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Supplementary appendix

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Supplementary Methods

Data ingestion and harmonization in N3C is an iterative process between the Phenotype & Data Acquisition workstream and contributing sites. Contributing sites send updated data payloads approximately weekly. N3C harmonizes site data into Observational Medical Outcomes Partnership (OMOP) version 5.3.1 in partnership with subject matter experts from each common data model (CDM) community. In this process, all data (e.g., laboratory measurements, clinical observations such as vital signs, medications, and clinical conditions) are harmonized and mapped to the OMOP vocabulary. Site data that pass the robust data quality assessment pipeline are integrated into the “release” set for use by the community. Details about the data transfer, harmonization, quality, and integration processes have been reported elsewhere.¹

Supplementary Table S1 Key Variables and Concept Definitions

Variables	Concepts
HIV infection	Concept set names (codeset ID): HIV infection (382527336) cs_isc_hiv_labs_procedures (684826767) HIV drug (331061593)
Comorbid conditions	Concept Set Names (codeset ID):
Hemiplegia or Paraplegia	Charlson – Paralysis (489555336)
Dementia	Charlson – Dementia (78746470)
Liver Disease	Charlson – LiverMild(494981955) Charlson – LiverSevere(248333963)
Myocardial Infarction	Charlson – MI (259495957)
Congestive Heart Failure	Charlson – CHF (359043664)
Chronic Pulmonary Disease	Charlson – Pulmonary (514953976)
Cancer	Charlson – Mets (378462283) Charlson – Cancer (535274723)
Diabetes Mellitus	Charlson – DMcx(403438288) Charlson – DM (719585646)
Stroke	Charlson – Stroke (652711186)
Peripheral Vascular Disease	Charlson – PVD (376881697)
Rheumatologic Disease	Charlson – Rheumatic (765004404)
Renal Disease	Charlson – Renal (220495690)
Peptic Ulcer Disease	Charlson – PUD (510748896)

Supplementary Table S2 Estimates for all parameters of COVID-19 hospitalization among people living with and without HIV infection -- N3C data, January 1, 2020--May 8, 2021 (n=1,436,622)

	Unadjusted OR (95%CI)	Age+race+ethnicity+race AOR (95%CI)	+smoking/obesity AOR (95%CI)	+comorbidity+month of COVID-19 diagnosis AOR (95%CI)
Social demographics				
HIV status	1.78 (1.71,1.84)	1.62 (1.56,1.69)	1.48 (1.42,1.54)	1.20 (1.15,1.26)
Age 18-49 (years)		1	1	1
Age 50-64		2.00 (1.98,2.03)	1.94 (1.92,1.96)	1.43 (1.41,1.44)
Age ≥65		4.98 (4.92,5.03)	4.85 (4.80,4.91)	2.38 (2.35,2.41)
Sex				
Female		1	1	1
Male		1.20 (1.19,1.21)	1.23 (1.22,1.24)	1.53 (1.49,1.57)
Race				
White		1	1	1
Black or African American		1.98 (1.96,2.00)	1.97 (1.94,1.99)	1.66 (1.64,1.69)
Asian/Other/unknown		1.22 (1.20,1.23)	1.24 (1.22,1.25)	1.35 (1.34,1.37)
Ethnicity				
Not Hispanic or Latino		1	1	1
Hispanic or Latino		1.31 (1.29,1.33)	1.37 (1.35,1.39)	1.26 (1.24,1.27)
Others/unknown		0.55 (0.54,0.56)	0.63 (0.62,0.64)	0.62 (0.61,0.63)
Lifestyle factors				
BMI*				
30 or under			1	1
Over 30			1.19 (1.18,1.21)	1.05 (1.04,1.07)
Unknown			0.52 (0.52,0.53)	0.58 (0.57,0.58)
Smoking status				
Nonsmoker			1	1
Current or Former			0.89 (0.88,0.90)	0.82 (0.81,0.83)
Comorbidities				
Hemiplegia or Paraplegia				3.15 (3.01,3.29)
Dementia				2.69 (2.61,2.77)
Mycardial Infarction				1.94 (1.89,1.98)

Congestive Heart Failure		2.13 (2.09,2.17)
Chronic Pulmonary Disease		1.41 (1.39,1.42)
Cancer		1.39 (1.36,1.41)
Diabetes Mellitus		1.84 (1.82,1.86)
Stroke		1.46 (1.43,1.49)
Peripheral Vascular Disease		1.10 (1.08,1.12)
Rheumatologic Disease		0.98 (0.96,1.00)
Renal Disease		1.94 (1.9,01.97)
Peptic Ulcer Disease		1.45 (1.40,1.51)
Liver Disease		1.68 (1.65,1.71)
Month of COVID-19 diagnosis		0.97 (0.97,0.97)

*BMI=body mass index

Supplementary Table S3 Estimates for all parameters of COVID-19 death among people living with and without HIV infection --- N3C data, January 1, 2020—May 8, 2021 (n=1,436,622)

	Unadjusted OR (95%CI)	Age+sex+ethnicity+race AOR (95%CI)	+smoking/obesity AOR (95%CI)	+comorbidity+month of COVID-19 diagnosis AOR (95%CI)
Social demographics				
HIV status	1.90 (1.73,2.09)	1.85 (1.67,2.04)	1.76 (1.59,1.94)	1.29 (1.16,1.44)
Age 18-49 (years)	1	1	1	1
Age 50-64		6.15 (5.82,6.49)	6.03 (5.71, 6.37)	4.17 (3.95,4.41)
Age ≥65		29.99(28.56, 31.50)	29.14 (27.74, 30.61)	12.28 (11.66,12.94)
Sex				
Female		1	1	1
Male		1.67 (1.63,1.72)	1.68 (1.64,1.72)	1.53 (1.49,1.57)
Race				
White		1	1	1
Black or African American		1.63 (1.57,1.68)	1.62 (1.57,1.67)	1.16 (1.12,1.20)
Asian/Other/unknown		1.02 (0.99,1.06)	1.03 (0.99,1.07)	1.16 (1.12,1.21)
Ethnicity				
Not Hispanic or Latino		1	1	1
Hispanic or Latino		1.23 (1.18,1.28)	1.24 (1.19,1.30)	1.07 (1.02,1.12)
Others/unknown		0.85 (0.82,0.89)	0.91 (0.87,0.95)	0.88 (0.84,0.92)
Lifestyle factors				
BMI*				
30 or under			1	1
Over 30			1.03 (0.99,1.07)	0.96 (0.92,0.99)
Unknown			0.73 (0.71,0.76)	0.95 (0.92,0.98)
Smoking status				
Nonsmoker			1	1
Current or Former			1.01 (0.97,1.04)	0.93 (0.90,0.96)
Comorbidities				
Hemiplegia or Paraplegia				2.01 (1.88,2.15)

Dementia		2.71 (2.60,2.82)
Myocardial Infarction		1.62 (1.56,1.69)
Congestive Heart Failure		1.84 (1.77,1.90)
Chronic Pulmonary Disease		1.24 (1.20,1.28)
Cancer		1.48 (1.43,1.53)
Diabetes Mellitus		1.77 (1.72,1.82)
Stroke		1.20 (1.16,1.25)
Peripheral Vascular Disease		0.95 (0.91,0.98)
Rheumatologic Disease		0.86 (0.81,0.90)
Renal Disease		1.87 (1.81,1.93)
Peptic Ulcer Disease		1.14 (1.06,1.23)
Liver Disease		2.02 (1.95,2.09)
Month of COVID-19 diagnosis		0.95 (0.94,0.95)

*BMI=body mass index

Supplementary Table S4 Estimates for all parameters of COVID-19 disease severity among people living with and without HIV infection --- N3C data, January 1, 2020--May 8, 2021 (n=1,436,622)

	Mild*/Moderate vs unaffected AOR, 95%CI	Severe [#] vs unaffected AOR, 95%CI	Mild*/Moderate vs unaffected AOR, 95%CI	Severe [#] vs unaffected AOR, 95%CI	Mild*/Moderate vs unaffected AOR, 95%CI	Severe [#] vs unaffected AOR, 95%CI
Social demographics						
HIV status	0.53 (0.51,0.55)	1.34 (1.22,1.48)	0.59 (0.57,0.61)	1.34 (1.21, 1.47)	0.61 (0.59,0.64)	1.04 (0.94,1.16)
Age (years)						
18-49	0.79 (0.78,0.79)	3.62 (3.46,3.78)	0.80(0.79,0.81)	3.51 (3.35,3.67)	0.81 (0.80,0.82)	2.29 (2.18,2.40)
50-64	0.68 (0.67,0.68)	12.04 (11.57,12.54)	0.70 (0.69,0.70)	11.70 (11.24,12.19)	0.71 (0.70,0.72)	4.62 (4.42,4.83)
≥65						
Male (vs female)	1.13(1.12,1.14)	1.89 (1.84,1.94)	1.13 (1.12,1.14)	1.92 (1.87,1.972)	1.12 (1.12,1.13)	1.73 (1.69,1.78)
Race						
White	1	1	1	1	1	1
Black or African American	0.89 (0.88,0.90)	1.74 (1.69,1.80)	0.90 (0.89,0.91)	1.723 (1.67,1.79)	0.93 (0.92,0.94)	1.26 (1.21,1.30)
Asian/other/unknown	0.97 (0.96,0.98)	1.04 (1.00,1.08)	0.996 (0.99,1.01)	1.07 (1.03,1.11)	1.01 (1.00,1.02)	1.19 (1.14,1.23)
Ethnicity						
Not Hispanic or Latino	1	1	1	1	1	1
Hispanic or Latino	1.07 (1.06,1.08)	1.52 (1.46,1.58)	1.06 (1.05,1.07)	1.56 (1.49,1.62)	1.09 (1.08,1.11)	1.37 (1.31,1.43)
Others/unknown	0.76 (0.75,0.77)	0.71 (0.68,0.74)	0.73 (0.72,0.73)	0.79 (0.75,0.82)	0.72 (0.71,0.73)	0.78 (0.74,0.81)
Lifestyle factors						
BMI [¶]						
30 or under			1	1	1	1
Over 30			1.08 (1.07,1.10)	1.25 (1.20,1.29)	1.09 (1.08,1.11)	1.11 (1.07,1.15)
Unknown			1.06 (1.05,1.06)	0.59 (0.57,0.61)	1.06 (1.05,1.07)	0.74 (0.72,0.77)
Smoking status						
Nonsmoker			1	1	1	1
Current or Former			0.33 (0.33,0.33)	0.53 (0.51,0.54)	0.33 (0.33,0.33)	0.48 (0.46,0.5)
Comorbidities						
Hemiplegia or Paraplegia					1.05 (1.01,1.10)	2.63 (2.45,2.81)
Dementia					1.02 (0.99,1.05)	2.24 (2.14,2.35)
Liver Disease					0.93 (0.92,0.95)	1.96 (1.88,2.03)
Myocardial Infarction					1.17 (1.14,1.20)	1.78 (1.71,1.86)
Congestive Heart Failure					0.98 (0.96,1.00)	1.82 (1.75,1.88)
Chronic Pulmonary Disease					0.91 (0.90,0.92)	1.25 (1.21,1.29)
Cancer					0.89 (0.87,0.90)	1.19 (1.15,1.24)
Diabetes Mellitus					0.92 (0.91,0.93)	2.10 (2.04,2.17)
Stroke					1.01 (1.00,1.03)	1.29 (1.24,1.34)
Peripheral Vascular Disease					1.14 (1.12,1.16)	1.01 (0.97,1.05)
Rheumatologic Disease					0.91 (0.89,0.93)	0.80 (0.75,0.84)
Renal Disease					1.08 (1.06,1.09)	1.84 (1.77,1.90)
Peptic Ulcer Disease					1.07 (1.03,1.11)	1.31 (1.22,1.41)
Month of COVID-19 diagnosis					1.03 (1.03,1.03)	0.98 (0.98,0.99)

*Includes both ‘mild (outpatient, WHO severity 1-3)’ and ‘mild ED (outpatient with ED visit, WHO severity ~3)’ categories

Include both ‘severe (hospitalized with invasive ventilation or ECMO, WHO severity 7-9)’ and ‘mortality/hospice (hospital mortality or discharge to hospice, WHO severity 10)’ categories based on WHO criterion

¶BMI=body mass index

Supplementary Table S5 Sensitivity analysis of the estimates for all parameters of COVID-19 disease severity among people living with and without HIV infection --- N3C data, January 1, 2020--May 8, 2021 (n=1,396,795)

	Mild*/Moderate vs unaffected ARR, 95%CI	Severe# vs unaffected ARR, 95%CI	Mild*/Moderate vs unaffected ARR, 95%CI	Severe# vs unaffected ARR, 95%CI	Mild*/Moderate vs unaffected ARR, 95%CI	Severe# vs unaffected ARR, 95%CI
Social demographics						
HIV status	0.49 (0.47,0.51)	1.24 (1.13,1.37)	0.55 (0.53,0.57)	1.25 (1.13,1.38)	0.58 (0.56, 0.60)	1.00 (0.90,1.10)
Age (years)						
18-49	1	1	1	1	1	1
50-64	0.77 (0.77,0.78)	3.55 (3.39,3.71)	0.79 (0.78,0.80)	3.46 (3.31,3.62)	0.81 (0.80,0.82)	2.27 (2.17,2.38)
≥65	0.67 (0.67,0.68)	11.96(11.49,12.45)	0.70 (0.69,0.70)	11.68 (11.22,12.16)	0.72 (0.71,0.73)	4.69 (4.49,4.90)
Male (vs female)	1.14 (1.13,1.15)	1.91 (1.86,1.96)	1.13 (1.13,1.14)	1.92 (1.87,1.97)	1.13 (1.12,1.13)	1.73 (1.69,1.78)
Race						
White	1	1	1	1	1	1
Black or African American	0.98 (0.97,0.99)	1.89 (1.83,1.96)	0.97 (0.96,0.98)	1.84 (1.78,1.91)	1.01 (1.00,1.02)	1.35 (1.30,1.40)
Asian/other/unknown	0.995 (0.99,1.00)	1.08 (1.04,1.13)	1.01 (0.996,1.02)	1.09 (1.05,1.13)	1.02 (1.01,1.03)	1.21 (1.16,1.25)
Ethnicity						
Not Hispanic or Latino	1	1	1	1	1	1
Hispanic or Latino	1.018 (1.01,1.03)	1.43 (1.38,1.49)	1.00 (0.99,1.01)	1.46 (1.40, 1.52)	1.04 (1.03,1.05)	1.29 (1.24,1.35)
Others/unknown	0.83 (0.82,0.84)	0.78(0.74,0.81)	0.76 (0.75,0.77)	0.826 (0.79,0.864)	0.76 (0.75,0.77)	0.80 (0.77,0.84)
Lifestyle factors						
BMI [¶]						
30 or under			1	1	1	1
Over 30			1.10 (1.08,1.11)	1.27(1.22,1.31)	1.12 (1.10,1.13)	1.13 (1.09,1.18)
Unknown			1.30 (1.29,1.31)	0.741 (0.72,0.77)	1.30 (1.29,1.32)	0.91 (0.88,0.94)
Smoking status						
Nonsmoker			1	1	1	1
Current or Former			0.51 (0.50,0.51)	0.751 (0.726,0.777)	0.52 (0.51,0.52)	0.67 (0.65,0.70)
Comorbidities						
Hemiplegia or Paraplegia					1.04 (1.00,1.09)	2.61 (2.44,2.79)
Dementia					1.03 (1.00,1.07)	2.28 (2.18,2.39)
Liver Disease					0.91 (0.90,0.93)	1.92 (1.85,1.99)
Myocardial Infarction					1.14 (1.11,1.17)	1.75 (1.68,1.82)
Congestive Heart Failure					0.98 (0.96,1.00)	1.82 (1.75,1.89)
Chronic Pulmonary Disease					0.87 (0.86,0.88)	1.21 (1.17,1.24)
Cancer					0.87 (0.86,0.89)	1.18 (1.13,1.22)
Diabetes Mellitus					0.90 (0.90,0.91)	2.08 (2.01,2.14)
Stroke					1.00 (0.98,1.02)	1.28 (1.23,1.33)
Peripheral Vascular Disease					1.12 (1.10,1.14)	0.99 (0.95,1.03)
Rheumatologic Disease					0.90 (0.88,0.92)	0.79 (0.75,0.84)
Renal Disease					1.07 (1.05,1.09)	1.83 (1.76,1.89)
Peptic Ulcer Disease					1.04 (1.00,1.08)	1.29 (1.20,1.38)
Month of COVID-19 diagnosis					1.04 (1.03,1.04)	0.98 (0.98,0.99)

*Includes both ‘mild (outpatient, WHO severity 1-3)’ and ‘mild ED (outpatient with ED visit, WHO severity ~3)’ categories

[#] Include both ‘severe (hospitalized with invasive ventilation or ECMO, WHO severity 7-9)’ and ‘mortality/hospice (hospital mortality or discharge to hospice, WHO severity 10)’ categories based on WHO criterion

[¶]BMI=body mass index

Supplementary Table S6 Sensitivity analyses for all the estimates of COVID-19 outcomes with matched PLWH and non-PLWH

Match ratio	Death OR (95%CI)	Hospitalization OR (95%CI)	Mild [*] /moderate vs unaffected OR, 95%CI	Severe [#] vs unaffected OR, 95%CI
HIV status				
1:2 ¹				
Crude	1.36(1.21,1.54)	1.27(1.21,1.33)	0.55(0.53,0.58)	0.99(0.88,1.12)
Adjusted Ethnicity+race	1.28(1.30,1.45)	1.14(1.08,1.19)	0.53(0.51,0.56)	0.90(0.79,1.02)
1:4 ²				
Crude	1.40(1.26,1.57)	1.29(1.23,1.34)	0.55(0.53,0.57)	1.02(0.92,1.14)
Adjusted Ethnicity+race	1.28(1.15,1.42)	1.14(1.10,1.19)	0.54(0.52,0.56)	0.91(0.81,0.56)

^{*}Includes both ‘mild (outpatient, WHO severity 1-3)’ and ‘mild ED (outpatient with ED visit, WHO severity ~3)’ categories

[#]Include both ‘severe (hospitalized with invasive ventilation or ECMO, WHO severity 7-9)’ and ‘mortality/hospice (hospital mortality or discharge to hospice, WHO severity 10)’ categories based on WHO criterion

¹PLWH (n=13,162) vs non-PLWH (n=26324); PLWH with unknown sex were excluded in the matching process. PLWH were matched with non-PLWH on age group (18-49, 50-64, ≥65 years), sex (male, female), and number of comorbidities (0, 1, ≥2).

²PLWH (n=13,162) vs non-PLWH (n=52648); PLWH with unknown sex were excluded in the matching process. PLWH were matched with non-PLWH on age group (18-49, 50-64, ≥65 years), sex (male, female), and number of comorbidities (0, 1, ≥2).

Supplementary Table S7 Estimates for interaction term parameters of COVID-19 clinical spectrum among people living with and without HIV infection --- N3C data, January 1, 2020--May 8, 2021 (n=1,436,622)

	Death AOR (95%CI)	Hospitalization AOR (95%CI)	Mild*/moderate vs unaffected AOR†, 95%CI	Severe‡ vs unaffected AOR, 95%CI
HIV positive	3.47 (2.43,4.97)	1.86 (1.66,2.08)	0.70 (0.64,0.78)	2.17 (1.56,3)
Interaction terms				
Age*HIV status				
HIV=1&Age18-49 (ref)	1	1	1	1
HIV=1&Age50-64	7.86(5.86,10.53)	2.17(1.93,2.44)	0.48(0.49,0.61)	3.08(2.30,4.13)
HIV=1&Age≥65	22.20(16.91,29.12)	3.42(2.98,3.93)	0.57(0.50,0.64)	7.57(5.73,9.99)
HIV=0 & 18-49 (ref)	1	1	1	1
HIV=0 & 50-64	4.23 (4.4,4.48)	1.43 (1.41,1.45)	0.81 (0.81,0.82)	2.32 (2.21,2.43)
HIV=0 & ≥65	12.46 (11.82,13.13)	2.39 (2.36,2.42)	0.71 (0.70,0.72)	4.66 (4.45,4.87)
Sex*HIV status				
HIV=1& Male (<i>vs female</i>)	3.13(2.29,4.28)	1.32(1.20,1.44)	0.50(0.47,0.53)	1.89(1.44,2.48)
HIV=0& Male (<i>vs female</i>)	1.54 (1.50,1.59)	1.16 (1.15,1.17)	1.13 (1.12,1.14)	1.75 (1.70,1.80)
Race*HIV status				
HIV=1& Black or African American (<i>vs white</i>)	3.64(2.59,5.11)	3.16(2.85,3.49)	1.10(1.00,1.20)	3.25(2.40,4.41)
HIV=1& Asian/other/unknown (<i>vs white</i>)	4.32(2.88,6.46)	2.85(2.48,3.27)	0.79(0.70,0.89)	3.63 (2.52,5.23)
HIV=0& Black or African American (<i>vs white</i>)	1.16 (1.12,1.20)	1.66 (1.64,1.68)	0.92 (0.91,0.93)	1.25 (1.21,1.30)
HIV=0& Asian/other/unknown (<i>vs white</i>)	1.16 (1.11,1.20)	1.35 (1.33,1.37)	1.01 (1.00,1.02)	1.18 (1.13,1.22)
Ethnicity				
HIV=1&Not Hispanic or Latino	1	1	1	1
HIV=1& Hispanic or Latino	3.48(2.25,5.37)	1.88(1.62,2.19)	0.86(0.76,0.97)	2.33(1.55,3.50)
HIV=1& Others/unknown	3.50(2.20,5.59)	1.70(1.42,2.03)	0.49(0.42,0.57)	1.98(1.28,3.05)
HIV=0&Not Hispanic or Latino	1	1	1	1
HIV=0& Hispanic or Latino	1.07 (1.02,1.12)	1.26 (1.24,1.28)	1.09 (1.08,1.10)	1.38 (1.32,1.44)
HIV=0& Others/unknown	0.87 (0.84,0.91)	0.62 (0.61,0.63)	0.72 (0.71,0.73)	0.77 (0.74,0.81)
Lifestyle factors				
BMI				
30 or under	1	1	1	1

Over 30	0.95 (0.92,0.99)	1.05 (1.04,1.07)	1.09 (1.08,1.11)	1.11 (1.07,1.15)
Unknown	0.95 (0.92,0.98)	0.58 (0.57,0.58)	1.06 (1.05,1.07)	0.74 (0.72,0.77)
Smoking status				
Nonsmoker	1	1	1	1
Current or Former	0.93 (0.90,0.96)	0.82 (0.81,0.83)	0.33 (0.33,0.33)	0.48 (0.46,0.50)
Comorbidities				
Hemiplegia or Paraplegia	2.01 (1.88,2.15)	3.14 (3.01,3.29)	1.05 (1.01,1.10)	2.62 (2.45,2.81)
Dementia	2.71 (2.60,2.82)	2.69 (2.60,2.77)	1.02 (0.99,1.05)	2.25 (2.14,2.35)
Myocardial Infarction	1.62 (1.56,1.69)	1.94 (1.89,1.98)	1.17 (1.14,1.2)	1.78 (1.71,1.86)
Congestive Heart Failure	1.83 (1.77,1.90)	2.12 (2.08,2.16)	0.98 (0.96,1.00)	1.81 (1.75,1.88)
Chronic Pulmonary Disease	1.24 (1.20,1.28)	1.41 (1.39,1.42)	0.91 (0.90,0.92)	1.25 (1.21,1.29)
Cancer	1.48 (1.43,1.53)	1.39 (1.36,1.41)	0.89 (0.87,0.90)	1.19 (1.15,1.24)
Diabetes Mellitus	1.77 (1.72,1.82)	1.84 (1.82,1.86)	0.92 (0.91,0.93)	2.10 (2.04,2.17)
Stroke	1.20 (1.16,1.25)	1.46 (1.43,1.49)	1.01 (1.00,1.03)	1.29 (1.24,1.34)
Peripheral Vascular Disease	0.95 (0.91,0.98)	1.1 (1.08,1.13)	1.14 (1.12,1.16)	1.01 (0.97,1.05)
Rheumatologic Disease	0.86 (0.81,0.90)	0.98 (0.96,1.00)	0.91 (0.89,0.93)	0.80 (0.75,0.84)
Renal Disease	1.87 (1.81,1.93)	1.94 (1.91,1.97)	1.08 (1.06,1.09)	1.84 (1.78,1.90)
Peptic Ulcer Disease	1.14 (1.06,1.23)	1.45 (1.4,1.51)	1.07 (1.03,1.11)	1.31 (1.22,1.41)
Liver Disease	2.02 (1.95,2.09)	1.68 (1.65,1.71)	0.93 (0.92,0.95)	1.96 (1.89,2.03)
Month of COVID-19 diagnosis	0.95 (0.95,0.95)	0.97 (0.97,0.97)	1.03 (1.03,1.03)	0.98 (0.98,0.99)

*Includes both 'mild (outpatient, WHO severity 1-3)' and 'mild ED (outpatient with ED visit, WHO severity ~3)' categories

#Include both 'severe (hospitalized with invasive ventilation or ECMO, WHO severity 7-9)' and 'mortality/hospice (hospital mortality or discharge to hospice, WHO severity 10)' categories based on WHO criterion

[†]AOR: Adjusted odds ratio

**Supplementary Table S8 Estimates for all parameters of COVID-19 clinical spectrum with CCI adjusted among people living with and without HIV infection --- N3C data, January 1, 2020--May 8, 2021
(n=1,436,622)¹**

	Mild*/Moderate vs unaffected AOR, 95%CI	Severe [#] vs unaffected AOR, 95%CI	Hospitalization AOR, 95%CI	Mortality AOR, 95%CI
Social demographics				
HIV status	0.61 (0.58,0.63)	1.15 (1.04,1.27)	1.28 (1.23,1.34)	1.43 (1.29, 1.59)
Age (years)				
18-49	1	1	1	1
50-64	0.80 (0.80,0.81)	2.56 (2.44,2.68)	1.51 (1.49,1.53)	4.42 (4.18,4.66)
≥65	0.71 (0.70,0.712)	5.80 (5.55,6.05)	2.80 (2.77,2.84)	14.67 (13.94,15.44)
Male (vs female)	1.13(1.13,1.14)	1.79 (1.75,1.84)	1.18 (1.17,1.20)	1.56 (1.52,1.60)
Race				
White	1	1	1	1
Black or African American	0.93 (0.92,0.94)	1.41 (1.36,1.46)	1.73 (1.71,1.75)	1.26 (1.22,1.31)
Asian/other/unknown	1.01 (1.00,1.02)	1.20 (1.15,1.24)	1.34 (1.32,1.35)	1.16 (1.12,1.21)
Ethnicity				
Not Hispanic or Latino	1	1	1	1
Hispanic or Latino	1.09 (1.08,1.10)	1.45 (1.39,1.52)	1.28 (1.27,1.30)	1.11 (1.06,1.16)
Others/unknown	0.73 (0.72,0.73)	0.77 (0.74,0.81)	0.62 (0.61,0.63)	0.88 (0.84,0.92)
Lifestyle factors				
BMI				
30 or under	1	1	1	1
Over 30	1.08 (1.06,1.09)	1.19 (1.15,1.23)	1.11 (1.09,1.13)	0.98 (0.94,1.02)
Unknown	1.06 (1.05,1.07)	0.76 (0.74,0.79)	0.59 (0.58,0.59)	0.96 (0.93,0.99)
Smoking status				
Nonsmoker	1	1	1	1
Current or Former	0.33 (0.32,0.33)	0.48 (0.47,0.50)	0.84 (0.82,0.85)	0.92 (0.89,0.95)
Charlson comorbidity index	0.994 (0.992,0.996)	1.28 (1.27,1.28)	1.33 (1.32,1.33)	1.29 (1.28,1.29)
Month of COVID-19 diagnosis	1.03 (1.03,1.03)	0.98 (0.98,0.98)	0.97 (0.97,0.97)	0.95 (0.94,0.95)

*Includes both ‘mild (outpatient, WHO severity 1-3)’ and ‘mild ED (outpatient with ED visit, WHO severity ~3)’ categories

[#] Include both ‘severe (hospitalized with invasive ventilation or ECMO, WHO severity 7-9)’ and ‘mortality/hospice (hospital mortality or discharge to hospice, WHO severity 10)’ categories based on WHO criterion

¹ The Charlson comorbidity index (CCI) was included in all the adjusted models, replacing the individual comorbid conditions.

Supplementary Table S9 Estimates for interaction term parameters of COVID-19 clinical spectrum with CCI adjusted among people living with and without HIV infection --- N3C data, January 1, 2020--May 8, 2021 (n=1,436,622)¹

	Death AOR (95%CI)	Hospitalization AOR (95%CI)	Mild[*]/moderate vs unaffected AOR[#], 95%CI	Severe[#] vs unaffected AOR, 95%CI
HIV positive	3.70(2.58,5.29)	1.97 (1.76,2.21)	0.69(0.63,0.76)	2.37(1.71,3.29)
Interaction terms				
Age*HIV status				
HIV=1&Age18-49 (ref)	1	1	1	1
HIV=1&Age50-64	9.51(7.11,12.73)	2.57(2.29,2.89)	0.53(0.48,0.59)	3.99(2.99,5.33)
HIV=1&Age≥65	28.33(21.61,37.13)	4.28(3.73,4.90)	0.56(0.49,0.63)	10.30(7.80,13.57)
HIV=0 & 18-49 (ref)	1	1	1	1
HIV=0 & 50-64	3.70 (2.58,5.29)	1.51 (1.49,1.53)	0.80 (0.80,0.81)	2.58 (2.47,2.71)
HIV=0 & >=65	14.88 (14.13,15.67)	2.81 (2.78,2.85)	0.71 (0.70,0.71)	5.84 (5.60,6.10)
Sex*HIV status				
HIV=1& Male (<i>vs female</i>)	3.36(2.44,4.56)	1.39(1.27,1.52)	0.50(0.46,0.53)	2.07 (1.58,2.72)
HIV=0& Male (<i>vs female</i>)	1.57 (1.53,1.61)	1.19 (1.18,1.20)	1.14 (1.13,1.15)	1.81 (1.76,1.86)
Race*HIV status				
HIV=1& Black or African American (<i>vs white</i>)	4.42(3.16,6.20)	3.51(3.18,3.88)	1.08(0.98,1.18)	4.14(3.07,5.59)
HIV=1& Asian/other/unknown (<i>vs white</i>)	4.94(3.30,7.38)	3.06(2.67,3.51)	0.77(0.68,0.87)	4.26(2.97,6.12)
HIV=0& Black or African American (<i>vs white</i>)	1.26 (1.22,1.31)	1.73 (1.71,1.75)	0.92 (0.91,0.93)	1.40 (1.35,1.45)
HIV=0& Asian/other/unknown (<i>vs white</i>)	1.16 (1.11,1.20)	1.33 (1.32,1.35)	1.01 (1.00,1.02)	1.19 (1.14,1.23)
Ethnicity				
HIV=1&Not Hispanic or Latino	1	1	1	1
HIV=1& Hispanic or Latino	3.69(2.38,5.72)	1.99(1.72,2.32)	0.84(0.74,0.96)	2.60 (1.73,3.90)
HIV=1& Others/unknown	3.55(2.22,5.66)	1.78(1.49,2.12)	0.48(0.42,0.56)	2.07(1.34,3.19)
HIV=0&Not Hispanic or Latino	1	1	1	1
HIV=0& Hispanic or Latino	1.11 (1.06,1.16)	1.29 (1.27,1.31)	1.09 (1.08,1.10)	1.46 (1.40,1.53)
HIV=0& Others/unknown	0.87 (0.84,0.91)	0.62 (0.61,0.63)	0.73 (0.72,0.73)	0.77 (0.73,0.81)
Lifestyle factors				
BMI				

30 or under	1	1	1	1
Over 30	0.98 (0.94,1.01)	1.11 (1.09,1.12)	1.08 (1.06,1.09)	1.19 (1.14,1.23)
Unknown	0.96 (0.93,0.99)	0.59 (0.58,0.59)	1.06 (1.05,1.07)	0.76 (0.74,0.79)
Smoking status				
Non-smoker	1	1	1	1
Current or Former	0.92 (0.89,0.95)	0.84 (0.82,0.85)	0.33 (0.33,0.33)	0.48 (0.47,0.50)
Charlson Comorbidity Index	1.29 (1.28, 1.29)	1.33 (1.32,1.33)	0.994 (0.992,996)	1.28 (1.27,1.28)
Month of COVID-19 diagnosis	0.95 (0.94,0.95)	0.97 (0.97,0.97)	1.03 (1.03,1.03)	0.98 (0.98,0.98)

*Includes both ‘mild (outpatient, WHO severity 1-3)’ and ‘mild ED (outpatient with ED visit, WHO severity ~3)’ categories

Include both ‘severe (hospitalized with invasive ventilation or ECMO, WHO severity 7-9)’ and ‘mortality/hospice (hospital mortality or discharge to hospice, WHO severity 10)’ categories based on WHO criterion

[†]AOR: Adjusted odds ratio

[‡]The Charlson comorbidity index (CCI) was included in all the adjusted models, replacing the individual comorbid conditions.

Supplementary References:

1. Melissa H, Christopher C, Kenneth G. The National COVID Cohort Collaborative (N3C): Rationale, Design, Infrastructure, and Deployment. *J Am Med Inform Assoc.* 2020.