Electronic Health Record-based Surveillance of Hypertension Prevalence

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Background:

Public health officials require timely, accurate data to guide decision-making. The Behavioral Risk Factor Surveillance System (BRFSS), a nationwide telephone survey of U.S. adults conducted by the CDC, serves as a primary source for chronic disease prevalence data. However, limitations like small sample sizes and publication delays exist.

A promising alternative is Electronic Health Record-based (EHR) surveillance. Under the CDC-funded Multi-state Electronic Health Record-based Network for Disease Surveillance (MENDS) project, the Regenstrief Institute utilizes EHR data from the Indiana Network for Patient Care database to detect hypertension using algorithms based on a combination of blood pressure measurements, diagnostic codes, and antihypertensive prescriptions.

Methods:

We compared hypertension prevalence estimates between BRFSS and MENDS using 2015 data from Indiana residents. BRFSS included individuals who positively reported a diagnosis of hypertension or antihypertensive medication use. MENDS included individuals based on clinical diagnosis, abnormal blood pressure readings, and medication history. Gestational hypertension and end-stage renal disease cases were excluded. Equivalence was empirically tested using the two one-sided t-tests (TOST) statistical method.

Results:

TOST analysis revealed the two methods were not equivalent overall ($p < 0.0001$) or in any strata measured. The EHR-based model produced a lower estimate of 18.7% (95% CI $\pm$ 7.1 x 10^{-6}, n=10,800,076), while BRFSS produced a higher estimate of 28.4% (95% CI $\pm$ 3.8, n=934).

Conclusion:

BRFSS might overestimate (i.e., too sensitive) hypertension prevalence due to survey methodology, while the EHR-based model might underestimate (i.e., too specific) due to its more complex hypertension-detection algorithm. Nevertheless, the EHR-based model provides a reliable and more timely method for estimating hypertension prevalence.

Implications:

MENDS provides estimates for other chronic disease risk measures such as diabetes, smoking, and obesity. Participating health departments receive updated data each month and can monitor trends. By providing reliable and timely data, public health officials can make well-informed decisions to serve their communities.