International Journal of Population Data Science

Using weighted hospital service area networks to explore variation in preventable hospitalisation.

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Objectives

Markets of health care are created in health services research to attribute variation in performance to characteristics of the health system. Defining patient catchments to capture hospital-level variation poses particular difficulties, because many factors other than geography drive choice of hospital. Several methods using linked data have been developed to create patient catchments or 'hospital service areas' (HSAs), including patterns of patient flow and networks of patient and physician referrals, yet these discrete catchments often have poor patient loyalty and are unable to attribute variation to specific hospitals. This study sought to demonstrate the use of multiple membership multilevel models, which cluster people in one or more higher-level units (such as multiple hospitals), in exploring between-hospital variation of preventable hospitalisations.

Approach

Linked hospital data from 267,014 participants in the 45 and Up Study, NSW Australia, with linkage by the NSW CHeReL, were used to create weighed hospital service area networks (HSANs) in which patterns of patient flow to large public hospitals within 593 postal areas were used to create a weighted probability of admission of participants to each hospital. Multiple membership multilevel Poisson models were used to explore variation in rates of preventable hospitalisation, clustering participants in hospitals using a weighted HSAN, and compared with models clustering participants in HSAs based on the most common hospital of admission.

Results

The most common hospital of admission accounted for an average of 67% of all admissions in each postal area. There was significant variation in rates of preventable hospitalisation between all 79 large public hospitals when clustering participants in a weighted HSAN, which was more than twice as large as the variation between the 72 hospitals forming the basis of HSAs. The ranking of hospitals differed between modelling approaches, and the hospital with the highest rate of preventable hospitalisation wasn't identified when using HSAs. There was no association between hospital bed occupancy rate and preventable hospitalisations when using either modelling approach.

Conclusion

Quantifying variation in health service use and outcomes is the cornerstone of creating accountable health care systems, yet much information is lost in creating discrete health catchments. Multiple membership multilevel models can help capture this uncertainty, and given they can be applied using extensions of current methodology, have potential to be used across a variety of methods for defining and analysing health care catchments.

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