

International Journal of Population Data Science

Journal Website: www.ijpds.org



Understanding healthcare burden in relation to obesity and hypertension as risk factors: a multistate model

Roberta Chiovoloni¹, Sebastian Stannard^{2,3}, Nida Ziauddeen³, Simon Fraser^{2,3,4}, Nisreen A Alwan^{2,3,4}, and Rhiannon K Owen¹

¹Population Data Science, Faculty of Medicine, Swansea University Medical School, Swansea, United Kingdom

²School of Primary Care, Population Sciences and Medical Education, Faculty of Medicine, University of Southampton, Southampton, United Kingdom

³NIHR Applied Research Collaboration Wessex, Southampton, United Kingdom

⁴University Hospital Southampton NHS Foundation Trust, Southampton, United Kingdom

Objectives

Using multistate models, we evaluated how the sequence of developing coexisting diseases, specifically obesity and hypertension, influences the trajectories to patient burden (defined as two hospital admissions within a five year period) and mortality. Our findings aim to provide insights into disease trajectories, identifying potential delays in diagnosis and prolonged high-burden states.

Method

We used administrative and electronic health record data from Welsh residents aged 18 and older on the 1st January 2005. Obesity and hypertension records were identified using primary and secondary care data sources.

We applied a multistate model to examine condition accrual and its association with hospital admissions and mortality in an 18-year window, accounting for competing risks. Individuals transitioned between healthy, obesity, hypertension, combined obesity and hypertension, burden, and death (absorbing state). Cox regression models estimated transition hazards, adjusting for age, sex, and Welsh Index of Multiple Deprivation. Analyses were conducted in the SAIL Databank using R.

Results

The study included 2,432,723 individuals (48.8% female) with a median age of 37.9 (24.1-51.7) years. 950,001 individuals remained event-free, 822,728 developed obesity and 185,056 hypertension as first condition, and 157,066 developed both

Overall, 805,076 (33.1%) reached the burden state.

Middle-aged individuals (40 years old) in the hypertension state had a higher risk of burden (0.80) by the end of the 18-year window than those in the combined obesity and hypertension states (0.62 and 0.55). Risk was lower for females than males (aHR 0.96, 95% 0.95-0.98).

Mortality risk within the first five years post-diagnosis was highest for individuals who developed hypertension followed by obesity, compared to those with hypertension alone or obesity preceding hypertension (0.01 vs 0.0075 and 0.008).

Men had higher mortality risks than women across all transitions.

Conclusion

Our study highlights the differential risk of multiple hospital admissions in people with earlier healthcare coding of obesity and/or hypertension. These findings can highlight optimal times to identify risk factors to prevent adverse health outcomes.

