A Small Area Estimation Model of Comorbidity for England

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Abstract

Background: Along with an increased prevalence of cardiovascular disease (CVD), diabetes and obesity as single health conditions, there is a growing body of evidence that individuals are increasingly experiencing two or more of these conditions at the same time. Previous research on comorbidity has focused on identifying the most common groupings of illnesses among elderly healthcare users using hospital administrative data. Using small area estimation techniques, this paper develops a population-wide dataset of comorbidity of CVD, diabetes and obesity for England at the small area level.

Methods: Matching data from the 2011 Health Survey for England and the 2011 Census in England and Wales, we propose a new global optimisation (GO) survey calibration method for the estimation of small area (SA) estimates of comorbidity. Unlike previous SA estimation methods, the GO method is time efficient and always convergent, uses initial weights as a priori for the small area distribution, and allows the user to certify optimality of the solution. Validation of the newly simulated data involved comparing the fit (as measured by the relative difference of the sum of squared Z-scores, $Z^2_{rel} < 0$) of the benchmark constraints and non-benchmark constraints to Census data.

Findings: Validation revealed a significant fit for the benchmark constraints, age and sex ($Z^2_{rel} < 0$). Validation of the simulated non-benchmark constraint, health status constraint also revealed a significant fit ($Z^2_{rel} < 0$). In the absence of real small area data on comorbidity, the close fit of both the benchmark and non-benchmark constraints allows us to assume that the simulated estimates of comorbidity are statistically robust.

Interpretation: The World Health Organisation has identified increased rates of comorbidity as a major challenge for health policy. GO a new approach to SA estimation allows the prevalence of cardiovascular disease (CVD), diabetes and obesity as both single and comorbid health conditions to be estimated at the small area level. The newly estimated data has the potential to highlight comorbidity hotspots across England and inform future health policy.

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