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Determinants of asthma length of stay in London hospitals: individual versus area effects

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Objective
To identify predictors of length of stay (LOS) of asthma admissions in London and to model their area and individual effects.

Introduction
Asthma is a chronic condition of public health concern associated with morbidity, mortality and healthcare utilisation. It disproportionately affects certain ethnic and demographic groups.

Methods
Asthma admission records in London (2001–2006) were used. Negative binomial regression was used to model the effect of demographic (*sex, age & ethnic group*), diagnostic (*primary & secondary diagnosis, method of admission*) and temporal (*day of the week, meteorological season & year of admission*) factors on the LOS, accounting for the random effects of each patient's attendance, as model 'I' and again for area of residence, model 'A'. Akaike information criterion (AIC) was used to compare the two models.

Table 1. Summary statistics of asthma-related hospital admissions in London, 2001–2006

Characteristics	N (%)
Age (years)	
< 5	12,420 (12.4)
5–14	10,700 (10.7)
15–44	16,612 (16.6)
45–59	7,029 (7.0)
60–74	5,698 (5.7)
≥ 75	4,309 (4.3)
Ethnic Group	
White	26,230 (46.2)
Black	6,604 (11.6)
Asian	6,382 (11.2)
Mixed/Other	5,780 (10.2)
Not stated	11,782 (20.8)
Secondary Diagnosis	
Other diseases of URT	25,053 (44.1)
Influenza and Pneumonia	692 (1.2)
Other acute lower respiratory infections	6,256 (11.0)
Acute upper respiratory infections	70 (0.1)
Chronic lower respiratory infections	1,207 (2.1)
Lung diseases due to external agents	1,519 (2.7)
Other diseases of respiratory system	378 (0.7)
Other Non-respiratory system diseases	15,227 (26.8)
Missing Values	6,376 (11.2)
Method of Admission	
Accident and emergency services	52,074 (91.7)
General Practitioner (GP)	2,602 (4.6)
Bed bureau	41 (0.1)
Consultants out patient clinic	577 (1.0)
Other means	1,484 (2.6)
Meteorological Season	
Summer	12,340 (21.7)
Spring	13,453 (23.7)
Autumn	16,800 (29.6)
Winter	14,185 (25.0)

Results
The median and mean asthma LOS over the period of study were 2 and 3 days, respectively. Admissions increased over the years from 8308 (2001) to 10,554 (2006), but LOS declined within the same period. Fewer males (48%) than females (52%) were admitted and, the latter had longer LOS compared to males. Only 5% were primarily diagnosed as *predominantly allergic*, whilst >94% were classified as '*asthma, unspecified*'. Younger people were more likely to be admitted than elderly, but the latter had higher LOS ($p < 0.001$). The secondary diagnosis and method of admission were important diagnostic determinants of length of stay, with very marginal differences between the two statistical models ('I' & 'A'). Again, all the temporal factors were significant determinants of LOS. Overall the patient cluster model (AIC=239394.8) outperformed the area model (AIC=247899.9).

Conclusions
Asthma LOS is best predicted by demographic, diagnostic and temporal factors with individual patients as a random effect.

Keywords
Asthma; length of stay; spell duration; risk factors; hospital admission

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