Understanding hospital admissions for military personnel in England, Scotland and Wales: a data linkage study

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Background

- In recent years we have seen a large rise in the use of electronic healthcare records (EHRs) to model and analyse secondary healthcare services.
- EHRs offer novel insight into common non-communicable diseases and healthcare utilisation of the UK Armed Forces.
- Secondary health systems in the United Kingdom (UK) are unique for recording Outpatient, Admitted Patient Care and Accident & Emergency (A&E) visits.
- These EHRs offer a variety of parameters such as admission/discharge date, diagnosis (ICD10 codes), treatment/procedure undertaken (OPCS codes) and the cost of treatment.
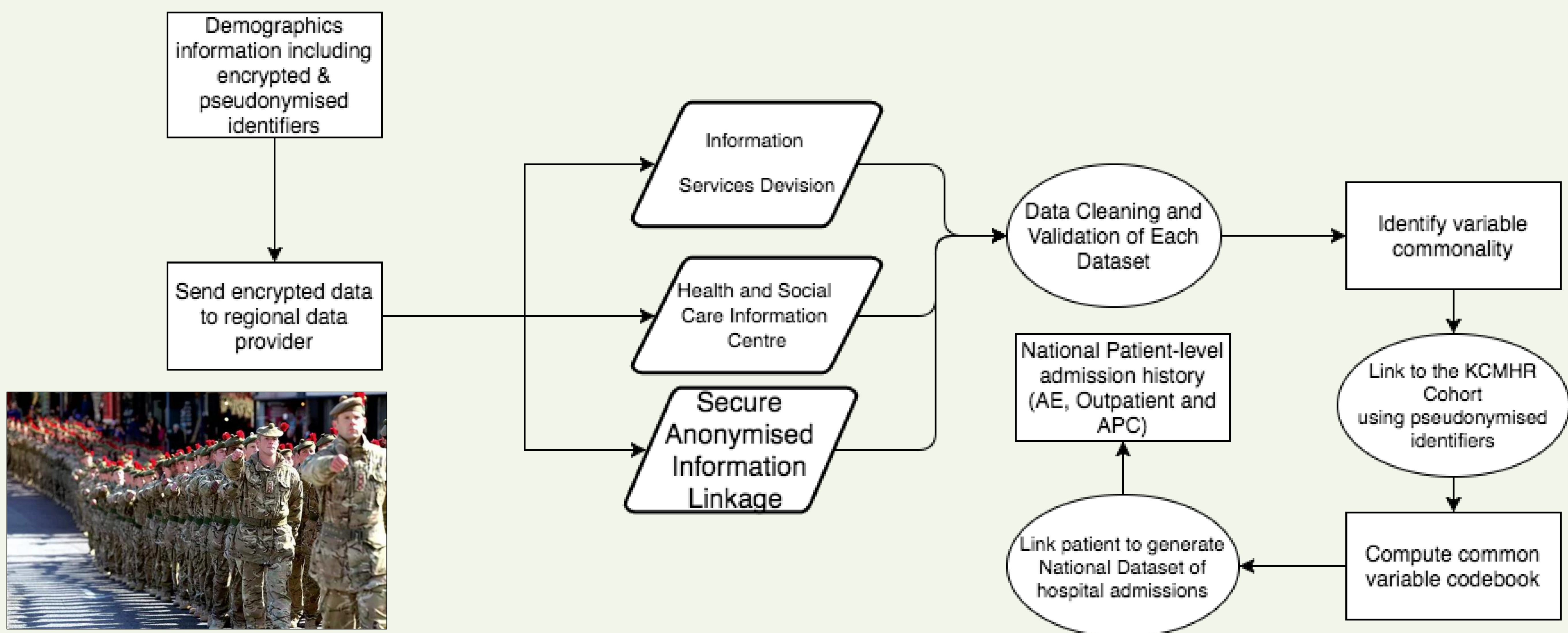
Aim: In this study we have undertaken a data linkage of the King's Centre for Military Health Research (KCMHR) cohort to EHR records of England, Scotland and Wales, identifying use of secondary care in a large representative sample of serving and ex-serving personnel.

Methods

- Sample is derived from the **KCMHR cohort study** which included two phases of data collection: phase 1 from 2004-2006 and phase 2 from 2007-2009 (Fear et al, 2010[1]; Hotopf et al, 2006[2]).
- Phases recruited approximately 10% of UK military personnel who had been deployed to the first phase of the 2003 Iraq war and a further sample of military personnel who had not been deployed to Iraq at that time.
- A total of **8602 participants** consented for their NHS records to be obtained and linked.
- EHRs for each nation were requested by matching on unique patient identifiers which were: NHS/CHI Number, forename, surname, sex and date of birth.
- Record Linkage: Personal identifiers were passed to each nation data provider. Record linkage in Scotland and Wales was undertaken using pseudo-anonymised fuzzy matching. England required NHS number to be the blocking variable.
- Variables for each nation were evaluated and linked based on variable commonality principles.
- A national dataset of health and social care covering A&E, Admitted Patient Care and Outpatients was developed (Figure 1).

Figure 1: Linkage framework methodology.
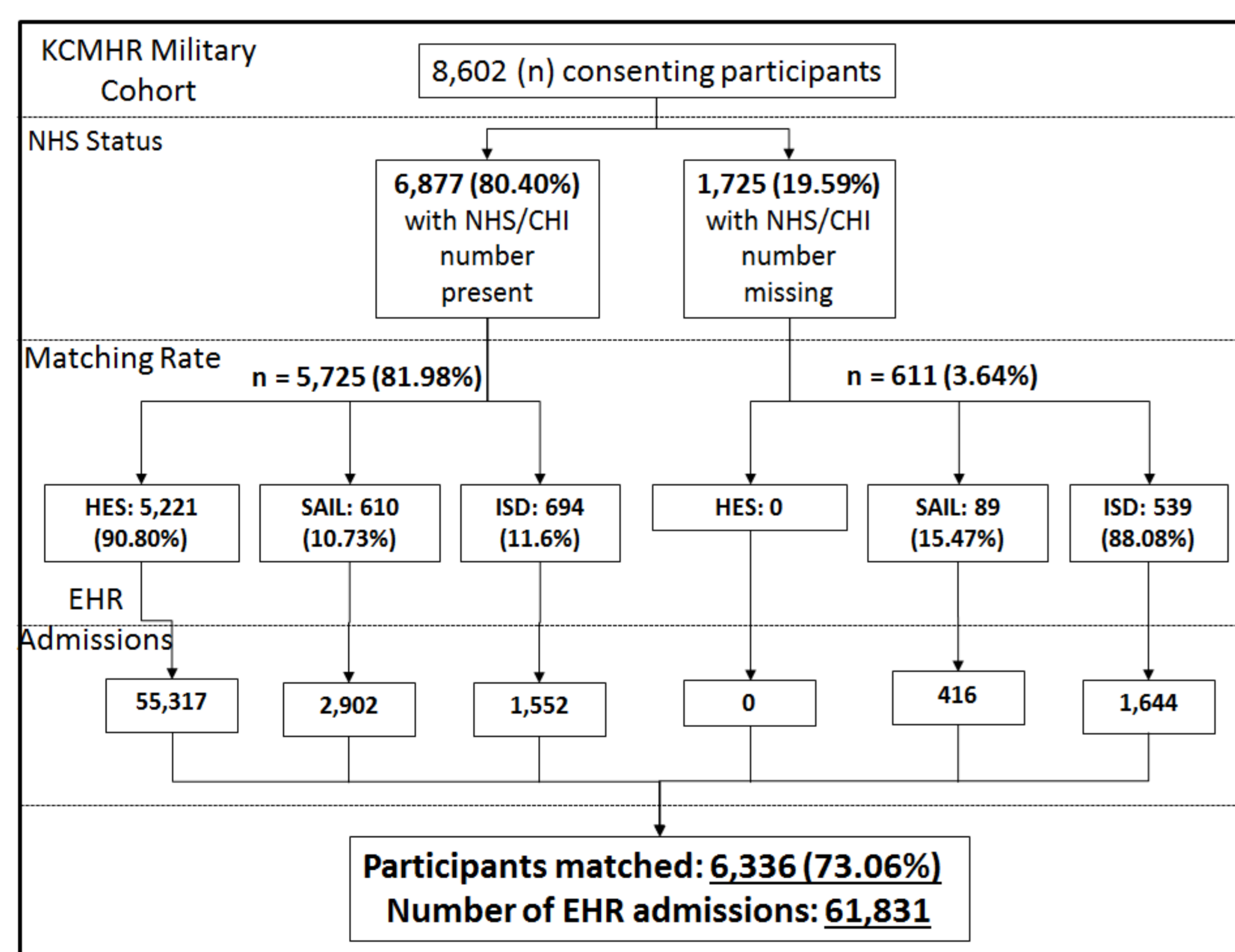

Results

Figure 2: Data Linkage

Participants matched: 6,336 (73.06%)
Number of EHR admissions: 61,831

Table 1: Variable completeness

	NHS Number/CHI Number	Initial	Forename	Surname	Gender	Date of Birth (DOB)
Variable Completeness	6,878 (79.96%)	8,179 (95.08%)	8,413 (97.8%)	8602 (100%)	8,602 (100%)	8597 (99.94%)
Missing Values	1,724 (20.04%)	423 (4.92%)	189 (2.2%)	0	0	5 (0.06%)

- Overall matching rate is **76.66% (n=6,336)**. There were nation discrepancies. Scotland had a matching rate of 14.22% (n=1,223), Wales 8.13% (n=899) and England 60.7% (n=5221) (Figure 2).
- Differences for those who provide an NHS number were observed. 79.95% (n=6,877) of participants who had a NHS number had a matching rate of 83.25% (n=5,725), whereas for those who did not have an NHS number a matching rate of 35.42% (n=611) was obtained.
- A total of 61,558 EHRs episodes of care were identified and extracted.

References

[1] N. T. Fear, M. Jones, D. Murphy, L. Hull, A. C. Iversen, B. Coker, L. Machell, J. Sundin, C. Woodhead, N. Jones, N. Greenberg, S. Landau, C. Dandeker, R. J. Rona, M. Hotopf, and S. Wessely, "What are the consequences of deployment to Iraq and Afghanistan on the mental health of the (UK) armed forces? A cohort study," *Lancet*, vol. 375, no. 9728, pp. 1783–1797, 2010.

[2] M. Hotopf, L. Hull, N. T. Fear, T. Browne, O. Horn, A. Iversen, M. Jones, D. Murphy, D. Bland, M. Earnshaw, N. Greenberg, J. H. Hughes, A. R. Tate, C. Dandeker, R. Rona, and S. Wessely, "The health of (UK) military personnel who deployed to the 2003 Iraq war: a cohort study," *Lancet*, vol. 367, no. 9524, pp. 1731–1741, 2006.

Conclusions

- England, Scotland and Wales store, manage and process EHRs differently. This makes it difficult to evaluate national trends and associations across the UK.
- Matching methodology used by each nation data provider has created linkage bias and errors. England required an NHS number as the blocking variable whereas Wales and Scotland did not.
- National coding schemes are utilised in England, Scotland and Wales – further work should seek to develop UK-wide coding schemes to enable a more efficient and robust analysis.