

Supplementary Information

Forecasting Multimorbidity in Aging People with HIV Using a Microsimulation Model

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Individual-based microsimulation model

Model overview

We developed an individual-based microsimulation model to simulate the complex health trajectories of people diagnosed with HIV in British Columbia (BC), Canada. The model captures the interactions between HIV disease progression, antiretroviral therapy (ART) history, and the incidence of age-related non-communicable diseases (NCDs) (Figure 1). The model created an initial population of individuals, representing the people diagnosed with HIV and alive in BC as of January 1, 2008. New individuals were introduced into the model biannually, as new HIV diagnoses or migrants living with HIV. For each individual, time-varying characteristics - including age, stages of HIV care, development of physical and mental comorbidities - were updated every six months until death or the end of 2034.

Four health states regarding HIV care following HIV diagnosis were considered in the model: Aware but not on ART (*A*) (i.e., HIV-diagnosed individuals without ART initiation in BC), On ART with unsuppressed viral load (U_{on}), On ART with viral suppression (*S*), and Off ART with unsuppressed viral load (U_{off}). Individuals newly diagnosed HIV or people living with HIV (PLWH) who moved to BC for the first time were in State *A* before first ART dispensation in BC. Once initiated ART, PLWH moved to one of the three states classified by ART and viral load (i.e., *S*, U_{on} and U_{off}), determined by time on ART and ART adherence. Once suppressed (State *S*), PLWH could experience ART interruption or ART failure to have unsuppressed viral load again (U_{on} or U_{off}). PLWH with unsuppressed viral load (U_{on} or U_{off}) could achieve viral suppression again by re-engaging into HIV care or regimen change.

To evaluate the comorbidity burden other than HIV among PLWH, we considered the following eight age-related non-communicable diseases (NCDs): cardiovascular disease (CVD), diabetes (mellitus), chronic kidney disease (CKD), chronic liver disease (CLD), chronic obstructive pulmonary disease (COPD), hypertension (HTN), osteoarthritis (OA), and non-AIDS-related cancers (henceforth referred to as cancers after excluding Kaposi sarcoma, non-Hodgkin's lymphoma, and cervical cancer.). In addition, three mental health conditions were considered: mood and anxiety disorders (MANX), schizophrenia (SCZ), and personality disorders (PD) [1, 2]. The determination of developments of comorbidities (i.e., one comorbidity as a risk factor for the development of another comorbidity) was informed by a literature review and clinical assessments made by co-authors.

The microsimulation model also accounted for the impact of health-related behaviors (drug-related substance use, physical activity, smoking and alcohol consumption) on comorbidity development and mortality. Drug-related substance use was also a risk factor for ART initiation and viral load suppression.

Transition probabilities between health states (HIV care, comorbidity development, and death) were modeled using different statistical methods as described in the following sections. For each individual, the transition probabilities were updated every six months based on time-varying characteristics, accounting for heterogeneity at individual level.

The model was built based on the data from the Seek and Treat for Optimal Prevention of HIV/AIDS (STOP HIV/AIDS) population-based cohort, which is derived from various linkages between provincial administrative databases.

Data Steward: British Columbia Centre for Disease Control [3, 4]

i. Provincial HIV/AIDS Surveillance Database: a surveillance database that collates all HIV laboratory testing, new HIV diagnosis and occurrence of AIDS-defining illnesses data;

Data Steward: British Columbia Centre for Excellence in HIV/AIDS [5]

ii. Drug Treatment and Laboratory Databases, which captures all antiretroviral dispensing data, plasma viral load testing, drug resistance testing, occurrence of AIDS-defining illnesses, approximately 85% of CD4 cell count measurements, and key patient demographic information;

Data Steward: British Columbia Ministry of Health [6-8]

iii. The Medical Services Plan (MSP) billing database, which captures HIV and non-HIV-related inpatient and outpatient services provided by physicians and supplementary health care practitioners, as well as diagnostic

procedures. This database also contains cost associated with claims paid through fee-for-service and the Alternative Payment Program;

iv. Home and Community Care database, which captures a variety of services including hospice and home nursing care, adult day services, assisted living, respite care, residential and convalescent care;

v. Mental Health Services database, which captures utilization of mental health services including fee-for-service, institutional care, community clinics and acute care;

vi. Addictions Information Management Systems, which captures referral to treatment for alcohol, drug or gambling addictions;

vii. The PharmaNet database is a real-time system, which captures all prescriptions for drugs and medical supplies dispensed from community pharmacies in BC as well as prescriptions dispensed from hospital outpatient pharmacies use at home. Note that this database does not capture antiretroviral dispensing data;

viii. The Client Roster or Consolidation File, which captures individual demographic and geographic data. This database is also used to construct population denominators;

ix. The Discharge Abstract Database, which captures all discharges, transfers and deaths of in-patients and day surgery patients from acute care hospitals across BC;

Data Steward: British Columbia Vital Statistics Agency [9]

x. The Vital Statistics database, which records death information of all BC's residents.

New individuals diagnosed with HIV in BC

In the microsimulation model, the number of new diagnosed PLWH in BC (including new local diagnoses and PLWH moving to BC for the first time) was estimated biannually since January 1, 2008, based on the population of undiagnosed PLWH in BC, the probability of HIV diagnosis every six months, and the number of diagnosed PLWH moving to BC. Both the diagnosis rate and the annual number of diagnosed PLWH moving to BC were estimated based on data from the STOP HIV/AIDS cohort between 2008 and 2016, using a sigmoid function, shown in Figure S1.

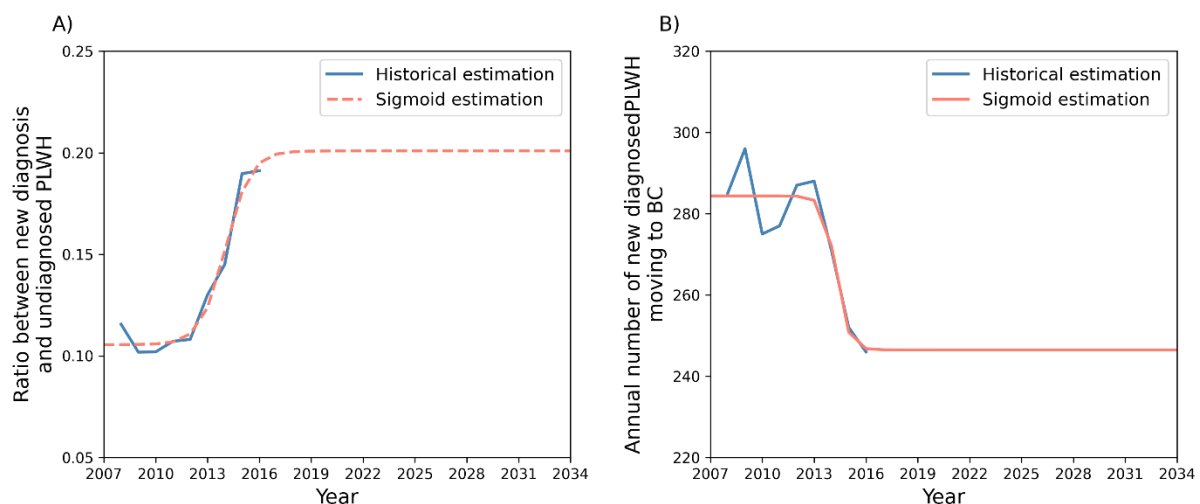


Figure S1. The simulated rate of diagnosis based on the ratio between new diagnoses and undiagnosed PLWH (A) and the simulated annual number of PLWH moving to BC (B) for 2007-2034.

The size of the undiagnosed population (U) was updated every six months, by $U_{i+1} = U_i + I_{i+1} - N_{d_{i+1}} - D_{U_{i+1}}$, where i represented the previous time step, I represented the number of new HIV infections during the six months period, N_d represented the number of new HIV diagnoses from U during the six-months period, and D_U represented the number of deaths among undiagnosed PLWH during the six-months period. The probability of death among undiagnosed PLWH was converted from the median survival time after seroconversion as 12.1 years [10]. The number of new HIV infections was estimated as the product of the incidence-to-unsuppressed ratio and unsuppressed population over time in BC [11]. The incidence-to-unsuppressed ratio was estimated based on data between 2007 and 2022 using a sigmoid function for the period between 2007 and 2034, shown in Figure S2.

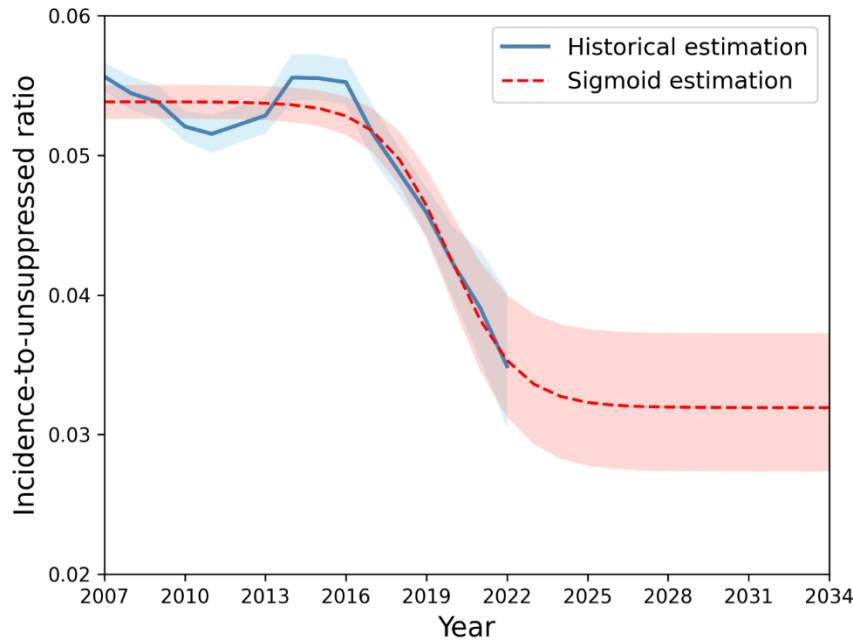


Figure S2. The estimated incidence-to-unsuppressed ratio for 2007-2034. The shaded region in blue represents the credible interval of the incidence-to-unsuppressed ratio based on 10000 simulations. The shaded region in red shows fitted sigmoid functions for the blue credible intervals.

The initial population of undiagnosed PLWH in BC on January 1, 2008 was estimated at 2060 (95% credible interval: 1051, 2861), given the estimated HIV prevalence in BC at 9381 (8372, 10182) from the Public Health Agency of Canada (PHAC) and 7321 diagnosed PLWH in BC by the end of 2007 from the STOP HIV/AIDS cohort [11, 12]. The probability of HIV diagnosis was further adjusted by a constant 1.0291, after fitting the sum of simulated new diagnoses and new migrants to historical data from the STOP HIV/AIDS cohort. The simulated numbers of new diagnosed PLWH in BC (new local diagnoses and PLWH moving to BC) between 2008 and 2016 with and without adjustment are shown in Figure S3.

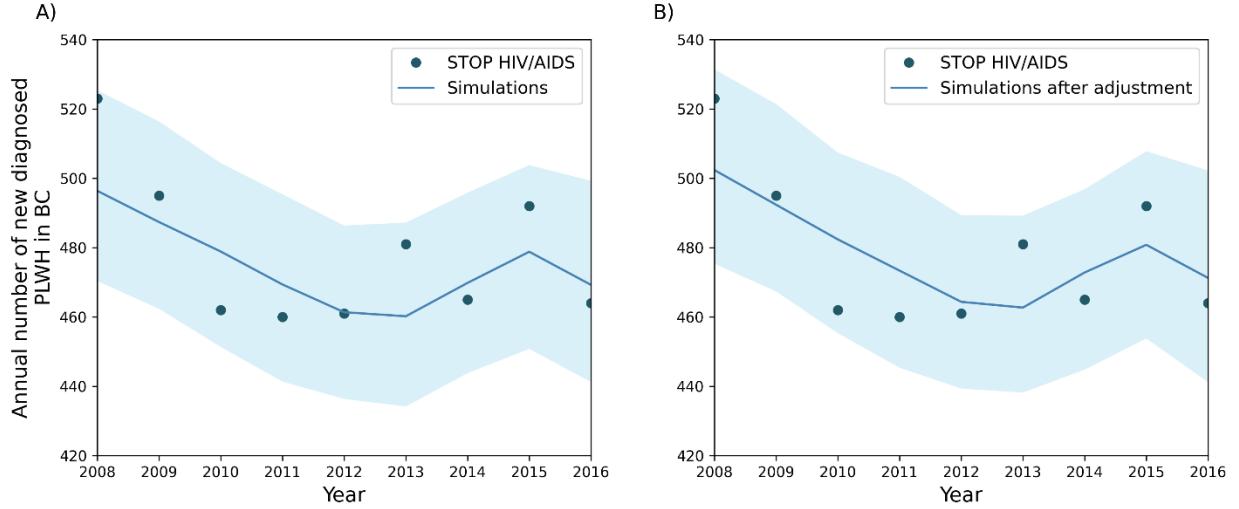


Figure S3. The simulated annual number of new diagnosed PLWH in BC (new local diagnoses and PLWH moving to BC) before (A) and after (B) adjusting the probability of HIV diagnosis, compared with data from the STOP HIV/AIDS cohort. The light blue region represents the 2.5th-97.5th percentiles from 1000 simulations.

Probability of ART initiation

5689 PLWH were eligible for modeling the probability of ART initiation using the generalized linear mixed model: (1) the last follow-up date was from January 1, 2008 onward; (2) at least 18 years old; (3) never went on supervised therapy interruption or blinded trials; (4) at least six months of follow-up after enrolled in the STOP HIV/AIDS cohort; (5) never initiated ART in BC at the baseline of the analysis; (6) had known CD4 nadir and known status of injected drug use at the baseline. The baseline of the analysis was the later date between January 1, 2008 and the date of enrollment in the STOP HIV/AIDS cohort, which is the earliest date to be known as HIV-positive in BC for the individual. To increase the sample size of the analysis, additional 239 individuals with extrapolated CD4 cell counts at baseline were added [13].

The explanatory variables considered in the model included: sex at birth (male, female), substance use (drug-related) at baseline (Yes, No), CD4 nadir at baseline (<200, ≥200), age at baseline (continuous, scaled by 10), year of HIV diagnosis (i.e., the earliest year known to be HIV-positive in BC, discrete, with the reference year as 1980), and follow-up time (time-varying). The modeling of the probability was separated for PLWH diagnosed before 2008, during 2008-2011, and from 2012 onward, to reflect changes in the eligibility of ART initiation in BC [12]. The results from the multivariable model are shown in Table S1.

The logit function used to estimate the probability (p) of ART initiation every six months since baseline is $\text{logit}(p) = \sum \beta_i x_i$, where x_i represents the binomial/continuous variable and β_i represents the coefficient value in Table S1, and $\text{logit}(p) = \log\left(\frac{p}{1-p}\right)$.

Table S1. Generalized linear mixed model for the probability of ART initiation among diagnosed PLWH, separated by the year of diagnosis (before 2008, 2008-2011, from 2012 onward).

Variable	Diagnosed before 2008 [‡]		Diagnosed during 2008-2011 [‡]		Diagnosed from 2012 onward [‡]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-3.75 (-4.69, -2.82)	<0.0001	-16.93 (-21.77, -12.09)	<0.0001	-14.42 (-23.84, -5.00)	0.0095
Sex at birth (Ref.=Male)						
Female	-0.24 (-0.47, -0.02)	0.0314			-1.08 (-1.97, -0.20)	0.0168
Substance use at baseline (Ref.=No)[§]						
Yes			-0.57 (-0.91, -0.22)	0.0013	-2.06 (-2.94, -1.18)	<0.0001
CD4 nadir at baseline (Ref.=≥200)						
<200	1.83 (1.50, 2.16)	<0.0001	3.07 (2.51, 3.64)	<0.0001	2.12 (1.19, 3.04)	<0.0001
Age at baseline (scaled by 10)	0.20 (0.10, 0.31)	<0.0001	0.38 (0.23, 0.54)	<0.0001		
Year of HIV diagnosis (Ref.=1980)	0.05 (0.02, 0.07)	0.0008	0.50 (0.34, 0.66)	<0.0001	0.54 (0.26, 0.83)	0.0002
Follow-up time	0.06 (0.01, 0.11)	0.0292	0.16 (0.08, 0.25)	0.0003	0.25 (0.01, 0.48)	0.0393
Individual effect	0.59 (SE: 0.16)		1.71 (SE: 0.21)		3.35 (SE: 0.41)	

CI: confidence interval; Ref.: reference group; SE: standard error.

[‡]Only the coefficients for selected variables in the multivariate model are shown.

[§]Substance use was estimated based on whether to be identified as people who inject drugs, since the case-finding algorithm was not applicable at baseline (HIV diagnosis date or January 1, 2008, whichever is the latest).

Separate generalized linear mixed models were used for people living with HIV diagnosed in different time periods, all using a binary distribution, logit link function, and a random intercept term.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Probability of transitions after ART initiation

6469 PLWH were eligible for modeling the probability of transitions between three HIV care states every six months after ART initiation: On ART with viral suppression (S), On ART with unsuppressed viral load (U_{on}), and Off ART with unsuppressed viral load (U_{off}). The eligibility criteria include: (1) the last follow-up date was from January 1, 2008 onward; (2) at least 18 years old; (3) never went on supervised therapy interruption or blinded trials; (4) at least six months of follow-up after ART initiation; (5) had at least one ART dispensation record since the baseline of the analysis; (6) had known CD4 nadir and status of injected drug use at the baseline for the probability of ART initiation; (7) had known status of mental comorbidities (MANX, SCZ and PD). The baseline of the analysis was the later date between January 1, 2008 and the date of ART initiation.

The explanatory variables considered in the model included: sex at birth (male, female), year of ART initiation (<2012, ≥ 2012), substance use (drug-related) at baseline (Yes, No), CD4 nadir at baseline (<200, ≥ 200), prior status (S , U_{on} , U_{off}), prevalent MANX (Yes, No), prevalent SCZ (Yes, No), prevalent PD (Yes, No), age at baseline (continuous, scaled by 10), and follow-up time (time-varying). The results from the multivariable model are shown in Table S2.

The probability of transitions between the three states were modelled by multinomial generalized linear mixed model. The ratio between the probability to be U_{off} and the probability to be S is

$$\log \frac{p(U_{off})}{p(S)} = \sum \beta_i x_i,$$

where x_i represents the binomial/continuous variable and β_i represents the coefficient value in Table S2. Similar relationship can be built for the probability to be U_{on} and the probability to be S . And the probability for each state can be estimated given the additional condition $p(S) + p(U_{on}) + p(U_{off}) = 1$.

Table S2. Multinomial generalized linear mixed model for the probability of transitions between three HIV care states after ART initiation: On ART with viral suppression (reference group), On ART with unsuppressed viral load, and Off ART with unsuppressed viral load.

Variable	Off ART with unsuppressed viral load		On ART with unsuppressed viral load	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-3.90 (-4.30, -3.51)	<0.0001	-4.07 (-4.38, -3.76)	<0.0001
Sex at birth (Ref.=Male)				
Female	0.53 (0.37, 0.70)	<0.0001	0.32 (0.19, 0.46)	<0.0001
Substance use at baseline (Ref.=No)[§]				
Yes	0.81 (0.65, 0.96)	<0.0001	0.95 (0.84, 1.07)	<0.0001
CD4 nadir at baseline (Ref.=≥ 200)				
<200	0.43 (0.28, 0.58)	<0.0001	0.62 (0.51, 0.74)	<0.0001
Prior status (Ref.=On ART with viral suppression)				
Off ART with unsuppressed viral load	4.60 (4.43, 4.78)	<0.0001	3.11 (2.95, 3.27)	<0.0001
On ART with unsuppressed viral load	2.63 (2.46, 2.79)	<0.0001	2.22 (2.11, 2.34)	<0.0001
MANX (Ref.=No)				
Yes	0.09 (-0.05, 0.24)	0.2097	0.18 (0.07, 0.29)	0.0011
PD (Ref.=No)				
Yes	-0.21 (-0.50, 0.07)	0.1444	0.20 (-0.01, 0.41)	0.0564
Age at analysis baseline (scaled by 10)[£]	-0.33 (-0.41, -0.25)	<0.0001	-0.14 (-0.20, -0.08)	<0.0001
Follow-up time since analysis baseline[£]	-0.06 (-0.07, -0.04)	<0.0001	-0.02 (-0.03, -0.01)	<0.0001

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; MANX: mood and anxiety disorders; PD: personality disorders.

[§]Substance use was estimated based on whether to be identified as people who inject drugs, since the case-finding algorithm was not applicable at baseline (HIV diagnosis date or January 1, 2008, whichever is the latest).

[£]Analysis baseline was defined as the later date between ART initiation date and January 1, 2008.

A multinomial generalized linear mixed model with a generalized logit link function and a random intercept term was used.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Probability of comorbidity development

The model considered the development of physical and mental comorbidities that contribute to the overall health of the aging population of PLWH: CVD, diabetes, CKD, CLD, COPD, HTN, OA, cancers, MANX, SCZ, and PD [1, 2, 14]. There were 9063 PLWH eligible for modeling the incidence rate of physical and mental comorbidities based on the following criteria: (1) the last follow-up date was from January 1, 2008 onward; (2) at least 18 years old; (3) never went on supervised therapy interruption or blinded trials; (5) at least six months of follow-up since the baseline of the analysis; (6) known status of substance use (drug-related) and CD4 nadir at baseline. The baseline was the latest date among January 1, 2008, one year after the date of enrollment in the STOP HIV/AIDS cohort, one year after ART initiation in BC, five years after the earliest administrative record (registration in the MSP or the earliest healthcare encounter in BC) [1].

Whether or not the individual had a specific comorbidity at baseline was identified by a case-finding algorithm which identified comorbidity-related healthcare encounter (MSP, Pharmacy record, and hospitalizations) using the International Classification of Disease Ninth and Tenth Revisions (ICD 9/10) codes and Canada-wide Drug Identification Numbers [1]. During the five-year observational window prior to the baseline, the individual was considered to have a prevalent condition if at least one comorbidity-related healthcare encounter was found [1, 15]. A new comorbidity was developed after baseline if no comorbidity-related healthcare encounter was found during the observational window but after baseline. The case-finding algorithm for cancers were based on the estimation of Charlson Comorbidity Index by the University of Manitoba, after excluding the AIDS-defining cancers (Kaposi sarcoma, non-Hodgkin's lymphoma, and cervical cancer) [16, 17]. The case definitions for MANX and SCZ were from the BC Centre for Disease Control [18]. PD was identified based on the definition from Manitoba Centre for Health Policy [19]. Similarly, the status of substance use (drug-related) was determined by the record of injected drug use history at the enrollment of the STOP HIV/AIDS cohort and the case-finding algorithms to identify people with opioid disorder or people who inject drugs [12, 20, 21].

The explanatory variables considered in the model included: sex at birth (male, female), substance use (drug-related) at baseline (Yes, No), viral suppression (Yes, No), CD4 nadir at baseline (<200 , ≥ 200), prevalent physical or mental comorbidities which elevated the risk (Figure 1, Yes, No), age at baseline (continuous, scaled by 10), year of HIV diagnosis (i.e., the earliest year known to be HIV-positive in BC, discrete, with the reference year as 1979), and follow-up time (time-varying). In addition, percent time on non-backbone classes (non-nucleoside reverse transcriptase inhibitors [NNRTI], protease inhibitors [PI], and integrase inhibitors [INSTI]) during one-year period while on ART (continuous) was included in the analysis for the incidence of CVD, CKD and CLD [22]. Percent time on abacavir and tenofovir disoproxil (TDF, continuous) were included in the analysis for the incidence of CVD and CKD, respectively [22]. For each physical or mental comorbidity, the incidence rate was estimated separately for PLWH ever on ART and for those never on ART, since the ART regimen could not be considered as a factor for PLWH never on ART in BC. The results from the multivariable models are shown in Tables S3-S13.

The incidence rate of each comorbidity (r) was estimated by $\log(r) = \sum \beta_i x_i$, where x_i represents the binomial/continuous variable and β_i represents the coefficient value in Tables S3-S13. The probability of developing the comorbidity (p) after six months was estimated by $p = 1 - e^{-r/2}$ [23-25].

Table S3. Generalized linear mixed model for the incidence rate of cardiovascular diseases among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART ^e	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-14.04 (-14.73, -13.35)	<0.0001	-16.66 (-19.74, -13.57)	<0.0001
Sex at birth (Ref.=Male)				
Female	-0.29 (-0.61, 0.03)	0.0804	1.02 (0.09, 1.94)	0.0311
Substance use at baseline (Ref.=No)				
Yes	0.34 (0.10, 0.58)	0.0051	1.53 (0.01, 3.05)	0.0481
Viral suppression (Ref.=Yes)[§]				
No	0.32 (0.03, 0.60)	0.0277		
CD4 nadir at baseline (Ref.=≥ 200)				

<200	0.34 (0.10, 0.57)	0.0053		
HTN (Ref.=No)				
Yes	1.35 (1.12, 1.58)	<0.0001	0.88 (-0.19, 1.95)	0.1083
Diabetes (Ref.=No)				
Yes	0.27 (-0.01, 0.55)	0.0613	1.60 (0.57, 2.64)	0.0025
COPD (Ref.=No)				
Yes	0.76 (0.47, 1.05)	<0.0001		
CKD (Ref.=No)				
Yes	0.39 (0.11, 0.66)	0.0059		
MANX (Ref.=No)				
Yes	0.39 (0.17, 0.61)	0.0005		
Age at baseline (scaled by 10)	0.45 (0.34, 0.56)	<0.0001	0.82 (0.32, 1.31)	0.0012
Follow-up time	0.04 (0.00, 0.08)	0.0645		
Percent time on PI[§]	0.18 (-0.05, 0.42)	0.1248		

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; HTN: hypertension; COPD: chronic obstructive pulmonary disease; CKD: chronic kidney disease; MANX: mood and anxiety disorders; PI: protease inhibitors.

[§]The variable was measured for each year.

[§]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a negative binomial distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S4. Generalized linear mixed model for the incidence rate of diabetes among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART [§]		Never on ART [§]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-11.00 (-11.77, -10.22)	<0.0001	-14.10 (-16.93, -11.28)	<0.0001
Sex at birth (Ref.=Male)				
Female			1.00 (-0.08, 2.08)	0.0703
Viral suppression (Ref.=Yes)[§]				
No	-0.32 (-0.64, 0.01)	0.0570		
HTN (Ref.=No)				
Yes	0.91 (0.67, 1.15)	<0.0001		
MANX (Ref.=No)				
Yes	0.19 (-0.02, 0.40)	0.0834	0.86 (-0.43, 2.15)	0.1907
Age at baseline (scaled by 10)	0.25 (0.14, 0.37)	<0.0001	0.40 (-0.16, 0.96)	0.1599
Year of HIV diagnosis (Ref.=1979)	-0.04 (-0.05, -0.02)	0.0002		
Follow-up time	-0.06 (-0.10, -0.01)	0.0106		

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; HTN: hypertension; MANX: mood and anxiety disorders.

[§]The variable was measured for each year.

[§]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S5. Generalized linear mixed model for the incidence rate of chronic kidney disease among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART [§]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-13.20 (-13.91, -12.49)	<0.0001	-15.71 (-19.27, -12.16)	<0.0001
Sex at birth (Ref.=Male)				
Female	0.20 (-0.06, 0.47)	0.1380	1.17 (0.27, 2.06)	0.0107
Substance use at baseline (Ref.=No)				

Yes	0.63 (0.39, 0.87)	<0.0001		
Viral suppression (Ref.=Yes)[§]				
No	0.79 (0.55, 1.03)	<0.0001		
CD4 nadir at baseline (Ref.=≥200)				
<200	0.73 (0.50, 0.95)	<0.0001		
HTN (Ref.=No)				
Yes	0.76 (0.50, 1.02)	<0.0001	1.37 (0.19, 2.55)	0.0230
Diabetes (Ref.=No)				
Yes	0.66 (0.37, 0.94)	<0.0001		
MANX (Ref.=No)				
Yes	0.31 (0.09, 0.52)	0.0065	0.89 (-0.17, 1.94)	0.0992
SCZ (Ref.=No)				
Yes	0.32 (-0.07, 0.72)	0.1079		
Age at baseline (scaled by 10)	0.37 (0.25, 0.49)	<0.0001	0.73 (0.27, 1.19)	0.0020
Follow-up time	-0.03 (-0.07, 0.01)	0.1958		
Percent time on TDF[§]	-0.78 (-1.03, -0.53)	<0.0001		
Percent time on PI[§]	0.19 (-0.05, 0.43)	0.1287		
Percent time on INSTI[§]	0.33 (0.04, 0.62)	0.0269		

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; HTN: hypertension; MANX: mood and anxiety disorders; SCZ: schizophrenia; TDF: tenofovir disoproxil fumarate; PI: protease inhibitor; INSTI: integrase strand transfer inhibitor.

[§]The variable was measured for each year.

^εOnly the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S6. Generalized linear mixed model for the incidence rate of chronic liver disease among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART ^ε	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-11.96 (-12.69, -11.23)	<0.0001	-11.31 (-12.09, -10.53)	<0.0001
Sex at birth (Ref.=Male)				
Female	0.35 (0.17, 0.54)	0.0002		
Substance use at baseline (Ref.=No)				
Yes	1.63 (1.42, 1.84)	<0.0001	1.39 (0.65, 2.13)	0.0002
Viral suppression (Ref.=Yes)[§]				
No	0.72 (0.53, 0.91)	<0.0001		
CD4 nadir at baseline (Ref.=≥200)				
<200	0.47 (0.30, 0.63)	<0.0001		
MANX (Ref.=No)				
Yes	0.27 (0.10, 0.43)	0.0018	1.00 (0.43, 1.57)	0.0006
SCZ (Ref.=No)				
Yes	0.43 (0.16, 0.70)	0.0018		
Age at baseline (scaled by 10)	0.24 (0.15, 0.34)	<0.0001		
Year of HIV diagnosis (Ref.=1979)	-0.02 (-0.03, 0.00)	0.0526		
Follow-up time	-0.03 (-0.06, 0.00)	0.0853		
Percent time on NNRTI[§]	-0.29 (-0.54, -0.03)	0.0273		
Percent time on PI[§]	-0.18 (-0.41, 0.05)	0.1322		

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; MANX: mood and anxiety disorders; SCZ: schizophrenia; NNRTI: non-nucleoside reverse transcriptase inhibitor; PI: protease inhibitor.

[§]The variable was measured for each year.

^εOnly the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S7. Generalized linear mixed model for the incidence rate of chronic obstructive pulmonary disease among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART [‡]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-14.68 (-15.52, -13.84)	<0.0001	-16.08 (-18.63, -13.53)	<0.0001
Sex at birth (Ref.=Male)				
Female	0.53 (0.28, 0.77)	<0.0001	0.61 (0.00, 1.21)	0.0487
Substance use at baseline (Ref.=No)				
Yes	1.42 (1.16, 1.67)	<0.0001	0.97 (0.12, 1.82)	0.0246
CD4 nadir at baseline (Ref.=≥200)				
<200	0.28 (0.06, 0.50)	0.0133		
MANX (Ref.=No)				
Yes	0.39 (0.17, 0.61)	0.0005	0.94 (0.19, 1.69)	0.0141
PD (Ref.=No)				
Yes	0.34 (-0.03, 0.70)	0.0726		
Age at baseline (scaled by 10)	0.68 (0.57, 0.79)	<0.0001	1.12 (0.78, 1.46)	<0.0001
Year of HIV diagnosis (Ref.=1979)	-0.03 (-0.05, -0.01)	0.0064	-0.05 (-0.11, 0.01)	0.1128
Follow-up time	0.04 (0.00, 0.08)	0.0692	0.10 (-0.01, 0.21)	0.0835

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; MANX: mood and anxiety disorders; PD: personality disorders.

[‡]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S8. Generalized linear mixed model for the incidence rate of hypertension among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART [‡]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-11.04 (-11.79, -10.29)	<0.0001	-12.91 (-14.46, -11.36)	<0.0001
Substance use at baseline (Ref.=No)				
Yes	-0.28 (-0.46, -0.10)	0.0025		
Diabetes (Ref.=No)				
Yes	0.65 (0.40, 0.89)	<0.0001	1.53 (0.73, 2.33)	0.0002
CKD (Ref.=No)				
Yes	0.63 (0.37, 0.88)	<0.0001	0.87 (-0.02, 1.76)	0.0567
PD (Ref.=No)				
Yes	-0.36 (-0.81, 0.10)	0.1267		
SCZ (Ref.=No)				
Yes	0.61 (0.25, 0.96)	0.0009		
Age at baseline (scaled by 10)	0.50 (0.40, 0.59)	<0.0001	0.54 (0.20, 0.87)	0.0016
Year of HIV diagnosis (Ref.=1979)	-0.06 (-0.07, -0.04)	<0.0001		
Follow-up time	-0.05 (-0.09, -0.02)	0.0051		

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; CKD: chronic kidney disease; PD: personality disorders; SCZ: schizophrenia.

[‡]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S9. Generalized linear mixed model for the incidence rate of osteoarthritis among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART [‡]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-14.73 (-15.54, -13.92)	<0.0001	-14.11 (-15.90, -12.32)	<0.0001
Sex at birth (Ref.=Male)				
Female	0.50 (0.17, 0.82)	0.0027		
Substance use at baseline (Ref.=No)				
Yes	0.43 (0.14, 0.72)	0.0035		
CD4 nadir at baseline (Ref.=≥200)				
<200	0.36 (0.07, 0.64)	0.0136		
MANX (Ref.=No)				
Yes	0.66 (0.39, 0.93)	<0.0001	1.10 (0.26, 1.94)	0.0103
Age at baseline (scaled by 10)	0.65 (0.52, 0.78)	<0.0001	0.66 (0.32, 1.00)	0.0002
Follow-up time	-0.05 (-0.11, 0.00)	0.0624		

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; MANX: mood and anxiety disorders.

[‡]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S10. Generalized linear mixed model for the incidence rate of non-AIDS-related cancers among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART [‡]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-13.63 (-14.54, -12.72)	<0.0001	-15.09 (-17.13, -13.04)	<0.0001
Sex at birth (Ref.=Male)				
Female	-0.32 (-0.62, -0.03)	0.0310	-0.82 (-1.80, 0.16)	0.1000
Viral suppression (Ref.=Yes)[§]				
No	0.70 (0.47, 0.93)	<0.0001		
Diabetes (Ref.=No)				
Yes	0.36 (0.10, 0.62)	0.0062		
COPD (Ref.=No)				
Yes	0.44 (0.15, 0.73)	0.0027		
CKD (Ref.=No)				
Yes	0.58 (0.33, 0.84)	<0.0001		
CLD (Ref.=No)				
Yes	0.63 (0.40, 0.86)	<0.0001	0.84 (0.09, 1.59)	0.0281
MANX (Ref.=No)				
Yes	0.16 (-0.03, 0.36)	0.1027	0.82 (-0.04, 1.68)	0.0618
Age at baseline (scaled by 10)	0.58 (0.47, 0.68)	<0.0001	0.85 (0.48, 1.22)	<0.0001
Year of HIV diagnosis (Ref.=1979)	-0.02 (-0.03, 0.00)	0.0687		
Follow-up time	0.06 (0.02, 0.10)	0.0028		

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; COPD: chronic obstructive pulmonary disease; CKD: chronic kidney disease; CLD: chronic liver disease; MANX: mood and anxiety disorders.

[§]The variable was measured for each year.

[‡]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S11. Generalized linear mixed model for the incidence rate of mood and anxiety disorders among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART		Never on ART [‡]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-9.00 (-9.38, -8.62)	<0.0001	-8.00 (-9.07, -6.93)	<0.0001
Sex at birth (Ref.=Male)				
Female	0.29 (0.11, 0.47)	0.0018	0.42 (-0.02, 0.87)	0.0639
Substance use at baseline (Ref.=No)				
Yes	0.70 (0.56, 0.85)	<0.0001	0.78 (0.29, 1.27)	0.0017
PD (Ref.=No)				
Yes	0.80 (0.42, 1.18)	<0.0001	0.75 (-0.16, 1.66)	0.1049
SCZ (Ref.=No)				
Yes	1.10 (0.80, 1.40)	<0.0001		
Age at baseline (scaled by 10)	-0.10 (-0.17, -0.02)	0.0116	-0.24 (-0.48, 0.01)	0.0562
Follow-up time	-0.07 (-0.10, -0.04)	<0.0001	-0.16 (-0.26, -0.05)	0.0031

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; PD: personality disorders; SCZ: schizophrenia.

[‡]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S12. Generalized linear mixed model for the incidence rate of schizophrenia among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART [‡]		Never on ART [‡]	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-12.33 (-13.5, -11.16)	<0.0001	-11.59 (-14.06, -9.13)	<0.0001
Sex at birth (Ref.=Male)				
Female	-0.36 (-0.72, -0.01)	0.0463		
Substance use at baseline (Ref.=No)				
Yes	0.97 (0.64, 1.31)	<0.0001		
MANX (Ref.=No)				
Yes	1.86 (1.43, 2.28)	<0.0001	3.32 (1.33, 5.31)	0.0011
PD (Ref.=No)				
Yes	0.99 (0.63, 1.35)	<0.0001		
Age at baseline (scaled by 10)	-0.31 (-0.48, -0.14)	0.0004	-0.27 (-0.65, 0.10)	0.1489
Year of HIV diagnosis (Ref.=1979)	0.03 (0.00, 0.05)	0.0343		
Follow-up time			-0.15 (-0.30, 0.01)	0.0671

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; PD: personality disorders.

[‡]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized linear mixed models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART, both using a Poisson distribution, log link function, random intercept term, and including an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Table S13. Generalized linear mixed model for the incidence rate of personality disorders among diagnosed people living with HIV ever/never on ART.

Variable	Ever on ART [‡]	Never on ART [‡]
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	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-12.34 (-13.34, -11.35)	<0.0001	-10.65 (-11.50, -9.79)	<0.0001
Sex at birth (Ref.=Male)				
Female			-0.62 (-1.31, 0.07)	0.0767
Substance use at baseline (Ref.=No)				
Yes	1.10 (0.71, 1.48)	<0.0001		
MANX (Ref.=No)				
Yes	2.34 (1.78, 2.90)	<0.0001	1.52 (0.69, 2.35)	0.0003
SCZ (Ref.=No)				
Yes	1.22 (0.86, 1.58)	<0.0001	0.94 (0.24, 1.64)	0.0084
Age at baseline (scaled by 10)	-0.27 (-0.44, -0.10)	0.0024		
Follow-up time	-0.08 (-0.14, -0.01)	0.0188	-0.14 (-0.27, -0.01)	0.0324

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; SCZ: schizophrenia.

^eOnly the coefficients for selected variables in the multivariate model are shown.

For diagnosed people living with HIV who were ever on ART, a generalized linear mixed model with a negative binomial distribution was used. For diagnosed people living with HIV who were never on ART, a Poisson generalized linear mixed model was used. Both models employed a log link function, random intercept term, and included an offset for follow-up time.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

All-cause mortality rate

The same 9063 individuals eligible for the analysis of comorbidity incidence rates were included for modeling the all-cause mortality rate, with the same baseline for each individual, using generalized estimating equations.

The explanatory variables considered in the model included: sex at birth (male, female), substance use (drug-related) at baseline (Yes, No), viral suppression in one year (Yes, No), CD4 nadir at baseline (<200 , ≥ 200), prevalent status of all the physical comorbidities (Yes, No), prevalent status of the three mental comorbidities (Yes, No), age at baseline (continuous, scaled by 10), year of HIV diagnosis (i.e., the earliest year known to be HIV-positive in BC, discrete, with the reference year as 1979), and follow-up time (time-varying). For PLWH never on ART, the following variables were excluded: viral suppression in one year and CD4 nadir at baseline. The results from the multivariable model are shown in Table S14.

Similar to the analysis for comorbidity incidence rates, the all-cause mortality rate (r) was estimated by $\log(r) = \sum \beta_i x_i$, where x_i represents the binomial/continuous variable and β_i represents the coefficient value in Table S14. The probability of death (p) after six months was estimated by $p = 1 - e^{-r/2}$ [23-25].

Table S14. Estimating the all-cause mortality rate among diagnosed people living with HIV ever/never on ART using generalized estimating equations.

Variable	Ever on ART ^e		Never on ART ^e	
	Coefficient (95% CI)	p-value	Coefficient (95% CI)	p-value
Intercept	-13.24 (-13.73, -12.75)	<0.0001	-10.70 (-11.66, -9.74)	<0.0001
Substance use at baseline (Ref.=No)				
Yes	0.53 (0.32, 0.75)	<0.0001	0.55 (0.00, 1.09)	0.0489
Viral suppression (Ref.=Yes)[§]				
No	0.74 (0.55, 0.93)	<0.0001		
CD4 nadir at baseline (Ref.=≥ 200)				
<200	0.35 (0.17, 0.53)	0.0001		
CVD (Ref.=No)				
Yes	0.75 (0.53, 0.97)	<0.0001	1.17 (0.63, 1.70)	<0.0001
Diabetes (Ref.=No)				
Yes	0.19 (-0.05, 0.43)	0.1129		
COPD (Ref.=No)				
Yes	0.60 (0.38, 0.83)	<0.0001		

CKD (Ref.=No)				
Yes	0.75 (0.55, 0.94)	<0.0001		
CLD (Ref.=No)				
Yes	0.86 (0.66, 1.06)	<0.0001	0.77 (0.32, 1.23)	0.0009
Cancers (Ref.=No)				
Yes	1.13 (0.93, 1.34)	<0.0001	1.48 (0.84, 2.12)	<0.0001
SCZ (Ref.=No)				
Yes			-0.53 (-1.24, 0.18)	0.1448
Age at baseline (scaled by 10)				
	0.37 (0.28, 0.46)	<0.0001	0.20 (-0.01, 0.41)	0.0634
Follow-up time				
			-0.10 (-0.18, -0.02)	0.0196

ART: antiretroviral therapy; CI: confidence interval; Ref.: reference group; CVD: cardiovascular diseases; COPD: chronic obstructive pulmonary disease; CKD: chronic kidney disease; CLD: chronic liver disease; Cancers: non-AIDS-related cancers; SCZ: schizophrenia.

[§]The variable was measured for each year.

[£]Only the coefficients for selected variables in the multivariate model are shown.

Separate generalized estimating equation models were used for diagnosed people living with HIV who were ever on ART and those who were never on ART. Both models used a Poisson distribution with a log link function, and specified an unstructured working correlation matrix to account for within-subject correlations in the repeated measures.

P-values were reported to four decimal places wherever possible. Extremely small values were presented using standard conventions as $p < 0.0001$ to indicate high significance.

Impacts of health-related behavioral factors on incident rates of comorbidities and the all-cause mortality rate

Studies have found that physical inactivity, current smoker or heavy drinking are risk factors to comorbidities such as CVD and cancers, and to all-cause mortality [26-29]. In the model, we also accounted for the impact of those health-related behavioral factors (i.e., physical activity, smoking, and alcohol consumption) on the development of physical/mental comorbidities and all-cause mortality. The health-related behavioral factors were randomly assigned for each diagnosed PLWH using the distributions derived based on the data from the Canadian Community Health Survey (CCHS) 2019, shown in Table S15 [30]. The combined distribution of smoking and alcohol consumption was used to reflect that current smoker was more likely to drink heavily observed based on the data from the CCHS.

Table S15. Distributions of physical activity, smoking and alcohol consumption used in the microsimulation model.

Health behaviors	Percent	95% CI
Physical active[§]		
Yes	75.76	(74.23, 77.29)
No	24.24	(22.71, 25.77)
Smoking status[£]		
Current	13.99	(12.76, 15.22)
Former	40.99	(39.48, 42.49)
Never	45.02	(43.36, 46.68)
Heavy drinking[£]		
Yes	15.57	(14.13, 17.01)
No	84.43	(82.99, 85.87)
Heavy drinking in each smoker subgroup		
Current	35.20	(30.00, 40.41)
Former	16.27	(14.31, 18.23)
Never	7.57	(5.71, 9.42)

[§]Physical active was defined as physically active above or below recommended level from Canada's physical activity guides.

[£]Current or former smoker combined daily and occasional smokers.

[£]Heavy drinking was defined as having 5 (male) / 4 (female) or more drinks on one occasion at least once a week.

CI: Confidence interval.

The elevated risk for development of physical or mental comorbidities and for all-cause mortality due to physical inactivity, being a smoker or heavy drinking were based on an in-depth literature review. Table S16 shows the rate ratio of comorbidity development or all-cause mortality between the at-risk group and the reference group for each health-related behavioral factor used in the microsimulation model.

Table S16. Elevated risks for comorbidity development and for all-cause mortality, due to health-related behavioral factors (physical activity, smoking, and alcohol consumption), shown as risk ratios compared to individuals with low-risk behaviors.

Outcome	Ratio (95% Confidence interval)				Data source
	Physical inactive [§]	Current smoker [£]	Former smoker [£]	Heavy drinking [£]	
HTN	1.28 (1.10, 1.49)	--	--	1.40 (1.03, 1.87)	[26, 31]
CVD	1.48 (1.07, 2.06)	2.19 (1.80, 2.67)	1.39 (1.10, 1.76)	1.62 (1.32, 1.98)	[26, 28, 32]
Diabetes	1.49 (1.14, 1.94)	1.37 (1.33, 1.42)	1.14 (1.10, 1.18)	--	[26, 33]
COPD	1.35 (1.22, 1.52)	2.41 (1.70, 3.42)	2.41 (1.70, 3.42)	--	[27, 34]
CKD	1.34 (1.10, 1.63)	1.34 (1.23, 1.47)	1.15 (1.08, 1.23)	--	[35, 36]
CLD	1.33 (1.19, 1.49)	--	--	3.80 (2.40, 5.80)	[37, 38]
Osteoarthritis	--	--	--	1.43 (1.01, 2.02)	[39]
Cancers	1.18 (1.04, 1.32)	1.45 (1.17, 1.79)	1.06 (0.82, 1.36)	1.22 (1.08, 1.38)	[40-42]
MANX	1.27 (1.01, 1.59)	1.99 (1.71, 2.32)	1.99 (1.71, 2.32)	1.68 (1.17, 2.42)	[43-45]
PD	--	--	--	--	
SCZ	--	2.27 (1.67, 3.08)	2.27 (1.67, 3.08)	--	[44]
All-cause mortality	1.41 (1.39, 1.45)	1.28 (1.13, 1.46)	--	1.90 (1.30, 2.70)	[32, 38, 46]

HTN: hypertension; CVD: cardiovascular disease; COPD: chronic obstructive pulmonary disease; CKD: chronic kidney disease; CLD: chronic liver disease; OA: osteoarthritis; Cancers: non-AIDS-related cancers; MANX: mood and anxiety disorders; PD: personality disorders; SCZ: schizophrenia.

[§]Physical active as the reference group; [£]Never smoker as the reference group; [£]No heavy drinking as the reference group.

Model calibration and validation

After health-related behaviors were introduced into the model, the model was calibrated to fit: (1) the cumulative number of new ART initiations during 2008-2015; (2) the cumulative number of transitions between HIV care states after ART initiation (six different transitions in total between S , U_{on} , and U_{off}) during 2008-2015; (3) the cumulative number of all-cause deaths from different HIV care states (including A) during 2008-2015; and (4) the cumulative number of new diagnosis for each physical/mental comorbidity during 2008-2016. The historical targets were derived based on data from the STOP HIV/AIDS cohort between 2008 and 2015 for (1)-(3), since the number of PLWH alive in 2016 was overestimated in the STOP HIV/AIDS cohort due to the definition of lost to follow-up (at least 18 months between the last contact date and the cohort end date) [12]. The model was first calibrated to each target one by one to get reasonable initial guesses for parameters. Then 1000 sets of parameters were randomly sampled from 10% variation of the initial guesses using the Latin Hypercube sampling method and the one with the minimal sum of squared residual between simulated means and historical targets was kept for final simulation [47]. 100 simulations were used to estimate the simulated means for each parameter set, to balance the computation time and accuracy of the estimation. For each simulation, the model started with 7321 PLWH whose characteristic information was replicated from the STOP HIV/AIDS cohort as of January 1, 2008, and new diagnosed PLWH were introduced biannually since January 1, 2008, based on the STOP HIV/AIDS cohort. Target (4) was only considered among those PLWH with known comorbidity status on January 1, 2008. Figures S4-S7 show the comparisons between model simulation and historical targets estimated based on data from the STOP HIV/AIDS cohort.

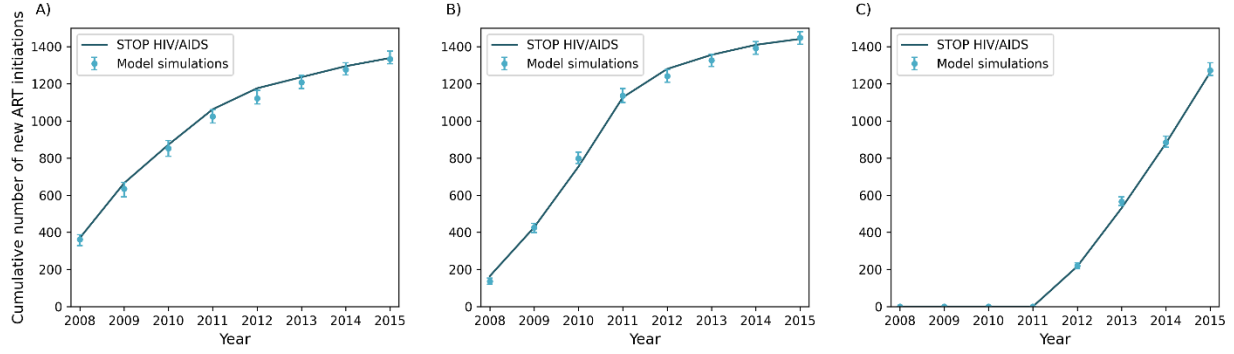


Figure S4. Cumulative number of new ART initiations during 2008-2015 from the STOP HIV/AIDS cohort and from the microsimulation model, among PLWH diagnosed before 2008 (A), between 2008 and 2011 (B), and from 2012 onward (C). The error bars represent the 2.5th-97.5th percentiles from 1000 simulations.

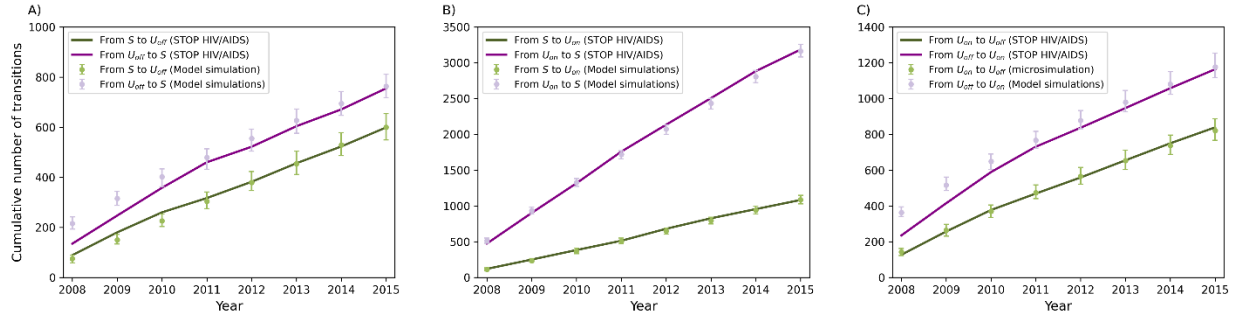


Figure S5. Cumulative number of transitions between three HIV states after ART initiation from the STOP HIV/AIDS cohort and from the microsimulation model: On ART with viral suppression (S), On ART with unsuppressed viral load (U_{on}), and Off ART with unsuppressed viral load (U_{off}). The error bars represent the 2.5th-97.5th percentiles from 1000 simulations.

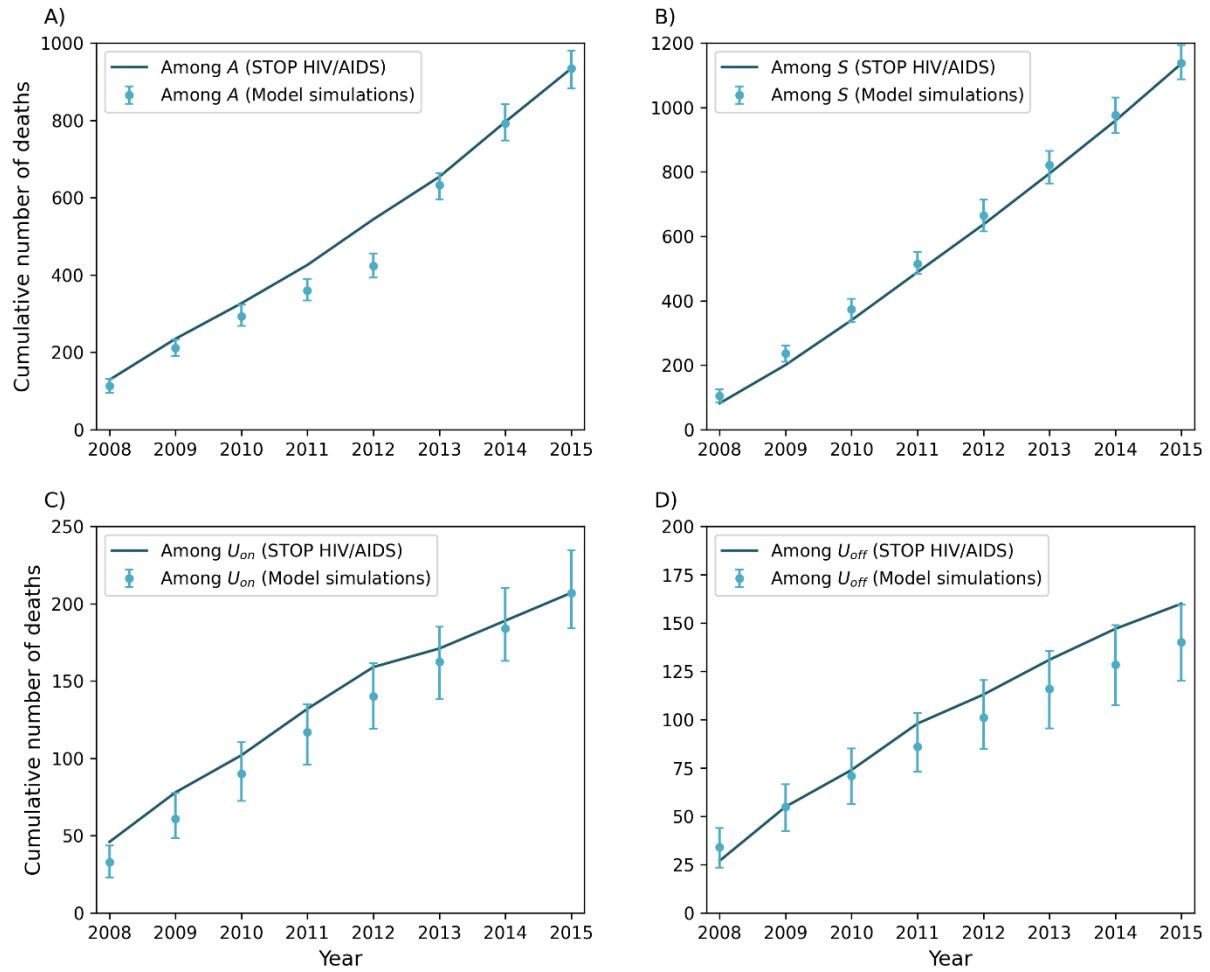


Figure S6. Cumulative number of all-cause deaths among PLWH aware of HIV diagnosis but not on ART (A), PLWH on ART with viral suppression (B), PLWH on ART with unsuppressed viral load (C), and PLWH off ART with unsuppressed viral load (D), from the STOP HIV/AIDS cohort and from the microsimulation model. The error bars represent the 2.5th-97.5th percentiles from 1000 simulations.

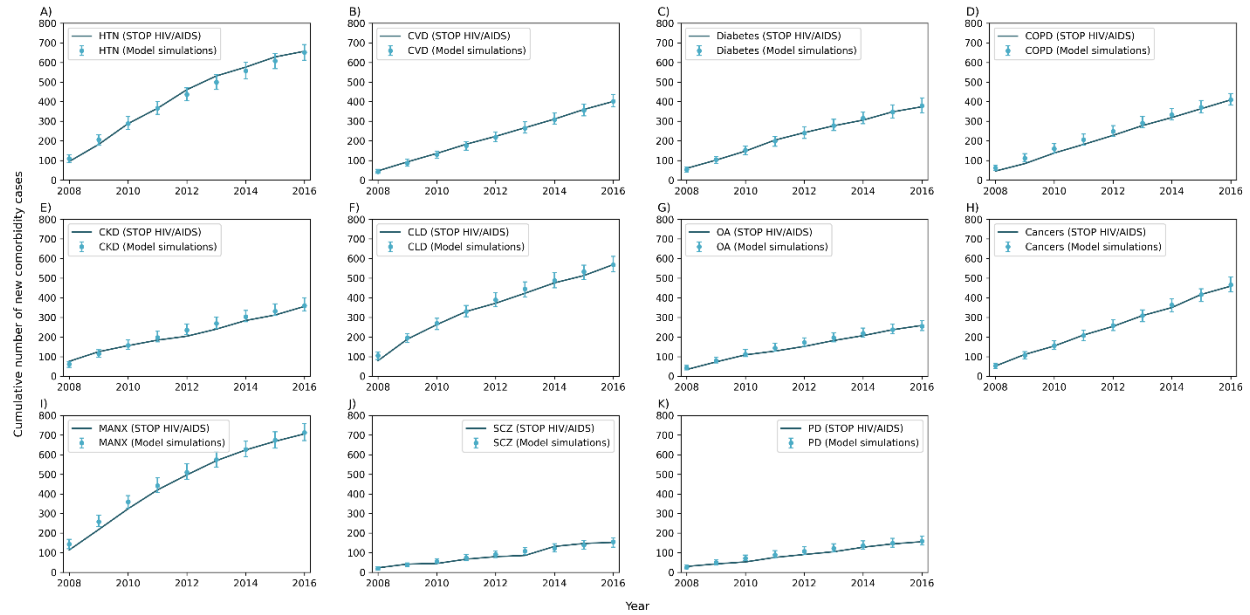


Figure S7. Cumulative number of new cases for hypertension (A), cardiovascular diseases (B), diabetes (C), chronic obstructive pulmonary disease (D), chronic kidney disease (E), chronic liver disease (F), osteoarthritis (G), non-AIDS-related cancers (H), mood and anxiety disorders (I), schizophrenia (J), and personality disorders (K) from the STOP HIV/AIDS cohort and from the microsimulation model. The error bars represent the 2.5th-97.5th percentiles from 1000 simulations.

The final model started with 7321 PLWH in BC on January 1, 2008, with randomly sampled characteristics from the STOP HIV/AIDS cohort. After every six months, the probability of ART initiation, transitions after ART initiation, and development of comorbidities were estimated and the status of each individual was determined based on the given probabilities. The characteristics of each individual were updated, and new diagnosed PLWH were introduced into the model, with characteristics sampled from new STOP participants between 2008 and 2016. The simulation of each individual stopped if the person died at one time step or on 31 December 2034 if alive. The process was repeated 1000 times and the final outcomes were shown as median (2.5th, 97.5th percentiles as the 95% credible interval). The model validation was done by comparing the simulated number of PLWH on ART with viral suppression, the number of PLWH on ART and the number of PLWH ever on ART with data from the Drug Treatment Program (DTP) during 2007-2019, shown in Figure S8. In addition, the simulated age distribution of PLWH on ART was compared with data from the DTP, shown in Figure S9. Finally, we compared the simulated number of new HIV infections and HIV prevalence with estimates from the PHAC during 2007-2019, shown in Figure S10.

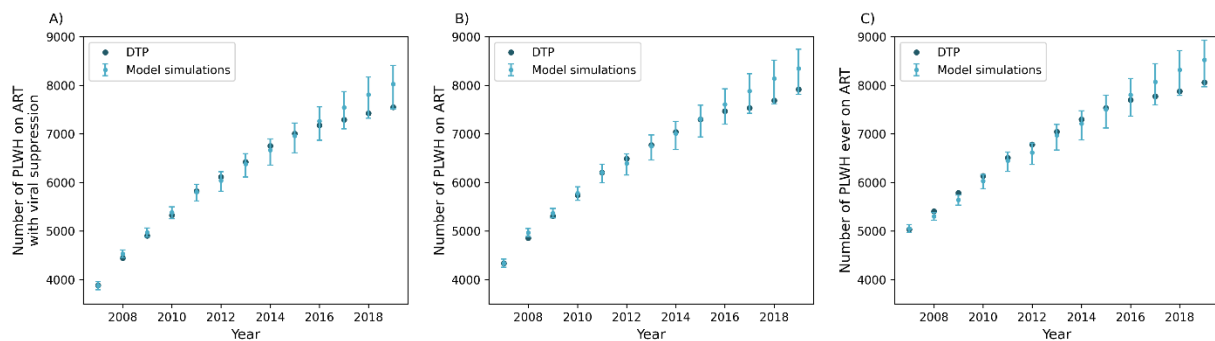


Figure S8. Comparison between data from the Drug Treatment Program (DTP) and simulations from the microsimulation model for the number of PLWH on ART with viral suppression (A), the number of PLWH on ART (B), and the number of PLWH ever on ART (C) during 2007-2019. The error bars represent the 2.5th-97.5th percentiles from 1000 simulations.

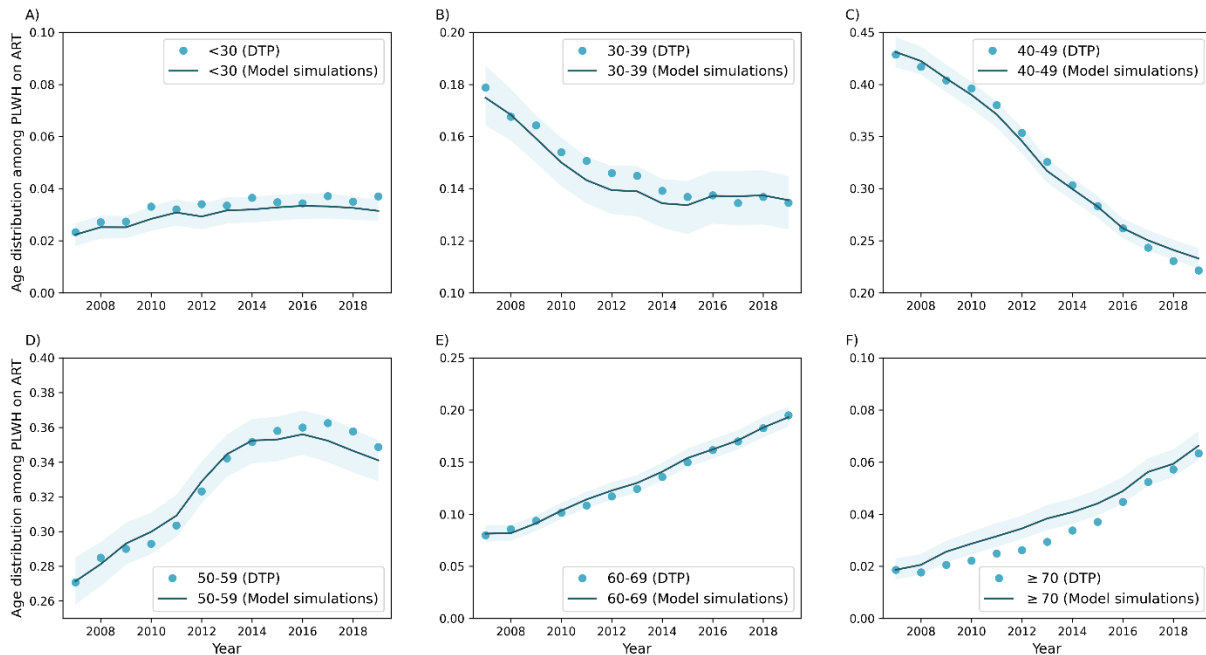


Figure S9. Comparison between data from the Drug Treatment Program (DTP) and simulations from the microsimulation model for age distributions of PLWH on ART over time during 2007-2019. The light blue region indicates the credible intervals of the simulations.

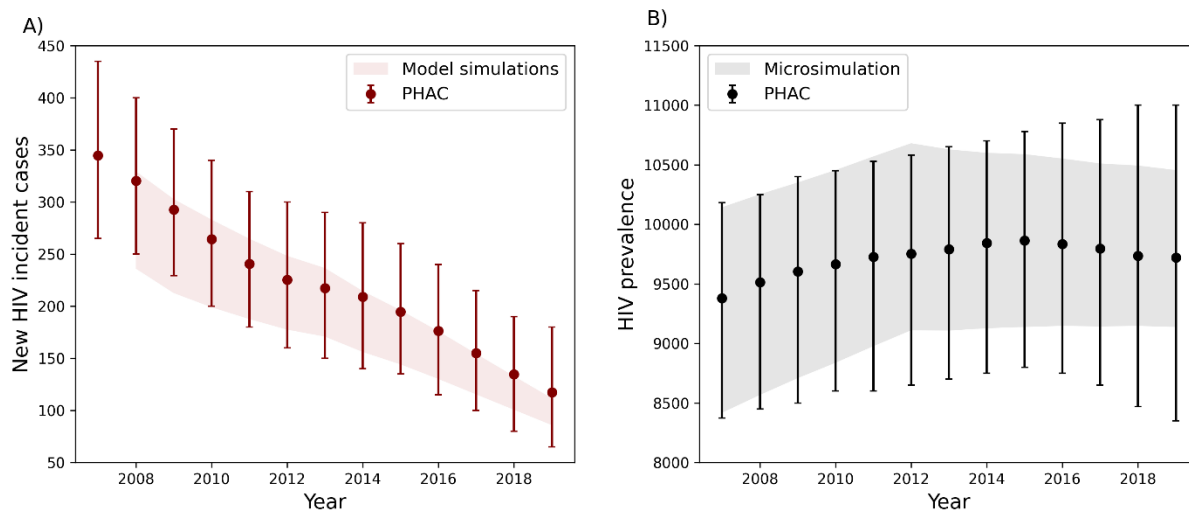


Figure S10. Comparison between estimations of new HIV infections (A) and HIV prevalence (B) from the Public Health Agency of Canada (PHAC) and the microsimulation model (shaded area as the credible intervals) during 2007-2019.

Model outcomes

Tables S17 and S18 show the number and age distribution of diagnosed PLWH in BC during 2007-2034 based on model simulations.

Table S17. Simulated number of diagnosed PLWH in BC during 2007-2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Number of diagnosed PLWH (n)					
	<30	30-39	40-49	50-59	60-69	≥70
2007	414	1672	3005	1612	470	150
	(375, 450)	(1599, 1737)	(2923, 3082)	(1542, 1684)	(429, 509)	(127, 174)
2008	428	1618	3008	1802	518	164
	(384, 473)	(1545, 1688)	(2921, 3100)	(1726, 1879)	(476, 559)	(140, 190)
2009	428	1562	3007	1961	602	190
	(373, 483)	(1481, 1646)	(2912, 3109)	(1878, 2049)	(556, 648)	(164, 217)
2010	445	1506	3012	2100	709	210
	(381, 504)	(1408, 1604)	(2892, 3113)	(2006, 2187)	(655, 759)	(182, 240)
2011	445	1462	2989	2261	811	233
	(377, 508)	(1349, 1566)	(2856, 3104)	(2159, 2357)	(753, 867)	(202, 265)
2012	440	1464	2878	2477	895	261
	(371, 503)	(1336, 1575)	(2744, 3006)	(2370, 2583)	(831, 954)	(228, 296)
2013	417	1439	2700	2660	972	289
	(350, 481)	(1298, 1559)	(2562, 2833)	(2540, 2774)	(904, 1034)	(254, 329)
2014	410	1401	2604	2788	1080	314
	(344, 474)	(1250, 1522)	(2459, 2745)	(2665, 2905)	(1005, 1149)	(277, 356)
2015	408	1382	2519	2872	1216	348
	(337, 468)	(1217, 1508)	(2362, 2659)	(2739, 3005)	(1137, 1294)	(308, 395)
2016	401	1406	2390	2979	1316	397
	(334, 463)	(1233, 1538)	(2224, 2536)	(2831, 3111)	(1231, 1400)	(352, 446)
2017	395	1395	2322	3021	1421	465
	(330, 454)	(1214, 1527)	(2146, 2479)	(2866, 3163)	(1334, 1513)	(421, 517)
2018	384	1390	2270	3028	1557	502
	(324, 440)	(1209, 1522)	(2092, 2423)	(2868, 3178)	(1465, 1651)	(455, 557)
2019	373	1367	2210	3030	1671	572
	(318, 425)	(1186, 1498)	(2028, 2370)	(2864, 3189)	(1570, 1771)	(521, 629)
2020	359	1347	2145	3029	1772	647
	(308, 402)	(1174, 1489)	(1950, 2307)	(2854, 3177)	(1671, 1867)	(589, 704)
2021	342	1323	2083	3000	1889	723
	(294, 385)	(1151, 1457)	(1896, 2246)	(2815, 3154)	(1781, 1988)	(662, 781)
2022	325	1289	2061	2896	2039	788
	(282, 366)	(1122, 1418)	(1862, 2225)	(2715, 3052)	(1927, 2145)	(721, 851)
2023	309	1245	2038	2772	2204	857
	(269, 347)	(1088, 1368)	(1846, 2199)	(2594, 2933)	(2086, 2315)	(793, 925)
2024	295	1206	1990	2694	2314	941
	(258, 331)	(1061, 1325)	(1791, 2155)	(2519, 2861)	(2189, 2433)	(870, 1013)
2025	281	1160	1950	2611	2386	1052
	(248, 317)	(1031, 1272)	(1744, 2107)	(2439, 2767)	(2263, 2512)	(974, 1132)
2026	270	1115	1942	2490	2472	1150
	(237, 304)	(998, 1218)	(1740, 2099)	(2321, 2644)	(2335, 2593)	(1069, 1231)
2027	259	1073	1903	2423	2502	1268
	(229, 290)	(969, 1165)	(1703, 2056)	(2245, 2576)	(2368, 2633)	(1184, 1352)
2028	249	1031	1872	2364	2509	1382
	(221, 278)	(935, 1118)	(1677, 2024)	(2185, 2513)	(2364, 2642)	(1294, 1469)
2029	241	992	1826	2300	2516	1504
	(212, 271)	(904, 1066)	(1636, 1973)	(2115, 2461)	(2368, 2647)	(1409, 1596)

2030	235 (208, 265)	953 (873, 1020)	1788 (1610, 1935)	2228 (2051, 2386)	2515 (2368, 2650)	1619 (1521, 1714)
2031	231 (202, 260)	917 (846, 977)	1744 (1574, 1881)	2168 (1989, 2322)	2492 (2341, 2624)	1752 (1646, 1856)
2032	227 (199, 253)	883 (819, 943)	1692 (1535, 1826)	2138 (1959, 2291)	2415 (2261, 2552)	1907 (1794, 2011)
2033	222 (194, 252)	855 (801, 911)	1635 (1482, 1763)	2110 (1929, 2260)	2318 (2166, 2459)	2073 (1957, 2183)
2034	218 (192, 249)	827 (768, 882)	1578 (1438, 1700)	2058 (1876, 2208)	2257 (2106, 2396)	2219 (2090, 2334)

PLWH: people living with HIV.

Table S18. Age distribution of simulated diagnosed PLWH in BC during 2007-2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Age distribution of diagnosed PLWH (%)					
	<30	30-39	40-49	50-59	60-69	≥70
2007	5.65 (5.12, 6.15)	22.84 (21.84, 23.73)	41.05 (39.93, 42.10)	22.01 (21.06, 23.00)	6.42 (5.86, 6.95)	2.05 (1.73, 2.38)
2008	5.68 (5.13, 6.24)	21.49 (20.54, 22.37)	39.90 (38.84, 41.02)	23.90 (22.94, 24.87)	6.87 (6.32, 7.42)	2.17 (1.86, 2.51)
2009	5.52 (4.90, 6.13)	20.15 (19.29, 21.01)	38.79 (37.72, 39.98)	25.31 (24.28, 26.25)	7.77 (7.18, 8.36)	2.45 (2.11, 2.80)
2010	5.57 (4.91, 6.20)	18.86 (17.95, 19.75)	37.73 (36.63, 38.86)	26.33 (25.28, 27.33)	8.88 (8.24, 9.48)	2.63 (2.29, 3.01)
2011	5.42 (4.75, 6.07)	17.82 (16.89, 18.70)	36.46 (35.33, 37.60)	27.62 (26.48, 28.64)	9.91 (9.21, 10.50)	2.84 (2.50, 3.24)
2012	5.22 (4.58, 5.81)	17.37 (16.40, 18.25)	34.20 (33.16, 35.31)	29.48 (28.39, 30.46)	10.65 (9.92, 11.29)	3.10 (2.76, 3.50)
2013	4.91 (4.32, 5.51)	16.93 (15.95, 17.90)	31.87 (30.87, 32.87)	31.41 (30.26, 32.50)	11.48 (10.74, 12.17)	3.42 (3.04, 3.84)
2014	4.76 (4.17, 5.34)	16.24 (15.25, 17.22)	30.33 (29.28, 31.29)	32.46 (31.27, 33.65)	12.55 (11.82, 13.33)	3.66 (3.28, 4.08)
2015	4.64 (4.03, 5.19)	15.78 (14.67, 16.66)	28.82 (27.82, 29.75)	32.88 (31.78, 34.13)	13.89 (13.14, 14.74)	3.98 (3.59, 4.46)
2016	4.50 (3.94, 5.05)	15.76 (14.65, 16.69)	26.88 (25.96, 27.74)	33.57 (32.44, 34.85)	14.82 (14.05, 15.72)	4.47 (4.05, 4.95)
2017	4.38 (3.86, 4.87)	15.41 (14.27, 16.37)	25.72 (24.82, 26.69)	33.53 (32.39, 34.85)	15.79 (14.98, 16.69)	5.17 (4.72, 5.67)
2018	4.20 (3.73, 4.68)	15.16 (14.00, 16.08)	24.83 (23.91, 25.77)	33.21 (32.08, 34.40)	17.08 (16.24, 17.99)	5.52 (5.06, 6.03)
2019	4.03 (3.60, 4.46)	14.74 (13.61, 15.67)	23.96 (22.99, 24.90)	32.89 (31.81, 34.01)	18.16 (17.31, 19.10)	6.21 (5.72, 6.71)
2020	3.85 (3.46, 4.23)	14.46 (13.44, 15.43)	23.04 (22.13, 23.97)	32.59 (31.51, 33.69)	19.07 (18.24, 20.02)	6.97 (6.46, 7.48)
2021	3.65 (3.28, 4.01)	14.09 (13.09, 15.04)	22.26 (21.33, 23.14)	32.05 (30.98, 33.15)	20.20 (19.32, 21.14)	7.73 (7.18, 8.25)
2022	3.47 (3.10, 3.81)	13.67 (12.69, 14.52)	21.90 (21.01, 22.84)	30.83 (29.84, 31.84)	21.74 (20.79, 22.72)	8.39 (7.82, 8.96)
2023	3.29 (2.94, 3.63)	13.18 (12.23, 13.97)	21.57 (20.70, 22.54)	29.42 (28.46, 30.44)	23.40 (22.42, 24.46)	9.12 (8.50, 9.70)
2024	3.14 (2.76, 3.47)	12.73 (11.89, 13.50)	21.02 (20.08, 21.99)	28.55 (27.64, 29.54)	24.55 (23.53, 25.67)	9.99 (9.34, 10.63)
2025	2.98 (2.65, 3.34)	12.26 (11.50, 13.03)	20.62 (19.59, 21.51)	27.67 (26.74, 28.60)	25.32 (24.34, 26.36)	11.17 (10.51, 11.90)
2026	2.86	11.80	20.51	26.39	26.22	12.22

	(2.54, 3.19)	(11.10, 12.54)	(19.48, 21.49)	(25.48, 27.28)	(25.27, 27.23)	(11.54, 12.95)
	2.75	11.38	20.13	25.69	26.59	13.48
2027	(2.43, 3.09)	(10.75, 12.01)	(19.07, 21.08)	(24.80, 26.60)	(25.69, 27.59)	(12.73, 14.23)
	2.66	10.96	19.82	25.09	26.72	14.72
2028	(2.36, 2.98)	(10.39, 11.57)	(18.78, 20.86)	(24.19, 26.00)	(25.74, 27.66)	(13.96, 15.52)
	2.59	10.57	19.40	24.51	26.86	16.08
2029	(2.27, 2.90)	(10.03, 11.16)	(18.36, 20.33)	(23.58, 25.38)	(25.91, 27.80)	(15.32, 16.85)
	2.52	10.20	19.10	23.85	26.95	17.36
2030	(2.22, 2.86)	(9.66, 10.80)	(18.09, 20.01)	(22.94, 24.69)	(26.05, 27.91)	(16.58, 18.20)
	2.48	9.86	18.69	23.27	26.81	18.87
2031	(2.17, 2.79)	(9.29, 10.44)	(17.73, 19.60)	(22.38, 24.14)	(25.88, 27.80)	(18.04, 19.75)
	2.45	9.55	18.24	23.05	26.08	20.62
2032	(2.16, 2.77)	(8.98, 10.13)	(17.35, 19.05)	(22.17, 24.03)	(25.21, 27.05)	(19.79, 21.48)
	2.42	9.29	17.69	22.87	25.16	22.58
2033	(2.12, 2.75)	(8.70, 9.87)	(16.85, 18.55)	(21.91, 23.77)	(24.31, 26.08)	(21.65, 23.44)
	2.39	9.05	17.24	22.40	24.65	24.26
2034	(2.09, 2.74)	(8.48, 9.63)	(16.41, 18.05)	(21.43, 23.34)	(23.84, 25.56)	(23.27, 25.12)

PLWH: people living with HIV.

Tables S19–S21 show the burden of multimorbidity as the number or proportion of diagnosed PLWH in BC with zero, one, two or at least three comorbidities (in addition to HIV) during 2007–2034 (Table S19: physical or mental multimorbidity; Table S20: physical multimorbidity; Table S21: mental multimorbidity) based on model simulations.

Table S19. Trends in the burden of multimorbidity as the number or proportion of diagnosed PLWH in BC with zero, one, two or at least three comorbidities (physical or mental) during 2007–2034 based on model simulations, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Number (n)				Proportion (%)			
	0	1	2	≥3	0	1	2	≥3
2007	3492 (3403, 3578)	2169 (2093, 2240)	1001 (945, 1062)	662 (616, 709)	47.70 (46.48, 48.87)	29.63 (28.59, 30.60)	13.67 (12.91, 14.51)	9.04 (8.41, 9.68)
2008	3268 (3168, 3361)	2338 (2257, 2420)	1149 (1087, 1214)	784 (733, 840)	43.36 (42.28, 44.39)	30.99 (30.07, 32.02)	15.23 (14.47, 16.04)	10.40 (9.73, 11.13)
2009	3114 (2988, 3223)	2454 (2356, 2553)	1279 (1217, 1351)	906 (850, 967)	40.13 (39.02, 41.16)	31.69 (30.66, 32.67)	16.51 (15.72, 17.33)	11.69 (11.00, 12.41)
2010	3004 (2858, 3136)	2549 (2434, 2660)	1398 (1325, 1479)	1028 (965, 1093)	37.63 (36.56, 38.73)	31.94 (30.87, 32.98)	17.53 (16.72, 18.42)	12.94 (12.13, 13.61)
2011	2926 (2758, 3064)	2617 (2489, 2745)	1501 (1419, 1586)	1151 (1077, 1222)	35.65 (34.66, 36.74)	31.95 (30.91, 32.96)	18.31 (17.51, 19.19)	14.07 (13.22, 14.80)
2012	2872 (2689, 3025)	2679 (2534, 2811)	1595 (1500, 1680)	1270 (1191, 1348)	34.09 (33.07, 35.20)	31.84 (30.80, 32.81)	18.96 (18.08, 19.80)	15.14 (14.29, 15.83)
2013	2800 (2609, 2955)	2693 (2533, 2827)	1646 (1543, 1731)	1347 (1264, 1430)	32.96 (31.95, 34.02)	31.73 (30.71, 32.72)	19.41 (18.55, 20.30)	15.92 (15.16, 16.73)
2014	2759 (2552, 2925)	2708 (2535, 2857)	1698 (1594, 1797)	1436 (1350, 1524)	32.03 (30.95, 33.07)	31.52 (30.53, 32.55)	19.75 (18.93, 20.68)	16.71 (15.90, 17.54)
2015	2734 (2520, 2910)	2739 (2553, 2892)	1748 (1637, 1857)	1524 (1435, 1617)	31.23 (30.20, 32.23)	31.31 (30.26, 32.22)	20.02 (19.22, 20.92)	17.47 (16.66, 18.28)
2016	2715 (2486, 2895)	2764 (2562, 2930)	1796 (1681, 1913)	1612 (1514, 1711)	30.51 (29.44, 31.56)	31.05 (30.16, 32.02)	20.25 (19.45, 21.08)	18.19 (17.34, 19.00)
2017	2698 (2461, 2885)	2784 (2578, 2959)	1840 (1714, 1962)	1699 (1588, 1801)	29.86 (28.78, 30.87)	30.86 (29.94, 31.83)	20.43 (19.58, 21.32)	18.86 (18.06, 19.72)
2018	2674 (2436, 2865)	2799 (2593, 2975)	1877 (1751, 1999)	1779 (1662, 1882)	29.23 (28.16, 30.23)	30.67 (29.73, 31.52)	20.59 (19.78, 21.49)	19.51 (18.70, 20.41)
2019	2644	2809	1910	1860	28.62	30.43	20.76	20.16

	(2404, 2833)	(2601, 2992)	(1774, 2042)	(1736, 1967)	(27.61, 29.62)	(29.59, 31.41)	(19.97, 21.64)	(19.39, 21.09)
	2611	2814	1940	1934	28.03	30.23	20.90	20.81
2020	(2381, 2798)	(2598, 2993)	(1796, 2071)	(1805, 2054)	(27.07, 29.06)	(29.37, 31.23)	(20.06, 21.72)	(19.97, 21.73)
	2571	2813	1962	2003	27.50	30.03	21.02	21.42
2021	(2348, 2753)	(2600, 2998)	(1822, 2093)	(1866, 2126)	(26.49, 28.42)	(29.21, 31.00)	(20.19, 21.89)	(20.59, 22.35)
	2538	2805	1986	2067	26.97	29.83	21.16	22.02
2022	(2318, 2715)	(2588, 2986)	(1838, 2110)	(1930, 2189)	(26.02, 27.86)	(28.94, 30.71)	(20.36, 22.01)	(21.14, 22.93)
	2496	2797	2006	2127	26.49	29.63	21.28	22.59
2023	(2292, 2674)	(2580, 2979)	(1848, 2135)	(1994, 2256)	(25.59, 27.37)	(28.76, 30.55)	(20.44, 22.11)	(21.70, 23.46)
	2455	2788	2018	2180	26.01	29.47	21.40	23.15
2024	(2243, 2627)	(2564, 2954)	(1867, 2153)	(2043, 2313)	(25.10, 26.87)	(28.58, 30.39)	(20.53, 22.19)	(22.25, 24.07)
	2413	2767	2029	2230	25.57	29.29	21.49	23.68
2025	(2218, 2581)	(2557, 2941)	(1877, 2166)	(2086, 2366)	(24.69, 26.44)	(28.36, 30.23)	(20.61, 22.33)	(22.77, 24.54)
	2376	2746	2034	2281	25.16	29.09	21.55	24.19
2026	(2187, 2539)	(2541, 2911)	(1879, 2171)	(2129, 2423)	(24.27, 26.03)	(28.13, 30.03)	(20.75, 22.37)	(23.30, 25.09)
	2335	2725	2038	2326	24.77	28.90	21.62	24.70
2027	(2151, 2492)	(2523, 2895)	(1886, 2169)	(2173, 2473)	(23.91, 25.62)	(27.99, 29.83)	(20.83, 22.44)	(23.81, 25.61)
	2297	2703	2041	2366	24.43	28.73	21.70	25.16
2028	(2118, 2450)	(2507, 2875)	(1885, 2169)	(2207, 2505)	(23.59, 25.27)	(27.78, 29.68)	(20.86, 22.53)	(24.28, 26.05)
	2257	2680	2038	2402	24.08	28.55	21.76	25.61
2029	(2086, 2408)	(2485, 2839)	(1886, 2166)	(2242, 2541)	(23.27, 24.93)	(27.59, 29.46)	(20.94, 22.52)	(24.75, 26.53)
	2220	2652	2035	2437	23.76	28.36	21.79	26.06
2030	(2054, 2368)	(2460, 2811)	(1883, 2171)	(2276, 2578)	(22.95, 24.63)	(27.42, 29.26)	(20.95, 22.62)	(25.19, 27.00)
	2180	2622	2033	2465	23.46	28.19	21.85	26.50
2031	(2023, 2331)	(2433, 2778)	(1884, 2158)	(2305, 2614)	(22.62, 24.27)	(27.22, 29.06)	(21.07, 22.68)	(25.62, 27.45)
	2146	2593	2028	2493	23.17	28.01	21.88	26.90
2032	(1991, 2285)	(2411, 2754)	(1881, 2156)	(2328, 2639)	(22.34, 24.02)	(27.08, 28.90)	(21.12, 22.77)	(26.04, 27.83)
	2111	2563	2024	2515	22.90	27.85	21.95	27.29
2033	(1959, 2241)	(2390, 2729)	(1879, 2148)	(2343, 2667)	(22.10, 23.75)	(26.94, 28.75)	(21.18, 22.83)	(26.41, 28.23)
	2070	2534	2014	2535	22.63	27.69	21.99	27.67
2034	(1923, 2200)	(2368, 2694)	(1869, 2137)	(2369, 2681)	(21.79, 23.47)	(26.77, 28.59)	(21.15, 22.84)	(26.81, 28.62)

Table S20. Trends in the burden of multimorbidity as the number or proportion of diagnosed PLWH in BC with zero, one, two or at least three physical comorbidities during 2007–2034 based on model simulations, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Number (n)				Proportion (%)			
	0	1	2	≥3	0	1	2	≥3
2007	5065	1468	530	257	69.18	20.05	7.24	3.51
	(4990, 5143)	(1402, 1535)	(489, 574)	(228, 288)	(68.16, 70.25)	(19.15, 20.97)	(6.68, 7.84)	(3.11, 3.93)
2008	4921	1711	611	295	65.31	22.70	8.11	3.92
	(4807, 5029)	(1636, 1784)	(567, 661)	(261, 329)	(64.16, 66.38)	(21.69, 23.65)	(7.52, 8.74)	(3.49, 4.36)
2009	4824	1906	690	336	62.14	24.58	8.91	4.34
	(4659, 4969)	(1821, 1989)	(644, 743)	(300, 373)	(61.06, 63.32)	(23.62, 25.53)	(8.32, 9.58)	(3.89, 4.80)
2010	4764	2071	771	380	59.60	25.93	9.67	4.77
	(4557, 4934)	(1973, 2165)	(718, 828)	(339, 425)	(58.47, 60.72)	(24.97, 26.97)	(9.03, 10.33)	(4.28, 5.28)
2011	4725	2208	848	425	57.48	26.96	10.36	5.19
	(4489, 4921)	(2101, 2315)	(789, 910)	(381, 469)	(56.37, 58.66)	(26.03, 27.94)	(9.67, 11.03)	(4.71, 5.67)
2012	4702	2326	922	472	55.73	27.65	10.98	5.62
	(4434, 4914)	(2202, 2440)	(860, 987)	(425, 519)	(54.57, 56.94)	(26.70, 28.69)	(10.29, 11.63)	(5.11, 6.13)
2013	4636	2384	969	500	54.49	28.14	11.45	5.89
	(4350, 4863)	(2249, 2507)	(907, 1038)	(453, 548)	(53.33, 55.73)	(27.20, 29.19)	(10.75, 12.14)	(5.40, 6.44)
2014	4606	2447	1020	537	53.39	28.49	11.87	6.25
	(4298, 4844)	(2307, 2580)	(948, 1088)	(489, 585)	(52.17, 54.60)	(27.51, 29.45)	(11.18, 12.57)	(5.72, 6.75)
2015	4596	2508	1071	575	52.41	28.72	12.27	6.60
	(4269, 4844)	(2360, 2646)	(998, 1142)	(525, 624)	(51.19, 53.63)	(27.71, 29.65)	(11.56, 12.98)	(6.06, 7.12)

2016	4593 (4244, 4862)	2568 (2405, 2708)	1120 (1040, 1195)	615 (565, 668)	51.53 (50.35, 52.68)	28.91 (27.90, 29.88)	12.62 (11.86, 13.39)	6.93 (6.40, 7.49)
2017	4582 (4219, 4860)	2620 (2443, 2768)	1166 (1078, 1243)	653 (600, 708)	50.74 (49.38, 51.87)	29.06 (28.10, 30.09)	12.95 (12.22, 13.74)	7.26 (6.72, 7.82)
2018	4566 (4198, 4843)	2664 (2485, 2817)	1208 (1122, 1288)	692 (634, 747)	49.91 (48.68, 51.03)	29.23 (28.31, 30.24)	13.26 (12.55, 14.03)	7.60 (7.05, 8.20)
2019	4538 (4177, 4823)	2711 (2516, 2864)	1249 (1158, 1335)	729 (674, 788)	49.11 (47.88, 50.24)	29.38 (28.46, 30.35)	13.55 (12.81, 14.31)	7.93 (7.38, 8.50)
2020	4506 (4135, 4783)	2750 (2546, 2907)	1286 (1189, 1376)	766 (707, 828)	48.35 (47.15, 49.49)	29.54 (28.55, 30.47)	13.85 (13.16, 14.57)	8.26 (7.70, 8.86)
2021	4466 (4102, 4744)	2778 (2571, 2936)	1319 (1223, 1413)	802 (738, 864)	47.61 (46.39, 48.74)	29.66 (28.77, 30.62)	14.13 (13.43, 14.87)	8.59 (7.97, 9.20)
2022	4416 (4062, 4693)	2801 (2598, 2958)	1352 (1253, 1445)	836 (770, 901)	46.92 (45.68, 48.03)	29.80 (28.90, 30.73)	14.41 (13.65, 15.13)	8.92 (8.30, 9.51)
2023	4362 (4023, 4637)	2823 (2610, 2978)	1379 (1276, 1475)	866 (800, 934)	46.21 (45.14, 47.33)	29.92 (29.04, 30.79)	14.66 (13.89, 15.36)	9.21 (8.60, 9.86)
2024	4309 (3969, 4573)	2839 (2629, 2990)	1403 (1301, 1500)	896 (825, 969)	45.57 (44.49, 46.60)	30.01 (29.15, 30.91)	14.89 (14.13, 15.60)	9.53 (8.92, 10.15)
2025	4250 (3921, 4512)	2845 (2638, 3003)	1427 (1316, 1527)	924 (851, 1004)	44.95 (43.87, 46.01)	30.11 (29.17, 31.06)	15.14 (14.33, 15.90)	9.82 (9.21, 10.50)
2026	4195 (3873, 4447)	2848 (2646, 3008)	1448 (1337, 1547)	952 (885, 1029)	44.37 (43.29, 45.41)	30.19 (29.30, 31.11)	15.34 (14.60, 16.12)	10.11 (9.46, 10.75)
2027	4129 (3815, 4374)	2856 (2649, 3012)	1467 (1352, 1569)	976 (903, 1057)	43.77 (42.72, 44.78)	30.26 (29.37, 31.17)	15.57 (14.81, 16.35)	10.40 (9.76, 11.06)
2028	4067 (3769, 4308)	2855 (2647, 3016)	1482 (1368, 1587)	1001 (923, 1083)	43.21 (42.16, 44.21)	30.32 (29.47, 31.27)	15.77 (15.03, 16.61)	10.67 (10.03, 11.33)
2029	4005 (3718, 4245)	2854 (2637, 3014)	1496 (1383, 1597)	1022 (945, 1105)	42.69 (41.65, 43.67)	30.40 (29.52, 31.30)	15.97 (15.27, 16.75)	10.93 (10.32, 11.66)
2030	3939 (3658, 4175)	2846 (2637, 3006)	1510 (1398, 1614)	1044 (966, 1129)	42.16 (41.14, 43.15)	30.47 (29.54, 31.41)	16.15 (15.44, 16.95)	11.18 (10.57, 11.88)
2031	3875 (3604, 4100)	2844 (2641, 2999)	1523 (1410, 1624)	1063 (983, 1147)	41.67 (40.58, 42.61)	30.51 (29.56, 31.48)	16.35 (15.61, 17.17)	11.45 (10.81, 12.16)
2032	3813 (3539, 4029)	2837 (2627, 2987)	1533 (1420, 1632)	1080 (1002, 1164)	41.18 (40.11, 42.15)	30.59 (29.62, 31.56)	16.58 (15.83, 17.34)	11.71 (11.06, 12.40)
2033	3749 (3486, 3962)	2824 (2625, 2979)	1542 (1431, 1645)	1097 (1017, 1179)	40.68 (39.68, 41.66)	30.65 (29.66, 31.59)	16.76 (15.96, 17.54)	11.94 (11.28, 12.63)
2034	3682 (3429, 3889)	2810 (2616, 2968)	1551 (1442, 1653)	1112 (1030, 1196)	40.21 (39.19, 41.16)	30.71 (29.75, 31.63)	16.96 (16.13, 17.73)	12.15 (11.51, 12.83)

Table S21. Trends in the burden of multimorbidity as the number or proportion of diagnosed PLWH in BC with zero, one, two or three mental comorbidities during 2007–2034 based on model simulations, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Number (n)				Proportion (%)			
	0	1	2	3	0	1	2	3
2007	4674 (4592, 4750)	2280 (2204, 2361)	317 (282, 351)	52 (38, 66)	63.84 (62.72, 64.88)	31.14 (30.11, 32.25)	4.33 (3.85, 4.79)	0.71 (0.52, 0.90)
2008	4606 (4503, 4714)	2490 (2406, 2577)	376 (340, 415)	66 (50, 83)	61.12 (60.01, 62.14)	33.02 (31.99, 34.12)	4.98 (4.50, 5.50)	0.88 (0.67, 1.10)
2009	4580 (4431, 4713)	2663 (2559, 2767)	433 (392, 475)	81 (65, 99)	59.03 (57.91, 60.14)	34.35 (33.35, 35.40)	5.58 (5.08, 6.09)	1.04 (0.84, 1.28)
2010	4582 (4396, 4741)	2819 (2699, 2932)	485 (441, 530)	95 (78, 115)	57.39 (56.31, 58.52)	35.35 (34.28, 36.40)	6.09 (5.55, 6.58)	1.19 (0.97, 1.44)
2011	4603 (4380, 4785)	2956 (2820, 3081)	535 (487, 584)	110 (89, 131)	56.06 (54.97, 57.11)	36.09 (35.07, 37.10)	6.53 (6.00, 7.06)	1.34 (1.10, 1.59)
2012	4634	3078	580	124	54.99	36.64	6.89	1.48

	(4385, 4827)	(2931, 3227)	(529, 634)	(102, 147)	(53.90, 56.04)	(35.65, 37.66)	(6.34, 7.45)	(1.22, 1.75)
2013	4602	3142	609	137	54.18	37.01	7.20	1.61
	(4335, 4811)	(2976, 3298)	(554, 667)	(114, 162)	(53.02, 55.16)	(36.05, 38.04)	(6.64, 7.76)	(1.35, 1.89)
2014	4609	3207	642	148	53.50	37.29	7.45	1.73
	(4329, 4831)	(3031, 3369)	(583, 698)	(127, 174)	(52.32, 54.53)	(36.35, 38.39)	(6.91, 8.04)	(1.49, 2.02)
2015	4637	3283	672	161	52.93	37.50	7.69	1.85
	(4324, 4870)	(3087, 3450)	(612, 732)	(139, 188)	(51.81, 53.94)	(36.52, 38.60)	(7.17, 8.26)	(1.61, 2.14)
2016	4666	3353	701	174	52.44	37.69	7.91	1.96
	(4342, 4913)	(3145, 3535)	(639, 766)	(149, 201)	(51.27, 53.44)	(36.69, 38.83)	(7.38, 8.47)	(1.70, 2.26)
2017	4697	3412	729	187	52.02	37.81	8.11	2.08
	(4353, 4959)	(3190, 3601)	(665, 796)	(161, 216)	(50.89, 53.02)	(36.87, 38.89)	(7.58, 8.66)	(1.81, 2.37)
2018	4718	3465	756	199	51.59	37.92	8.29	2.18
	(4377, 4989)	(3233, 3669)	(685, 822)	(171, 228)	(50.53, 52.61)	(36.95, 39.05)	(7.77, 8.86)	(1.91, 2.48)
2019	4733	3507	781	211	51.21	38.03	8.48	2.29
	(4381, 5007)	(3269, 3718)	(707, 852)	(182, 241)	(50.17, 52.23)	(37.05, 39.06)	(7.95, 9.04)	(2.01, 2.59)
2020	4739	3545	804	222	50.85	38.11	8.66	2.40
	(4384, 5003)	(3294, 3756)	(728, 876)	(191, 254)	(49.83, 51.87)	(37.10, 39.15)	(8.11, 9.24)	(2.11, 2.69)
2021	4734	3575	824	233	50.53	38.17	8.83	2.50
	(4385, 5004)	(3318, 3783)	(750, 898)	(203, 265)	(49.47, 51.51)	(37.16, 39.24)	(8.26, 9.41)	(2.21, 2.80)
2022	4725	3597	842	245	50.22	38.21	8.98	2.60
	(4376, 4991)	(3333, 3803)	(768, 916)	(211, 278)	(49.19, 51.18)	(37.20, 39.21)	(8.45, 9.54)	(2.31, 2.91)
2023	4710	3606	861	255	49.91	38.23	9.16	2.70
	(4380, 4978)	(3355, 3811)	(782, 935)	(220, 288)	(48.91, 50.92)	(37.25, 39.22)	(8.63, 9.70)	(2.40, 2.99)
2024	4692	3614	878	263	49.64	38.25	9.31	2.79
	(4365, 4960)	(3362, 3819)	(802, 955)	(231, 299)	(48.64, 50.65)	(37.21, 39.23)	(8.75, 9.89)	(2.49, 3.11)
2025	4673	3616	894	273	49.40	38.22	9.47	2.90
	(4351, 4932)	(3358, 3814)	(813, 972)	(238, 308)	(48.43, 50.47)	(37.21, 39.19)	(8.87, 10.04)	(2.59, 3.20)
2026	4648	3608	907	281	49.21	38.19	9.61	2.99
	(4339, 4898)	(3359, 3810)	(825, 985)	(245, 318)	(48.20, 50.25)	(37.17, 39.16)	(9.06, 10.21)	(2.67, 3.30)
2027	4630	3602	918	289	49.03	38.15	9.76	3.07
	(4316, 4871)	(3348, 3793)	(835, 996)	(251, 327)	(48.03, 50.08)	(37.12, 39.09)	(9.17, 10.35)	(2.73, 3.40)
2028	4604	3586	929	297	48.86	38.08	9.91	3.15
	(4291, 4845)	(3341, 3778)	(844, 1009)	(258, 334)	(47.91, 49.90)	(37.08, 39.07)	(9.28, 10.51)	(2.81, 3.49)
2029	4574	3568	939	303	48.72	37.99	10.02	3.23
	(4275, 4812)	(3326, 3755)	(855, 1021)	(264, 343)	(47.79, 49.75)	(37.00, 38.97)	(9.41, 10.68)	(2.87, 3.57)
2030	4550	3544	949	310	48.61	37.90	10.16	3.30
	(4252, 4790)	(3313, 3732)	(865, 1029)	(271, 349)	(47.66, 49.65)	(36.94, 38.86)	(9.54, 10.82)	(2.95, 3.66)
2031	4520	3519	956	315	48.52	37.80	10.27	3.38
	(4238, 4752)	(3287, 3711)	(868, 1041)	(275, 354)	(47.57, 49.52)	(36.87, 38.78)	(9.65, 10.91)	(3.00, 3.73)
2032	4489	3494	962	320	48.45	37.68	10.40	3.45
	(4217, 4717)	(3253, 3683)	(872, 1043)	(278, 360)	(47.49, 49.47)	(36.74, 38.70)	(9.76, 11.05)	(3.09, 3.81)
2033	4464	3464	968	324	48.40	37.57	10.51	3.52
	(4193, 4686)	(3233, 3654)	(876, 1048)	(283, 367)	(47.43, 49.41)	(36.62, 38.58)	(9.86, 11.16)	(3.15, 3.90)
2034	4430	3434	973	328	48.35	37.45	10.62	3.58
	(4171, 4651)	(3194, 3615)	(887, 1053)	(287, 369)	(47.36, 49.40)	(36.46, 38.43)	(9.97, 11.25)	(3.20, 3.96)

Table S22 shows prevalence of each physical and mental comorbidity among diagnosed PLWH in BC during 2007–2034 based on model simulations.

Table S22. Prevalence of key physical and mental comorbidities among diagnosed PLWH in BC during 2007–2034 based on model simulations, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	HTN	CVD	Diabetes	CKD	CLD	COPD	OA	Cancers	MANX	SCZ	PD
2007	9.60	4.34	6.08	6.28	9.56	2.90	3.65	4.07	35.02	3.31	3.57
	(8.93, 10.26)	(3.89, 4.75)	(5.59, 6.61)	(5.74, 6.88)	(8.86, 10.22)	(2.51, 3.29)	(3.24, 4.08)	(3.62, 4.51)	(34.00, 36.17)	(2.91, 3.70)	(3.13, 3.99)
2008	11.01	4.59	6.70	6.73	10.69	3.63	4.31	4.53	37.72	3.75	4.18
	(10.30, 11.69)	(4.14, 5.08)	(6.19, 7.30)	(6.16, 7.28)	(9.99, 11.41)	(3.20, 4.06)	(3.87, 4.77)	(4.07, 5.03)	(36.69, 38.82)	(3.34, 4.19)	(3.73, 4.62)
2009	12.21	4.88	7.28	7.09	11.60	4.18	4.86	5.01	39.78	4.15	4.71
	(11.48, 12.90)	(4.44, 5.36)	(6.73, 7.85)	(6.52, 7.72)	(10.88, 12.35)	(3.72, 4.66)	(4.41, 5.37)	(4.54, 5.53)	(38.69, 40.89)	(3.73, 4.61)	(4.23, 5.16)
2010	13.26	5.23	7.80	7.41	12.31	4.68	5.32	5.45	41.39	4.53	5.16
	(12.52, 13.93)	(4.75, 5.70)	(7.24, 8.41)	(6.82, 7.99)	(11.61, 13.08)	(4.20, 5.13)	(4.84, 5.84)	(4.94, 5.96)	(40.28, 42.48)	(4.10, 4.98)	(4.68, 5.65)
2011	14.14	5.58	8.28	7.68	12.88	5.12	5.74	5.88	42.70	4.89	5.56
	(13.35, 14.87)	(5.11, 6.07)	(7.71, 8.89)	(7.10, 8.28)	(12.11, 13.59)	(4.63, 5.58)	(5.20, 6.28)	(5.34, 6.39)	(41.67, 43.74)	(4.45, 5.35)	(5.03, 6.04)
2012	14.87	5.94	8.70	7.90	13.31	5.52	6.11	6.29	43.75	5.22	5.89
	(14.10, 15.61)	(5.46, 6.44)	(8.11, 9.33)	(7.32, 8.53)	(12.55, 14.05)	(5.03, 5.99)	(5.57, 6.62)	(5.77, 6.81)	(42.70, 44.78)	(4.77, 5.69)	(5.41, 6.38)
2013	15.44	6.19	9.05	8.07	13.47	5.83	6.38	6.52	44.54	5.56	6.14
	(14.68, 16.17)	(5.69, 6.69)	(8.48, 9.71)	(7.52, 8.71)	(12.69, 14.22)	(5.32, 6.34)	(5.83, 6.90)	(5.98, 7.06)	(43.58, 45.60)	(5.08, 6.04)	(5.66, 6.67)
2014	15.94	6.52	9.38	8.25	13.63	6.13	6.61	6.85	45.20	5.88	6.37
	(15.17, 16.70)	(6.03, 7.05)	(8.82, 10.02)	(7.72, 8.84)	(12.87, 14.37)	(5.62, 6.66)	(6.07, 7.13)	(6.30, 7.44)	(44.19, 46.34)	(5.38, 6.40)	(5.87, 6.86)
2015	16.37	6.87	9.66	8.42	13.76	6.43	6.82	7.21	45.76	6.16	6.55
	(15.59, 17.16)	(6.37, 7.43)	(9.07, 10.32)	(7.88, 8.99)	(12.98, 14.49)	(5.95, 6.94)	(6.31, 7.38)	(6.68, 7.77)	(44.70, 46.85)	(5.67, 6.68)	(6.02, 7.08)
2016	16.70	7.21	9.91	8.59	13.86	6.70	7.01	7.60	46.22	6.44	6.73
	(15.92, 17.51)	(6.69, 7.77)	(9.28, 10.57)	(8.05, 9.19)	(13.09, 14.62)	(6.17, 7.25)	(6.48, 7.56)	(7.05, 8.21)	(45.22, 47.37)	(5.93, 6.97)	(6.19, 7.24)
2017	17.01	7.58	10.11	8.77	13.96	6.95	7.21	8.02	46.67	6.73	6.87
	(16.18, 17.83)	(7.06, 8.15)	(9.48, 10.78)	(8.20, 9.38)	(13.22, 14.70)	(6.44, 7.54)	(6.64, 7.72)	(7.47, 8.57)	(45.64, 47.75)	(6.23, 7.21)	(6.34, 7.38)
2018	17.25	7.96	10.30	9.01	14.04	7.18	7.38	8.44	47.07	7.01	7.00
	(16.44, 18.06)	(7.43, 8.54)	(9.68, 10.98)	(8.43, 9.59)	(13.31, 14.73)	(6.69, 7.77)	(6.84, 7.92)	(7.88, 8.99)	(46.08, 48.12)	(6.52, 7.53)	(6.48, 7.55)
2019	17.47	8.35	10.46	9.28	14.10	7.44	7.54	8.87	47.43	7.29	7.13
	(16.66, 18.28)	(7.78, 8.95)	(9.82, 11.13)	(8.68, 9.87)	(13.37, 14.78)	(6.88, 8.01)	(7.02, 8.06)	(8.29, 9.44)	(46.41, 48.47)	(6.81, 7.79)	(6.62, 7.66)
2020	17.64	8.75	10.61	9.53	14.14	7.66	7.71	9.33	47.80	7.57	7.24
	(16.84, 18.48)	(8.20, 9.36)	(9.97, 11.28)	(8.93, 10.15)	(13.43, 14.87)	(7.14, 8.26)	(7.16, 8.24)	(8.73, 9.92)	(46.74, 48.82)	(7.07, 8.09)	(6.74, 7.78)
2021	17.80	9.17	10.75	9.80	14.17	7.89	7.86	9.79	48.09	7.87	7.35
	(16.97, 18.60)	(8.60, 9.78)	(10.08, 11.35)	(9.23, 10.42)	(13.48, 14.91)	(7.36, 8.49)	(7.30, 8.37)	(9.16, 10.42)	(47.11, 49.19)	(7.33, 8.39)	(6.85, 7.87)
2022	17.93	9.57	10.86	10.06	14.19	8.12	8.00	10.27	48.39	8.15	7.44
	(17.10, 18.75)	(9.02, 10.24)	(10.23, 11.53)	(9.49, 10.67)	(13.48, 14.91)	(7.60, 8.73)	(7.45, 8.55)	(9.65, 10.93)	(47.42, 49.45)	(7.63, 8.69)	(6.95, 7.96)
2023	18.03	10.01	10.95	10.31	14.18	8.33	8.15	10.79	48.66	8.44	7.53
	(17.19, 18.87)	(9.43, 10.67)	(10.34, 11.62)	(9.73, 10.95)	(13.46, 14.92)	(7.81, 8.95)	(7.58, 8.73)	(10.13, 11.43)	(47.62, 49.69)	(7.89, 8.98)	(7.01, 8.04)
2024	18.11	10.41	11.02	10.56	14.17	8.53	8.28	11.32	48.93	8.71	7.61
	(17.25, 18.91)	(9.84, 11.09)	(10.39, 11.68)	(9.99, 11.20)	(13.45, 14.91)	(8.00, 9.17)	(7.72, 8.85)	(10.65, 11.95)	(47.94, 49.94)	(8.16, 9.27)	(7.11, 8.15)
2025	18.18	10.85	11.08	10.80	14.13	8.74	8.41	11.85	49.17	9.00	7.69

	(17.32, 18.98)	(10.29, 11.58)	(10.48, 11.77)	(10.21, 11.45)	(13.41, 14.86)	(8.19, 9.37)	(7.86, 9.00)	(11.17, 12.51)	(48.12, 50.19)	(8.48, 9.57)	(7.18, 8.23)
2026	18.20	11.29	11.13	11.03	14.08	8.94	8.54	12.38	49.35	9.28	7.76
	(17.36, 19.03)	(10.71, 12.01)	(10.52, 11.78)	(10.42, 11.65)	(13.32, 14.81)	(8.40, 9.56)	(8.02, 9.10)	(11.68, 13.09)	(48.29, 50.35)	(8.73, 9.87)	(7.27, 8.29)
2027	18.22	11.74	11.16	11.25	14.02	9.15	8.66	12.96	49.49	9.55	7.81
	(17.39, 19.04)	(11.14, 12.44)	(10.55, 11.82)	(10.61, 11.87)	(13.28, 14.71)	(8.59, 9.75)	(8.11, 9.24)	(12.22, 13.65)	(48.46, 50.50)	(8.99, 10.15)	(7.33, 8.37)
2028	18.22	12.18	11.18	11.44	13.95	9.34	8.77	13.51	49.63	9.82	7.87
	(17.42, 19.06)	(11.53, 12.86)	(10.58, 11.89)	(10.79, 12.07)	(13.24, 14.65)	(8.76, 9.97)	(8.19, 9.36)	(12.76, 14.24)	(48.58, 50.60)	(9.25, 10.45)	(7.37, 8.43)
2029	18.21	12.63	11.19	11.63	13.87	9.51	8.90	14.11	49.77	10.09	7.91
	(17.39, 19.05)	(12.01, 13.33)	(10.59, 11.84)	(10.98, 12.25)	(13.16, 14.57)	(8.89, 10.16)	(8.30, 9.51)	(13.39, 14.92)	(48.73, 50.71)	(9.50, 10.71)	(7.40, 8.46)
2030	18.17	13.07	11.18	11.81	13.77	9.70	9.01	14.72	49.86	10.36	7.95
	(17.39, 19.00)	(12.41, 13.77)	(10.57, 11.83)	(11.12, 12.44)	(13.12, 14.50)	(9.07, 10.32)	(8.42, 9.67)	(13.97, 15.51)	(48.84, 50.80)	(9.75, 10.99)	(7.45, 8.52)
2031	18.14	13.51	11.15	11.98	13.66	9.88	9.14	15.34	49.92	10.61	7.97
	(17.34, 18.95)	(12.85, 14.20)	(10.56, 11.82)	(11.34, 12.64)	(13.03, 14.39)	(9.30, 10.54)	(8.55, 9.78)	(14.62, 16.11)	(48.92, 50.89)	(9.98, 11.23)	(7.48, 8.56)
2032	18.10	13.95	11.13	12.12	13.56	10.05	9.27	15.96	49.97	10.87	8.00
	(17.25, 18.86)	(13.27, 14.63)	(10.53, 11.79)	(11.50, 12.79)	(12.88, 14.29)	(9.44, 10.71)	(8.65, 9.85)	(15.21, 16.75)	(48.97, 50.97)	(10.27, 11.52)	(7.52, 8.58)
2033	18.03	14.41	11.11	12.24	13.44	10.23	9.37	16.60	50.00	11.11	8.02
	(17.24, 18.76)	(13.67, 15.09)	(10.49, 11.75)	(11.64, 12.88)	(12.78, 14.19)	(9.62, 10.89)	(8.78, 9.95)	(15.82, 17.37)	(49.01, 50.99)	(10.48, 11.79)	(7.50, 8.58)
2034	17.94	14.83	11.07	12.37	13.33	10.39	9.50	17.24	50.04	11.35	8.03
	(17.14, 18.68)	(14.11, 15.53)	(10.43, 11.72)	(11.72, 13.04)	(12.69, 14.07)	(9.77, 11.04)	(8.84, 10.10)	(16.47, 18.03)	(48.94, 51.02)	(10.70, 12.03)	(7.52, 8.63)

HTN: hypertension; CVD: cardiovascular disease; CKD: chronic kidney disease; CLD: chronic liver disease; COPD: chronic obstructive pulmonary disease; OA: osteoarthritis; Cancers: non-AIDS-related cancers; MANX: mood and anxiety disorders; SCZ: schizophrenia; PD: personality disorders.

Figure S11 shows age-specific trends in mental multimorbidity during 2007–2034. And Tables S23–S28 show the simulated number of diagnosed PLWH in different age category with zero, one, two or at least three physical or mental morbidities during 2007–2034.

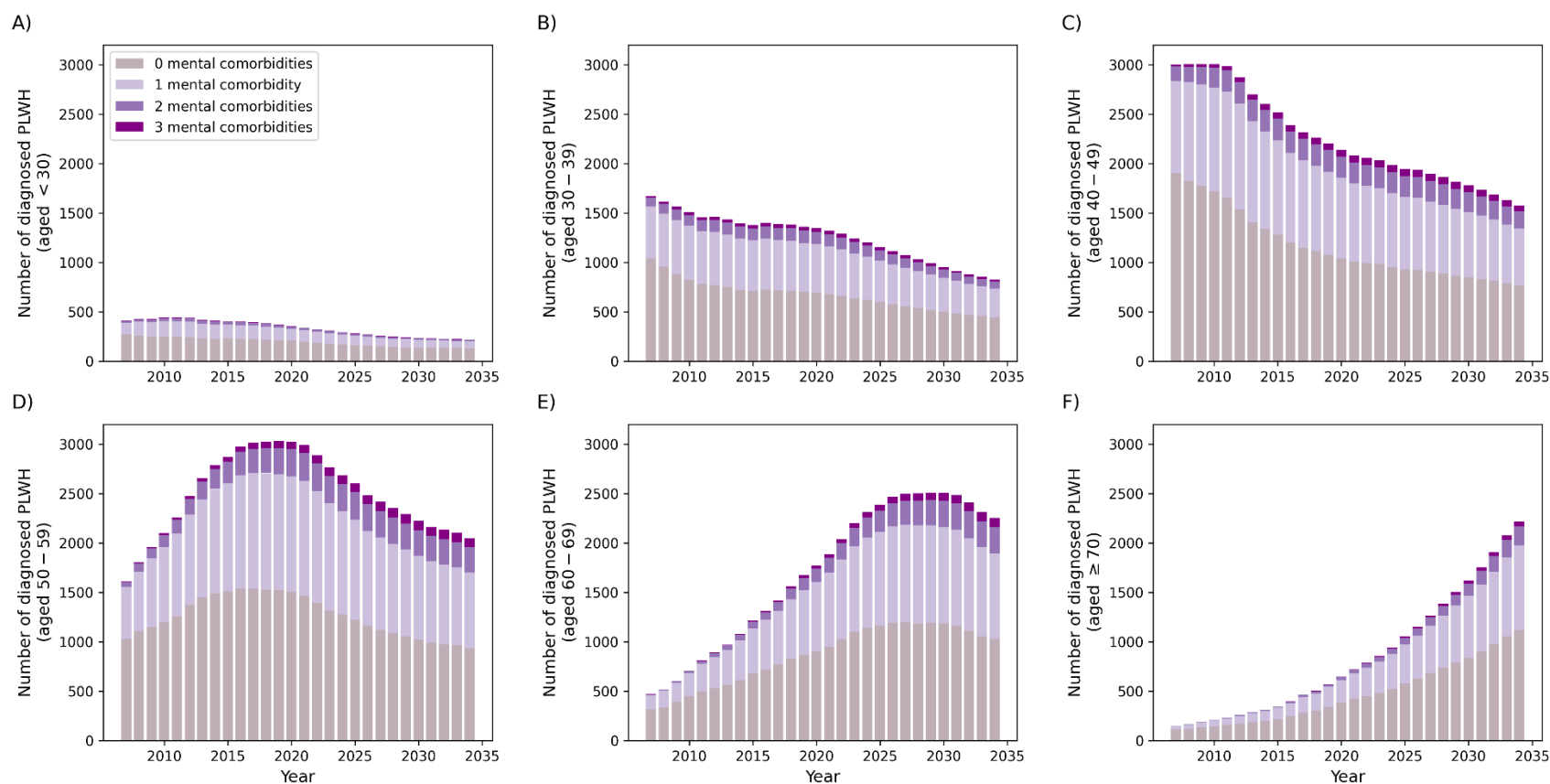


Figure S11. Age-specific trends in mental multimorbidity among diagnosed PLWH in BC during 2007-2034.

Table S23. Simulated number of diagnosed PLWH aged <30 with zero, one, two or at least three physical or mental or both comorbidities during 2007–2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Both physical and mental comorbidities				Physical comorbidities				Mental comorbidities			
	0	1	2	≥3	0	1	2	≥3	0	1	2	3
2007	224 (196, 255)	116 (97, 138)	41 (29, 55)	32 (21, 45)	319 (285, 354)	60 (47, 77)	23 (14, 34)	11 (5, 18)	272 (242, 305)	119 (100, 140)	15 (8, 23)	6 (2, 11)

2008	207	131	53	37	317	73	25	13	261	139	22	6
	(177, 238)	(109, 157)	(39, 68)	(25, 51)	(280, 356)	(57, 91)	(16, 37)	(6, 20)	(227, 293)	(118, 164)	(13, 32)	(2, 12)
2009	192	137	58	39	309	80	25	13	249	146	26	6
	(160, 225)	(114, 165)	(43, 76)	(28, 53)	(264, 355)	(62, 100)	(15, 37)	(7, 22)	(211, 287)	(122, 173)	(16, 37)	(2, 12)
2010	190	144	65	43	314	87	28	13	250	158	30	6
	(158, 226)	(117, 175)	(49, 83)	(30, 59)	(264, 362)	(67, 107)	(17, 40)	(7, 22)	(208, 293)	(129, 185)	(18, 41)	(2, 12)
2011	186	143	68	45	310	90	29	14	246	158	31	7
	(152, 222)	(115, 173)	(50, 86)	(32, 61)	(258, 358)	(69, 112)	(18, 41)	(7, 23)	(205, 291)	(129, 190)	(20, 43)	(3, 12)
2012	182	141	69	46	305	90	29	14	242	157	33	7
	(148, 217)	(114, 170)	(52, 89)	(33, 62)	(255, 352)	(70, 112)	(19, 41)	(8, 23)	(199, 284)	(129, 189)	(22, 45)	(2, 12)
2013	173	133	66	44	290	86	28	13	230	148	32	7
	(138, 206)	(106, 162)	(49, 85)	(31, 59)	(239, 339)	(67, 107)	(17, 40)	(6, 21)	(189, 270)	(118, 180)	(21, 43)	(2, 13)
2014	172	130	64	42	285	84	27	12	228	143	31	7
	(138, 207)	(103, 157)	(46, 83)	(30, 56)	(235, 332)	(65, 107)	(17, 39)	(6, 20)	(186, 270)	(112, 173)	(19, 42)	(2, 13)
2015	171	128	62	41	283	83	27	12	229	140	30	6
	(138, 206)	(99, 158)	(47, 81)	(28, 56)	(232, 329)	(64, 104)	(17, 38)	(6, 20)	(187, 270)	(111, 170)	(19, 41)	(2, 12)
2016	171	127	61	40	280	82	26	12	227	138	28	6
	(138, 205)	(98, 154)	(45, 80)	(28, 55)	(229, 326)	(62, 104)	(16, 38)	(6, 20)	(185, 270)	(108, 167)	(18, 40)	(2, 12)
2017	169	124	60	40	274	81	26	12	225	135	27	6
	(135, 201)	(98, 151)	(44, 77)	(27, 55)	(226, 319)	(62, 104)	(17, 38)	(6, 19)	(182, 266)	(106, 163)	(18, 39)	(2, 12)
2018	165	121	58	39	267	79	25	12	220	130	26	6
	(133, 198)	(96, 147)	(42, 75)	(27, 53)	(222, 311)	(60, 101)	(16, 37)	(5, 19)	(178, 258)	(104, 157)	(17, 37)	(2, 12)
2019	161	116	56	38	258	78	24	11	214	127	26	6
	(130, 192)	(94, 142)	(40, 73)	(26, 51)	(215, 299)	(61, 97)	(15, 36)	(5, 18)	(176, 251)	(101, 151)	(16, 37)	(2, 12)
2020	154	113	55	36	248	75	24	11	206	121	24	6
	(125, 179)	(92, 136)	(38, 69)	(25, 49)	(207, 284)	(58, 94)	(14, 34)	(5, 18)	(170, 238)	(99, 144)	(15, 35)	(2, 11)
2021	147	108	52	35	236	72	23	11	197	116	23	5
	(119, 172)	(87, 130)	(37, 68)	(24, 47)	(197, 269)	(54, 90)	(14, 33)	(5, 18)	(163, 227)	(93, 139)	(15, 33)	(2, 11)
2022	138	103	49	33	223	69	22	10	187	111	22	5
	(114, 164)	(83, 125)	(35, 64)	(22, 46)	(187, 257)	(53, 86)	(13, 32)	(4, 17)	(158, 217)	(88, 133)	(14, 32)	(1, 10)
2023	132	98	47	32	212	66	21	10	178	105	21	5
	(110, 156)	(78, 117)	(33, 61)	(21, 44)	(182, 245)	(50, 83)	(13, 30)	(4, 16)	(152, 207)	(84, 126)	(13, 31)	(1, 10)
2024	125	93	45	30	202	63	20	9	170	100	20	5
	(103, 150)	(74, 113)	(32, 59)	(20, 42)	(173, 232)	(47, 78)	(12, 30)	(4, 16)	(144, 198)	(80, 121)	(12, 29)	(1, 9)
2025	120	89	43	29	193	60	19	9	162	95	19	4
	(98, 142)	(71, 107)	(31, 58)	(19, 40)	(165, 223)	(47, 77)	(11, 29)	(4, 15)	(136, 188)	(77, 116)	(11, 27)	(1, 9)
2026	115	85	41	27	184	58	18	8	156	91	18	4
	(95, 137)	(68, 103)	(30, 55)	(18, 39)	(156, 210)	(44, 73)	(10, 28)	(3, 15)	(133, 181)	(73, 111)	(10, 27)	(1, 9)
2027	111	82	40	26	177	56	17	8	150	87	17	4

	(91, 132)	(64, 98)	(28, 53)	(17, 36)	(152, 201)	(42, 72)	(10, 26)	(3, 14)	(127, 173)	(70, 108)	(10, 26)	(1, 8)
2028	107	78	38	25	170	54	17	8	145	83	16	4
	(88, 128)	(62, 97)	(27, 50)	(16, 37)	(147, 195)	(41, 68)	(9, 26)	(3, 14)	(124, 169)	(67, 102)	(9, 24)	(1, 8)
2029	103	76	37	25	164	53	17	8	141	81	16	4
	(84, 122)	(61, 94)	(26, 49)	(15, 35)	(140, 189)	(39, 67)	(9, 25)	(3, 13)	(119, 164)	(63, 98)	(9, 24)	(0, 8)
2030	101	74	36	24	160	51	16	7	137	79	15	3
	(83, 122)	(58, 91)	(25, 47)	(15, 34)	(137, 184)	(39, 65)	(9, 24)	(3, 13)	(116, 161)	(62, 95)	(9, 23)	(1, 7)
2031	100	72	35	23	156	50	16	7	136	76	15	3
	(81, 118)	(56, 89)	(24, 48)	(15, 33)	(133, 181)	(36, 65)	(9, 24)	(3, 13)	(114, 156)	(60, 94)	(8, 23)	(0, 7)
2032	98	70	34	23	153	49	16	7	134	75	14	3
	(78, 117)	(55, 88)	(23, 46)	(14, 33)	(130, 177)	(36, 62)	(9, 24)	(3, 13)	(111, 156)	(59, 92)	(8, 22)	(0, 7)
2033	97	69	34	22	150	49	15	7	132	73	14	3
	(77, 116)	(54, 86)	(23, 45)	(14, 32)	(126, 173)	(35, 64)	(8, 24)	(2, 13)	(110, 153)	(57, 91)	(7, 22)	(0, 7)
2034	95	68	33	22	148	48	15	7	130	72	14	3
	(76, 115)	(54, 83)	(23, 45)	(14, 33)	(123, 172)	(36, 62)	(9, 24)	(3, 13)	(107, 153)	(57, 87)	(7, 22)	(0, 7)

Table S24. Simulated number of diagnosed PLWH aged 30–39 with zero, one, two or at least three physical or mental or both comorbidities during 2007–2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Both physical and mental comorbidities				Physical comorbidities				Mental comorbidities			
	0	1	2	≥3	0	1	2	≥3	0	1	2	3
2007	847	495	217	113	1265	297	77	32	1041	524	90	17
	(795, 902)	(452, 537)	(187, 244)	(93, 133)	(1202, 1325)	(267, 330)	(62, 95)	(21, 45)	(982, 1101)	(481, 568)	(71, 109)	(9, 25)
2008	756	502	227	133	1175	323	86	35	958	536	101	22
	(700, 803)	(462, 545)	(199, 255)	(112, 156)	(1106, 1237)	(288, 355)	(69, 106)	(24, 47)	(894, 1015)	(495, 580)	(82, 122)	(13, 31)
2009	674	501	239	148	1091	338	95	36	884	543	109	26
	(618, 725)	(459, 546)	(210, 270)	(125, 173)	(1021, 1160)	(304, 376)	(76, 114)	(25, 49)	(819, 945)	(499, 590)	(89, 131)	(16, 36)
2010	615	489	244	158	1018	345	102	40	824	544	109	28
	(558, 670)	(443, 535)	(213, 275)	(133, 182)	(942, 1097)	(308, 382)	(83, 122)	(28, 53)	(754, 891)	(498, 596)	(87, 130)	(19, 38)
2011	569	480	245	165	968	345	105	42	779	539	111	29
	(512, 631)	(431, 527)	(213, 277)	(139, 192)	(884, 1047)	(306, 383)	(86, 127)	(30, 56)	(704, 852)	(487, 594)	(92, 134)	(19, 40)
2012	552	479	253	175	954	351	110	45	769	542	119	32
	(492, 618)	(425, 529)	(219, 285)	(148, 205)	(867, 1042)	(308, 391)	(88, 132)	(32, 59)	(689, 842)	(488, 599)	(97, 143)	(22, 44)
2013	541	470	250	176	934	348	108	44	752	529	121	33
	(475, 611)	(414, 521)	(214, 282)	(147, 206)	(839, 1027)	(305, 389)	(86, 130)	(31, 59)	(668, 830)	(469, 587)	(98, 144)	(24, 45)
2014	516	457	247	176	904	341	108	45	721	519	122	33
	(449, 586)	(399, 513)	(210, 282)	(146, 207)	(800, 995)	(296, 385)	(86, 131)	(33, 58)	(633, 804)	(457, 581)	(100, 148)	(22, 45)
2015	512	448	242	174	901	329	105	44	712	511	121	33

	(442, 580)	(387, 503)	(204, 278)	(143, 203)	(789, 994)	(283, 374)	(84, 129)	(32, 59)	(618, 796)	(445, 572)	(98, 148)	(22, 45)
2016	518	454	248	179	915	336	106	46	722	518	125	35
	(446, 587)	(390, 515)	(210, 284)	(146, 210)	(797, 1011)	(286, 383)	(85, 131)	(32, 61)	(625, 808)	(447, 585)	(102, 152)	(23, 47)
2017	516	449	244	179	906	333	106	46	718	509	124	36
	(443, 585)	(383, 511)	(207, 283)	(148, 211)	(785, 1006)	(282, 380)	(84, 130)	(33, 61)	(619, 805)	(438, 580)	(101, 150)	(24, 48)
2018	509	445	245	182	897	333	107	47	715	506	126	37
	(435, 580)	(378, 505)	(206, 286)	(150, 216)	(777, 997)	(280, 379)	(84, 132)	(33, 62)	(614, 801)	(433, 575)	(102, 154)	(24, 49)
2019	498	439	242	180	879	331	106	46	701	497	125	36
	(427, 566)	(371, 499)	(202, 283)	(147, 213)	(761, 979)	(277, 375)	(83, 130)	(33, 62)	(600, 786)	(424, 568)	(100, 152)	(24, 49)
2020	490	434	242	180	865	330	106	46	692	494	125	37
	(419, 557)	(368, 495)	(199, 283)	(150, 214)	(747, 967)	(276, 377)	(84, 131)	(32, 61)	(594, 777)	(422, 563)	(100, 152)	(25, 50)
2021	479	425	237	177	845	325	105	46	678	483	123	36
	(409, 543)	(358, 484)	(195, 277)	(147, 210)	(735, 941)	(273, 371)	(82, 128)	(33, 60)	(585, 762)	(411, 545)	(97, 149)	(25, 49)
2022	465	414	232	174	818	317	103	45	662	471	120	36
	(402, 525)	(354, 467)	(190, 272)	(143, 206)	(716, 911)	(267, 364)	(82, 127)	(32, 59)	(573, 737)	(398, 530)	(95, 147)	(23, 49)
2023	447	400	224	170	788	309	100	44	637	453	116	34
	(384, 505)	(341, 451)	(186, 262)	(140, 200)	(688, 881)	(260, 354)	(78, 123)	(31, 59)	(552, 713)	(386, 512)	(91, 141)	(22, 47)
2024	432	387	217	165	760	299	98	43	621	438	112	34
	(374, 488)	(332, 438)	(180, 250)	(134, 194)	(666, 845)	(253, 343)	(76, 120)	(30, 57)	(540, 694)	(376, 493)	(88, 136)	(21, 45)
2025	417	373	208	160	729	290	95	42	600	419	106	32
	(363, 468)	(320, 421)	(175, 242)	(129, 189)	(641, 808)	(247, 331)	(75, 117)	(29, 56)	(527, 670)	(361, 473)	(84, 131)	(20, 45)
2026	401	358	201	154	699	281	92	41	577	403	102	30
	(351, 450)	(309, 405)	(169, 233)	(126, 183)	(619, 776)	(239, 318)	(73, 114)	(28, 55)	(509, 638)	(350, 452)	(80, 125)	(20, 43)
2027	384	343	193	148	668	271	90	40	558	387	98	29
	(340, 431)	(297, 388)	(164, 224)	(122, 177)	(597, 740)	(232, 307)	(71, 110)	(27, 53)	(497, 615)	(337, 434)	(77, 120)	(19, 41)
2028	370	329	186	143	642	262	87	39	538	371	93	28
	(327, 416)	(285, 371)	(159, 215)	(118, 169)	(577, 704)	(224, 296)	(69, 107)	(27, 51)	(482, 592)	(327, 413)	(74, 116)	(18, 40)
2029	357	317	179	138	615	253	84	38	520	356	89	26
	(314, 398)	(277, 357)	(152, 206)	(113, 163)	(554, 673)	(218, 286)	(65, 104)	(27, 50)	(466, 569)	(313, 397)	(70, 110)	(17, 38)
2030	343	304	172	132	588	244	82	36	501	341	85	25
	(305, 380)	(268, 341)	(147, 198)	(109, 157)	(532, 641)	(211, 277)	(64, 100)	(26, 49)	(452, 548)	(302, 380)	(67, 104)	(16, 35)
2031	330	292	165	127	565	236	79	36	485	327	80	23
	(292, 368)	(258, 328)	(140, 191)	(105, 152)	(514, 613)	(205, 266)	(60, 97)	(25, 49)	(438, 529)	(289, 366)	(63, 99)	(14, 34)
2032	318	282	160	122	542	229	77	34	468	313	77	22
	(283, 355)	(251, 316)	(135, 184)	(101, 146)	(494, 590)	(197, 260)	(60, 96)	(25, 47)	(426, 512)	(277, 352)	(62, 94)	(13, 32)
2033	309	272	154	119	522	223	75	34	456	302	74	21
	(276, 345)	(239, 305)	(130, 179)	(97, 140)	(480, 569)	(191, 251)	(58, 92)	(24, 46)	(418, 497)	(267, 338)	(57, 90)	(13, 31)
2034	300	263	149	115	505	216	73	33	444	292	71	20

(264, 333) (231, 294) (125, 173) (93, 136) (460, 549) (187, 246) (57, 91) (22, 45) (405, 487) (258, 327) (55, 88) (12, 29)

Table S25. Simulated number of diagnosed PLWH aged 40–49 with zero, one, two or at least three physical or mental or both comorbidities during 2007–2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Both physical and mental comorbidities				Physical comorbidities				Mental comorbidities			
	0	1	2	≥3	0	1	2	≥3	0	1	2	3
2007	1510	867	401	226	2206	547	183	71	1903	933	148	21
	(1445, 1578)	(811, 920)	(363, 441)	(198, 255)	(2129, 2278)	(501, 590)	(157, 207)	(55, 88)	(1828, 1973)	(878, 991)	(123, 170)	(14, 31)
2008	1377	934	438	258	2085	643	202	77	1824	1001	157	26
	(1309, 1444)	(875, 989)	(397, 476)	(227, 290)	(2006, 2166)	(593, 691)	(175, 231)	(60, 93)	(1745, 1900)	(945, 1062)	(134, 182)	(17, 38)
2009	1289	956	470	292	1996	704	222	87	1774	1029	173	32
	(1221, 1356)	(896, 1015)	(431, 511)	(258, 327)	(1913, 2082)	(655, 755)	(193, 252)	(68, 105)	(1694, 1856)	(966, 1092)	(149, 200)	(21, 43)
2010	1216	968	503	322	1931	753	235	92	1717	1053	199	38
	(1147, 1287)	(904, 1030)	(460, 546)	(285, 358)	(1838, 2019)	(703, 806)	(206, 268)	(72, 111)	(1634, 1802)	(988, 1118)	(171, 226)	(26, 50)
2011	1145	969	523	350	1862	781	249	96	1652	1078	213	44
	(1074, 1216)	(905, 1032)	(479, 569)	(311, 386)	(1760, 1957)	(727, 837)	(216, 281)	(77, 115)	(1566, 1736)	(1010, 1143)	(185, 242)	(32, 58)
2012	1050	934	526	364	1753	773	252	98	1537	1070	218	49
	(977, 1121)	(866, 1001)	(482, 573)	(325, 403)	(1648, 1855)	(717, 833)	(220, 284)	(80, 119)	(1446, 1631)	(1001, 1141)	(189, 249)	(36, 63)
2013	951	877	506	364	1616	737	249	96	1408	1023	216	52
	(880, 1024)	(812, 946)	(460, 558)	(326, 401)	(1513, 1718)	(683, 800)	(218, 280)	(78, 116)	(1315, 1506)	(953, 1089)	(189, 248)	(39, 66)
2014	900	840	493	370	1543	720	245	97	1341	985	219	57
	(825, 979)	(773, 908)	(445, 544)	(331, 409)	(1430, 1646)	(662, 780)	(213, 278)	(78, 116)	(1245, 1439)	(919, 1053)	(191, 250)	(44, 72)
2015	848	808	486	373	1466	710	243	96	1280	955	222	60
	(770, 919)	(739, 876)	(437, 535)	(334, 415)	(1356, 1569)	(651, 770)	(212, 275)	(78, 117)	(1182, 1374)	(887, 1023)	(193, 253)	(46, 76)
2016	791	761	466	366	1377	677	237	95	1202	908	216	61
	(713, 862)	(694, 826)	(420, 516)	(329, 410)	(1263, 1484)	(619, 738)	(204, 268)	(75, 115)	(1096, 1300)	(837, 977)	(187, 249)	(48, 77)
2017	751	740	459	366	1330	661	234	93	1147	888	219	63
	(676, 825)	(672, 813)	(410, 507)	(326, 406)	(1213, 1434)	(600, 720)	(202, 265)	(73, 112)	(1043, 1242)	(812, 963)	(189, 252)	(49, 81)
2018	728	722	447	366	1294	647	230	93	1116	862	218	67
	(654, 799)	(651, 790)	(399, 494)	(326, 410)	(1179, 1404)	(583, 704)	(199, 263)	(73, 114)	(1007, 1214)	(787, 941)	(187, 251)	(52, 84)
2019	700	699	438	368	1254	631	228	94	1077	841	218	69
	(629, 772)	(629, 770)	(387, 486)	(328, 412)	(1139, 1366)	(565, 693)	(197, 263)	(73, 113)	(972, 1180)	(760, 921)	(188, 252)	(53, 86)
2020	674	676	426	362	1210	613	223	94	1041	816	213	68
	(603, 748)	(603, 750)	(372, 473)	(321, 408)	(1094, 1318)	(548, 674)	(193, 257)	(75, 114)	(933, 1138)	(735, 898)	(182, 247)	(52, 86)
2021	650	659	415	357	1174	596	218	94	1008	793	210	68
	(577, 722)	(585, 726)	(366, 464)	(313, 402)	(1062, 1285)	(528, 657)	(186, 252)	(74, 114)	(902, 1105)	(712, 872)	(179, 244)	(52, 86)
2022	637	648	412	358	1159	589	216	94	992	783	212	71

	(567, 709)	(575, 721)	(360, 463)	(313, 406)	(1039, 1272)	(521, 653)	(184, 248)	(75, 115)	(888, 1090)	(695, 862)	(181, 245)	(54, 88)
2023	628	643	406	357	1143	584	215	94	982	767	212	72
	(557, 697)	(565, 712)	(358, 459)	(307, 402)	(1024, 1250)	(514, 648)	(179, 246)	(73, 115)	(880, 1078)	(685, 849)	(178, 245)	(55, 90)
2024	605	626	400	354	1112	571	211	93	951	749	212	71
	(533, 672)	(547, 695)	(348, 452)	(305, 397)	(990, 1218)	(498, 636)	(176, 242)	(73, 114)	(849, 1044)	(665, 836)	(178, 245)	(55, 89)
2025	594	613	392	346	1094	556	205	92	931	732	209	71
	(522, 661)	(539, 682)	(335, 447)	(299, 391)	(971, 1198)	(486, 621)	(172, 238)	(70, 112)	(829, 1022)	(648, 820)	(176, 241)	(55, 88)
2026	586	607	391	350	1082	556	204	93	925	727	210	74
	(517, 652)	(531, 677)	(337, 445)	(300, 394)	(961, 1186)	(486, 621)	(172, 239)	(72, 112)	(822, 1015)	(640, 814)	(176, 244)	(55, 90)
2027	574	593	385	346	1058	546	202	91	908	708	208	73
	(504, 640)	(519, 658)	(328, 436)	(297, 392)	(945, 1158)	(476, 610)	(168, 238)	(72, 112)	(809, 995)	(622, 794)	(175, 242)	(55, 91)
2028	559	580	378	345	1035	540	200	92	888	696	206	73
	(494, 621)	(507, 644)	(325, 429)	(295, 391)	(924, 1136)	(469, 600)	(166, 233)	(71, 113)	(794, 974)	(608, 775)	(173, 242)	(55, 91)
2029	542	566	371	338	1005	527	196	90	866	675	203	73
	(479, 608)	(492, 629)	(320, 419)	(289, 383)	(893, 1104)	(458, 587)	(164, 228)	(71, 112)	(773, 953)	(592, 755)	(167, 236)	(54, 90)
2030	530	554	363	335	979	518	194	89	850	660	199	72
	(469, 592)	(483, 617)	(313, 415)	(287, 380)	(876, 1078)	(453, 580)	(163, 227)	(71, 111)	(757, 936)	(582, 739)	(166, 231)	(54, 89)
2031	516	537	355	328	951	507	190	88	832	641	195	70
	(457, 574)	(473, 602)	(306, 403)	(283, 374)	(848, 1042)	(442, 567)	(159, 224)	(70, 111)	(742, 915)	(565, 714)	(162, 225)	(52, 88)
2032	500	520	344	320	920	495	186	87	812	620	189	67
	(445, 557)	(461, 583)	(300, 392)	(273, 363)	(822, 1005)	(433, 552)	(155, 220)	(69, 109)	(729, 886)	(550, 687)	(155, 221)	(49, 86)
2033	484	502	333	309	884	480	181	85	787	598	181	65
	(431, 538)	(444, 562)	(289, 377)	(261, 351)	(794, 967)	(424, 533)	(152, 214)	(66, 106)	(710, 860)	(531, 665)	(149, 213)	(47, 82)
2034	468	486	322	300	851	467	178	83	766	576	174	62
	(418, 519)	(430, 545)	(282, 365)	(258, 342)	(766, 930)	(413, 518)	(148, 208)	(64, 103)	(692, 840)	(513, 640)	(144, 204)	(45, 79)

Table S26. Simulated number of diagnosed PLWH aged 50–59 with zero, one, two or at least three physical or mental or both comorbidities during 2007–2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Both physical and mental comorbidities				Physical comorbidities				Mental comorbidities			
	0	1	2	≥3	0	1	2	≥3	0	1	2	3
2007	711	488	234	179	1006	377	157	69	1029	523	54	5
	(663, 761)	(447, 530)	(204, 263)	(154, 205)	(947, 1066)	(343, 417)	(133, 181)	(54, 86)	(969, 1088)	(482, 567)	(41, 69)	(2, 11)
2008	725	559	301	218	1058	472	189	82	1108	603	81	10
	(678, 777)	(514, 603)	(267, 336)	(187, 246)	(1000, 1120)	(432, 515)	(163, 215)	(66, 101)	(1046, 1165)	(559, 649)	(65, 99)	(5, 17)
2009	728	621	353	258	1104	547	215	94	1150	695	102	14
	(678, 778)	(576, 669)	(318, 392)	(226, 291)	(1040, 1168)	(503, 594)	(189, 242)	(74, 113)	(1085, 1215)	(646, 748)	(83, 123)	(7, 22)
2010	728	672	398	298	1138	610	245	107	1195	766	119	19

	(673, 782)	(622, 726)	(358, 439)	(267, 332)	(1071, 1203)	(559, 655)	(215, 275)	(87, 127)	(1126, 1259)	(713, 822)	(99, 141)	(12, 29)
2011	743	720	446	350	1180	674	280	127	1258	837	141	24
	(686, 798)	(665, 772)	(404, 489)	(315, 387)	(1106, 1253)	(627, 729)	(246, 312)	(104, 148)	(1185, 1331)	(779, 891)	(117, 164)	(16, 35)
2012	790	785	496	405	1255	755	317	148	1373	912	162	30
	(729, 848)	(726, 841)	(447, 536)	(366, 444)	(1176, 1330)	(699, 812)	(285, 354)	(125, 172)	(1294, 1450)	(852, 973)	(137, 187)	(19, 42)
2013	829	845	543	444	1336	820	344	160	1451	990	182	35
	(766, 888)	(782, 902)	(494, 588)	(405, 489)	(1249, 1416)	(761, 876)	(307, 381)	(136, 185)	(1364, 1533)	(925, 1055)	(155, 208)	(23, 48)
2014	843	881	580	485	1380	867	370	173	1491	1054	201	41
	(777, 907)	(816, 942)	(532, 628)	(441, 529)	(1294, 1463)	(807, 926)	(334, 407)	(148, 198)	(1404, 1575)	(986, 1123)	(172, 230)	(30, 55)
2015	846	901	603	521	1400	897	390	185	1509	1098	217	48
	(775, 907)	(839, 972)	(555, 655)	(475, 567)	(1314, 1486)	(834, 959)	(352, 428)	(158, 212)	(1416, 1596)	(1029, 1172)	(189, 248)	(36, 63)
2016	853	935	631	556	1438	934	410	196	1541	1146	236	55
	(783, 924)	(871, 1005)	(582, 684)	(512, 606)	(1340, 1527)	(874, 1002)	(373, 449)	(168, 223)	(1445, 1636)	(1071, 1217)	(206, 268)	(42, 72)
2017	851	940	642	582	1443	950	421	204	1541	1165	247	62
	(783, 919)	(877, 1013)	(585, 696)	(536, 632)	(1347, 1535)	(883, 1016)	(383, 462)	(177, 231)	(1440, 1638)	(1094, 1241)	(218, 283)	(47, 78)
2018	836	942	648	599	1432	958	427	210	1526	1179	255	65
	(763, 902)	(874, 1011)	(595, 703)	(550, 650)	(1332, 1521)	(888, 1026)	(387, 469)	(181, 238)	(1420, 1615)	(1103, 1258)	(225, 290)	(50, 82)
2019	828	938	653	610	1423	961	429	214	1521	1177	262	70
	(752, 893)	(869, 1008)	(597, 707)	(560, 664)	(1316, 1519)	(890, 1035)	(388, 473)	(185, 241)	(1415, 1610)	(1097, 1256)	(231, 295)	(55, 87)
2020	815	931	653	624	1412	964	434	216	1504	1171	274	76
	(740, 885)	(858, 1005)	(598, 706)	(575, 682)	(1303, 1506)	(891, 1036)	(391, 478)	(187, 242)	(1394, 1596)	(1089, 1252)	(240, 309)	(59, 92)
2021	795	917	649	632	1387	958	433	216	1468	1163	280	81
	(721, 865)	(847, 993)	(595, 704)	(579, 685)	(1280, 1490)	(884, 1031)	(391, 477)	(185, 244)	(1359, 1565)	(1081, 1247)	(246, 321)	(64, 98)
2022	756	880	631	623	1337	927	420	209	1394	1132	281	84
	(684, 824)	(812, 955)	(573, 685)	(569, 679)	(1233, 1436)	(854, 996)	(377, 465)	(179, 240)	(1291, 1491)	(1050, 1212)	(247, 320)	(67, 103)
2023	714	837	606	608	1278	887	403	202	1318	1085	276	86
	(649, 784)	(768, 911)	(551, 659)	(557, 664)	(1175, 1377)	(814, 957)	(359, 447)	(172, 229)	(1220, 1422)	(1004, 1166)	(244, 314)	(69, 105)
2024	692	810	587	598	1242	864	390	197	1275	1046	277	90
	(629, 757)	(740, 884)	(532, 647)	(548, 656)	(1138, 1339)	(790, 936)	(349, 436)	(168, 225)	(1178, 1374)	(966, 1130)	(243, 315)	(72, 109)
2025	661	782	572	590	1193	842	382	191	1224	1013	276	92
	(600, 726)	(715, 851)	(518, 626)	(537, 647)	(1094, 1288)	(767, 908)	(340, 425)	(163, 219)	(1131, 1323)	(931, 1090)	(244, 313)	(74, 113)
2026	628	741	545	569	1135	802	365	183	1162	962	268	92
	(565, 689)	(672, 813)	(493, 601)	(517, 625)	(1036, 1228)	(732, 872)	(323, 406)	(154, 211)	(1072, 1260)	(879, 1034)	(236, 303)	(74, 111)
2027	602	720	533	560	1102	780	357	179	1120	935	268	93
	(540, 664)	(652, 790)	(478, 588)	(509, 615)	(1006, 1193)	(712, 848)	(315, 399)	(150, 205)	(1028, 1213)	(852, 1014)	(234, 303)	(76, 113)
2028	586	699	519	553	1075	761	348	174	1090	904	267	95
	(530, 645)	(631, 769)	(464, 573)	(500, 605)	(981, 1165)	(689, 828)	(308, 391)	(147, 202)	(998, 1179)	(824, 984)	(232, 299)	(77, 116)
2029	567	678	505	545	1043	741	338	172	1057	876	264	97
	(509, 629)	(613, 749)	(448, 559)	(488, 600)	(950, 1136)	(667, 807)	(297, 382)	(145, 201)	(962, 1146)	(797, 955)	(229, 297)	(77, 118)

2030	547 (490, 611)	656 (589, 725)	490 (431, 542)	532 (476, 588)	1010 (915, 1103)	719 (645, 784)	330 (288, 370)	168 (141, 197)	1022 (928, 1113)	848 (766, 926)	258 (223, 292)	95 (75, 116)
2031	530 (471, 590)	637 (572, 703)	476 (423, 531)	519 (459, 573)	980 (888, 1073)	698 (624, 766)	320 (276, 358)	164 (137, 191)	993 (897, 1078)	823 (739, 900)	254 (220, 292)	94 (74, 115)
2032	520 (463, 584)	628 (560, 693)	470 (416, 522)	515 (453, 569)	970 (880, 1060)	689 (614, 751)	315 (272, 355)	162 (135, 191)	977 (882, 1065)	807 (725, 881)	254 (219, 291)	96 (76, 116)
2033	512 (455, 572)	617 (549, 680)	463 (408, 517)	510 (452, 570)	956 (860, 1044)	679 (603, 745)	310 (270, 350)	160 (133, 188)	965 (872, 1049)	789 (706, 863)	253 (218, 292)	97 (78, 118)
2034	494 (439, 551)	599 (530, 665)	454 (400, 505)	501 (444, 559)	928 (833, 1019)	663 (587, 730)	303 (259, 341)	157 (131, 186)	936 (850, 1022)	767 (684, 840)	252 (215, 289)	96 (77, 116)

Table S27. Simulated number of diagnosed PLWH aged 60–69 with zero, one, two or at least three physical or mental or both comorbidities during 2007–2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Both physical and mental comorbidities				Physical comorbidities				Mental comorbidities			
	0	1	2	≥3	0	1	2	≥3	0	1	2	3
2007	164 (140, 189)	158 (135, 183)	73 (57, 89)	74 (57, 91)	231 (203, 260)	138 (115, 160)	56 (42, 71)	45 (32, 59)	315 (282, 350)	145 (122, 168)	8 (3, 14)	1 (0, 3)
2008	169 (144, 196)	169 (144, 195)	92 (75, 111)	86 (69, 105)	239 (211, 272)	156 (131, 179)	73 (57, 91)	49 (36, 63)	338 (304, 373)	165 (139, 190)	11 (5, 18)	1 (0, 4)
2009	188 (162, 214)	190 (165, 219)	114 (94, 136)	110 (88, 130)	265 (233, 297)	182 (158, 208)	93 (76, 113)	62 (47, 78)	390 (351, 428)	194 (168, 221)	17 (9, 25)	2 (0, 5)
2010	209 (181, 236)	219 (189, 250)	141 (118, 165)	138 (115, 163)	297 (261, 331)	217 (189, 247)	119 (99, 139)	76 (59, 94)	447 (406, 490)	236 (205, 265)	22 (13, 32)	3 (0, 6)
2011	232 (200, 262)	248 (216, 279)	166 (143, 190)	164 (139, 190)	333 (292, 371)	250 (220, 282)	137 (116, 160)	90 (73, 109)	500 (458, 545)	276 (244, 310)	30 (20, 41)	4 (1, 8)
2012	238 (207, 271)	270 (238, 303)	191 (165, 219)	193 (168, 222)	353 (313, 393)	281 (247, 315)	158 (134, 183)	103 (84, 123)	531 (484, 577)	317 (282, 355)	40 (28, 53)	5 (1, 10)
2013	243 (211, 276)	289 (256, 324)	213 (185, 241)	226 (198, 256)	367 (325, 408)	309 (275, 343)	178 (152, 203)	119 (97, 141)	560 (513, 608)	355 (317, 393)	48 (35, 62)	8 (3, 14)
2014	260 (230, 297)	320 (283, 357)	239 (209, 270)	257 (227, 289)	398 (357, 446)	343 (308, 380)	200 (172, 227)	136 (113, 159)	614 (565, 667)	399 (359, 441)	56 (42, 73)	9 (4, 16)
2015	288 (253, 324)	356 (316, 394)	274 (240, 307)	298 (266, 333)	444 (398, 492)	389 (349, 429)	227 (197, 256)	154 (132, 180)	681 (624, 736)	454 (411, 499)	68 (53, 86)	11 (5, 18)
2016	304 (267, 343)	380 (341, 422)	298 (264, 336)	332 (299, 369)	473 (427, 525)	421 (376, 461)	250 (221, 281)	171 (147, 198)	721 (664, 777)	502 (458, 550)	78 (61, 98)	13 (7, 21)
2017	324 (283, 361)	407 (366, 450)	325 (289, 363)	365 (329, 406)	509 (457, 559)	456 (410, 501)	272 (238, 308)	185 (160, 213)	770 (707, 834)	544 (495, 593)	91 (71, 111)	16 (9, 25)

2018	344 (303, 385)	440 (396, 485)	360 (324, 400)	413 (374, 457)	546 (489, 598)	502 (453, 548)	302 (268, 339)	206 (181, 236)	830 (768, 895)	601 (550, 652)	106 (86, 128)	21 (13, 30)
2019	359 (318, 403)	472 (425, 516)	387 (346, 428)	454 (410, 499)	583 (526, 639)	542 (492, 591)	325 (288, 363)	221 (193, 251)	865 (798, 931)	659 (605, 714)	123 (100, 145)	25 (16, 35)
2020	371 (330, 414)	498 (450, 545)	412 (369, 452)	488 (444, 536)	614 (557, 670)	574 (524, 623)	346 (310, 384)	235 (207, 267)	900 (832, 964)	705 (651, 763)	135 (111, 160)	30 (21, 41)
2021	389 (347, 433)	526 (480, 574)	440 (399, 482)	530 (484, 581)	648 (590, 706)	614 (561, 666)	371 (332, 410)	252 (223, 285)	947 (878, 1016)	752 (694, 811)	151 (125, 177)	35 (25, 47)
2022	419 (374, 461)	571 (516, 620)	476 (430, 518)	576 (528, 628)	695 (635, 750)	667 (612, 721)	402 (362, 440)	275 (243, 307)	1028 (952, 1095)	804 (742, 867)	166 (141, 193)	40 (29, 53)
2023	448 (404, 489)	614 (563, 668)	515 (469, 559)	626 (574, 677)	750 (690, 809)	724 (667, 782)	432 (390, 474)	294 (260, 331)	1099 (1026, 1172)	869 (803, 932)	186 (160, 214)	47 (34, 60)
2024	464 (419, 509)	642 (589, 700)	543 (493, 590)	665 (613, 718)	787 (724, 848)	762 (702, 819)	456 (412, 498)	308 (275, 345)	1139 (1063, 1218)	919 (856, 985)	202 (175, 232)	52 (39, 67)
2025	474 (427, 518)	659 (609, 719)	560 (510, 609)	692 (635, 746)	811 (747, 879)	786 (724, 846)	470 (427, 514)	318 (285, 355)	1162 (1084, 1241)	948 (882, 1017)	215 (187, 247)	60 (44, 76)
2026	485 (434, 533)	683 (628, 742)	580 (526, 631)	721 (664, 774)	841 (773, 906)	815 (751, 876)	485 (443, 532)	328 (292, 362)	1189 (1109, 1274)	981 (910, 1048)	231 (202, 265)	66 (49, 83)
2027	489 (440, 537)	691 (636, 749)	584 (534, 634)	734 (678, 792)	854 (782, 923)	827 (763, 889)	491 (443, 540)	330 (292, 366)	1196 (1117, 1279)	990 (921, 1063)	241 (209, 274)	71 (54, 89)
2028	486 (436, 536)	690 (633, 750)	588 (534, 635)	741 (683, 800)	852 (780, 919)	832 (767, 896)	492 (447, 543)	330 (291, 368)	1188 (1106, 1269)	993 (925, 1069)	248 (217, 282)	74 (58, 92)
2029	487 (437, 536)	694 (633, 749)	589 (534, 640)	744 (688, 808)	859 (785, 928)	836 (768, 897)	493 (446, 541)	327 (290, 364)	1190 (1109, 1275)	988 (915, 1063)	254 (223, 291)	79 (61, 97)
2030	484 (434, 534)	690 (630, 749)	588 (535, 639)	749 (688, 812)	858 (780, 928)	836 (767, 898)	495 (445, 540)	326 (289, 362)	1184 (1101, 1266)	980 (910, 1058)	263 (232, 300)	83 (65, 102)
2031	478 (429, 526)	681 (620, 740)	582 (528, 634)	749 (690, 814)	851 (775, 922)	829 (760, 893)	491 (439, 535)	321 (284, 357)	1163 (1079, 1247)	969 (897, 1041)	268 (235, 308)	88 (70, 107)
2032	459 (411, 508)	655 (596, 715)	564 (511, 616)	732 (671, 794)	826 (751, 896)	805 (738, 876)	474 (423, 516)	309 (271, 343)	1112 (1026, 1193)	939 (868, 1013)	269 (233, 307)	90 (72, 110)
2033	438 (390, 488)	626 (570, 688)	541 (489, 595)	706 (644, 765)	797 (721, 869)	773 (705, 839)	452 (407, 498)	293 (258, 327)	1057 (978, 1139)	898 (830, 969)	266 (232, 301)	91 (72, 113)
2034	429 (384, 477)	610 (553, 668)	525 (473, 579)	689 (623, 750)	780 (705, 852)	753 (690, 821)	440 (394, 485)	281 (246, 317)	1027 (946, 1106)	867 (794, 941)	265 (232, 300)	94 (76, 115)

Table S28. Simulated number of diagnosed PLWH aged ≥ 70 with zero, one, two or at least three physical or mental or both comorbidities during 2007–2034, shown as the median (2.5th–97.5th percentiles) based on 1000 simulation runs.

Year	Both physical and mental comorbidities				Physical comorbidities				Mental comorbidities			
	0	1	2	≥3	0	1	2	≥3	0	1	2	3
2007	32	44	37	37	41	47	33	28	112	37	1	0
	(22, 43)	(32, 57)	(26, 49)	(26, 49)	(29, 55)	(34, 61)	(23, 45)	(19, 40)	(92, 134)	(25, 48)	(0, 4)	(0, 1)
2008	34	43	37	50	44	44	36	39	118	42	3	0
	(23, 47)	(30, 56)	(26, 50)	(37, 63)	(32, 58)	(32, 58)	(26, 49)	(28, 51)	(98, 141)	(30, 54)	(0, 7)	(0, 2)
2009	40	49	44	58	52	54	40	44	132	53	4	0
	(27, 53)	(36, 62)	(32, 58)	(44, 72)	(38, 66)	(40, 70)	(29, 53)	(33, 57)	(111, 156)	(41, 68)	(1, 8)	(0, 2)
2010	42	53	46	68	57	58	43	52	141	62	6	1
	(30, 56)	(39, 69)	(34, 60)	(54, 84)	(43, 73)	(43, 74)	(31, 55)	(39, 65)	(117, 165)	(47, 78)	(2, 12)	(0, 3)
2011	45	59	52	76	61	66	49	56	156	68	7	1
	(32, 59)	(44, 75)	(40, 68)	(60, 93)	(45, 78)	(50, 83)	(36, 63)	(43, 71)	(133, 184)	(53, 85)	(3, 13)	(0, 3)
2012	50	66	59	86	69	73	56	63	171	80	8	1
	(36, 65)	(50, 82)	(45, 74)	(69, 104)	(52, 87)	(56, 91)	(43, 70)	(48, 78)	(145, 200)	(64, 98)	(3, 14)	(0, 4)
2013	56	74	66	93	78	83	63	66	187	91	10	1
	(40, 72)	(58, 92)	(51, 82)	(77, 113)	(59, 96)	(66, 103)	(49, 79)	(52, 83)	(160, 217)	(74, 111)	(4, 16)	(0, 4)
2014	58	80	72	104	82	89	68	74	198	102	11	2
	(43, 74)	(63, 97)	(56, 90)	(85, 126)	(64, 100)	(71, 110)	(53, 85)	(57, 92)	(169, 232)	(83, 123)	(5, 17)	(0, 5)
2015	62	87	80	118	89	100	77	82	216	117	13	2
	(47, 79)	(70, 109)	(63, 97)	(97, 143)	(70, 109)	(80, 123)	(61, 96)	(65, 102)	(186, 251)	(97, 140)	(6, 20)	(0, 5)
2016	69	100	92	136	98	114	89	95	245	133	16	2
	(51, 85)	(80, 120)	(74, 112)	(113, 161)	(79, 119)	(94, 139)	(70, 108)	(75, 115)	(212, 281)	(112, 159)	(9, 24)	(0, 6)
2017	77	117	110	163	113	136	106	112	283	161	19	3
	(60, 97)	(94, 139)	(90, 131)	(137, 188)	(92, 137)	(112, 161)	(84, 127)	(91, 135)	(245, 321)	(139, 189)	(11, 28)	(0, 7)
2018	82	124	118	178	120	146	115	123	302	176	21	3
	(64, 101)	(102, 148)	(97, 141)	(152, 206)	(98, 145)	(122, 171)	(95, 138)	(101, 145)	(267, 342)	(149, 203)	(13, 31)	(0, 7)
2019	90	140	135	207	131	165	132	143	341	201	25	4
	(72, 111)	(115, 166)	(114, 158)	(179, 237)	(109, 156)	(139, 193)	(110, 156)	(120, 168)	(303, 382)	(173, 231)	(16, 35)	(1, 9)
2020	100	156	152	238	146	186	151	164	382	231	29	5
	(81, 122)	(131, 183)	(128, 176)	(207, 270)	(121, 173)	(159, 216)	(125, 177)	(140, 188)	(341, 426)	(199, 261)	(20, 41)	(1, 10)
2021	109	174	171	267	161	208	169	183	423	257	35	6
	(88, 132)	(147, 202)	(145, 198)	(235, 300)	(135, 190)	(178, 240)	(142, 196)	(156, 209)	(378, 467)	(223, 291)	(24, 48)	(2, 11)
2022	114	187	186	299	172	227	185	202	450	287	42	7
	(93, 138)	(158, 215)	(158, 214)	(265, 334)	(145, 200)	(195, 258)	(157, 214)	(173, 231)	(402, 496)	(252, 322)	(30, 54)	(2, 13)
2023	120	199	203	333	183	246	205	223	482	318	48	9
	(98, 144)	(172, 229)	(174, 232)	(296, 370)	(155, 212)	(213, 278)	(175, 236)	(194, 253)	(431, 527)	(283, 358)	(35, 63)	(4, 15)
2024	130	219	222	369	199	270	226	246	523	352	54	10
	(107, 154)	(189, 252)	(191, 256)	(329, 409)	(169, 230)	(235, 304)	(193, 258)	(215, 278)	(472, 575)	(314, 394)	(41, 70)	(4, 17)

2025	144 (119, 170)	243 (210, 278)	250 (218, 284)	414 (372, 457)	222 (192, 255)	305 (268, 341)	253 (218, 287)	273 (240, 308)	578 (523, 631)	396 (355, 443)	66 (50, 84)	12 (6, 20)
2026	155 (131, 183)	265 (232, 299)	272 (234, 309)	457 (415, 502)	242 (209, 276)	332 (293, 369)	278 (242, 315)	299 (266, 335)	625 (568, 678)	436 (395, 482)	75 (58, 93)	15 (8, 22)
2027	169 (143, 197)	291 (256, 326)	300 (264, 337)	506 (460, 554)	264 (231, 301)	367 (328, 407)	306 (269, 342)	329 (290, 368)	682 (625, 738)	482 (436, 530)	85 (68, 106)	17 (10, 26)
2028	182 (154, 211)	316 (280, 353)	326 (288, 367)	556 (508, 607)	286 (251, 326)	401 (358, 448)	335 (294, 375)	359 (317, 395)	736 (677, 794)	527 (478, 578)	98 (78, 119)	21 (13, 30)
2029	195 (167, 225)	342 (303, 381)	356 (318, 399)	609 (557, 661)	312 (274, 351)	438 (397, 484)	364 (325, 404)	387 (345, 427)	786 (721, 847)	579 (529, 634)	113 (90, 135)	25 (15, 35)
2030	208 (178, 238)	368 (329, 410)	384 (342, 426)	659 (605, 717)	337 (299, 376)	472 (428, 523)	393 (353, 435)	415 (374, 459)	838 (773, 899)	628 (576, 684)	125 (102, 149)	30 (20, 41)
2031	224 (194, 255)	398 (354, 442)	415 (374, 458)	715 (658, 773)	366 (326, 406)	513 (466, 565)	426 (382, 470)	447 (404, 493)	900 (831, 971)	678 (621, 734)	141 (116, 166)	34 (23, 47)
2032	244 (212, 276)	434 (387, 480)	452 (407, 498)	774 (716, 835)	397 (356, 441)	562 (510, 615)	463 (420, 508)	481 (435, 528)	977 (906, 1050)	732 (671, 788)	157 (131, 183)	39 (27, 53)
2033	266 (232, 299)	472 (426, 520)	492 (443, 538)	843 (784, 908)	435 (392, 482)	615 (563, 672)	505 (460, 553)	517 (470, 565)	1057 (981, 1132)	796 (732, 854)	177 (150, 203)	46 (32, 60)
2034	283 (247, 318)	503 (457, 553)	526 (478, 575)	902 (842, 970)	468 (419, 516)	658 (605, 717)	540 (491, 587)	548 (500, 599)	1119 (1041, 1195)	853 (791, 915)	195 (166, 223)	51 (37, 67)

Figure S12 shows age-specific patterns of comorbidity prevalence among diagnosed PLWH in 2024 and 2034. And Figure S13 shows the top five most prevalent comorbidities by age and sex among diagnosed PLWH in 2024 and 2034.

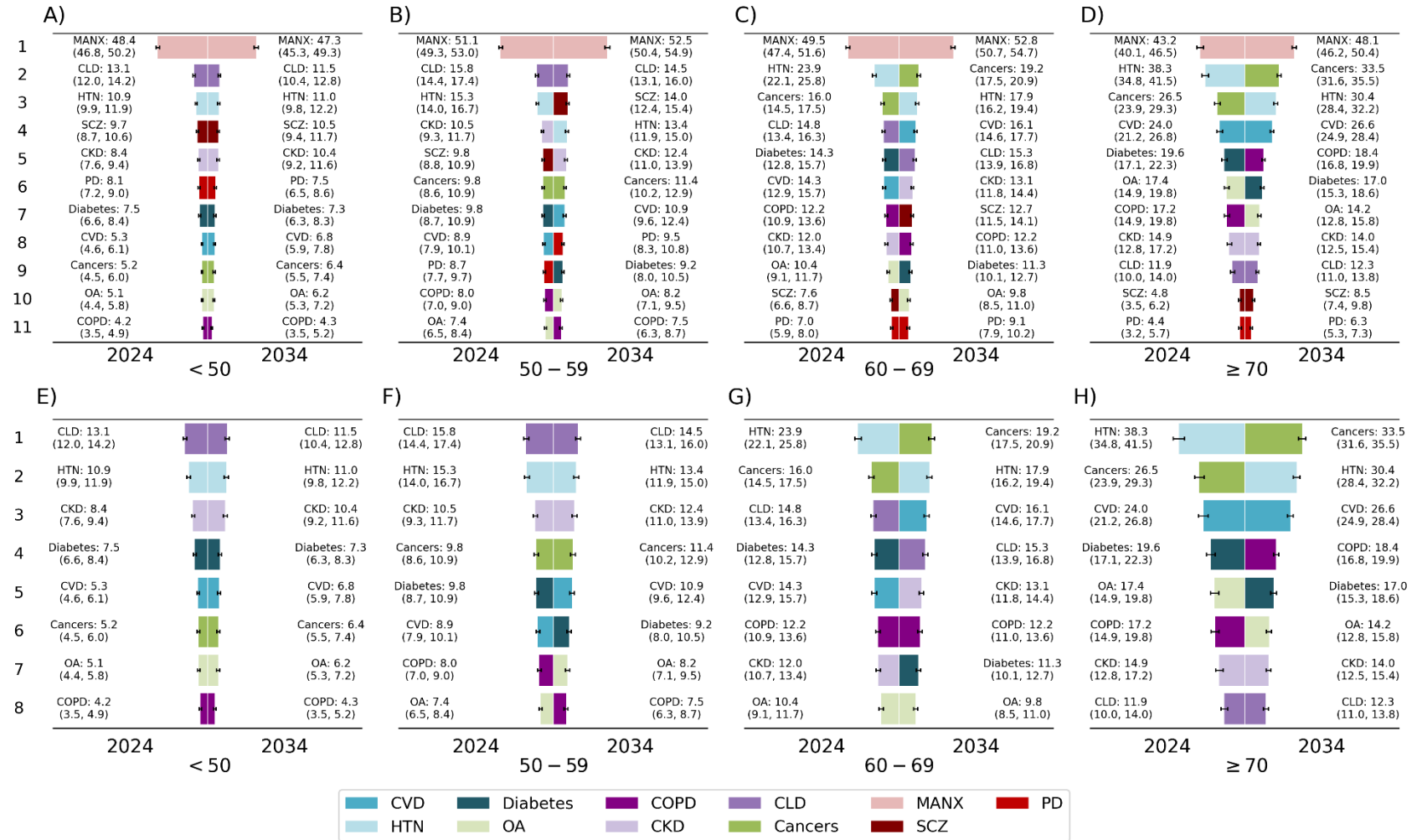


Figure S12. Age-specific patterns of comorbidity prevalence (A–D: both physical and mental; E–H: physical) among diagnosed PLWH in 2024 and 2034. The bar represents the median, and the error bars correspond to the 95% credible interval based on 1000 simulation runs.

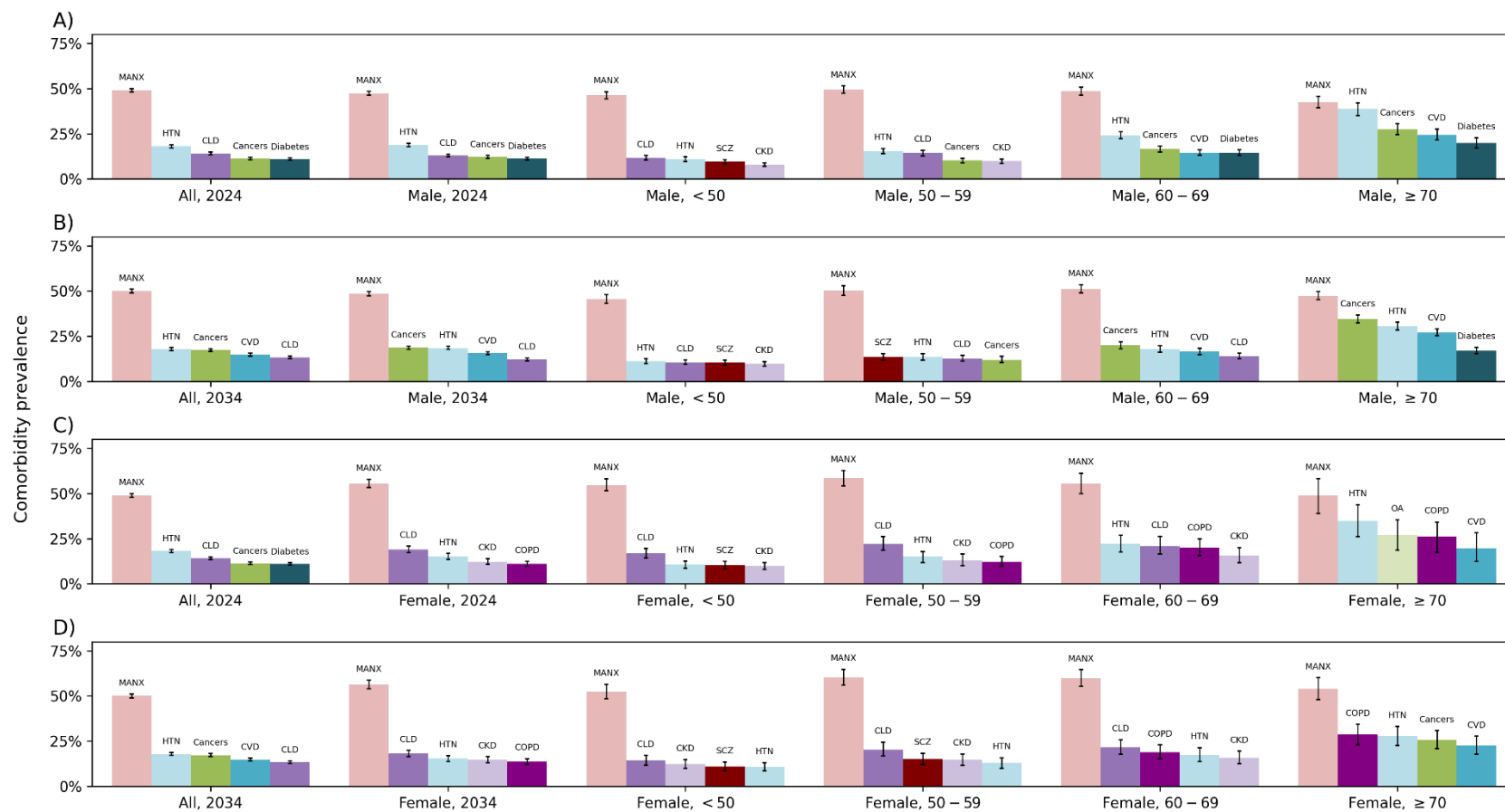


Figure S13. Top five most prevalent comorbidities among diagnosed PLWH stratified by age and sex in 2024 and 2034. The bar represents the median, and the error bars correspond to the 95% credible interval based on 1000 simulation runs.

Figure S14 shows co-occurring comorbidity dyad patterns among diagnosed PLWH in 2024, stratified by age and sex.

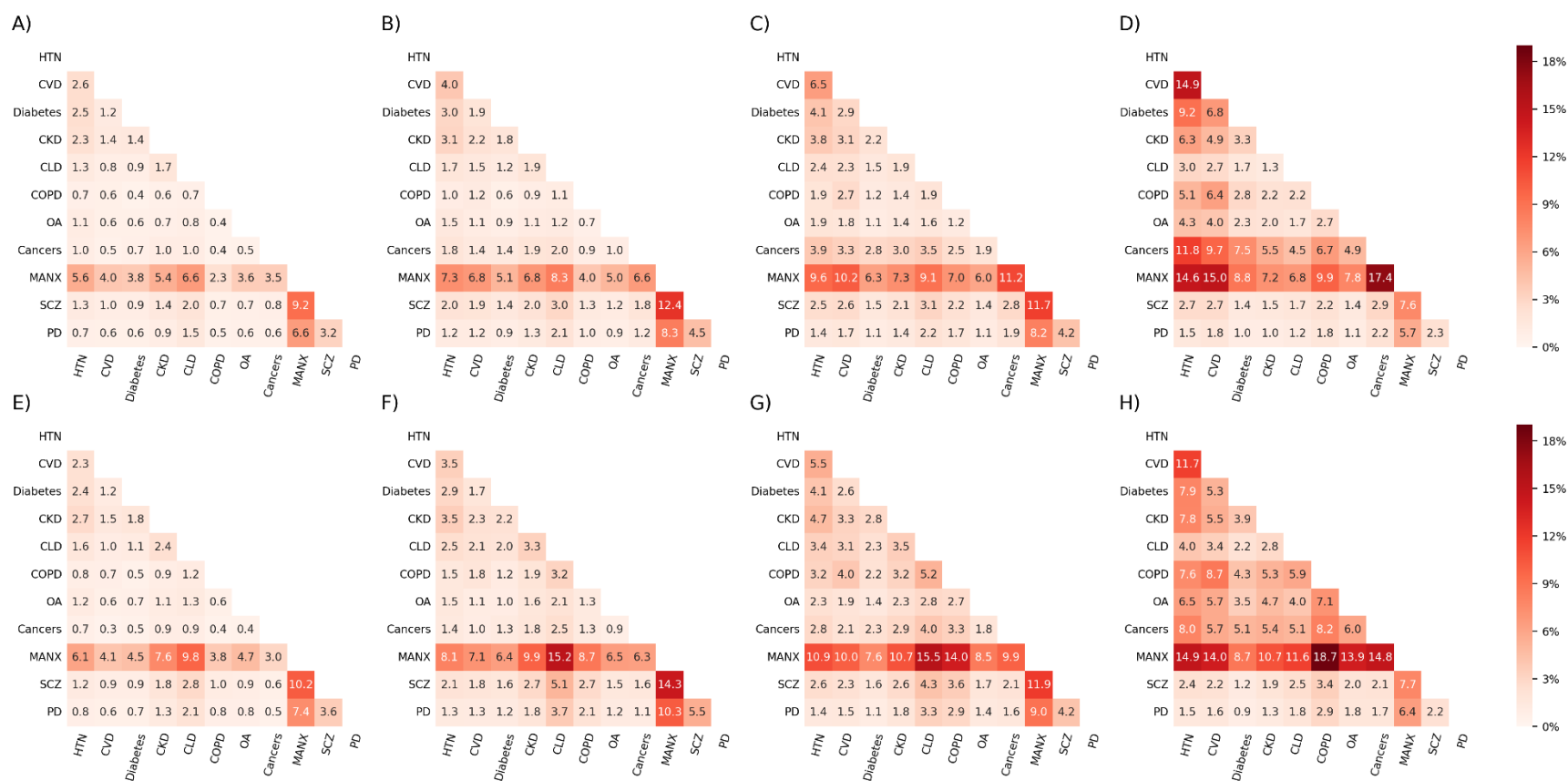


Figure S14. Co-occurring comorbidity dyad patterns among diagnosed PLWH in 2034, stratified by age and sex: A) male aged <50; B) male aged 50–59; C) male aged 60–69; D) male aged ≥70; E) female aged <50; F) female aged 50–59; G) female aged 60–69; H) female aged ≥70.

Figure S15 shows the relative difference in the proportion of PLWH with at least three comorbidities (including both physical and mental conditions) in 2034 after increasing or decreasing the probability of each comorbidity development. A <4% relative difference after adjusting the probability of each comorbidity by 25% indicated that the projected multimorbidity was robust to the estimated comorbidity incidence.

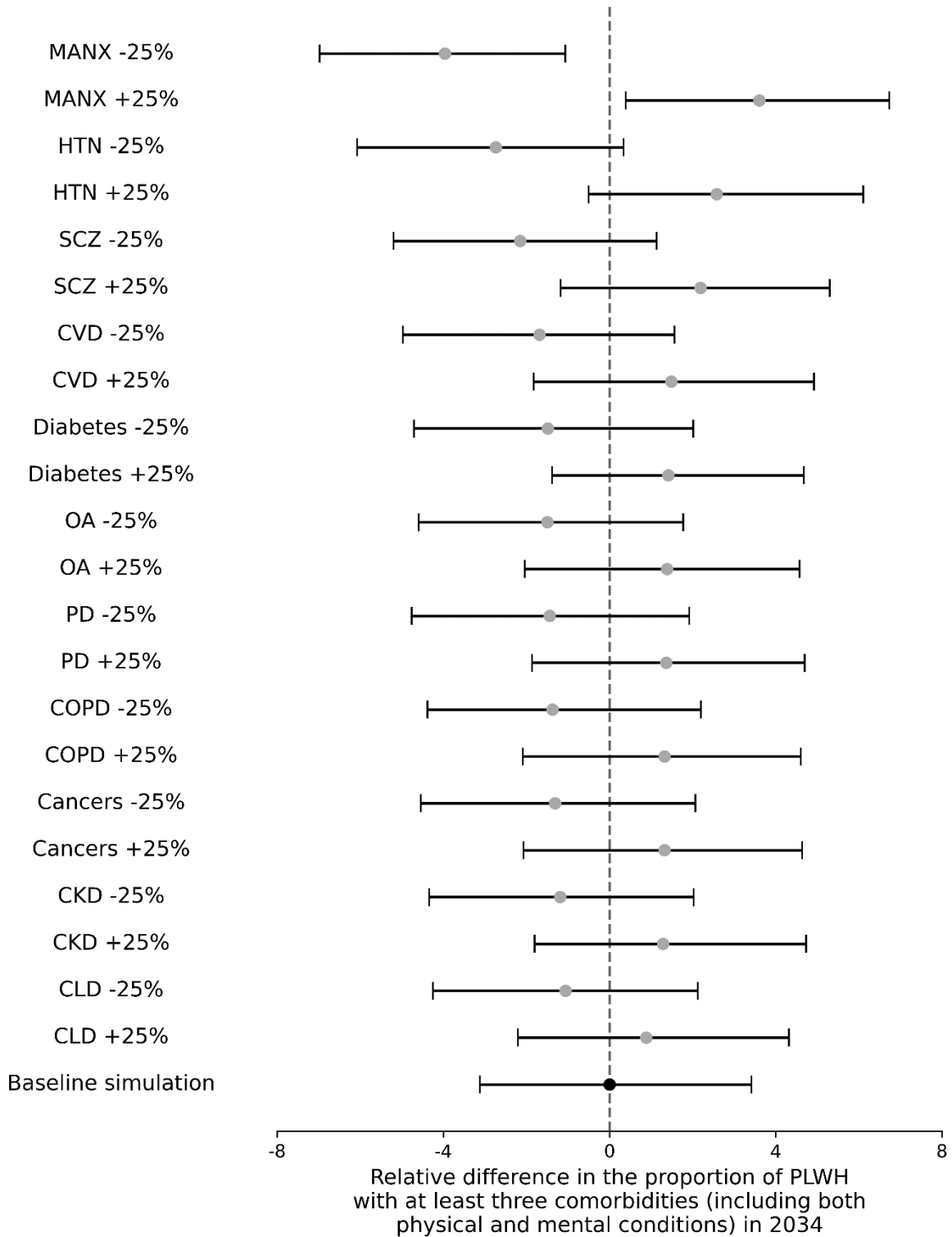


Figure S15. The relative difference in the proportion of PLWH with at least three comorbidities (including both physical and mental conditions) in 2034 after increasing or decreasing the probability of each comorbidity by 25%. The point represents the median, and the error bars correspond to the 95% credible interval based on 1000 simulation runs.

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