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Prevalence and transition of blood pressure and body mass index in South Africa

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ABSTRACT

Background: Hypertension and obesity are major risk factors for cardiovascular diseases and other chronic diseases, and their prevalence rates have been increasing in South Africa. Previous studies that have investigated prevalence of noncommunicable diseases and associated risk factors at the district level have used cross-sectional data that could not allow studying changes at both individual and ecological level. This PhD study's main aim was to address this gap by using two sets of longitudinal/panel data to profile and monitor the spatial and temporal distribution of hypertension and body mass index (BMI) by categories in South Africa. The PhD study's specific objectives were: (1) To estimate and compare the prevalence of hypertension over time and by districts for individuals aged 15 years and above; (2) to estimate the transition rates between BMI categories and to assess the factors associated with the transitions across all ages, and (3) to profile systolic (SBP) and diastolic blood pressure (DBP) changes by age and the effect of body mass index on the changes for women aged 22 to 89 years from an urban township. This integrated analysis provides policy makers with an improved and more accurate evidence in the variation of the burden of these two risk factors thereby enabling planning and resource allocation.

Methods: Data from the National income Dynamics Study (NiDS) panel survey were used for the first two specific objectives of the study, that is, estimation of the prevalence of hypertension at district level, and estimation of transition rates between BMI categories. Design-based and multilevel analyses were used for the estimation of hypertension prevalence, and multinomial regression model used for the analysis of the factors associated with BMI transitions. For the third specific objective, data from the Birth to twenty Plus Longitudinal Study (BT20) were used to fit growth curve models to describe intra- and inter-individual blood pressure (BP) trajectories, and the intra-class correlation coefficient (ICC) used to measure dependency of observations from the same individual.

Results: After accounting for demographic, behavioural, socioeconomic, and environmental factors, significant variation remained in the prevalence of hypertension at the district level. Districts with higher-than-average prevalence were found mostly in the South Western part of the country while those with prevalence below average were found in the Northern area.

Between 2008 and 2017, the highest BMI increase was by the 7-13 years (4.7kg/m^2), 14-18 years (3.3kg/m^2), 19-24 years (3.2kg/m^2) age groups, and women (3.1kg/m^2). Overall, prevalence of obesity increased from 19.4% to 23.5%, with the 19-24 years age group (10.9% to 28.4%) and those with at least high school education (25.2% to 40.1%) having the highest increases. The transition rates to upward BMI level were higher than those to the downward BMI level. In the BT20 Plus data, four BP patterns were identified: a slow decrease with age before 30 years; a period of rapid increase in midlife up to 60 years; a flattening and slightly declining trend; and another increase in advanced ages. These phases persisted but at slightly low levels after BMI adjustment. Of the 1969 individuals, three groups were evident based on the severity of BP. In SBP, 1386 (70.4%), 482 (24.5%), and 101 (5.1%) were in low, medium, and highly elevated BP levels. For DBP, 1167 (59.3%), 709 (36.0%), and 93 (4.7%) were in low, medium, and highly elevated BP levels. The ICC was strong at 0.71 and 0.79 for SBP and DBP, respectively.

Conclusions: The aim of this PhD was to monitor spatial and temporal distribution of hypertension and BMI using two longitudinal data sets in South Africa. Although it has been known that hypertension prevalence differed substantially by district, the use of model-based estimation in this study using combined data over several time points provided precise estimates that correctly classified the districts' prevalence as below average, above average, or just average. BMI increased substantially between 2008 and 2017, and upward transition rate exceeded downward rate. Due to high retention in the overweight/obesity states, life course approach interventions that prevent transition into these states may need improvement. Based on the BT20 data, preventive and control measures for blood pressure early in life would be beneficial for control later in life. The evidence generated in this thesis enables public health decision makers to focus their resources on geographical areas (mostly South West districts of the country) and population segments (mostly women, ages 19-24 years, and higher education) where they are most needed. Furthermore, the comprehensive longitudinal methodology of this study could be useful in assessing future achievements of the South African strategies for prevention and control of these two risk factors of noncommunicable diseases.