

Supplemental Online Content

Hyle EP, Ang L, Luu G, et al. Cost projections for Medicare beneficiaries with HIV aged 65 years or older over the next decade. *JAMA Netw Open*. 2026;9(7):e2621966. doi:10.1001/jamanetworkopen.2026.21966

eMethods.

eResults.

eReferences.

eTable 1. Input Parameters for the Simulated Cohorts of PWH Aged 20y+ in the United States in the CEPAC-US Model

eTable 2. Calibration of Model Transmissions to CDC Surveillance Estimates

eTable 3. Mean Annual Per Person Costs by Category While Alive and in the Year of Death for Male Medicare Beneficiaries With HIV on ART Who Received Any ART Prescription During the Year

eTable 4. Mean Annual Per Person Costs by Category While Alive and in the Year of Death for Female Medicare Beneficiaries With HIV on ART Who Received Any ART Prescription During the Year

eTable 5. Personal Health Care Index Projections Used to Adjust HIV-Related Non-ART and Non-HIV-Related Care Costs

eTable 6. Parameters Assessed in Sensitivity Analyses: Base Case Values, Lower-Bound (LB), Upper-Bound (UB), and Justifications for Ranges

eTable 7. Validation of CEPAC Model Projections of People Living With HIV and Deaths Among People Living With HIV Aged 20y+ From 2017-2022

eTable 8. Validation of CEPAC Model Output of Receipt of Care Among Diagnosed PWH 20y+ and Virologic Suppression Among PWH 20y+ in Care in 2022

eTable 9. Validation of CHARMED Model Output for the Number of PWH Over the Age of 65, Diagnosed, and in Care Compared With CDC Data (2021-2023)

eTable 10. Model-Projected Numbers of Deaths Among Medicare Beneficiaries With HIV Aged 65y+ by Year-End

eTable 11. Potential Reductions in Costs to Dolutegravir (DTG)-Containing Regimens Currently Recommended by the DHHS ART Guidelines, Assuming a 39% Reduction in the Cost of Dolutegravir

eTable 12. Comparison of Model-Projected Costs (in Billions of US Dollars) Based on 4 Different Approaches to Adjusting for Higher Costs Among Medicare Advantage Beneficiaries (vs Traditional Medicare Beneficiaries) and/or for Inflation (vs Not)

eFigure 1. Impact of Changes in ART Costs on 10 Years of Medicare Spending for Beneficiaries Aged 65y+ in Care (2026-2035)

eFigure 2. Multi-Way Sensitivity Analysis Regarding the Population of Medicare Beneficiaries Aged 65y+ in Care in 2035

eFigure 3. Multi-Way Sensitivity Analyses on Cumulative Costs of Medicare Beneficiaries Aged 65y+ in Care (2026-2035)

This supplemental material has been provided by the authors to give readers additional information about their work.

Supplemental eMethods

CEPAC-US Model Structure

CEPAC-US is a previously validated microsimulation model of HIV disease, treatment, and transmission.^{1–3} Simulated PWH draw characteristics from distributions of age, sex at birth, HIV RNA, initial CD4 count, and age-stratified adherence to ART at model start. PWH with undiagnosed HIV link to care after HIV testing or opportunistic infection. After linkage to care, PWH initiate ART and can become virologically suppressed, which results in a rise in CD4 cell count, decreased HIV RNA, and decreased HIV-related mortality. Mortality is informed by risk-related behavior among PWH and includes HIV-related causes and non-HIV-related causes. Full specification of the model is provided at <https://mpec.massgeneral.org/cepac-model/>.⁴

Transmission Cohort Structure

We defined four cohorts of PWH aged 20 and older to reflect the HIV care continuum in the CEPAC model: people newly infected with HIV (“incident” cohort), people living with HIV who are undiagnosed (“undiagnosed” cohort), people diagnosed with HIV receiving ART (“on ART” cohort), and people diagnosed with HIV who are out of care (“disengaged from care” cohort). We used three cohorts (i.e., the undiagnosed, on ART, and disengaged from care cohorts) to project the number and age distribution of people newly infected with HIV (“incident” cohort) based on community viral load, which we calibrated to CDC data (see Transmission Calibration, eMethods p. 4).²

Transmission Cohort Inputs

The population is 77% male with a mean ($\pm$ SD) initial age of 45.8 (12.1) years and a mean ($\pm$ SD) initial CD4 count of: 400 (166) cells/mm³ for the undiagnosed cohort, 576 (227) cells/mm³

for the on ART cohort, 325 (53) cells/mm³ for the disengaged from care cohort, and 652 (101) cells/mm³ for the incident cohort (**eTable 1**).^{5–10,11,12} To begin the analysis, we weighted cohorts by the 2014 HIV care continuum as reported by the CDC: PWH who are undiagnosed (151,954), people diagnosed with HIV receiving ART (675,439), and people diagnosed with HIV who are disengaged from care (244,778).^{9,10,12} Additional detailed CEPAC input parameters are included in **eTable 1** and prior publications.²

Transmission Calibration

To address the trend of decreasing HIV transmissions over the past decade, we applied deflators from 2015 through 2035 to reflect the impact of improving community viral suppression and increasing PrEP use: 1.00 (2015), 0.95 (2016), 0.90 (2017), 0.85 (2018-2019), 0.80 (2020), 0.75 (2021-2035) (**eTable 2**).^{13,14}

CEPAC Model Validation

We compared model-projected numbers of transmissions among PWH 20y+, the number of people living with diagnosed HIV, and the number of deaths among people with diagnosed HIV from 2017-2022 to CDC surveillance data.¹⁵ We also compared model-projected percentages of diagnosed PWH 20y+ who receive care and are virologically suppressed at the end of 2022 to CDC estimates.¹⁵

CHARMED Model

Model cohorts

In this analysis, the simulated population of the CHARMED model comprises: 1) Medicare beneficiaries living with HIV who are already aged 65 years or older and in care at model start, 2) people with HIV who turn 65 during follow-up and are enrolled in Medicare and in care, and

3) people aged 65 years or older who are newly diagnosed with HIV, initiate ART, and are enrolled in Medicare. We are simulating a population of people who are in care and enrolled in Medicare; therefore, we do not include people who are not in care or who disengage from clinical care, given limited data regarding their costs while disengaged from care. Similarly, we do not model people who enroll in Medicare after age 65; we anticipate that this is a small group of people given Medicare eligibility criteria and the absence of data regarding how many people with HIV enter Medicare after age 65.

Projecting the number of PWH age 65y+ enrolled in Medicare

Estimating the percentage of PWH age 65y+ in care and enrolled in Medicare

We projected costs and outcomes only for PWH over the age of 65 who are enrolled in Medicare Part D (and by definition, either Part A and/or Part B) or Medicare Advantage (Part C). Not all PWH aged 65 or older are enrolled in Medicare. Some individuals over the age of 65 are supported with employer-sponsored insurance; others are unable to acquire and maintain Medicare coverage (e.g., permanent residency requirements, prohibitive costs, work credit requirements).^{16–20} For some individuals who do not qualify for premium-free Part A due to permanent residency or work credit requirements, Marketplace coverage may be more affordable if their income is between 100–400% of the federal poverty level.²¹ In addition, although programs exist to alleviate the Part A, B, and D Medicare premium burden for low-income beneficiaries, regardless of their premium-free eligibility,^{22,23} these programs have historically had low participation rates due to high administrative burden and sharp eligibility cutoffs.²⁰ Individuals who cannot afford Medicare premiums may opt out of Medicare enrollment (in whole or in part).¹⁷

To estimate the percentage of PWH age 65 and older in clinical care who are also enrolled in Medicare, we used a 100% sample of TM and MA beneficiaries in January 2022.²⁴ We defined being in clinical care as having one inpatient or two non-inpatient claims with an HIV diagnosis/DRG code and having any ART filled between 2021-2022 (excluding PrEP). This resulted in a total of 83,485 PWH aged 65+ who were in care, enrolled in Medicare, and taking ART in 2021-2022.

We then derived the number of PWH 65y+ who are diagnosed and in care from the 2022 CDC surveillance data.¹⁵ We used the proportion of people 65y+ living with diagnosed HIV by year-end 2021 who received one VL or CD4 test in 2022 (71%) and multiplied it by the reported number of PWH 65y+ living with diagnosed HIV in 2022 (159,227) to estimate the number of PWH 65y+ who were in care: 112,573 PWH 65y+.^{15,25} Lastly, we compared the number of PWH 65y+ reported in care and enrolled in Medicare (83,485) with the number of PWH 65y+ reported by the CDC to be in care (112,573), and found that 74% of PWH 65y+ in care were enrolled in Medicare.^{15,24,25}

Estimating the number of PWH age 65y+ on ART on January 1st, 2026

To estimate the number of PWH aged 65y+ on ART at the CHARMED model start, we used the CEPAC output for the number of PWH 65y+ on ART at the end of December 2025 and applied the in-care (71%) and enrolled-in-Medicare (74%) deflators, as previously discussed.

Estimating the number of PWH turning 65 annually

We used the CEPAC model to estimate the number of people living with diagnosed HIV who are 65 years or older in 2026 and who will be turning 65 years old annually between 2026 and 2035.

We then applied the 71% in care multiplier from the CDC and the 74% estimate of PWH 65y+ in care and enrolled in Medicare as previously discussed.

Estimating the number of PWH 65y+ with newly diagnosed HIV

We then used CDC data regarding new diagnoses of HIV infection among adults aged 65 and older in 2016 to estimate the number of PWH aged 65 years or older who are newly diagnosed with HIV. In 2016, 844 new diagnoses of HIV infection among people 65y+ were reported, or a mean of 70 diagnoses monthly.¹¹ We estimated, based on 2022 CDC surveillance data, that 71% of newly diagnosed individuals engaged consistently in care,¹⁵ and that 74% of those diagnosed and in care will be enrolled in Medicare, as described in the section, *Projecting the number of PWH age 65y+ enrolled in Medicare*.^{24,26} We therefore estimated that 37 newly diagnosed PWH enter care each month and are Medicare-enrolled.

Validation of the CHARMED Model

We derived an estimated number of PWH 65y+ in care from CDC estimates for 2021-2023 as validation targets and compared the model projections with these validation targets.¹⁵

Parameterization of Medicare Costs

Using the Medicare dataset of PWH as previously described (see “*Projecting the number of PWH age 65y+ enrolled in Medicare*”), we estimated the age- and sex-stratified clinical care costs for Medicare beneficiaries who were alive for the entire calendar year, excluding any beneficiaries who died in the following 12 months. We separately estimated the clinical care costs of Medicare beneficiaries who died over the 12 months before their death (**eTables 3-4**).

To account for the increase in ART costs over time, we applied a 6% annual increase to ART costs based on trends in the annual cost of ART, which are similar for generic antiretrovirals

(e.g., tenofovir disoproxil fumarate [TDF]).^{27,28} We increased HIV-related and non-HIV-related clinical care costs based on the Centers for Medicare and Medicaid Services' projections of the Personal Health Care Index (2026-2035), with 2023 as the base year (**eTable 5**).^{29,30}

Sensitivity analyses: derivation of plausible parameter ranges

Given uncertainties in parameter estimates, we performed extensive one-way and multi-way sensitivity analyses to examine the impact of plausible ranges of estimates. For the population size of Medicare beneficiaries aged 65+ in care, we varied three elements. First, we assessed the impact of changes in the size of the PWH 65y+ population (i.e., the number of PWH 65y+ at model start, the number of PWH turning 65y each year of the simulation, and the number of newly diagnosed PWH who are also 65y+) using the range of annual cases reported by the CDC, including during the initial year of the COVID-19 pandemic.¹⁵ Second, we assessed the proportion of PWH 65y+ who are engaged in care, which we varied by +/- 15%, based on quasi-experimental studies of Medicaid expansion and disenrollment from the AIDS Drug Assistance Program.^{31,32} Last, we assessed the impact of Medicare enrollment.

To derive a range of plausible values for the percent of PWH 65y+ enrolled in Medicare, we used 2022 Ryan White data on client characteristics to estimate the percentage of PWH 65y+ in clinical care who are also enrolled in Medicare.³³ Since these estimates include "multiple coverages," which include clients with and without Medicare coverage, we included and excluded these clients to calculate the percentage of PWH enrolled in Medicare, which resulted in the range of 61-74% enrolled in Medicare, from which we used the midpoint (68%) as the lower bound in sensitivity analyses. The Ryan White HIV/AIDS program serves as a safety net program for individuals with HIV who are uninsured or underinsured. Therefore, the proportion of PWH in care enrolled in Medicare is expected to be lower among Ryan White clinics, making

them an appropriate source for the lower-bound estimate.³⁴ For the upper bound of the sensitivity analyses, we used the percentage of the general population (i.e., people with and without HIV) aged 65+ who had any form of Medicare coverage (Parts A, B, C, or D) in 2022 (94%).¹⁶ This upper bound was chosen to show the impact of PWH 65y+ enrolling in Medicare to the same extent as the general population.

For all cost parameters except ART, we used 95% confidence intervals from 2023 Medicare data. For ART, we varied costs from a lower bound reflecting the maximum impact of generic pricing starting in 2026 (40%) to an ongoing increase in ART prices (120%) beyond that explained by a 6% annual cost increase.³⁵ We summarized the justification for all parameter ranges used in sensitivity analyses in **eTable 6**.

Scenario analyses: modeling distinct mechanisms for ART cost reductions

In the base case, we did not differentiate between the different mechanisms by which the costs of antiretroviral therapy could be reduced. In a scenario analysis, we simulated two potential cost-reduction mechanisms: negotiations under the Inflation Reduction Act for Biktarvy and generic dolutegravir entry.

The Inflation Reduction Act (IRA) of 2022 provided the Centers for Medicare and Medicaid Services with a mechanism to negotiate prices for the drugs with highest total spending that are covered by Medicare Part B and Part D.³⁶ One of the most commonly prescribed ART regimens, Biktarvy, is among the list of drugs selected in the 2026 cycle of price negotiations, with negotiated prices taking effect beginning January 2028.^{37,38} The IRA provides guidance on the minimum discount required for negotiated drugs, depending on the type of drug, whether it is covered by Part B or Part D, and how many years the drug has had regulatory approval.^{39–41} For

drugs only covered by Part D, such as Biktarvy, the maximum fair price (MFP) is the lower of the post-rebate (net) weighted costs currently paid under Part D plans or a percentage (determined by years since regulatory approval) of the average non-federal average manufacturer price (non-FAMP).^{39–41} For the majority of drugs, the non-FAMP is estimated to be higher than the net price paid by Part D plans.^{42,43} As such, CMS has historically negotiated higher percentages than those outlined in the minimum statutory discounts.^{43,44} Since the non-FAMP is considered proprietary data and is not publicly available, we apply the non-FAMP percentage directly to pre-rebate claim amounts from Medicare Part D data.⁴² For these reasons, our estimates of the savings from the Inflation Reduction Act are conservative.

Biktarvy was first approved by the Food and Drug Administration on February 18, 2018.⁴⁵ For small-molecule drugs like Biktarvy, a drug with 9–12 years of regulatory approval will face a discount of the non-FAMP of 25%.³⁹ Drugs with 12–15 years of approval will face a discount of 35%, and drugs with 16+ years of approval will face a discount of 60%.^{39,40} Drugs must meet age criteria by February 1st.⁴⁶ Biktarvy has already been selected for negotiation in the 2026 cycle, with price-applicability year, 2028.⁴⁷ It will then be eligible for renegotiation for price-applicability years 2031 and 2035 due to moving into age categories with higher statutory minimum discounts.⁴⁰ We used these minimum discounts to project the potential impact of Medicare price negotiations. Based on 2023 Medicare claims data, 33.7% of Medicare beneficiaries aged 65+ on ART are taking Biktarvy for 10–12 months of the year.²⁴ We then applied these minimum discounts to the proportion of ART costs attributable to Biktarvy: no discount from 2026–2027; 25% from 2028–2030; 35% from 2031–2034; and 60% in 2035.^{39,40}

The patent for dolutegravir is expected to expire in June 2030, allowing a generic formulation to be produced for the US market.⁴⁸ We assume that generic dolutegravir will be available

beginning in 2031, although it is possible that may become available in mid-2030 (immediately after patent expiration) or be delayed.⁴⁹ Generic entry of Biktarvy is not expected within the study horizon, due to recent settlement agreements between Gilead and several generic manufacturers; therefore, we model only generic entry for dolutegravir, although generic entry of other antivirals could theoretically advance under circumstances such as patent invalidation.⁵⁰

Using 2023 traditional Medicare claims data, we estimated that 34.6% of PWH aged 65+ who received 10-12 months of ART were taking dolutegravir-based regimens.²⁴ A U.S. Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation (HHS ASPE) analysis of new generic markets has found that for drugs with over 15,000 users per month, the generic price of the drug was 61% of the brand price in 2016-19 (mean discount, 39%).³⁵ In 2023, 30,088 Medicare Part D beneficiaries had claims for Tivicay, the brand name for dolutegravir; therefore, we estimated a 39% reduction in the cost of generic dolutegravir.

Dolutegravir must be taken in combination with other antivirals to be effective in maintaining virologic suppression, so a 39% cost reduction for generic dolutegravir does not necessarily translate to a 39% reduction in the cost of dolutegravir-containing ART regimens. To derive a base-case estimate, we subtracted the average claims cost of Tivicay from Medicare Part D to obtain the average cost of the non-dolutegravir components. We then applied a 39% reduction to the cost of Tivicay to estimate the cost of generic dolutegravir, and added this amount to the cost of the remaining regimen components to estimate regimen costs in a world where generic dolutegravir is available.

Furthermore, for many ART regimens, providers can prescribe four main variations: 1) co-formulated brand-name, 2) a combination of brand-name antivirals, 3) hybrid-generic regimens having at least one branded and one generic antiviral, or 4) fully generic regimens. The

© 2026 Hyle EP et al. *JAMA Network Open*. This is an open access article distributed under the terms of the CC-BY-NC-ND License, which does not permit alteration or commercial use, including those for text and data mining, AI training, and similar technologies.

magnitude of savings from generics, therefore, depends not only on the type of dolutegravir-containing regimen prescribed but also on trends in prescribing co-formulated brand-name regimens, combination brand-name regimens, hybrid-generic regimens, and fully generic regimens.

To obtain plausible ranges for the impact of generic dolutegravir costs, we identified regimens containing dolutegravir recommended by the 2025 DHHS ART guidelines.⁵¹ For each regimen, we used the average 2023 Medicare Part D claim cost from the publicly available Medicare Part D drug spending dashboard.²⁸ For co-formulated branded regimens, we used the cost of the average claim listed. For combination brand-name regimens, we used the branded and generic (if available) costs of each regimen component and derived the cost of the regimen. We then assumed a 39% reduction in dolutegravir costs and calculated the proportion of costs after generic dolutegravir availability compared with 1) branded co-formulated regimens, 2) combination branded regimens, and 3) hybrid generic regimens (**eTable 11**). We do not compare cost against fully generic dolutegravir regimens, as they do not currently exist. We used the smallest and largest cost reductions that would result from generic dolutegravir-based regimens as the lower and upper bounds. If generic dolutegravir were used for DTG + TAF/FTC (tenofovir alafenamide/emtricitabine; brand name: Descovy), the regimen would cost only 20% less than it does now. In contrast, if generic dolutegravir were used for an entirely generic regimen, DTG + TDF/FTC, the regimen would cost 60% less than currently.

Supplementary eResults

CEPAC Model Validation

We projected that 31,870 transmissions would occur in 2022, compared with the calibration target of 31,800 from CDC data (**eTable 2**).¹⁵

In 2022, the projected number of diagnosed PWH aged 20 or older was 1,086,840, compared with CDC estimates of 1,088,862. The projected number of deaths among PWH with diagnosed HIV aged 20 or older would be 20,730 in 2022 compared with CDC estimates of 19,509 (**eTable 7**).¹⁵

We also compared selected outcomes for diagnosed PWH age 20 or older in 2022. Receipt of HIV medical care would be 70.7%, as compared to 75.6% per CDC estimates.¹⁵ Viral suppression is projected to be 67.3%, compared with 65.1% (**eTable 8**).¹⁵

CHARMED Model Validation

Population outcomes:

We projected the total number of PWH aged 65y+ in care from 2021 to 2023 and validated these projections against estimates derived from CDC data. For 2023, we projected that 128,780 PWH 65y+ would be in care, compared with 125,419 as derived from CDC estimates. Similarly, for 2021 and 2022, we projected that there would be 105,450 and 117,430 PWH 65y+ in care, compared with 100,440 and 112,573, respectively (**eTable 9**).

Projected deaths (2026-2035)

We projected that the total number of deaths of Medicare beneficiaries with HIV on ART would be 5,500 in 2026 and 9,640 in 2035. The increased number of projected deaths in future years

would be commensurate with the increased population sizes: 1,600 to 1,950 (65-69y), 1,450 to 2,520 (70-74y), 1,060 to 2,420 (75-79y), and 1,400 to 2,760 (80y+) in 2026 and 2035, respectively (**eTable 10**).

Impact of cost parameterization

We parameterized costs in four distinct ways: 1) adjusting for higher costs among Medicare Advantage beneficiaries compared with traditional Medicare beneficiaries, as well as inflation (base case); 2) adjusting for higher costs among Medicare Advantage beneficiaries but not for inflation; 3) adjusting for inflation but not higher costs among Medicare Advantage beneficiaries; and 4) adjusting for neither (**eTable 12**).

Multi-way sensitivity analyses: population outcomes

We performed a range of multi-way sensitivity analyses across plausible ranges and examined the impact on population outcomes (**eFigure 2**). When non-HIV-related mortality is 2.2-fold higher than that of the general population and the number of PWH turning 65 years in care who are enrolled in Medicare is 90% of base-case estimates, only 162,330 PWH 65y+ are projected to be enrolled in Medicare in 2035. This increases to 229,170 if non-HIV-related mortality is the same as that of the general population and the number of PWH turning 65 years in care who are enrolled in Medicare is 110% of base-case estimates (**eFigure 2A**). When non-HIV-related mortality is the same as in the general population and the number of Medicare beneficiaries aged 65+ on ART in 2026 is 14% higher than in the base case, the projected population size increases to 225,590. However, if non-HIV-related mortality is 2.2-fold higher than the general population and the number of Medicare beneficiaries 65y+ on ART in 2026 is 14% lower than base case projections, the population size would be only 168,140 in 2035 (**eFigure 2B**). Varying

the percentage of PWH in care and the percent of PWH in care who are enrolled in Medicare simultaneously would result in 165,750-262,620 Medicare beneficiaries with HIV aged 65y+ in care in 2035 (**eFigure 2C**). Varying the percentage of PWH aged 65y+ enrolled in Medicare and non-HIV-related mortality has the most substantial impact: if only 68% of PWH aged 65y+ on ART are enrolled in Medicare and non-HIV-related mortality is 2.2-fold higher among PWH than the general population, then only 160,580 PWH aged 65y+ would be enrolled in Medicare in 2035. Comparatively, if 94% of PWH aged 65y+ in care are enrolled in Medicare, and non-HIV-related mortality is the same as that of the general population, then 273,540 PWH aged 65y+ would be enrolled in Medicare and be engaged in care in 2035 (**eFigure 2D**).

Multi-way sensitivity analyses: cost outcomes

We performed a range of multiway sensitivity analyses to assess the impact of varying the most influential parameters from one-way sensitivity analyses on 10-year cumulative costs for Medicare beneficiaries with HIV aged 65y+ in care (**eFigure 3**). When the percent of PWH eligible for Medicare is 94% and background mortality is the same as that of the general population, the projected cumulative costs are \$251.0B compared with \$163.1B if the percent of PWH eligible is 68% and background mortality is 2.2-fold higher than the general population (**eFigure 3A**). When ART costs are 40% of 2023 estimates and the percent of PWH 65y+ in care is 56%, projected cumulative costs are \$103.3B. When ART costs are 120% of 2023 estimates, and the percent of PWH 65y+ in care is 86%, projected cumulative costs are \$131.0B higher (\$234.4B) (**eFigure 3B**). When the percent of PWH 65y+ in care and enrolled in Medicare are varied simultaneously, the projected 10-year cumulative costs range from 152.5 to 264.7B (**eFigure 3C**). Finally, ten-year cumulative costs would range from \$107.4B to \$267.5B if

68-94% of PWH 65+ on ART are enrolled in Medicare and ART costs range from 40% to 120% of 2023 estimates (**eFigure 3D**).

eReferences

1. Freedberg KA, Losina E, Weinstein MC, et al. The cost effectiveness of combination antiretroviral therapy for HIV disease. *N Engl J Med*. 2001;344(11):824-831. doi:10.1056/NEJM200103153441108
2. Hyle EP, Kasaie P, Schwamm E, et al. A growing number of men who have sex with men aging with HIV (2021-2031): a comparison of two microsimulation models. *J Infect Dis*. 2023;227(3):412-422. doi:10.1093/infdis/jiac473
3. Borre ED, Hyle EP, Paltiel AD, et al. The clinical and economic impact of attaining national HIV/AIDS strategy treatment targets in the United States. *J Infect Dis*. 2017;216(7):798-807. doi:10.1093/infdis/jix349
4. CEPAC Model. Massachusetts General Hospital. Accessed May 12, 2026. <https://mpec.massgeneral.org/cepac-model/>
5. Althoff KN, Rebeiro PF, Hanna DB, et al. A picture is worth a thousand words: maps of HIV indicators to inform research, programs, and policy from NA-ACCORD and CCASAnet clinical cohorts. *J Int AIDS Soc*. 2016;19(1):20707. doi:10.7448/IAS.19.1.20707
6. Buchacz K, Frazier EL, Hall HI, et al. A matter of perspective: Comparison of the characteristics of persons with HIV infection in the United States from the HIV Outpatient Study, Medical Monitoring Project, and National HIV Surveillance System. *Open AIDS J*. 2015;9:123-133. doi:10.2174/1874613601509010123
7. Robb ML, Eller LA, Kibuuka H, et al. Prospective study of acute HIV-1 infection in adults in East Africa and Thailand. *New Eng J Med*. 2016;374(22):2120-2130. doi:10.1056/NEJMoa1508952
8. Centers for Disease Control and Prevention. HIV Surveillance Report: Diagnoses of HIV infection in the United States and dependent areas, 2021. 2023;34. Accessed May 12, 2026. <https://stacks.cdc.gov/view/cdc/149071>
9. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data : United States and 6 dependent areas, 2016. 2018;23(4). Accessed May 12, 2026. <https://stacks.cdc.gov/view/cdc/59170>
10. Centers for Disease Control and Prevention. Diagnoses of HIV infection in the United States and dependent areas, 2018. 2020;31. Accessed May 12, 2026. <https://stacks.cdc.gov/view/cdc/87803>
11. Centers for Disease Control and Prevention. Diagnoses of HIV infection among adults aged 50 years and older in the United States and dependent areas 2011-2016. 2018;23(5). Accessed May 12, 2026. <https://stacks.cdc.gov/view/cdc/58352>
12. Centers for Disease Control and Prevention. Estimated HIV incidence and prevalence in the United States, 2014-2018. 2020;25(1). Accessed May 12, 2026. <https://stacks.cdc.gov/view/cdc/87841>

13. Sullivan PS, Juhasz M, DuBose SN, et al. Association of state-level PrEP coverage and new HIV diagnoses in the USA from 2012 to 2022: an ecological analysis of the population impact of PrEP. *The Lancet HIV*. 2025;12(6):e440-e448. doi:10.1016/S2352-3018(25)00036-0
14. AIDSvu. Tools & resources: datasets. Accessed May 12, 2026. <https://aidsvu.org/resources/#/datasets>
15. Centers for Disease Control and Prevention. National Center for HIV, Viral Hepatitis, STD, and Tuberculosis Prevention AtlasPlus. Accessed May 12, 2026. <https://www.cdc.gov/nchhstp/about/atlasplus.html>
16. US Census Bureau. Percentage of older adults with both private health insurance and Medicare decreased from 2017 to 2022. Census.gov. Accessed May 12, 2026. <https://www.census.gov/library/stories/2024/04/older-adults-health-coverage.html>
17. McKee K. Medicaid can pay Medicare Part A premiums for those who qualify – an update. February 22, 2023. Accessed May 12, 2026. <https://www.phlp.org/en/news/medicaid-can-pay-medicare-part-a-premiums-for-those-who-qualify-an-update>
18. Cubanski J, Freed M, Ochieng N, Cottrill A, Biniek JF, Neuman T. Medicare 101. KFF. October 3, 2025. Accessed May 12, 2026. <https://www.kff.org/medicare/health-policy-101-medicare/>
19. Centers for Medicare and Medicaid Services. Original Medicare (part A and B) eligibility and enrollment. CMS.gov. Accessed May 12, 2026. <https://www.cms.gov/medicare/enrollment-renewal/original-part-a-b>
20. Primus W, Bingham PR. Reducing premiums for low-income Medicare beneficiaries. Brookings. February 15, 2024. Accessed May 12, 2026. <https://www.brookings.edu/articles/reducing-premiums-for-low-income-medicare-beneficiaries/>
21. FAQs: Medicare and the Marketplace. KFF. Accessed May 12, 2026. <https://www.kff.org/faqs/faqs-health-insurance-marketplace-and-the-aca/medicare-and-the-marketplace/i-am-turning-65-years-old-next-month-but-i-am-not-entitled-to-medicare-without-having-to-pay-a-premium-for-part-a-because-i-have-not-worked-long-enough-to-qualify-can-i-sign-up-for-a-marketplace-pla/>
22. SSA - POMS: HI 03001.005 - Medicare Part D Extra Help (Low-Income Subsidy or LIS) - 12/13/2024. Accessed May 12, 2026. <https://secure.ssa.gov/poms.nsf/lnx/0603001005>
23. Medicare savings programs. Medicare.gov. Accessed June 15, 2026. <https://www.medicare.gov/basics/costs/help/medicare-savings-programs>
24. Centers for Medicare and Medicaid Services. Chronic Conditions Data Warehouse. Accessed May 12, 2026. <https://www2.ccwdata.org/web/guest/medicare-data>

25. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data : United States and 6 dependent areas, 2020. 2022;27(3). Accessed May 12, 2026. <https://stacks.cdc.gov/view/cdc/117803>
26. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data - United States and 6 territories and freely associated states, 2022. 2024;29(2). Accessed May 12, 2026. <https://www.cdc.gov/hiv-data/nhss/estimated-hiv-incidence-and-prevalence.html>
27. McCann NC, Horn TH, Hyle EP, Walensky RP. HIV antiretroviral therapy costs in the United States, 2012-2018. *JAMA Intern Med.* 2020;180(4):601-603. doi:10.1001/jamainternmed.2019.7108
28. Centers for Medicare & Medicaid Services. Medicare Part D drug spending dashboard. Data.CMS.gov. May 29, 2025. Accessed May 12, 2026. <https://data.cms.gov/tools/medicare-part-d-drug-spending-dashboard>
29. Centers for Medicare & Medicaid Services. National Health Expenditure Projections. Accessed May 12, 2026. <https://www.cms.gov/files/zip/nhe-projections-tables.zip>
30. Neumann PJ, Sanders GD, Russell LB, Siegel JE, Ganiats TG. *Cost-Effectiveness in Health and Medicine*. 2nd ed. Oxford University Press; 2017.
31. Erly SJ, Khosropour CM, Hajat A, Sharma M, Reuer JR, Dombrowski JC. AIDS Drug Assistance Program disenrollment is associated with loss of viral suppression beyond differences in homelessness, mental health, and substance use disorders: An evaluation in Washington state 2017–2019. *PLoS One.* 2023;18(5):e0285326. doi:10.1371/journal.pone.0285326
32. Creedon TB, Zuvekas SH, Hill SC, Ali MM, McClellan C, Dey JG. Effects of Medicaid expansion on insurance coverage and health services use among adults with disabilities newly eligible for Medicaid. *Health Serv Res.* 2022;57(Suppl 2):183-194. doi:10.1111/1475-6773.14034
33. Health Resources and Services Administration. Ryan White HIV/AIDS program annual data report 2023. Published online December 2023. <https://ryanwhite.hrsa.gov/data/reports>
34. Kates J, Dawson L, Horn TH, et al. Insurance coverage and financing landscape for HIV treatment and prevention in the USA. *Lancet.* 2021;397(10279):1127-1138. doi:10.1016/S0140-6736(21)00397-4
35. US Department of Health and Human Services; Office of the Assistant Secretary of Planning and Evaluation. Analysis of new generic markets, effect of market entry on generic drug prices: Medicare data 2007-2022. Published online January 16, 2025. Accessed May 12, 2026. <https://aspe.hhs.gov/sites/default/files/documents/510e964dc7b7f00763a7f8a1dbc5ae7b/aspe-ib-generic-drugs-competition.pdf>
36. Centers for Medicare and Medicaid Services. Medicare drug price negotiation program: Final guidance, implementation of sections 1191 – 1198 of the Social Security Act for initial

price applicability year 2028 and manufacturer effectuation of the maximum fair price in 2026, 2027, and 2028. Published online September 30, 2025.

37. Gilead Sciences, Inc. GILD Q4 and FY25 summary of prepared remarks. Published online February 10, 2026. Accessed May 22, 2026.
https://s29.q4cdn.com/585078350/files/doc_financials/2025/q4/GILD-Q425-Summary-of-Prepared-Remarks-10-February-2026.pdf
38. Centers for Medicare & Medicaid Services. Medicare drug price negotiation program: selected drugs for initial price applicability year 2028. Published online January 2026.
<https://www.cms.gov/files/document/factsheet-medicare-negotiation-selected-drug-list-ipay-2028.pdf>
39. Dickson S, Hernandez I. Drugs likely subject to Medicare negotiation, 2026-2028. *J Manag Care Spec Pharm*. 2023;29(3):10.18553/jmcp.2023.29.3.229.
doi:10.18553/jmcp.2023.29.3.229
40. Martin K, Sachs R. Analyzing the drugs selected for the 2028 Medicare drug price negotiation cycle. *Health Affairs*. February 5, 2026. Accessed May 12, 2026.
<https://www.healthaffairs.org/doi/10.1377/forefront.20260204.666780/full/>
41. Centers for Medicare and Medicaid Services. Medicare drug price negotiation program: Initial memorandum, implementation of sections 1191-1198 of the Social Security Act for initial price applicability year 2026, and solicitation of comments. Published online March 15, 2023. Accessed May 12, 2026. <https://www.cms.gov/files/document/medicare-drug-price-negotiation-program-initial-guidance.pdf>
42. Hernandez I, Gabriel N, Dickson S. Nonfederal average manufacturer price to estimate savings generated by minimum discounts under the Inflation Reduction Act. *J Manag Care Spec Pharm*. 2023;29(11):1261-1263. doi:10.18553/jmcp.2023.29.11.1261
43. Hernandez I, Gabriel N, Dickson S. Estimated discounts generated by Medicare drug negotiation in 2026. *J Manag Care Spec Pharm*. 2023;29(8):868-872.
doi:10.18553/jmcp.2023.29.8.868
44. US Department of Health and Human Services; Office of the Assistant Secretary of Planning and Evaluation. IRA research series: Medicare drug price negotiation program: Medicare prices negotiated for 2026 compared to list and U.S. market prices. Published online August 15, 2024. Accessed May 12, 2026.
<https://aspe.hhs.gov/sites/default/files/documents/3e8abec86039ac0ed674a8c5fac492e3/price-change-over-time-brief.pdf>
45. National Institutes of Health Office of AIDS Research (OAR). FDA-approved HIV medicines. HIVinfo.NIH.gov. May 22, 2026. Accessed May 26, 2026.
<https://hivinfo.nih.gov/understanding-hiv/fact-sheets/fda-approved-hiv-medicines>
46. Juliette Cubanski, Tricia Neuman. Key facts about Medicare drug price negotiation. KFF. March 11, 2026. Accessed May 12, 2026. <https://www.kff.org/medicare/key-facts-about-medicare-drug-price-negotiation/>

47. Centers for Medicare & Medicaid Services. CMS announces selection of drugs for third cycle of Medicare drug price negotiation program, including first-ever part B drugs. CMS.gov. January 27, 2026. <https://www.cms.gov/newsroom/press-releases/cms-announces-selection-drugs-third-cycle-medicare-drug-price-negotiation-program-including-first>
48. Tivicay patent expiration. Pharsight. Accessed May 22, 2026. <https://pharsight.greyb.com/drug/tivicay-patent-expiration>
49. Beall RF, Darrow JJ, Kesselheim AS. A method for approximating future entry of generic drugs. *Value Health*. 2018;21(12):1382-1389. doi:10.1016/j.jval.2018.04.1827
50. Gilead Sciences, Inc. Form 10-K for the fiscal year ended December 31, 2025. Accessed May 12, 2026. <https://d18rn0p25nwr6d.cloudfront.net/CIK-0000882095/656b3748-946b-4466-9bf5-47f7e5f7443f.pdf>
51. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in adults and adolescents with HIV. Published online September 25, 2025. Accessed December 19, 2025. <https://clinicalinfo.hiv.gov/sites/default/files/guidelines/documents/adult-adolescent-arv/guidelines-adult-adolescent-arv.pdf>
52. Daar ES, Tierney C, Fischl MA, et al. Atazanavir plus ritonavir or efavirenz as part of a 3-drug regimen for initial treatment of HIV-1. *Ann Intern Med*. 2011;154(7):445-456. doi:10.7326/0003-4819-154-7-201104050-00316
53. Multicenter AIDS Cohort Study (MACS) Public Dataset: Release PO4. Published online 1995.
54. Arias E, Heron M, Xu J. *United States Life Tables, 2014*. National Center for Health Statistics; 2017.
55. Shebl FM, Qian Y, Foote JHA, et al. The association between all-cause mortality and HIV acquisition risk groups in the United States, 2001–2014. *PLOS ONE*. 2023;18(8):e0290113. doi:10.1371/journal.pone.0290113
56. Walmsley S, Baumgarten A, Berenguer J, et al. Brief report: dolutegravir plus abacavir/lamivudine for the treatment of HIV-1 infection in antiretroviral therapy-naïve patients: week 96 and week 144 results from the single randomized clinical trial. *J Acquir Immune Defic Syndr*. 2015;70(5):515-519. doi:10.1097/QAI.0000000000000790
57. Raffi F, Rachlis A, Stellbrink HJ, et al. Once-daily dolutegravir versus raltegravir in antiretroviral-naïve adults with HIV-1 infection: 48 week results from the randomised, double-blind, non-inferiority SPRING-2 study. *The Lancet*. 2013;381(9868):735-743. doi:10.1016/S0140-6736(12)61853-4
58. Clotet B, Feinberg J, van Lunzen J, et al. Once-daily dolutegravir versus darunavir plus ritonavir in antiretroviral-naïve adults with HIV-1 infection (FLAMINGO): 48 week results from the randomised open-label phase 3b study. *The Lancet*. 2014;383(9936):2222-2231. doi:10.1016/S0140-6736(14)60084-2

59. Sax PE, Pozniak A, Montes ML, et al. Coformulated bictegravir, emtricitabine, and tenofovir alafenamide versus dolutegravir with emtricitabine and tenofovir alafenamide, for initial treatment of HIV-1 infection (GS-US-380–1490): a randomised, double-blind, multicentre, phase 3, non-inferiority trial. *Lancet*. 2017;390(10107):2073-2082. doi:10.1016/S0140-6736(17)32340-1
60. Orrell C, Hagins DP, Belonosova E, et al. Fixed-dose combination dolutegravir, abacavir, and lamivudine versus ritonavir-boosted atazanavir plus tenofovir disoproxil fumarate and emtricitabine in previously untreated women with HIV-1 infection (ARIA): week 48 results from a randomised, open-label, non-inferiority, phase 3b study. *Lancet HIV*. 2017;4(12):e536-e546. doi:10.1016/S2352-3018(17)30095-4
61. Gallant J, Lazzarin A, Mills A, et al. Bictegravir, emtricitabine, and tenofovir alafenamide versus dolutegravir, abacavir, and lamivudine for initial treatment of HIV-1 infection (GS-US-380-1489): a double-blind, multicentre, phase 3, randomised controlled non-inferiority trial. *Lancet*. 2017;390(10107):2063-2072. doi:10.1016/S0140-6736(17)32299-7
62. Attia S, Egger M, Müller M, Zwahlen M, Low N. Sexual transmission of HIV according to viral load and antiretroviral therapy: Systematic review and meta-analysis. *AIDS*. 2009;23(11):1397-1404. doi:10.1097/QAD.0b013e32832b7dca
63. Wawer MJ, Gray RH, Sewankambo NK, et al. Rates of HIV-1 transmission per coital act, by stage of HIV-1 infection, in Rakai, Uganda. *J Infect Dis*. 2005;191(9):1403-1409. doi:10.1086/429411
64. Centers for Disease Control and Prevention. HIV surveillance supplemental report: Monitoring selected national HIV prevention and care objectives by using HIV surveillance data—United States and 6 dependent areas, 2019. 2021;26(2). Accessed May 12, 2026. <https://stacks.cdc.gov/view/cdc/160192>
65. Centers for Disease Control and Prevention. Behavioral and clinical characteristics of persons with diagnosed HIV infection - Medical Monitoring Project, United States, 2019 Cycle (June 2019-May 2020). 2021;28. Accessed June 18, 2025. <https://stacks.cdc.gov/view/cdc/149116>
66. Rebeiro PF, Gange SJ, Horberg MA, et al. Geographic variations in retention in care among HIV-infected adults in the United States. *PLoS One*. 2016;11(1):e0146119. doi:10.1371/journal.pone.0146119
67. Centers for Disease Control and Prevention. National Vital Statistics System: Mortality multiple cause files. Accessed May 12, 2026. https://www.cdc.gov/nchs/data_access/vitalstatsonline.htm#Mortality_Multiple

eTable 1. Input parameters for the simulated cohorts of PWH aged 20y+ in the United States in the CEPAC-US Model.

Parameter	Base Case Input	Reference
Baseline cohort characteristics		
Male (%)	77	8
Initial CD4 count, mean cells/mm³		
Prevalent, undiagnosed	400 (166)	5
Prevalent, on ART	576 (227)	6
Prevalent, disengaged from care	325 (53)	5
Incident	652 (101)	7
HIV RNA setpoint distribution (%)		52
>100,000 copies/ml	25	
30,001-100,000 copies/ml	42	
10,001-30,000 copies/ml	21	
3,001-10,000 copies/ml	6	
≤ 3,000 copies/ml	6	
Initial age among people with prevalent HIV at model start in Jan 2015 (%)		9–12
20-24 years	6	
25-34 years	17	
35-44 years	21	
45-54 years	31	
55-64 years	19	
65-69 years	3	
≥ 70 years	2	

eTable 1. Input parameters for the simulated cohorts of PWH aged 20y+ in the United States in the CEPAC-US Model. (continued)

Parameter	Base Case Input	Reference
Baseline cohort characteristics		
Initial age among people newly infected with HIV (%)	<i>From 2015 onwards</i>	10,12
20-24 years	24.4	
25-34 years	35.8	
35-44 years	18.3	
45-54 years	14.2	
55-64 years	5.8	
65-69 years	0.8	
≥ 70 years	0.6	
Population size, n		9,10,12
Prevalent, undiagnosed	151,954	
Prevalent, on ART	675,439	
Prevalent, disengaged from care	244,778	
Incident	Determined by transmissions	
HIV Testing		
Monthly HIV testing probability (%)		
Prevalent, undiagnosed	1.2	Assumption
Incident	1.7	Assumption

eTable 1. Input parameters for the simulated cohorts of PWH aged 20y+ in the United States in the CEPAC-US Model. (continued)

Parameter	Base Case Input	Reference
Monthly mortality probabilities		
Associated with OIs		53
<i>Pneumocystis pneumonia</i> (PCP)	0.035	
<i>Mycobacterium avium</i> complex (MAC)	0.045	
Toxoplasmosis	0.182	
Cytomegalovirus (CMV)	0.048	
Fungal infection	0.036	
Other OI	0.043	
Associated with chronic HIV, stratified by CD4 count		53
≥ 500 cells/mm³	0.000033	
350-500 cells/mm³	0.000105	
200-350 cells/mm³	0.000212	
100-200 cells/mm³	0.002700	
50-100 cells/mm³	0.002660	
≤ 50 cells/mm³	0.005644	

eTable 1. Input parameters for the simulated cohorts of PWH aged 20+ in the United States in the CEPAC-US Model. (continued)

Parameter	Base Case Input	Reference
Monthly Mortality Probabilities		
Non-HIV-related causes of death		54,55
Male at birth		
20-24 years	0.000162 - 0.000209	
25-34 years	0.000211 - 0.000260	
35-44 years	0.000268 - 0.000445	
45-54 years	0.000484 - 0.000874	
55-64 years	0.000954 - 0.001797	
65-69 years	0.001900 - 0.002519	
70-100 years	0.002760 - 1	
Female at birth		
20-24 years	0.000152 - 0.000199	
25-34 years	0.000210 - 0.000345	
35-44 years	0.000371 - 0.000738	
45-54 years	0.000799 - 0.000880	
55-64 years	0.000951 - 0.001796	
65-69 years	0.001942 - 0.002740	
70-100 years	0.003029 - 1	
ART efficacy		
% Suppressed at 12 months if 95% adherence		
INSTI-based regimen	96.4	Derived from 56-60
Monthly probability of virologic failure after initial suppression (%)	0.20	Derived from 56-58,61

eTable 1. Input parameters for the simulated cohorts of PWH aged 20y+ in the United States in the CEPAC-US Model. (continued)

Parameter	Base Case Input	Reference
HIV transmission rate by disease stage and viral load, transmissions/100 person years		62,63
Acute infection (3 months after infection)	65.47	
Late-stage disease (CD4 cell count <200 cells/mm ³)	9.03	
> 100,000 copies/mL	9.03	
10,001 – 100,000 copies/mL	8.12	62,63
3,001 – 10,000 copies/mL	4.17	
501 – 3,000 copies/mL	2.06	
20 – 500 copies/mL	0.16	
≤ 20 copies/mL	0	
Engagement in care		
Monthly probability of disengagement from care (%)	0.01-15	Derived from 64,65
Monthly probability of return to care (%)	3.0	Derived from 66
Propensity to respond coefficients ^a	Age-adjusted	2

^a As previously described, we developed age-stratified likelihood of virologic suppression and engagement in care.²

eTable 2. Calibration of model transmissions to CDC surveillance estimates.

Year	CDC Estimated HIV Incidence ^{a 15}	CDC 95% Confidence Interval ¹⁵	HIV Transmission Deflator	Model-Projected HIV Incidence
2015	37,100	36,000 - 38,200	1	36,590
2016	37,200	36,000 - 38,400	0.95	38,160
2017	36,200	34,800 - 37,500	0.90	37,660
2018	36,200	34,600 - 37,700	0.85	36,100
2019	35,100	33,400 - 36,800	0.80	34,050
2020	34,200	32,100 - 36,300	0.80	34,190
2021	32,700	30,400 - 34,900	0.75	31,940
2022	31,800	29,200 - 34,400	0.75	31,870

^a CDC estimates are reported for PWH 13y+, whereas the CEPAC model projects PWH 20y+.

eTable 3. Mean annual per person costs by category while alive and in the year of death for male Medicare beneficiaries with HIV on ART who received any ART prescription during the year.²⁴

	ART			HIV-related care (excluding ART)			Non-HIV-related care		
Mean annual per-person costs in each year survived (2023 USD)									
Age	TM	MA	Weighted	TM	MA	Weighted	TM	MA	Weighted
65-69	41,278	50,359	46,683	1,937	2,364	2,191	24,282	29,624	27,462
70-74	41,394	50,501	46,815	2,028	2,474	2,294	25,552	31,173	28,898
75-79	39,867	48,638	45,088	2,239	2,731	2,532	27,825	33,947	31,469
≥ 80	39,370	48,031	44,526	2,827	3,448	3,197	30,143	36,774	34,090
Mean per-person costs in 12 months prior to death (2023 USD)									
65-69	36,607	44,661	41,276	16,612	20,267	18,731	93,701	114,315	105,653
70-74	37,434	45,669	42,209	16,575	20,222	18,689	92,789	113,203	104,624
75-79	34,421	41,994	38,811	16,417	20,029	18,511	96,209	117,375	108,480
≥ 80	33,791	41,225	38,101	14,659	17,884	16,529	78,491	95,759	88,503

Abbreviations: ART: Antiretroviral therapy, TM: traditional Medicare beneficiaries only, MA: Medicare Advantage beneficiaries only, Weighted Average: Weighted average costs for all Medicare beneficiaries (weighted by proportion of beneficiaries enrolled in traditional Medicare as opposed to Medicare Advantage).

eTable 4. Mean annual per person costs by category while alive and in the year of death for female Medicare beneficiaries with HIV on ART who received any ART prescription during the year.²⁴

	ART			HIV-related care (excluding ART)			Non-HIV-related care		
Mean annual per-person costs in year survived (2023 USD)									
Age	TM	MA	Weighted	TM	MA	Weighted	TM	MA	Weighted
65-69	40,949	49,958	47,012	2,080	2,537	2,387	23,707	28,923	27,217
70-74	40,415	49,306	46,399	2,295	2,799	2,634	24,783	30,235	28,452
75-79	40,466	49,369	46,457	2,539	3,097	2,915	23,741	28,964	27,256
≥ 80	37,968	46,321	43,590	2,207	2,692	2,533	25,816	31,496	29,638
Mean per-person costs in 12 months prior to death (2023 USD)									
65-69	34,218	41,746	38,958	19,672	24,000	22,397	103,163	125,859	117,455
70-74	34,202	41,726	38,940	14,759	18,006	16,804	99,811	121,769	113,638
75-79	33,550	40,931	38,198	16,323	19,914	18,584	69,889	85,265	79,571
≥ 80	36,807	44,905	41,906	18,684	22,794	21,272	86,937	106,063	98,981

Abbreviations: ART: Antiretroviral therapy, TM: traditional Medicare, MA: Medicare Advantage, Weighted Average: Weighted

average costs for all Medicare beneficiaries (weighted by proportion of beneficiaries enrolled in traditional Medicare as opposed to Medicare Advantage).

eTable 5. Personal health care index projections used to adjust HIV-related non-ART and non-HIV-related care costs.

Year	CMS personal healthcare price indices	Ratio (Base = 2023)
2023	112.7	1
2024	115.9	1.03
2025	119.0	1.06
2026	122.3	1.09
2027	125.8	1.12
2028	129.3	1.15
2029	132.9	1.18
2030	136.5	1.21
2031	140.1	1.24
2032	143.9	1.28
2033	147.6	1.31
2034 ^a	150.7	1.34
2035 ^a	154.3	1.37

^aThe personal healthcare index for 2024-2033 are projected by the Centers for Medicare and Medicaid Services. For 2034 and 2035, we projected the personal healthcare index based on the trend in projected price indices between 2024-2033. Abbreviations: ART: Antiretroviral therapy, CMS: Centers for Medicare and Medicaid Services.

eTable 6. Parameters assessed in sensitivity analyses: Base case values, lower-bound (LB), upper-bound (UB), and justifications for ranges.

Input	Base case	LB	Reference	UB	Reference
Population parameters					
Number of Medicare-enrolled PWH in care at model start in Jan 2026	111,600	86%	Largest variation from prior year between 2016 and 2023 in CDC surveillance data (14%) ¹⁵	114%	Largest variation from prior year between 2016 and 2023 in CDC surveillance data ¹⁵
Number of PWH in care turning 65y each month and enrolled in Medicare	321-1,354	90%	Largest variation from prior year between 2016 and 2023 in CDC surveillance data (10%) ¹⁵	110%	Largest variation from prior year between 2016 and 2023 in CDC surveillance data ¹⁵
Number of PWH 65y+ newly diagnosed and entering care and enrolled in Medicare monthly	37	80%	During the first year of the COVID-19 pandemic (2020), new 65y+ diagnoses decreased by 20% from the prior year. We use this as an example of how a large shock to the policy environment and healthcare system may impact diagnoses ¹⁵	120%	During the first year of the COVID-19 pandemic (2020), new 65y+ diagnoses decreased by 20% from the prior year. We use this as an example of how a large shock to the policy environment and healthcare system may impact diagnoses. ¹⁵

eTable 6. Parameters assessed in sensitivity analyses: Base case values, lower-bound (LB), upper-bound (UB), and justifications for ranges (cont.)

Input	Base case	LB	Reference	UB	Reference
Population parameters					
Percent of PWH in care	71%	56%	Impact of disenrollment from ADAP on viral suppression ³¹	86%	Impact of Medicaid expansion on primary care ³²
Percent of PWH enrolled in Medicare	74%	68%	Derived from Ryan White ^{a 33}	94%	Derived from Census.gov data for general 65y+ pop ¹⁶
Non-HIV-related mortality ^b	Age-/sex-stratified	RMR: 1.0	Mortality among people living without HIV ⁶⁷	RMR: 2.2	Derived from ⁵⁵

eTable 6. Parameters assessed in sensitivity analyses: Base case values, lower-bound (LB), upper-bound (UB), and justifications for ranges (cont.)

Input	Base case	LB	Reference	UB	Reference
Costs parameters					
ART costs	\$43,590-46,820	40%	Estimated impact of generic entry; Maximum minimum discount proposed by IRA ^{35,41}	120%	Assumption
Medical costs in the year of death	See eTables 3-4	93%	95% CI from CMS cost data ²⁴	107%	95% CI from CMS cost data ²⁴
Non-HIV-related costs	\$27,217-34,090	98%	95% CI from CMS cost data ²⁴	102%	95% CI from CMS cost data ²⁴
Non-ART HIV-related costs	\$2,191-3,197	96%	95% CI from CMS cost data ²⁴	104%	95% CI from CMS cost data ²⁴

^a See technical appendix section, “*Estimating the percentage of PWH age 65y+ in care and enrolled in Medicare*”

^b We used RMR-adjusted age-/sex-stratified mortality rates for non-HIV-related mortality and report them as a weighted-average

based on percent of the population who are male/female and from each HIV transmission risk group.⁵⁵ For the lower bound, we used an RMR of 1.0, meaning that there would be no increased non-HIV-related mortality among PWH compared with people without HIV. For the upper bound, we used an RMR of 1.92 (male) and 3.78 (female), which represents an increase from base case weighted RMR estimates that is the same magnitude as comparing the mean RMR (1.6) with no increased non-HIV-related mortality from the general population (RMR, 1.0).

Abbreviations: PWH: People with HIV, CMS: Centers for Medicare and Medicaid Services, RMR: Relative mortality ratio, CI:

Confidence interval, ART: Antiretroviral therapy.

eTable 7. Validation of CEPAC model projections of people living with HIV and deaths among people living with HIV aged 20y+ from 2017-2022.

Year	Persons living with diagnosed HIV infection aged 20y or older ^a			Deaths of persons with diagnosed HIV infection aged 20y or older ^a		
	CDC Data	Model output	Reference	CDC Data	Model output	Reference
2017	988,613	992,700	15	16,284	14,690	15
2018	1,011,633	1,016,450		16,162	16,300	
2019	1,033,995	1,037,700		16,224	17,740	
2020	1,046,955	1,056,380		19,128	18,950	
2021	1,065,413	1,072,660		20,202	19,970	
2022	1,088,862	1,086,840		19,509	20,730	

^a CDC estimates are reported for PWH 13y+, whereas the CEPAC model projects PWH 20y+.

eTable 8. Validation of CEPAC model output of receipt of care among diagnosed PWH 20y+ and virologic suppression among PWH 20y+ in care in 2022.

	CDC Estimates	Model output	Reference
Receipt of HIV medical care among PWH diagnosed by year-end 2021 and alive at year-end 2022 (%) ^a	75.6	70.7	
Virologically suppressed among PWH diagnosed by year-end 2021 and alive at year-end 2022 (%)	65.1	67.3	¹⁵

^a For CDC estimates, we defined receipt of HIV medical care as at least one CD4 count or viral load test during 2022.

eTable 9. Validation of CHARMED model output for the number of PWH over the age of 65, diagnosed, and in care compared with CDC data (2021-2023).

Year	CDC PWH 65y+ living with diagnosed HIV ¹⁵	CDC (% of diagnosed PWH 65y+ in care) ¹⁵	Estimated number of PWH 65y+ in care ^a	Model projections
2021	142,670	70.4	100,440	105,450
2022	159,227	70.7	112,573	117,430
2023 ^b	176,647	71.0	125,419	128,780

^a CDC estimates for the number of people diagnosed 65y+ and percent in care are not directly comparable. While the estimate for diagnosed prevalence includes all PWH alive at the end of the specified year, the estimate for percent in care includes only people who were diagnosed by the end of the previous year. To address this, we derived the estimated number of PWH in care by taking the estimated percent in care for a given year and applying it to the total population of PWH 65y+ diagnosed.

^b CDC data for 2023 are considered preliminary.

eTable 10. Model-projected numbers of deaths among Medicare beneficiaries with HIV aged 65y+ by year-end.

Projected number of deaths among Medicare beneficiaries with HIV aged 65y+ by year-					
Year	65-69y	70-74y	75-79y	80y+	All 65y+
2026	1,600	1,450	1,060	1,400	5,500
2027	1,680	1,540	1,180	1,450	5,850
2028	1,740	1,670	1,290	1,470	6,180
2029	1,820	1,810	1,480	1,540	6,650
2030	1,910	1,960	1,610	1,590	7,070
2031	1,970	2,110	1,740	1,770	7,590
2032	1,980	2,180	1,910	2,030	8,100
2033	1,980	2,260	2,060	2,300	8,600
2034	1,970	2,380	2,230	2,550	9,140
2035	1,950	2,520	2,420	2,760	9,640

eTable 11. Potential reductions in costs to dolutegravir (DTG)-containing regimens currently recommended by the DHHS ART guidelines, assuming a 39% reduction in the cost of dolutegravir.^a

	Average Medicare Part D claims costs (2023) ²⁸		Derived average claim costs to Medicare for each regimen (2023)				Proportion of cost if DTG is generic relative to current claims costs for each regimen		
Regimen	Non-DTG component Avg Claim Branded	Generic non-DTG component average claim	Hybrid	Branded	Co-formulated	Regimen cost if DTG Generic	Hybrid	Branded	Co-formulated
DTG+TDF/FTC	\$2,181	\$364	\$2,827	\$4,643	NA	\$1,867	0.66	0.40	NA
DTG+TAF/FTC	\$2,367	NA	NA	\$4,830	NA	\$3,869	NA	0.80	NA
DTG/3TC	\$365	\$142	\$2,605	\$2,828	\$3,066	\$1,645	0.63	0.58	0.54
DTG/ABC/3TC	\$1,542	\$495	\$2,958	\$4,005	\$3,927	\$1,997	0.68	0.50	0.51
DTG+FTC	\$513	\$420	\$2,883	\$2,976	NA	\$1,923	0.67	0.65	NA
DTG+RPV ^b	\$1,521	NA	NA	\$3,984	\$3,677	\$3,023	NA	0.76	0.82

^aThe average claim for branded dolutegravir in 2023 was \$2,463. We assume that generic dolutegravir will cost \$1,502 (39% reduction in or 61% of branded costs).

^bBranded DTG and RPV separately is not displayed because a non-coformulated branded combination would exceed the costs of the coformulated version.

Abbreviations: DTG: Dolutegravir, NA: Not applicable.

eTable 12. Comparison of model-projected costs (in billions of US dollars) based on 4 different approaches to adjusting for higher costs among Medicare Advantage beneficiaries (vs traditional Medicare beneficiaries) and/or for inflation (vs not).

Year	MA + Inflation Adjustment (base case)	MA Adjustment only	Inflation adjustment only	No MA or inflation adjustment
2026	\$10.9B	\$9.6B	\$9.6B	\$8.4B
2027	\$12.4B	\$10.4B	\$11.0B	\$9.1B
2028	\$14.0B	\$11.2B	\$12.4B	\$9.9B
2029	\$15.7B	\$12.0B	\$13.9B	\$10.6B
2030	\$17.5B	\$12.7B	\$15.4B	\$11.2B
2031	\$19.3B	\$13.4B	\$17.0B	\$11.8B
2032	\$21.3B	\$14.1B	\$18.8B	\$12.4B
2033	\$23.3B	\$14.7B	\$20.5B	\$13.0B
2034	\$25.3B	\$15.3B	\$22.3B	\$13.5B
2035	\$27.3B	\$15.8B	\$24.1B	\$13.9B
Total	\$187.0B	\$129.2B	\$165.0B	\$113.9B

Abbreviation: B: billion

FIGURE LEGENDS

eFigure 1. Impact of changes in ART costs on 10 years of Medicare spending for beneficiaries aged 65y+ in care (2026-2035).

The x-axis displays the percentage of the 2023 ART costs, ranging from 40% (a 60% reduction, left) to 120% (a 20% increase, right). Light blue represents other non-HIV-related costs, dark blue represents costs related to direct medical treatment of HIV, and grey represents ART costs. Abbreviations: ART: antiretroviral therapy.

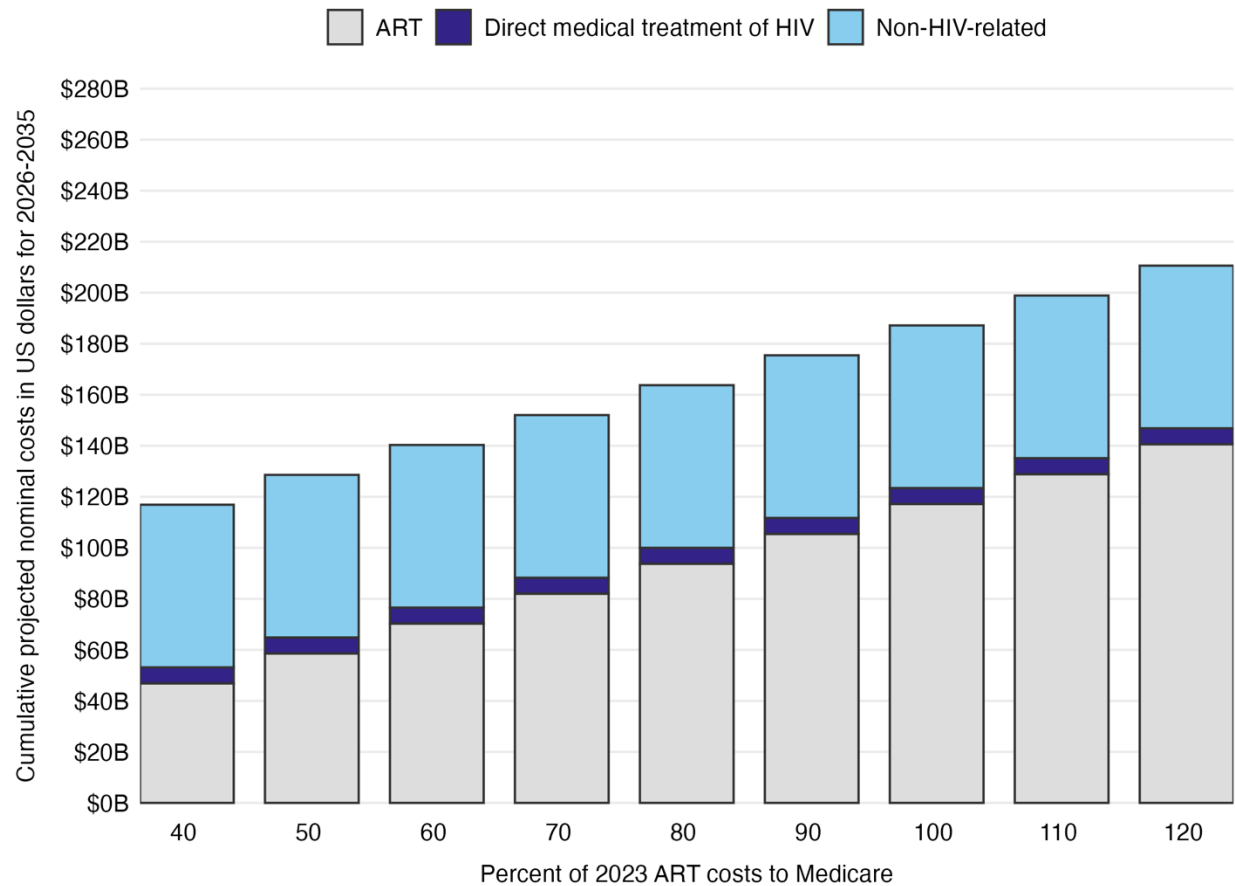
eFigure 2. Multi-way sensitivity analysis regarding the population of Medicare beneficiaries aged 65y+ in care in 2035.

The model-projected number of Medicare beneficiaries with HIV aged 65y+ who are in care in 2035 are displayed given a range in non-HIV-related mortality rates with the number of Medicare beneficiaries 65y+ in care in 2026. Base case results are designated with an “X.” Light orange shows lower 10-year population size, whereas dark orange shows higher 10-year population size. Abbreviations: ART: antiretroviral therapy.

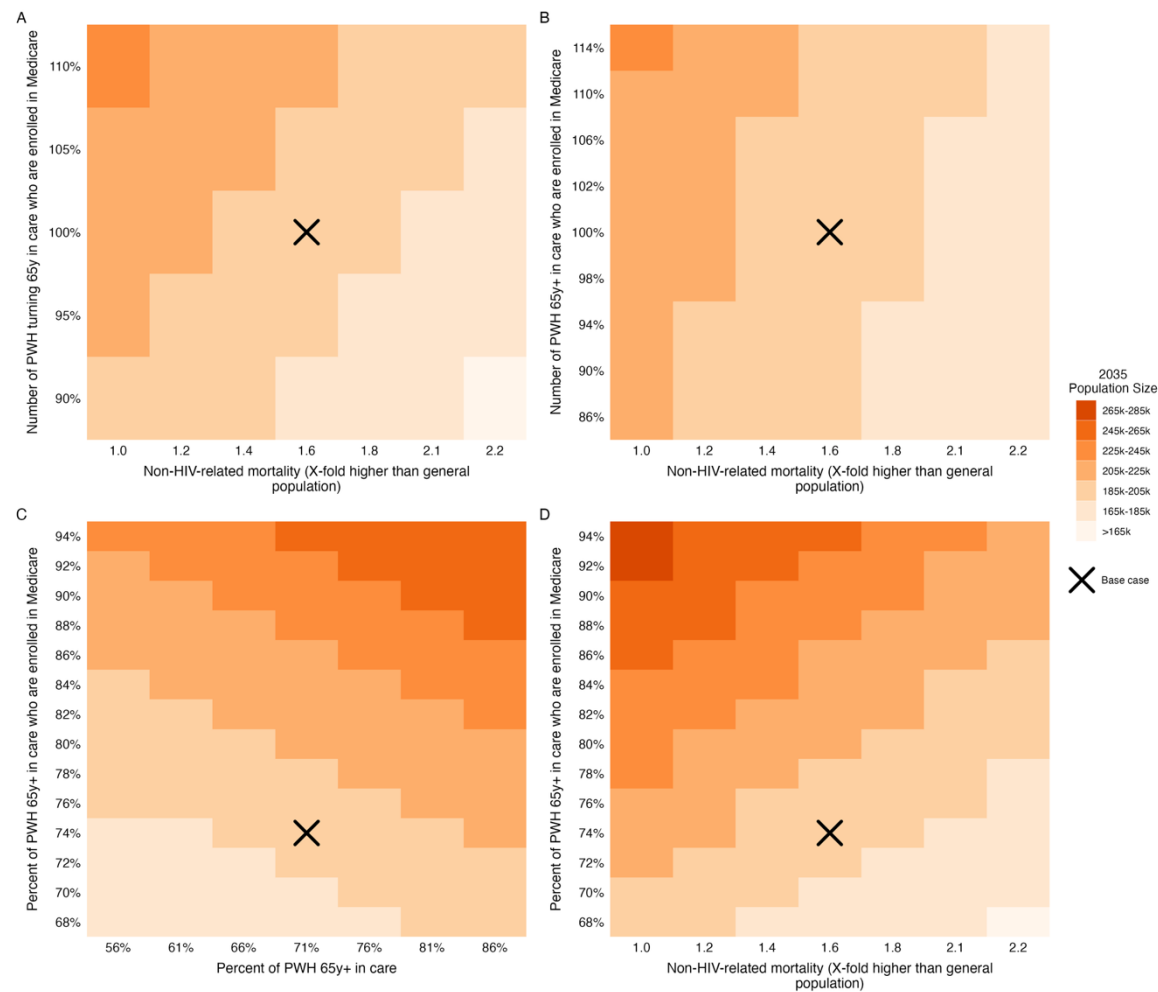
eFigure 3. Multi-way sensitivity analyses on cumulative costs of Medicare beneficiaries aged 65y+ in care (2026-2035).

The model-projected 10-year cumulative costs are displayed given a range of non-HIV-related mortality and the percent of PWH 65y+ diagnosed and in care (Panel A), percent of 2023 ART costs and the percentage of PWH 65y+ diagnosed and in care (Panel B), and percent of PWH 65y+ diagnosed and in care and the percentage of PWH 65+ on ART who are enrolled in Medicare (Panel C), and percent of 2023 ART costs and the percentage of PWH 65y+ on ART who are enrolled in Medicare (Panel D) . Base case results are designated with an “X.” Light

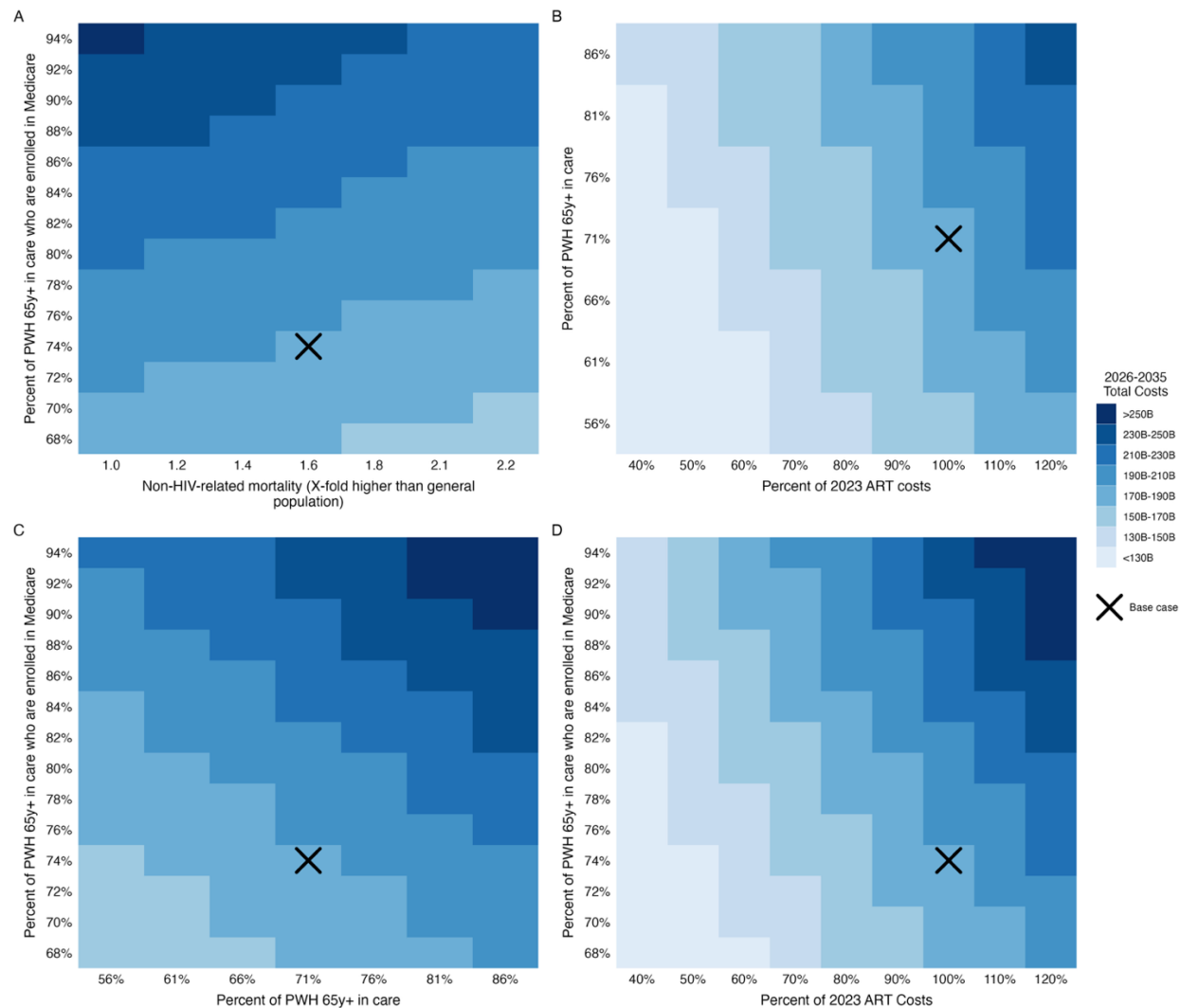
blue shows lower 10-year costs, whereas dark blue shows higher 10-year costs. Abbreviations:
PWH: people with HIV; ART: antiretroviral therapy. B: billion.



eFigure 1. Impact of changes in ART costs on 10 years of Medicare spending for beneficiaries aged 65y+ in care (2026-2035).



eFigure 2. Multi-way sensitivity analysis regarding the population of Medicare beneficiaries aged 65y+ in care in 2035.



eFigure 3. Multi-way sensitivity analyses on cumulative costs of Medicare beneficiaries aged 65y+ in care (2026-2035).