HYPERTENSION AND HIV AS COMORBIDITES IN SOUTH AFRICA: MODELING THE DUAL BURDEN

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Objective

We have adapted an established agent based model of HIV to include hypertension in order to quantify the growing dual HIV and NCD epidemic and predict the prevalence and incidence of HIV and hypertension individually and as comorbidities in South Africa.

Background

- Non-communicable diseases (NCDs) are a significant and growing source of morbidity and mortality among HIV positive people in sub-Saharan Africa.
- Calls for greater research in healthcare priorities and direct investments in the treatment of the co-epidemics of NCDs and HIV are stymied by the lack of viable population level estimates of hypertension and the co-burden of disease.
- In light of the data gaps for HIV and hypertension as comorbidities, a reliable model is imperative in the study of potential effectiveness of integrated HIV and NCD care.
- In this study we demonstrated that we can effectively model the prevalence and incidence of hypertension in South African populations over time, as well as HIV and hypertension as comorbidities

Methods

- STDSIM was developed using the Africa Health Research Institute's Health and Demographics Surveillance System (HDSS) in KwaZulu-Natal (KZN) annual HIV surveillance
- We calibrated the development of Hypertension to fit age- and sex-specific prevalence from HDSS data accounting for hypertension related mortality.
  - Hypertension surveillance of adults over 18 years old in 2003 and 2010 using WHO STEPS protocol
  - N= 22,124 had information on either condition in those years
  - Parameterized as the initial development of hypertension along the life course of an individual as drawn from a convex combination of densities for the baseline and growth component to account for temporal trends for differences in prevalence from 2003 and 2010

Figure 1: KwaZulu-Natal Data and Model Projections

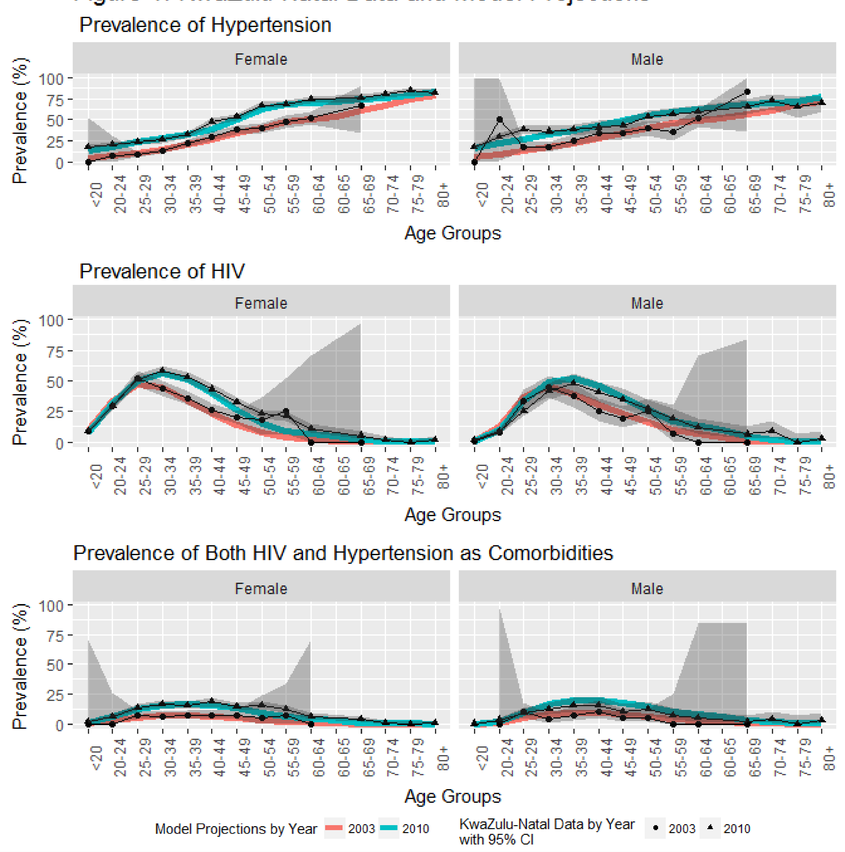
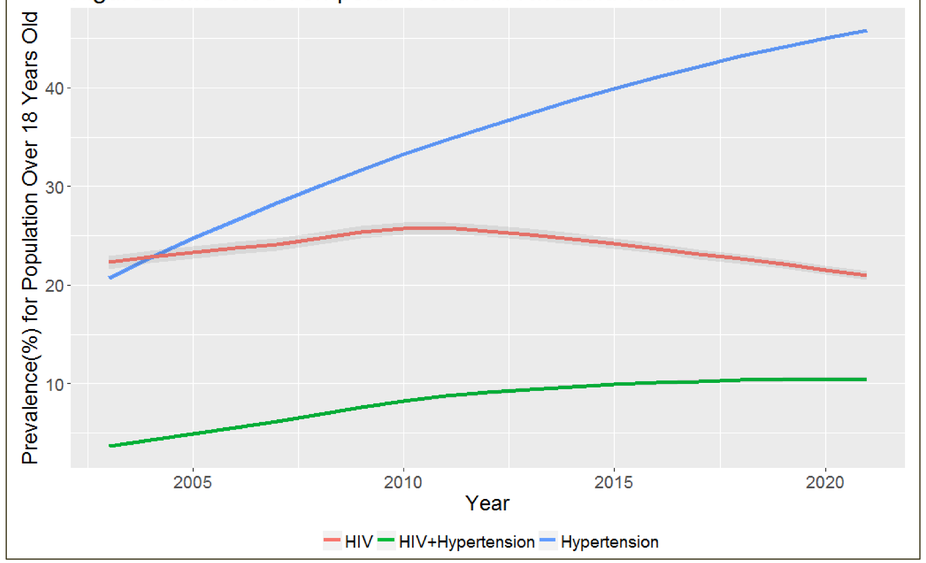


Figure 2: Modeled Temporal Trends in KwaZulu-Natal



Discussion

- The model recreates the adult population increase of hypertension from 21% in 2003 to 33% in 2010 (figure 1).
- The prevalence of HIV and hypertension as comorbidities from the surveillance estimates is replicated with an increase from 3.5% in 2003 to 8% in 2010.
- We predict a 2017 hypertension prevalence of 42%, with 595 new cases per 10,000 people.
- The predicted 2017 prevalence of hypertension and HIV as comorbidities is 10%, with 150 new comorbid cases per 10,000 people.
- There is substantial temporal increases in these conditions from the 2003 baseline to 2020 (Figure 2).
- Among people living with HIV, the predicted 2017 prevalence of hypertension is 46%. In the total 2017 adult population, a projected 52% has either hypertension, HIV, or both.

Conclusion

- The adapted STDSIM model incorporating hypertension is able to capture the empirically-measured dynamics of HIV and hypertension individually and as comorbidities in different South African settings.
- Demonstrated by the trends over time, hypertension prevalence is growing rapidly, and effective treatment of HIV will be complicated by the increased in NCDs.
- In the absence of more recent data on the co-burden of disease, these estimates of prevalent and incident cases approximate the dynamics of both conditions and may be used to address the gap in data.
- This model provides the foundation to support modeling studies aimed at understanding the impact of integrated care to treat HIV and chronic non-communicable diseases such as hypertension in sub-Saharan Africa.

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