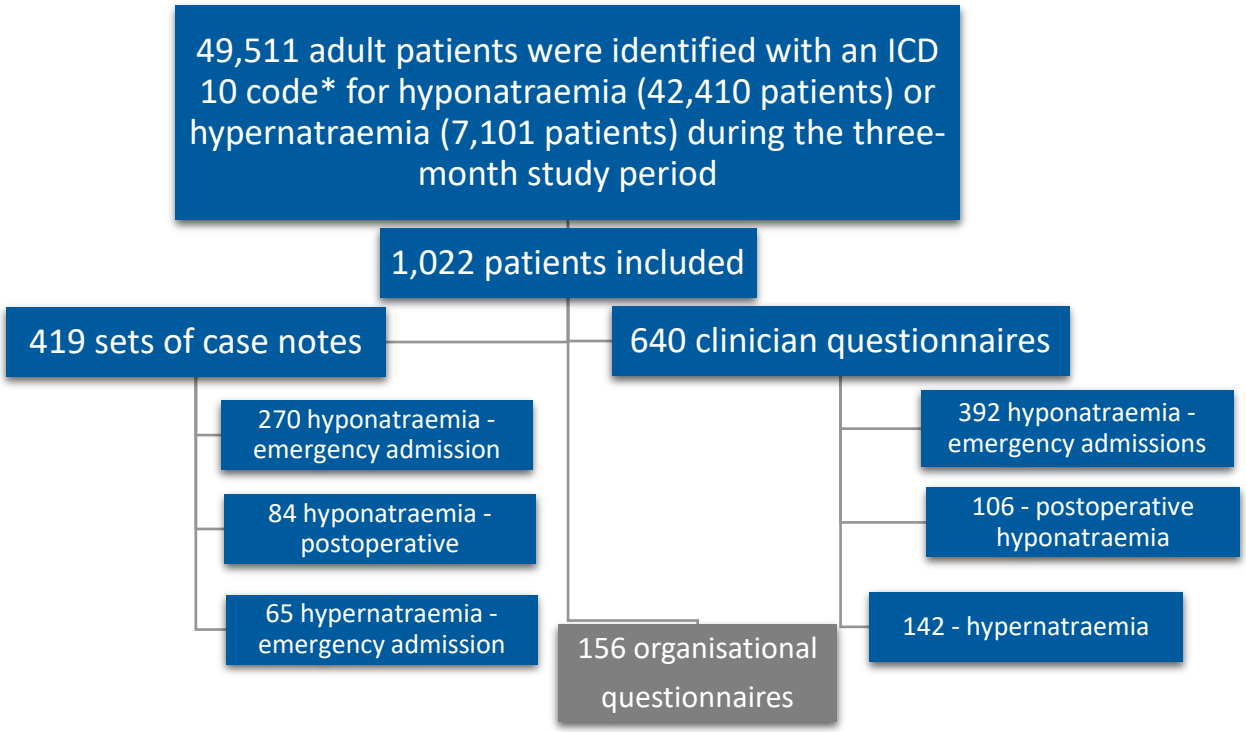
DETAILED FINDINGS ABOUT THE DATA RETURNED AND THE STUDY POPULATION

Data returned



**The presence of an ICD-10 code would only have captured that hyponatraemia and/or hypernatraemia occurred during the admission but would not indicate the cause of the abnormal sodium level.*

In the whole study population, patients with a diagnosis code of hyponatraemia were slightly older (mean 74.0, median 77 years) than patients with a diagnosis code of hypernatraemia (mean 76.9, median 81 years) (F2.1).

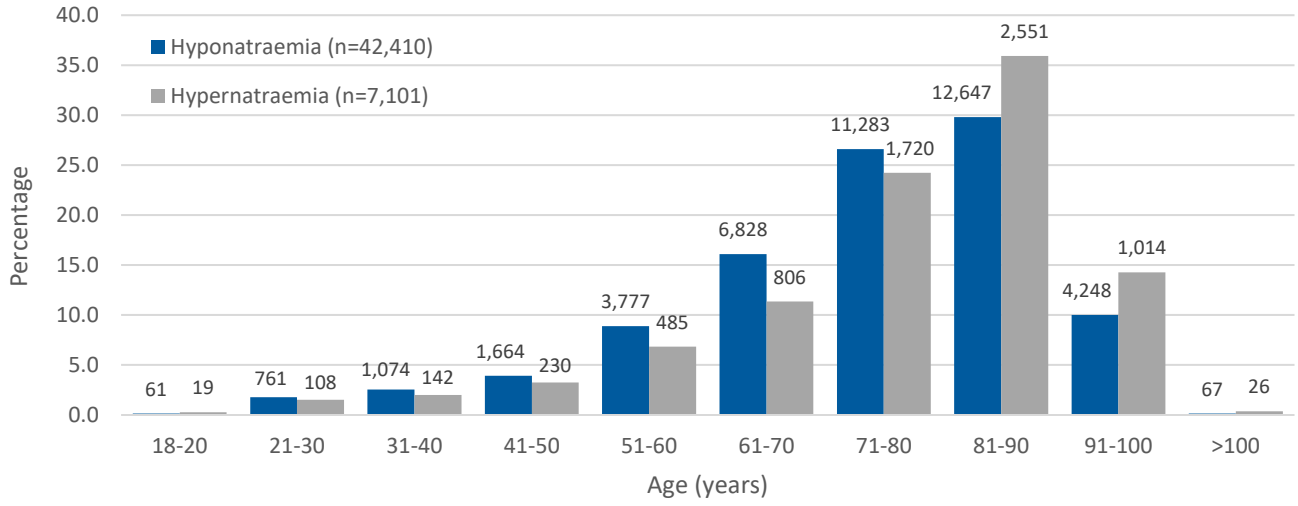


Figure 2.1 Age distribution of patients coded for hyponatraemia or hypernatraemia in the total study population

Patient identification data

In the sampled population patients coded with hyponatraemia hypernatraemia were slightly older (mean 69.8, median 73 years) than patients coded for hypernatraemia (mean 66.9, median 71 years) due to the sampling process which avoided over-including patients with hypernatraemia who had been admitted for end-of-life care (F2.2).

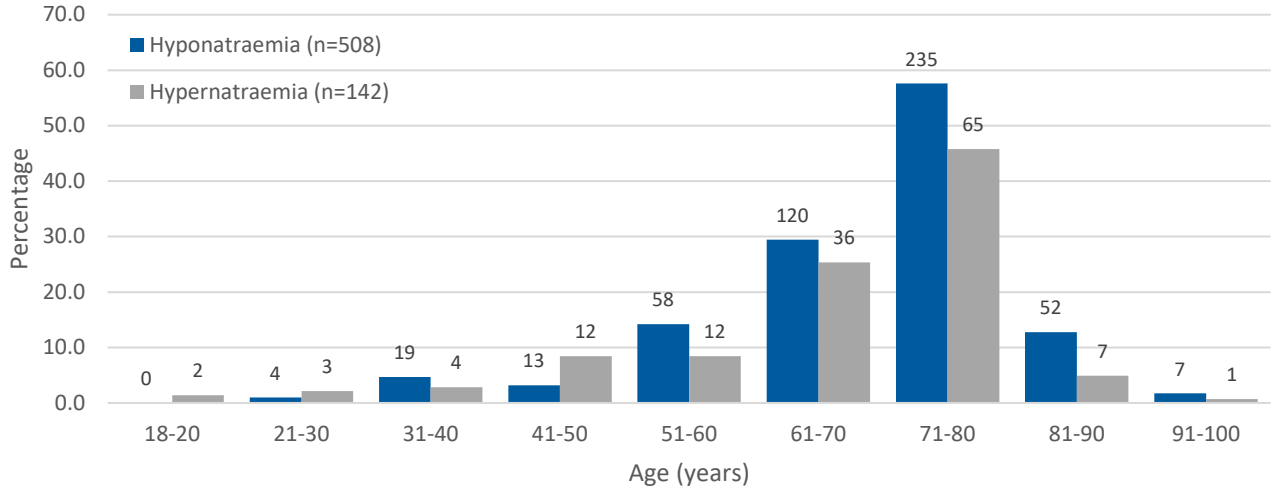


Figure 2.2 Age distribution of patients with hyponatraemia or hypernatraemia in the study sample
Clinician questionnaire data

In the sampled population, 281/508 (55.3%) patients with hyponatraemia were women and there was a higher proportion of women in the postoperative hyponatraemia group (72/106; 67.9%) compared to those admitted as an emergency (205/392; 52.3%).

The age distribution by sex for emergency admission-related hyponatraemia and postoperative hyponatraemia is shown in figures 2.3 and 2.4. While some previous reports have suggested that there is a sex difference between the risk of developing hyponatraemia, others have not.[1,2]

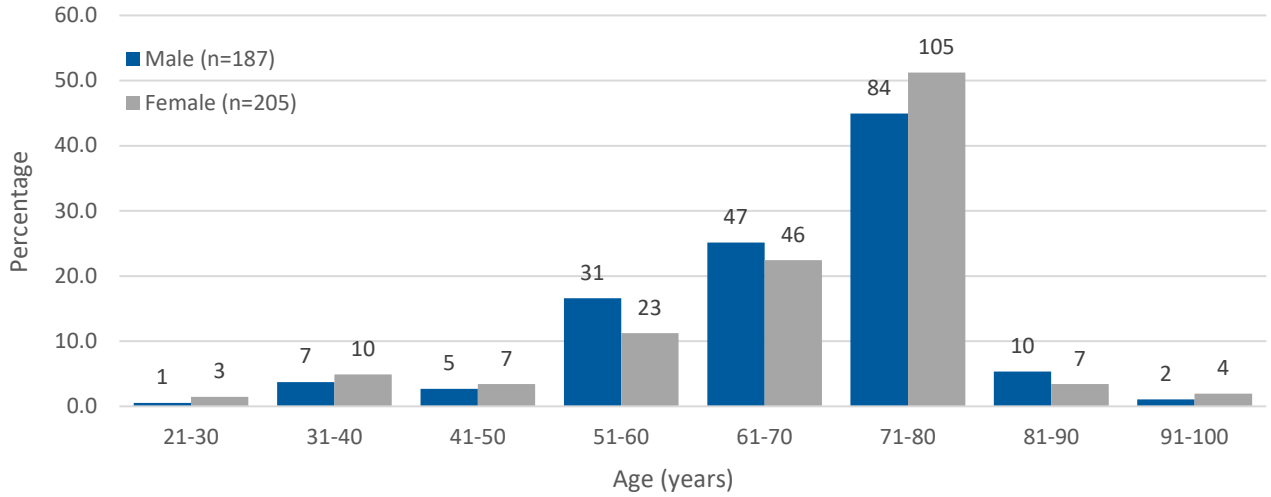


Figure 2.3 Age distribution by sex for emergency admission-related hyponatraemia
Clinician questionnaire data

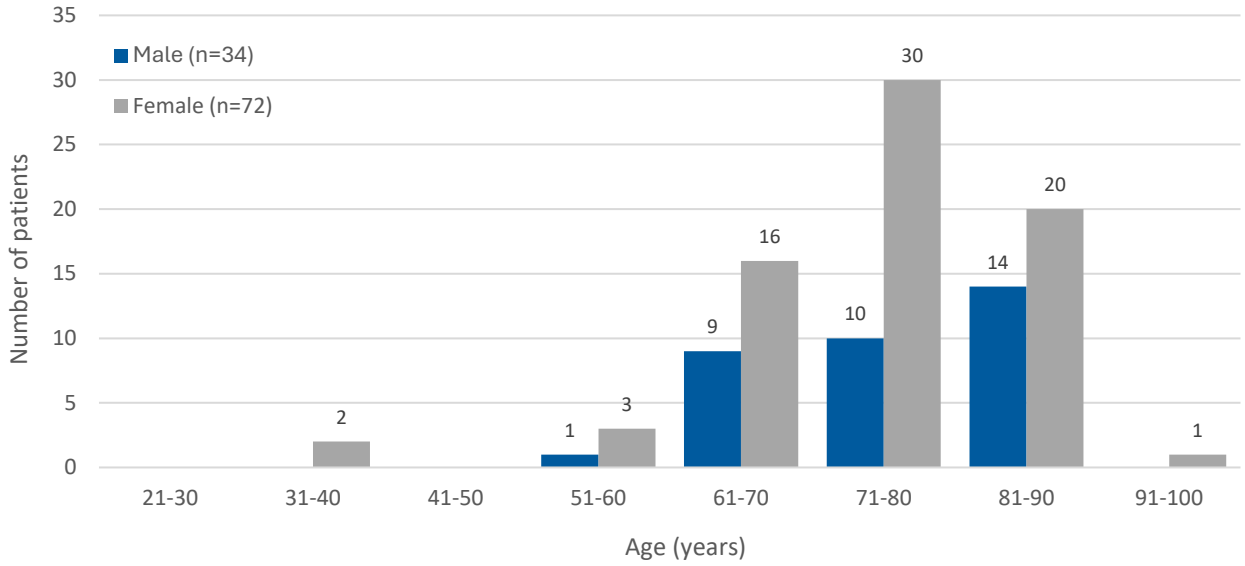


Figure 2.4 Age distribution by sex for postoperative hyponatraemia
Clinician questionnaire data

The higher proportion of women in both the emergency admission-related and postoperative hyponatraemia may reflect their greater risk factors. Additionally, the use of 'one size fits all' postoperative fluid protocols may increase the risk of hyponatraemia developing. Further work is needed to determine whether postoperative fluid protocols should be adjusted for weight and/or size, to reduce the risk of hyponatraemia and other electrolyte disturbances occurring.

Most patients with hyponatraemia (38,170/41,272; 92.5%) were emergency admissions; these patients were older than the elective admissions (median 78 years vs 72 years) (F2.5).

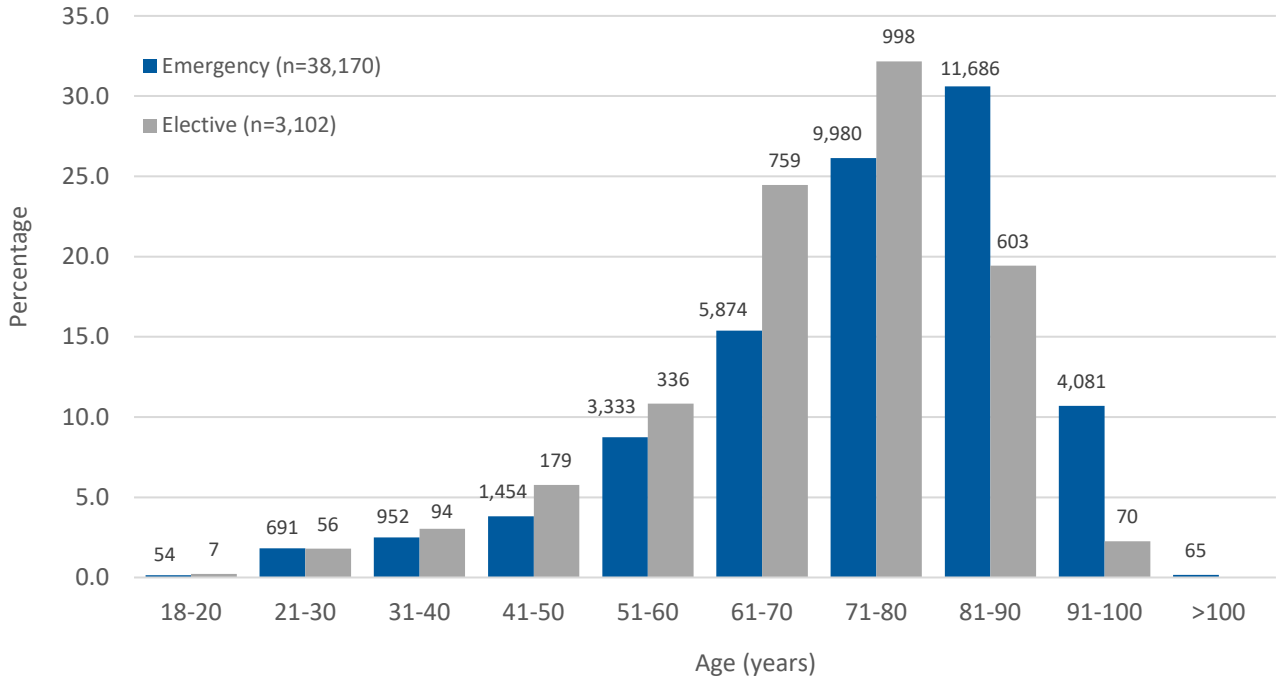


Figure 2.5 Age distribution of emergency and elective hyponatraemia coded admissions
Patient identification data

The ethnicity of the study sample was similar to the ethnicity data for England and Wales reported in the 2021 Census for England and Wales (T2.1).[3]

Table 2.1 Ethnicity of the study population compared with the 2021 England and Wales Census	Study population		Census data
	Number of patients	%	%
White British/White - other	537	82.6	81.7
Black/African/Caribbean/Black British	15	2.3	4.0
Asian/Asian British (Indian, Pakistani, Bangladeshi, Chinese, other Asian)	37	5.7	9.3
Mixed/multiple ethnic groups	1	0.2	2.9
Other (specified)	2	0.3	2.1
Unknown	48	8.9	Not applicable
Total	**640**		

Clinician questionnaire data

Overall, 26/640 (4.1%) of patients with abnormal blood sodium levels were reported by the treating clinician to have a documented learning disability or autism.

Patients admitted as emergencies with hypernatraemia were typically frailer than those admitted with hyponatraemia.

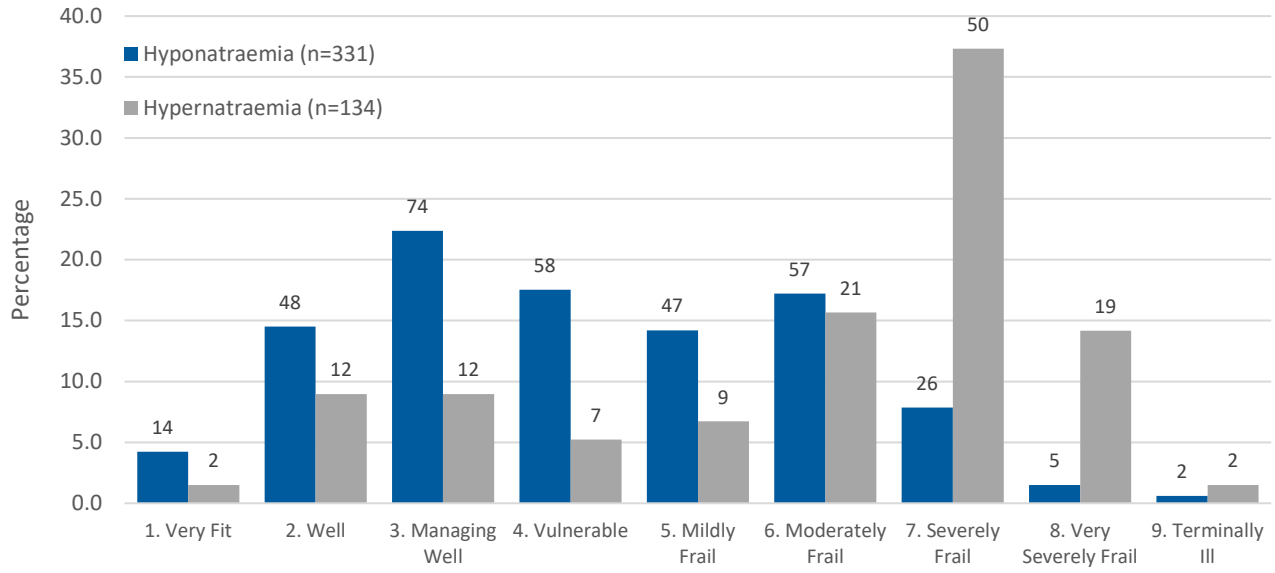


Figure 2.6 Rockwood Frailty Score for emergency admissions with hyponatraemia or hypernatraemia
Clinician questionnaire data

There were 136/331 (41.1%) patients with hyponatraemia who had a high functional status (Rockwood Frailty Score 1-3) compared to 26/134 (19.4%) with hypernatraemia (F2.6). This may reflect the greater proportion of patients with hypernatraemia who were admitted to hospital from a residential or nursing home (T2.2) and that they were more likely to have a 'do not attempt cardiopulmonary resuscitation' (DNACPR) decision or treatment escalation plan (TEP) in place (T2.3).

Table 2.2 Usual place of residence prior to admission	Hyponatraemia		Hypernatraemia	
	Number of patients	%	Number of patients	%
Own home	359	93.0	75	53.2
Residential home	7	1.8	15	10.6
Nursing home	8	2.1	45	31.9
Other (specified)	12	3.1	6	4.3
Subtotal	**386**		**141**	
Unknown	6		1	
Total	**392**		**142**	

Clinician questionnaire data

Table 2.3 Do not attempt cardiopulmonary resuscitation or treatment escalation plan in place	Hyponatraemia		Hypernatraemia	
	Number of patients	%	Number of patients	%
Yes - in place prior to admission	19	7.9	22	36.1
Yes - during initial clerking	12	5.0	6	9.8
Yes - during admission	19	7.9	11	18.0
No	190	79.2	22	36.1
Subtotal	**240**		**61**	
Unknown	30		4	
Total	**270**		**65**	

Reviewer assessment form data

Patients with hyponatraemia who are discharged without their sodium corrected, are potentially at risk of readmission related to hyponatraemia. Of the patients admitted as an emergency, 93/392 (23.7%) had been an inpatient in the previous 30 days and this was due to hyponatraemia in 31. Therefore, 31/384 (8.1%) of patients in this study with hyponatraemia had been in hospital in the previous 30 days for hyponatraemia.

The presence of hyponatraemia during any admission to hospital may be a risk factor for subsequent readmission. At discharge any patient with hyponatraemia or who has had hyponatraemia during the admission should have an appropriate follow-up plan to monitor and adjust risk factors to prevent future admissions. The monitoring and risk factor management can be delivered by either primary or secondary care, or a co-ordinated approach by both. Patients may need more than one admission to understand the cause of their hyponatraemia.[4]

During the study period there were only a small number of patients admitted with Addisonian crisis (512 admissions), diabetes insipidus (419 admissions) or demyelinating disease of the central nervous system (218 patients). This may reflect the rarity of these diseases. Adrenal crisis can occur in patients with underlying adrenal insufficiency; this adrenal insufficiency can be due to rare causes such as Addisonian disease (which affects around ~1 in 10,000 people), or more common causes such as long-term high-dose steroid use. A growing number of experts and international bodies recommend renaming ‘diabetes insipidus’ to ‘arginine vasopressin disorder’ to prevent the inappropriate treatment resulting from its confusion with diabetes mellitus.[5,6]

Despite this change in name to reduce potential harm, greater education is needed to ensure that all clinicians understand what arginine vasopressin disorder means, both in terms of pathophysiology and treatment. The current coding system in the UK uses the International Classification of Diseases version 10 (ICD-10), which still uses the term diabetes insipidus (ICD-10 code E23.2), and it is therefore used in this report. Although version 11 of this coding system (ICD-11) was released in 2018, it remains in pilot testing internationally with no agreed switch date for its use in the UK. Even after the switch, the old term will remain in use in coding for either central diabetes insipidus (ICD-11 code 5A61.5) or nephrogenic diabetes insipidus (ICD-11 code GB90.4A).

More patients with hypernatraemia in this study died than those with hyponatraemia; this persisted when a sodium abnormality was the primary reason for their admission (hypernatraemia: 56/374; 14.9% patients died and hyponatraemia 132/5,384; 2.5% patients died) (T2.4 and 2.5). This may reflect the common underlying causes for hypernatraemia, particularly as hypernatraemia is often seen in patients who have poor oral intake as they approaching the end of life.

Table 2.4 Mortality data – ICD-10 code in any position	Survived to discharge	Died	% mortality
Hyponatraemia E87.1	38,423	3,888	9.2
Hypernatraemia E87.0	4,836	2,259	31.8
Total	**43,259**	**6,147**	**12.4**

Patient identification spreadsheet data

Table 2.5 Mortality data – ICD-10 code in the primary position	Survived to discharge	Died	% mortality
Hyponatraemia E87.1	5,252	132	2.5
Hypernatraemia E87.0	319	56	14.9
Total	**5,571**	**188**	**3.4**

Patient identification spreadsheet data

Mortality was lower when the sodium abnormality was coded as the primary reason for admission compared to being coded at any other point in the admission. This may suggest that in the majority of admissions other reasons had a greater impact on the risk of mortality than the sodium abnormality itself, however it was a contributing factor. It is possible that patients with hyponatraemia as a primary reason for admission are identified at the point of admission, and appropriate treatment is delivered in a timely manner reducing the impact of the hyponatraemia on subsequent risk of morbidity and mortality during the admission.

Despite the limitations of the current coding systems in identifying patients with Addisonian crisis or diabetes insipidus, there were recorded deaths in admissions where these conditions were included in the diagnostic codes at any stage (Addisonian crisis: 24 deaths; 4.7%, diabetes insipidus: 40 deaths; 9.5%). However, it should be noted that there were no deaths where either of these conditions was listed as the primary ICD-10 code (primary reason for admission) during the study period.