**Abstract** (439/250 words)

**Background:** As people living with HIV continue to age in the United States (US), local healthcare systems should prepare to manage the increasing burden of age-related comorbidities. It remains unclear how these demographic trends - and their corresponding impacts on healthcare systems - will continue into the future and how they differ across US states.

**Methods:** The Johns Hopkins Epidemiologic and Economic Model (JHEEM) is a dynamic transmission model of HIV in the US. The model is calibrated to population demographics (by age, race/ethnicity, sex) and key HIV epidemiological targets - including new diagnoses and diagnosed prevalence by age group - in 11 states comprising 63% of diagnosed prevalence in the US (Alabama, California, Florida, Georgia, Illinois, Louisiana, Mississippi, Missouri, New York, Texas, and Wisconsin). We project HIV epidemics from 2025 to 2040, estimating the proportion of people with diagnosed HIV (PWDH) over the ages of 55 as well as the median age of PWDH. We report 95% credible intervals across 1,000 independent simulations per state.

**Results:** The model projected the number of PWDH across all 11 states to rise from 665,000 (95% credible interval: 658,000 to 671,000) in 2025 to 702,000 (673,000 to 726,000) in 2040, with the number age 55+ growing from 308,000 (302,000 to 315,000) in 2025 to 402,000 (379,000 to 326,000) in 2040. This reflects an increase in the proportion of PWDH age 55+ from 46% (45 to 47%) in 2025 to 57% (54 to 60%) in 2040 and a shift in median age of PWDH from 51 years (51 to 52) to 61 years (58 to 63). State-level analysis suggested substantial variations in local outcomes. For example, the proportion of PWDH age 55+ in California was projected to rise from 50% (47 to 53%) to 67% (59 to 75%), with the median age rising from 54 years (52 to 56) to 67 years (63 to 70). By contrast, simulations in Wisconsin projected a stable proportion of PWDH age 55+, 44% (41 to 47%) versus 43% (37 to 53%), accompanied by reductions in projected median age from 49 years (47 to 51) to 41 years (38 to 60) between 2025 and 2040. Projected state-level changes in the proportion of PWDH age 55+ were most strongly correlated with urbanicity (Pearson correlation coefficient = +0.72; p=0.01).

**Conclusions:** The population of persons living with HIV in the US is projected to age significantly by 2040. Aging patterns will vary across states, with more rapid aging projected to occur in urban states. It will be important to allocate resources to help healthcare systems adapt to changing demographic patterns of PWDH in a manner that reflects state-level needs.