Office for National Statistics

Statistical bulletin

Association between time spent in emergency care and 30-day post-discharge mortality, England: March 2021 to April 2022

Relationship between time spent in A&E and the odds of 30-day, post-discharge, all-cause mortality, controlling for other factors.

Contact:
Health Research Group
Health.Data@ons.gov.uk
+44 1329 444110

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Notice

17 January 2025

Following media reporting and to provide equality of access to the statistics, we have brought this publication forward from 22 January 2025.

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1 . Main points

- Of people who attended an accident and emergency (A&E) department in England between 21 March 2021 and 30 April 2022 and did not die during their A&E attendance, 1.3% died within 30 days of leaving A&E to return home or be admitted to inpatient care; this analysis covers patients who required non-immediate care in an emergency department.
- At two hours of total time spent in A&E from arrival to discharge for non-immediate care, 0.02% of patients aged 20 years died post-discharge, increasing to 0.1% for patients aged 40 years, 0.3% for patients aged 60 years and 0.8% for patients aged 80 years; this was after adjusting for a range of other socio-demographic and clinical factors related to post-discharge death.
- The adjusted risk of post-discharge death increased with total time spent in A&E after approximately two hours for patients requiring non-immediate care.
- Compared with patients requiring non-immediate care who spent two hours in A&E, the odds of post-discharge death were: 1.1 times higher for those who spent three hours in A&E; 1.6 times higher for those who spent six hours in A&E; 1.9 times higher for those who spent nine hours in A&E; and 2.1 times higher for those who spent 12 hours in A&E.
- The relationship between total time spent in A&E and post-discharge death among patients requiring non-immediate care varied by age, region, chief complaint and admission status.
- The relative difference in the risk of post-discharge death after 12 hours in A&E compared with two hours in A&E was greatest for: younger patients (for example, the odds at 12 hours were 4.6 times higher than at two hours for patients aged 20 years), those in London (2.7 times higher), those who attended A&E for reasons to do with their eyes (7.9 times higher), and those who were not admitted to hospital for inpatient care after visiting A&E (2.8 times higher).

2 . Data on association between time spent in emergency care and 30-day post-discharge mortality

Association between time spent in emergency care and 30-day post-discharge mortality, England: March 2021 to April 2022
Dataset | Released 17 January 2025
Relationship between total time spent in an accident and emergency (A&E) department and the risk of 30-day, post-discharge, all-cause mortality, controlling for other factors. March 2021 to April 2022.

3 . Glossary

Logistic regression

Logistic regression is a statistical modelling technique for quantifying the strength of association between a binary outcome, such as whether an individual died within 30 days of attending an accident and emergency (A&E) department, and a set of characteristics. The model can be used to understand the independent relationship between the outcome and a particular characteristic of interest, such as total time spent in A&E. This is while “adjusting” or “controlling” for other characteristics, which may be related to both the outcome and the characteristic of interest, such as age, sex, comorbidities, and other socio-demographic and clinical information.

Odds and odds ratios

Odds quantify the absolute level of risk of an outcome (for example, 30-day mortality after leaving A&E), and are calculated as the probability of experiencing the outcome divided by the probability of not experiencing the outcome.

An odds ratio (OR) for a particular group (for example, patients who spent 12 hours in A&E) describes the relative difference in the odds of the outcome in that group compared with a reference group (for example, patients who spent two hours in A&E). An OR higher than 1 indicates a greater likelihood of experiencing the outcome, while an OR less than 1 indicates a lower likelihood.

The relative difference in risk between two groups can be large even if the absolute level of risk is low. For example, the highest OR for post-discharge mortality when comparing patients who spent 12 hours in A&E with those who spent two hours in A&E (the relative difference in risk) is found among younger people, even though the rate of post-discharge mortality (the absolute risk) is highest among older people.

4 . Data sources and quality

Study data

A person-level dataset was created by linking the Emergency Care Dataset (ECDS) on accident and emergency (A&E) attendances from the National Health Service (NHS) England with:

- 2021 Census
- NHS Hospital Episode Statistics (HES) Admitted Patient Care (APC) and Outpatient (OP) datasets
- Office for National Statistics (ONS) death registration data

The 2021 Census was linked to the 2019 NHS Personal Demographics Service (PDS) to retrieve NHS numbers of census respondents, with a linkage rate of 95.8%. All other datasets were subsequently linked to the census using NHS numbers.

The study population included 6,721,179 individuals who:

- were enumerated at the 2021 Census as usual residents of England
- could be linked to the 2019 NHS PDS
- visited a type 1 A&E department (consultant-led 24-hour services with full resuscitation facilities) at least once during the study period 21 March 2021 to 31 March 2022
- did not die during their A&E attendance (including those who returned home or were admitted to hospital for inpatient care)
- had an ECDS record that was populated with both a non-immediate acuity level (low, standard, urgent, very urgent) and a chief complaint (reason for attending A&E)

Unreliable records were excluded from the analyses, including those with:

- a departure date occurring before the arrival date
- missing information on arrival or departure date or location
- missing information on method of arrival and admittance
- time spent in A&E exceeding 48 hours, as these records are likely to be erroneous

For patients who visited A&E more than once during the study period, we used their first visit that met the previously described criteria.

Analysis methods

A series of logistic regression models were used to assess the association between time spent in A&E and the risk of 30-day, post-discharge, all-cause mortality, controlling for other factors potentially related to both of these. Age and time spent in A&E (calculated from arrival to discharge, either home or admitted to hospital for inpatient care) were modelled as restricted cubic splines with knots determined by minimising the Bayesian Information Criterion (BIC).

The models were adjusted for the following Census 2021 variables:

- sex
- ethnicity (White, Asian, Black, Mixed or Multiple Ethnic Group, Other)
- region of residence
- area deprivation decile group
- highest qualification (Level 1, Level 2, Level 3, Level 4, Apprenticeship, No Qualifications)
- National Statistics Socio-Economic Classification (NS-SEC)
- self-reported long-term health condition or disability (“No long-term health conditions”, “Day-to-day activities reduced a little by long-term health conditions”, “Day-to-day activities reduced a lot by long-term health conditions”, “Day-to-day activities not reduced at all by long-term health conditions”)
- self-reported general health (“Very Good Health”, “Good Health”, “Fair Health”, “Bad Health”, “Very Bad Health”)

We also adjusted for the following variables from ECDS:

- age upon arrival at A&E
- whether arrival at A&E was via an emergency ambulance
- month of arrival at A&E
- time of day of arrival at A&E (12am to 6am, 6am to 12pm, 12pm to 6pm, 6pm to 12am)
- chief complaint upon arrival at A&E (“General, minor or admin”, “Airway or breathing”, “Circulation or chest”, “Environmental”, “Eye”, “Gastrointestinal”, “Genitourinary”, “Head and neck”, “Neurological”, “Obstetrics and gynaecology”, “Psychosocial or Behaviour change”, “Skin”, “Trauma or musculoskeletal”)

Hospital inpatient admission status was not included in the model as this takes place at the end of the A&E attendance rather than at arrival. However, it was included as an interaction term with time spent in A&E in one model, and the full results of this can be found in the dataset.

We adjusted for the following comorbidities, derived as binary variables (“Ever” or “Never”) indicating whether the individual had a hospital record of the following conditions, using HES AP and OP records over the five years prior to 21 March 2021:

- coronavirus disease 2019 (COVID-19)
- cancer
- diabetes
- dementia
- serious mental illness
- autism
- neurological motor neuron disease, Parkinson’s disease or multiple sclerosis (MS)
- Alzheimer’s disease
- epilepsy
- hypertension
- angina
- myocardial infarction
- ischaemic heart disease
- atrial fibrillation
- heart failure
- stroke
- other respiratory infections
- influenza pneumonia
- chronic obstructive pulmonary disease
- asthma
- inflammatory bowel disease
- liver disease
- rheumatoid arthritis
- osteoarthritis
- kidney disease

The logistic regression models were used to estimate: marginal probabilities of 30-day post-discharge mortality, standardised to the observed profile of the study population in terms of the variables listed previously; and the relative differences in these probabilities (converted to odds ratios) between various times spent in A&E compared with two hours.

Statistical uncertainty was quantified by 95% confidence intervals around the point estimates. We performed likelihood ratio tests for interactions between time spent in A&E and several potential effect-modifiers: age, sex, region, relative area deprivation, chief complaint upon arrival at A&E, and whether the patient was subsequently admitted to hospital.

A&E attendances are assigned one of five acuity levels when the patient is triaged after arriving at the department: “immediate” (also known as “resuscitation”, used for potentially life-threatening, time-critical conditions), “very urgent” (also known as “majors”), “urgent” (also known as “minors”), “standard”, or “low acuity”.

The analysis only covers patients with non-immediate acuity levels (all acuity levels other than “immediate”), who represent 98.5% of the total. These “non-immediate” groups were combined as they presented similar results when modelled separately. Patients in the “immediate” acuity group were excluded from the analysis because of the high mortality rate within a short time after arriving at A&E in this group.

Strengths and limitations

Strengths of the analysis include the large sample size with near-complete population coverage, and utilisation of linked health and socio-demographic information.

Limitations include the fact that not all confounding factors related to both time spent in A&E and 30-day post-discharge mortality could be adjusted for. For example, we did not have data on overcrowding, and some individuals may wait for longer because they need to access specialist treatments, advice or services. Our results therefore only relate to statistical associations; we cannot say with certainty whether longer times spent in A&E cause higher rates of post-discharge mortality.

The study period for this analysis fell at the end of the coronavirus pandemic. A&E departments implemented additional infection prevention control measures during the pandemic, which may have affected the way departments operated and may not be representative of how they operate now. However, A&E attendance numbers had largely returned to their pre-pandemic level by June 2021 after a fall in earlier months of the pandemic. In addition, post-discharge mortality rates during the pandemic may be different to the current situation, for example, because of direct and indirect mortality effects of the pandemic.

Collaboration

This analysis was produced with input from partners in the following organisations:

- Department for Health and Social Care
- NHS England
- Royal College of Emergency Medicine

5 . Related links

Association between delays to patient admission from the emergency department and all-cause 30-day mortality
BMJ Journals article | Published 18 October 2023
This article assesses and quantifies the increased risk of death resulting from delays to inpatient admission from emergency departments, using Hospital Episode Statistics and Office for National Statistics data in England.

6 . Cite this statistical bulletin

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