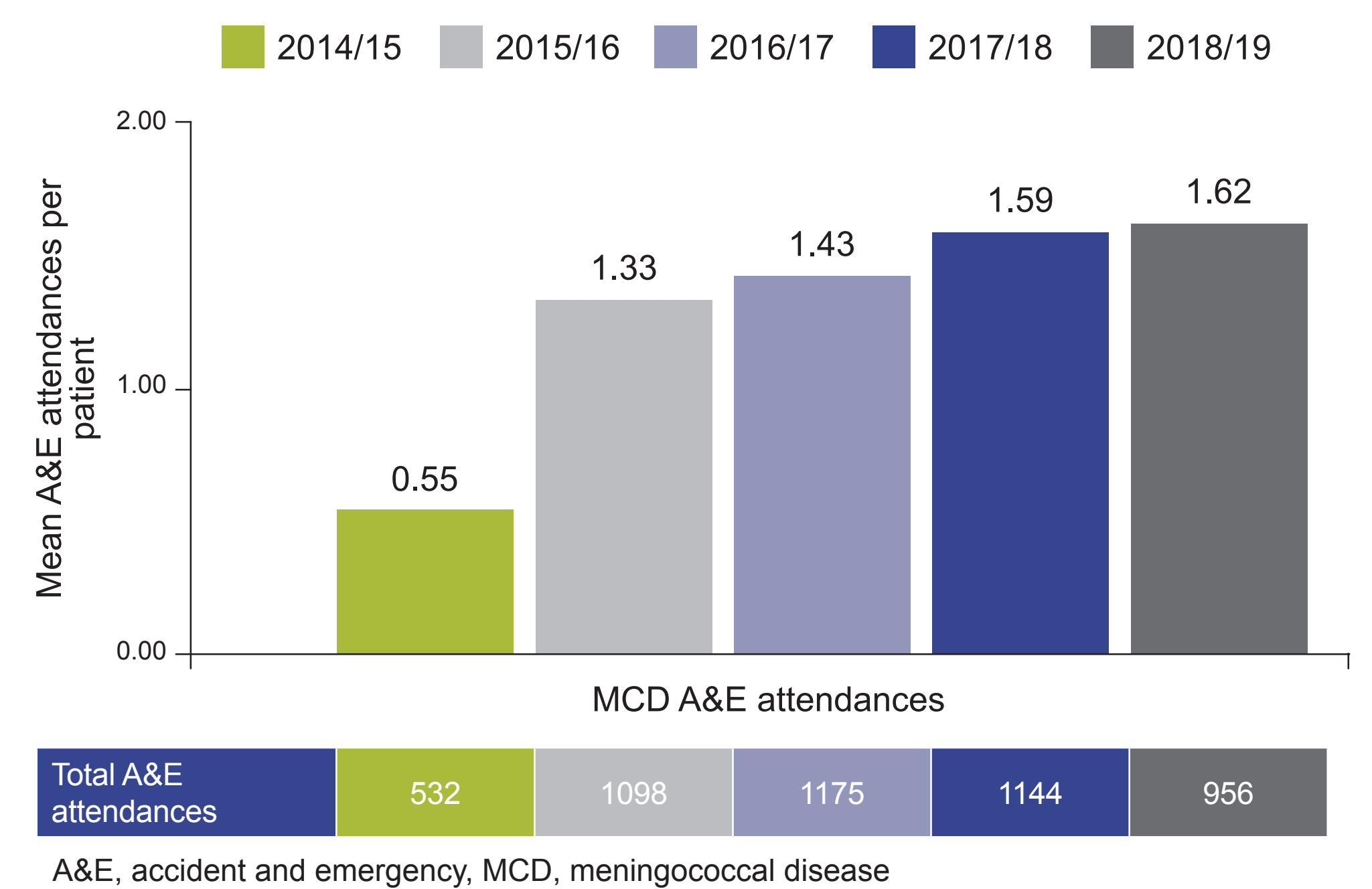
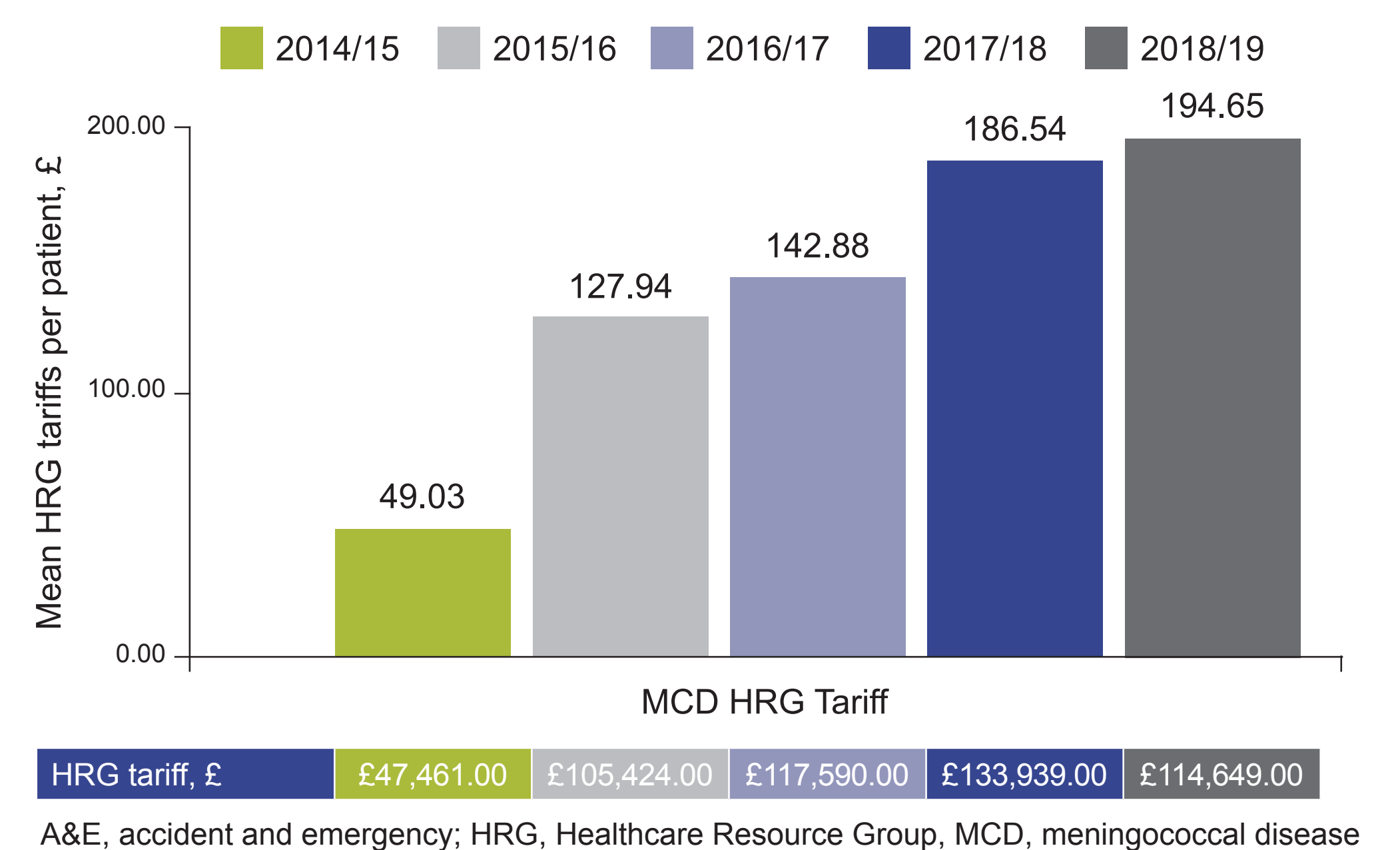


Figure 5. Mean A&E HRG Tariffs per patient



REFERENCES

- WHO Fact sheets. Meningococcal meningitis 2018. Last accessed on 1 Oct <https://www.who.int/news-room/fact-sheets/detail/meningococcal-meningitis>
- Martinón-Torres F. *J Adolesc Health* 2016;59(2):S12–20
- Vyse A, Ellsbury G, Madhava H. *Expert Rev Vaccines* 2018;17(3):229–37
- Stephen DS, Greenwood B, Brandtzaeg P. *Lancet* 2007;369:2196–210
- CDC Chapter 4: 2020 yellow book. <https://wwwnc.cdc.gov/travel/yellowbook/2020/travel-related-infectious-diseases/meningococcal-disease> (last accessed on 27 October 2019)
- Stefanelli P and Rezza G. *Human Vaccines & Immunotherapeutics* 2016;12(4):1051–55
- Laboratory confirmed cases of invasive meningococcal infection (England): April to June 2019 Health Protection Report Volume 13 Number 34. [file:///C:/Users/kzebra/Desktop/ISPOR%20references/Laboratory%20confirmed%20cases%20of%20invasive%20meningococcal%20infection%20\(England\)%20April%20to%20June%202019%20.pdf](file:///C:/Users/kzebra/Desktop/ISPOR%20references/Laboratory%20confirmed%20cases%20of%20invasive%20meningococcal%20infection%20(England)%20April%20to%20June%202019%20.pdf) (last accessed on 27 October 2019)
- Ladhani SN, et al. *Vaccines* 2012;30:3710–16