A Multimorbidity Model of HIV Disease Progression

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Background

Context
- AIDS among people with HIV (PWH) has declined
- Life expectancy among PWH has increased
- Non-AIDS comorbidities among PWH have increased and occur at a higher rate than among people without HIV (PWoH)

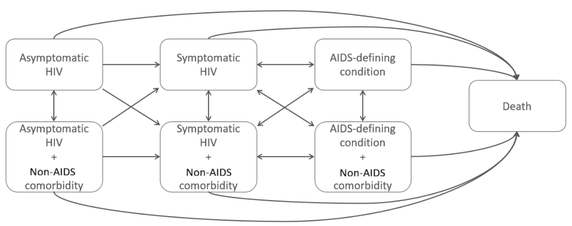
Problem
- Traditional models of HIV disease progression emphasize AIDS-defining conditions
- Health-related quality-of-life (HRQOL) for PWH today is primarily influenced by non-AIDS comorbidities rather than by AIDS-defining conditions
- HRQOL assessment and economic valuation of treatment for PWH relying on traditional models of HIV progression is now insufficient

Solution
- Extend previous models of HIV disease progression by including non-AIDS comorbidities
  - Provide accurate assessment of quality of life for PWH
  - Provide accurate economic valuation of treatment for PWH

Methods

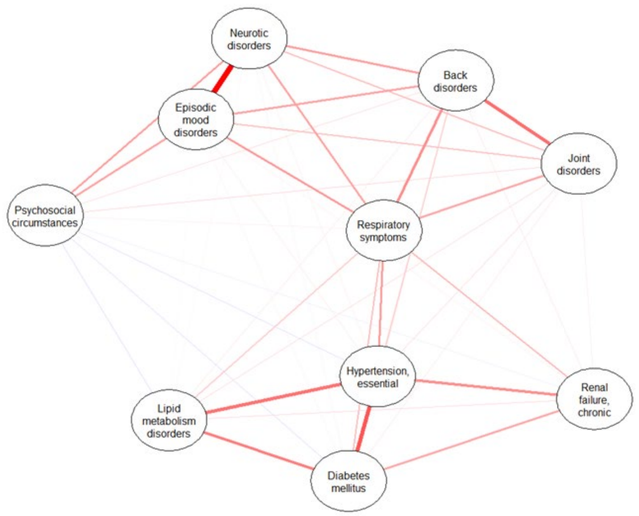
Data
- Retrospective cohort study
- U.S. Military Health System Data Repository
- Medical encounters, outpatient prescriptions, patient surveys
- Demographically matched 8334 PWH and 14586 PWoH, 82% Male
- Servicemembers, retirees, and dependents
- Years 2003 – 2018

Health states
- Stages of HIV (by antiretroviral therapy initiation and presence of AIDS-defining condition) and presence of non-AIDS comorbidities
- Quality of life predicted using SF-36 data and model of HIV stages



Blinder-Oaxaca decomposition
- Decomposes difference in mortality between PWH and PWoH into
  - Difference due to differences in morbidity frequency
  - Difference due to differences in morbidity effect on mortality

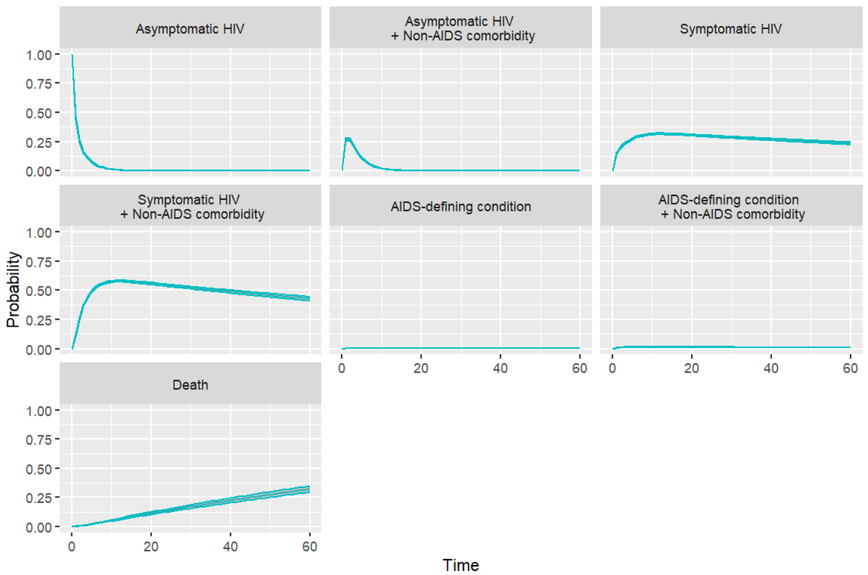
Results



Non-AIDS multimorbidity among PWH
- 10 most common International Classification of Diseases code categories
- Grouping created using a force-directed placement algorithm based on the correlations between comorbidities; line width proportional to correlations between comorbidities
- PWH had higher morbidity than PWoH
- Being diagnosed with a comorbidity was correlated with being diagnosed with other comorbidities of the same type.

Plain Language Summary

AIDS among people with HIV has declined. **HIV disease progression in the current era of improved treatment and extended lifespans should be defined in terms of the accumulation of non-AIDS comorbidities.**



Aging with HIV and non-AIDS comorbidities
- Markov state transition model
- The higher morbidity among PWH was predominantly driven by non-AIDS comorbidities
- AIDS-defining conditions were rare
- In spite of improved treatment and rare AIDS-defining conditions, life expectancy for PWH continued to lag behind that of PWoH by 7 years
- Omitting the more prevalent non-AIDS comorbidities could overestimate quality of life for PWH by up to 7 years

Conclusions

Previous models of HIV disease progression
- Relevant during the early stages of the HIV epidemic when AIDS was prevalent and AIDS was the prevalent cause of mortality
- Improved treatment has reduced AIDS and made previous models less relevant

Present model of HIV disease progression with non-AIDS comorbidities
- More relevant now
- Finds that although the life expectancy of PWH has improved, the quality of life of PWH is lower than assumed due to non-AIDS comorbidities being more prevalent
- Can provide more accurate assessment of the quality of life of PWH due to the higher probability of non-AIDS comorbidities as well as the higher survival and duration of living with non-AIDS comorbidities
- Can provide more accurate economic valuation of treatment for PWH when the treatment
  - targets non-AIDS comorbidities
  - affects non-AIDS side effects
- The occurrence of a non-AIDS comorbidity in PWH contributed more to mortality than the occurrence of a non-AIDS condition in PWoH potentially due to
  - Biological interactions with HIV
  - Need for additional treatment focus on non-AIDS comorbidities

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