Nursing Home Residents by Human Immunodeficiency Virus Status: Characteristics, Dementia Diagnoses, and Antipsychotic Use

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See related editorial by Justice and Akgün.

OBJECTIVES: Given an aging human immunodeficiency virus (HIV) population, we aimed to determine the prevalence of HIV for long-stay residents in US nursing homes (NHs) between 2001 and 2010 and to compare characteristics and diagnoses of HIV-positive (HIV+) and negative (HIV-) residents. Also, for residents with dementia diagnoses, we compared antipsychotic (APS) medication receipt by HIV status.

DESIGN: A cross-sectional comparative study.

SETTING: NHs in the 14 states accounting for 75% of persons living with HIV.

PARTICIPANTS: A total of 9 245 009 long-stay NH residents.

MEASUREMENTS: Using Medicaid fee-for-service claims data in the years 2001 to 2010, together with Medicare resident assessment and Chronic Condition Warehouse data, we identified long-stay (more than 89 days) NH residents by HIV status and dementia presence. We examined dementia presence by age groups and APS medication receipt by younger (aged younger than 65 years) vs older (aged 65 years or older) residents, using logistic regression.

RESULTS: Between 2001 and 2010, the prevalence of long-stay residents with HIV in NHs increased from 0.7% to 1.2%, a 71% increase. Long-stay residents with HIV were younger and less often female or white. For younger NH residents, rates of dementia were 20% and 16% for HIV+ and HIV- residents, respectively; they were 53% and 57%, respectively, for older residents. In adjusted analyses, younger HIV+ residents with dementia had greater odds of APS medication receipt than did HIV- residents (AOR = 1.3; 95% confidence interval [CI] = 1.2-1.4), but older HIV residents had lower odds (AOR = 0.9; 95% CI = 0.8-0.9).

CONCLUSION: The prevalence of long-stay HIV+ NH residents has increased over time, and given the rapid aging of the HIV population, this increase is likely to have continued. This study raises concern about potential differential quality of care for (younger) residents with HIV in NHs, but not for those aged 65 years and older. These findings contribute to the evidence base needed to ensure high-quality care for younger and older HIV+ residents in NHs.
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Key words: Alzheimer's disease; antipsychotics; dementia; human immunodeficiency virus; nursing homes

In 2014, an estimated 45% of persons living with human immunodeficiency virus (HIV) in the United States were aged 50 years or older.[1] Care for aging persons with HIV is complex since they experience complications of HIV and antiretroviral therapy (ART), and compared to controls, they have higher rates of non-AIDS conditions, including particular cancers and pulmonary, cardiovascular, and liver diseases.[2] Given this higher prevalence of chronic conditions, along with the aging of persons living with HIV, it is likely that the prevalence of persons with HIV in nursing homes (NHs) is increasing and will continue to do so. Studies of HIV in US NHs are relatively old (using data prior to 2000) and as such do not capture changes in the prevalence of HIV. Furthermore, they do not compare HIV-positive (HIV+) and HIV-negative (HIV-) residents and/or only reflect care provided in a single NH.[3-6]

Beyond the above conditions, and given dementia's high prevalence[7] and focus of care for long-stay NH residents, we were particularly interested in the relative

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prevalence and management of dementia in HIV+ as compared to HIV- residents. Also, in addition to the high prevalence of Alzheimer's disease (AD) and other dementias observed for HIV- NH residents, approximately 5% of persons with HIV have a diagnosis of HIV-associated dementia (post the advent of combination ART).[8,9] In NHs, the management of the behaviors and psychological symptoms that often accompany dementia and that are exhibited by most (over 80%) dementia residents is particularly challenging.[10,11] Antipsychotic (APS) medications are frequently used to control behavioral symptoms, such as aggression, despite the known serious complications and adverse consequences (including death) associated with their use.[12] Indeed, the prevalence of APS medications prescribed for residents with dementia is an important NH quality indicator.[13,14] Furthermore, there are added concerns about APS medication use for HIV+ residents, including drug interactions between second-generation APS medications and ART use,[15] which may contribute to an increased risk of hyperlipidemia, hypertension, and diabetes.[16]

This study uses population-based Medicaid and minimum data set (MDS) data along with data from the Centers for Medicaid and Medicare Services' (CMS') Chronic Condition Warehouse (CCW) to identify a population of HIV+ long-stay NH residents in the 14 US states with the highest HIV prevalence.[17] Using these data, we aimed to: (1) understand the prevalence of HIV in NHs from 2001 to 2010; (2) contrast sociodemographic and clinical characteristics of HIV+ and HIV- residents; and (3) using APS medication use as a quality indicator, describe how dementia care may differ by HIV status.

METHODS

Data source

We conducted a cross-sectional comparative study of long-stay (stays of 90 days or more) NH residents by HIV presence in the 14 states accounting for 75% of the HIV prevalence in the United States: New York, California, Florida, Texas, Maryland, New Jersey, Pennsylvania, Illinois, Georgia, North Carolina, Virginia, Louisiana, Ohio, and Massachusetts.[17] Given that HIV diagnoses are redacted from the MDS in some US states (California, Texas, Maryland, New Jersey, and Illinois) and that large proportions of HIV+ residents admitted to NHs are Medicaid beneficiaries,[4,6] we supplemented our identification of HIV by using 2001 to 2010 Medicaid Analytic Extract (MAX) data. We also used 2006 to 2010 CCW data to identify HIV. The Brown University Institutional Review Board approved this study.

MDS data were used to identify HIV+ residents and to characterize them across several dimensions. The MDS is a federally mandated assessment required for all residents in Medicare- or Medicaid-certified facilities. Federal regulations require NHs to complete MDS assessments for each resident at admission and at least quarterly thereafter.[18] The reliability and validity of the MDS data are generally high.[19-22] The CMS' CCW applies to Medicare and Medicaid enrollees in the United States and is a research database mandated by the Medicare Modernization Act of 2003. For beneficiaries with 62 chronic conditions, it provides researchers with linked Medicare and Medicaid claims and assessment data across beneficiaries' continuum of care. Expert-derived algorithms (based on diagnosis codes from medical claims data) are used to identify beneficiaries with one or more of the 62 chronic conditions (one of which is HIV/AIDS).[22]

Of note, the CMS redacted from the Medicaid MAX data all claims containing diagnoses of alcohol or drug addiction. Therefore, if all or most of an individual's Medicaid claims included a drug or alcohol diagnosis, we would have been unable to identify him/her as having HIV using the MAX data (Figure S1). However, this scenario is unlikely.

Study sample

Using MAX data, we first identified Medicaid beneficiaries who had a "likely" or "possible" HIV diagnosis (Figure S1). Data on Medicaid beneficiaries with likely HIV were merged with MDS data from 2001 to 2010 to determine which beneficiaries had NH use after an HIV diagnosis. To these identified NH HIV residents, we added those residents who had an MDS or CCW HIV diagnosis.

We used the 2001 to 2010 MDS data for residents with and without (identified) HIV to classify residents as having long stays by determining whether they had quarterly or annual MDS assessments (ie, both of which require at least 90-day stays). In the study years and states, 9 245 009 NH residents had long stays and 92 493 (1%) of these had HIV. To derive our study's prevalence sample, we randomly chose for each resident one quarterly or annual MDS assessment (dated after first documentation of HIV for HIV+ residents) to represent each unique resident in the study years and states. Also, using the MDS checkbox diagnosis of "Alzheimer's disease" or "dementia other than Alzheimer's disease" or a coded dementia diagnosis on the MDS, we classified residents as having AD or non-AD dementia.[21-23]

Study variables

We extracted resident-level data from the randomly selected quarterly or annual MDS. Sociodemographic variables included age, sex, and race/ethnicity. To examine the prevalence of AD and non-AD dementia by age groups, we categorized age as younger than 25, 26 to 34, 35 to 44, 45 to 54, 55 to 64, 65 to 74, 75 to 84, 85 to 94, and 95 years or older. Other descriptive analyses were stratified by the age group of younger than 65 years and 65 years or older. Race/ethnicity was identified as non-Hispanic white, black, Hispanic, and other. We also included MDS-derived indicator variables for AD (vs non-AD) diagnoses and for the diagnoses of depression, anxiety disorder, bipolar disorder, and schizophrenia. Also, for description only, indicator variables for common NH diagnoses were created. When sociodemographic and diagnosis variables were missing in the selected quarterly or annual MDS, we used values from previous assessments. Last, we included Indicator variables to control for a NH's state and its location in a metropolitan county (yes/no).

The Cognitive Performance Scale (CPS)[24] was used to determine cognitive impairment. This scale ranges from 0 to 6 and was categorized as: intact to mild impairment (0-2), moderate to moderately severe impairment (3-4), and severe to very severe impairment (5-6). To identify the severity of behavioral symptoms, we used the Aggressive Behavior Scale.[25] The scale uses MDS data on four core behavioral indicators (verbal

aggression, physical aggression, socially inappropriate behavior, and aggressive resistance to care) together with their documented frequency. For each behavior, frequency in the last seven days (prior to assessment) is documented (and scored) as: not exhibited (0); occurred 1 to 3 days (1); occurred 4 to 6 days, but less than daily (2); or occurred daily (3). The scale's score is an aggregate of these scores and ranges from 0 to 12, with higher scores indicating greater severity of behavioral problems.

The outcome of interest in our multivariable analysis is whether a resident received an APS drug (as documented on the MDS) in the seven days prior to the assessment date. To calculate this outcome, we removed residents with a diagnosis of schizophrenia or bipolar disorder from the denominator, creating an indicator of potentially inappropriate APS medication receipt. A similar indicator has been used in the United States[13] and Canada.[14]

Last, to control for changes in prescribing post the US Federal Drug Administration's (FDA's) warnings regarding APS medications, we included indicator variables to designate whether a resident's assessment was completed in calendar years 2000 to 2005, 2006 to 2008, or 2009 to 2010. In April 2005, the FDA issued a "black box" warning regarding atypical APS medication prescribing because of an observed association between atypical APS medication use and increased mortality; it extended this warning in June 2008 to include conventional APS medications.

Statistical analysis

We used descriptive statistics to portray HIV and dementia prevalence and to contrast resident characteristics. Logistic regression examined whether APS medication use was greater for HIV+ residents, controlling for the variables described above. We stratified our multivariate analyses by age (ie, younger than 65 years and 65 years or older) since we observed differing effects for many variables by this categorization and given there was a statistically significant interaction between HIV status and being 65 years or older (in the nonstratified model).

RESULTS

HIV prevalence in NHs

Across states, 0.7% of total long-stay residents had HIV in 2001, and this proportion increased to 1.2% by 2010. Increases in prevalence were greater in states with higher proportions of HIV+ long-stay residents, and greatest in New Jersey, Louisiana, Florida, New York, and Maryland (Figure 1).

Characteristics of HIV+ and HIV- long-stay residents

Using our prevalence sample of long-stay residents in 2001 to 2010 (N = 2 822 110), we found HIV+ residents compared to HIV- residents were younger, less often female and white, less often had common NH diagnoses (except renal failure), and more often resided in metropolitan-area NHs (Table 1). HIV+ residents represented only 0.5% of residents aged 65 years or older, but 6% of those younger than 65 years. Overall, 33% of HIV+ residents had dementia diagnoses compared to 52% of HIV- residents; however, there was only an approximate 4–percentage point difference in dementia prevalence when residents were stratified by the younger than 65 years and 65 years and older age groups (Table 1).

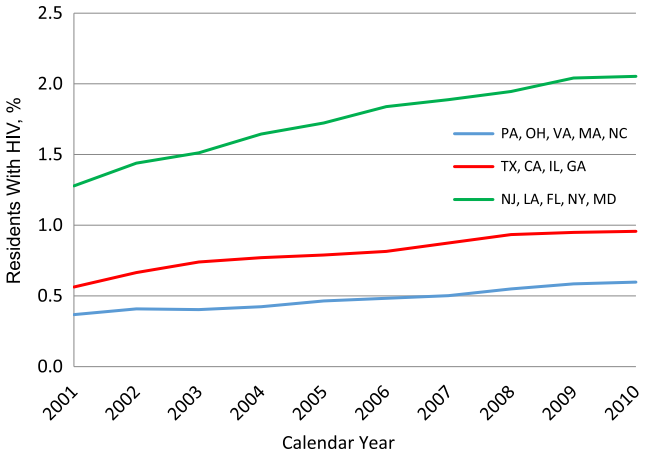

Figure 1. Annual proportion of long-stay nursing home residents with human immunodeficiency virus (HIV): by states with lower to higher prevalence of HIV in nursing homes. Note: states were categorized into three groups based on their prevalence of HIV in nursing homes: 0.5% or less: Pennsylvania, Ohio, Virginia, Massachusetts, and North Carolina; greater than 0.5% and 1% or less: Texas, California, Illinois, and Georgia; and greater than 1%: New Jersey, Louisiana, Florida, New York, and Maryland.

Figure 2 shows that HIV+ residents, compared to HIV- residents, had a higher prevalence of non-AD dementia until about the age of 95 years. These differences were greatest for HIV residents between the ages of 25 and 54 years. In contrast, AD was more common for HIV- residents compared to HIV+ residents between approximately the ages of 45 and 85 years.

HIV+ and HIV- long-stay residents with dementia

Table 2 shows long-stay residents with dementia (but without schizophrenia or bipolar disorders; n = 1 386 579) had demographic differences similar to those described above for all residents in the prevalence sample. Within both age groups, HIV+ residents were younger, had less depression and anxiety, and had lower aggressive behavior scores; those younger than 65 years had lower levels of cognitive impairment and lower prevalence of common NH diagnoses (except renal failure). For those aged 65 years or older, the prevalence of renal failure, diabetes, and cerebrovascular accident (CVA) was higher for HIV+ residents. Of younger HIV+ residents, 45% had APS medication use compared to 43.8% of younger HIV- residents; for older residents, this receipt was 28.0% compared to 31.8%, respectively.

Controlling for potential confounders, HIV+ residents younger than 65 years had a 24% greater odds of APS medication receipt than similar HIV- residents (adjusted odds ratio [AOR] = 1.2; 95% confidence interval [CI] = 1.15-1.34; Table 3). However, older HIV+ residents (vs HIV- residents) had lower odds of APS medication receipt (AOR = 0.82; 95% CI = 0.77-0.87). The odds ratios and significance levels for many confounders were similar across the younger and older age groups, and in the expected directions. However, for some confounders, this was not the case. For example, younger

Table 1. Individual Characteristics of Nursing Home Long-Stay Residents by HIV Status and by Younger vs Older Age Groups

	All		Those aged <65 y		Those aged ≥65 y	
	HIV-	HIV+	HIV-	HIV+	HIV-	HIV+
Variable	(n = 2 788 358)	(n = 33 752)	(n = 343 307)	(n = 21 078)	(n = 2 445 017)	(n = 12 674)
Alzheimer disease or other dementia[a]	51.8	32.6	16.4	20.1	56.8	53.5
Age, mean (SD), y	80.0 (13.1)	60.0 (17.9)	52.8 (10.1)	48.0 (9.1)	83.8 (8.0)	79.9 (9.0)
Female	66.9	42.3	44.5	32.6	70.0	58.4
Race/ethnicity						
White	78.7	34.8	60.5	24.4	81.3	52.1
Black	14.1	50.5	28.2	60.3	12.1	34.1
Hispanics	5.3	13.2	9.0	14.2	4.8	11.4
Other race	1.9	1.6	2.4	1.1	1.9	2.4
Diagnoses						
Congestive heart failure	23.2	12.9	12.0	6.5	24.8	23.5
Cancer	8.8	6.2	6.2	4.6	9.2	8.7
Renal failure	8.1	11.5	10.1	11.0	7.8	12.2
Diabetes mellitus	30.1	28.0	36.0	21.9	29.3	38.2
Cerebrovascular accident	21.5	19.1	20.1	12.8	21.7	29.6
COPD	18.4	14.6	15.6	10.5	18.8	21.2
ASHD	12.9	6.4	5.2	2.1	14.0	13.4
Depression	43.8	38.9	42.5	37.7	44.0	40.8
Anxiety	14.5	10.2	13.7	9.2	14.7	11.8
Bipolar disorder	2.6	5.2	7.5	6.9	1.9	2.5
Schizophrenia	4.2	9.3	15.5	11.9	2.6	5.0
ABS scale						
0	74.8	75.9	72.4	75.2	75.1	77.0
1-2	16.3	16.3	17.9	17.0	16.1	15.2
3-5	6.9	6.3	7.6	6.4	6.8	6.0
≥6	2.0	1.5	2.0	1.4	2.0	1.7
CPS scale						
0-2	42.3	59.6	61.2	73.0	39.7	37.3
3-4	40.8	26.6	25.9	20.6	42.9	36.7
5-6	16.8	13.7	12.8	6.4	17.4	25.9
Any use of antipsychotics	25.9	30.7	35.1	34.8	24.6	24.0
Years						
2001-2005	49.5	46.5	43.9	45.6	50.3	48.1
2006-2008	30.4	31.6	32.6	32.6	30.1	30.1
2009-2010	20.1	21.8	23.5	21.9	19.6	21.8
Metropolitan-area nursing home	83.9	93.6	87.2	96.1	83.5	89.6

Abbreviations: ABS, aggressive behavior scale; ASHD, arteriosclerotic heart disease; CPS, cognitive performance scale; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency virus.

Note: Data are given as percentage of each group, unless otherwise indicated.

[a]These diagnoses were identified by using the resident assessment (minimum data set) diagnosis checkboxes of "Alzheimer's disease" and "dementia other than Alzheimer's disease."

residents having the highest aggressive behavior score (6 or more; compared to those with no aggressive behaviors) had much greater odds of APS medication use than did comparable older residents (AOR = 5.03 vs 3.79, respectively). Also, the AORs for APS medication use appear to be significantly different for younger and older residents in many states and for those residents in metropolitan-area NHs (Table 3).

The period following the first FDA black box warning (2006-2008 compared to 2001-2005) was associated with significantly lower odds of APS medication receipt for residents aged 65 years or older (AOR = 0.92; 95% CI = 0.92-0.93), but not for younger residents. Being a resident in years 2009 to 2010 (compared to 2001-2005), the years after the extended black box warning, was significantly associated with lower APS medication receipt for both age groups; however, a larger 18% reduction in odds was observed for older residents (AOR = 0.82; 95% CI = 0.81-0.83; Table 3).

DISCUSSION

This population-based comparative study of long-stay NH residents with and without HIV (in the 14 US states accounting for 75% of HIV prevalence)[17,18] found that the proportion of HIV+ long-stay residents increased by 71% over a 10-year time period, from 0.7% in 2001 to 1.2% in 2010. The prevalence sample of (unduplicated) long-stay residents showed 6% of NH residents younger than 65 years were HIV+ compared with 0.5% of those 65 years or older. For residents with dementia, 35% of HIV+ residents were younger than 65 years compared to only 3% for HIV- residents. HIV+ residents had a higher prevalence of non-AD

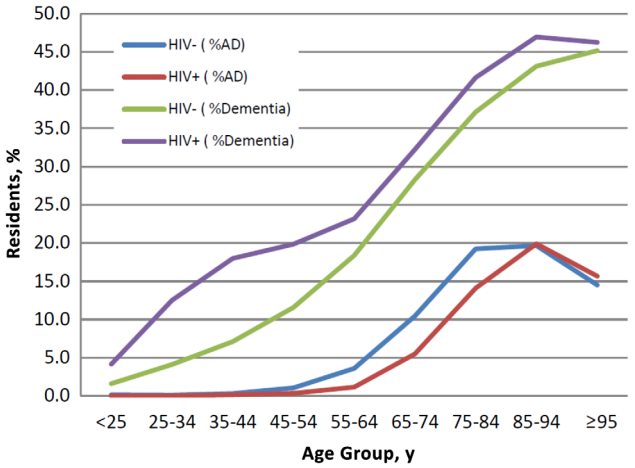

Figure 2. Prevalence of Alzheimer's disease (AD) or non-AD dementia by age group and human immunodeficiency virus status: long-stay nursing home residents in years 2001 to 2010. These diagnoses were identified by using the resident assessment (minimum data set) diagnosis checkboxes of "Alzheimer's disease" and "dementia other than Alzheimer's disease."

dementia and a lower prevalence of AD than did HIV- residents, and these differences fluctuated by age. HIV+ dementia residents younger than 65 years had 24% greater odds of receiving an APS medication compared to their HIV- counterparts (AOR = 1.24; 95% CI = 1.15-1.34), while older HIV residents had lower odds (AOR = 0.82; 95% CI = 0.77-0.87). These findings are timely given the observed increase of HIV+ residents in NHs (and the expected continued increase)[1]; as such, they contribute to an evidence base needed to ensure high-quality care for younger and older HIV+ residents in NHs.

The higher prevalence of non-AD dementia for younger HIV+ residents likely reflects a greater prevalence of HIV-associated dementia. However, our data do not identify the type of "other dementia." In addition, although there may be some misclassification, we believe the descriptive differences presented on the prevalence of AD and non-AD dementias by HIV status have much face validity. Notable is that our identified 56.7% prevalence of dementia in residents aged 65 years or older (in 2001-2010) is comparable to the 50.6% prevalence identified by the Centers for Disease Control and Prevention in 2013 to 2014.[7]

Table 2. Individual Characteristics of Long-Stay Nursing Home Residents with Dementia But Without Schizophrenia or Bipolar Disorder by HIV Status and Younger vs Older Age Groups

	All		Those aged <65 y		Those aged ≥65 y	
	HIV-	HIV+	HIV-	HIV+	HIV-	HIV+
Variable	(n = 1 376 898)	(n = 9681)	(n = 45 060)	(n = 3433)	(n = 1 331 830)	(n = 6248)
Age, mean (SD), y	84.1 (8.8)	70.6 (17.7)	56.8 (7.0)	49.6 (8.6)	85.0 (7.3)	82.2 (8.4)
Female	70.6	50.7	42.6	28.1	71.5	63.1
Race/ethnicity						
White	81.1	43.2	61.6	26.5	81.7	52.4
Black	12.4	42.0	27.1	58.6	11.9	32.9
Hispanic	4.9	12.9	9.4	14.0	4.7	12.3
Other	1.7	1.9	1.9	0.9	1.7	2.5
Diagnoses						
Congestive heart failure	20.9	16.7	9.8	5.3	21.3	22.9
Cancer	7.6	6.1	4.1	3.2	7.7	7.7
Renal failure	6.4	9.6	8.0	8.4	6.4	10.2
Diabetes mellitus	25.2	29.5	31.1	19.1	25.0	35.2
Cerebrovascular accident	19.9	24.7	27.8	16.2	19.7	29.4
COPD	15.5	15.0	12.8	8.1	15.6	18.8
ASHD	13.6	10.5	6.2	2.0	14.0	15.1
Depression	45.9	41.3	48.9	39.4	45.8	42.3
Anxiety	15.3	11.7	15.2	10.0	15.3	12.6
ABS scale						
0	68.6	71.5	63.7	69.8	68.7	72.5
1-2	19.3	18.4	21.3	19.5	19.2	17.7
3-5	9.2	7.7	11.2	8.0	9.1	7.5
≥6	3.0	2.4	3.8	2.7	2.9	2.2
CPS scale						
0-2	20.4	28.8	27.5	47.5	20.2	18.5
3-4	53.8	42.4	46.2	40.2	54.1	43.6
5-6	25.7	28.7	26.2	12.2	25.7	37.7
Any use of antipsychotics	32.2	34.1	43.8	45.2	31.8	28.0
Years						
2001-2005	49.5	49.1	43.6	46.8	49.7	50.4
2006-2008	30.3	29.3	32.0	30.2	30.3	28.8
2009-2010	20.2	21.5	24.4	23.0	20.0	20.7
Metropolitan-area nursing home	84.1%	91.6%	85.4%	95.0%	84.1%	89.7%

Abbreviations: ABS, aggressive behavior scale; ASHD, arteriosclerotic heart disease; CPS, cognitive performance scale; COPD, chronic obstructive pulmonary disease; HIV, human immunodeficiency virus.

Note: Data are given as percentage of each group, unless otherwise indicated. Dementia was identified by using the resident assessment (minimum data set) diagnosis checkboxes of "Alzheimer's disease" and "dementia other than Alzheimer's disease."

Table 3. Multivariate Regression Analyses—HIV Status and Receipt of Antipsychotic Medications for Long-Stay Nursing Home Residents with Dementia (But Without Schizophrenia or Bipolar Disorder)

	Those aged <65 y (n = 48 268)			Those aged ≥65 y (n = 1 334 366)		
Variable	**AOR**	***P* value**	**95% Confidence interval**	**AOR**	***P*-value**	**95% Confidence Interval**
HIV	1.24	<.001	1.15-1.34	0.82	<.001	0.77-0.87
Age	0.99	<.001	0.99-0.99	0.97	<.001	0.97-0.97
Female	0.83	<.001	0.80-0.86	0.83	<.001	0.82-0.83
Race (reference: white)						
Black, non-Hispanic	0.79	<.001	0.75-0.82	0.88	<.001	0.87-0.89
Hispanic	1.01	.81	0.94-1.08	1.09	<.001	1.07-1.11
Other	0.93	.32	0.81-1.07	0.73	<.001	0.70-0.75
AD (vs other dementia)	1.21	<.001	1.14-1.28	1.19	<.001	1.18-1.20
Depression	1.21	<.001	1.17-1.26	1.30	<.001	1.29-1.31
Anxiety disorder	1.52	<.001	1.44-1.60	1.62	<.001	1.61-1.64
ABS (reference: 0)						
Mild (1-2)	1.95	<.001	1.86-2.05	2.04	<.001	2.02-2.06
Moderate (3-5)	2.81	<.001	2.64-3.00	2.88	<.001	2.84-2.92
Severe (≥6)	5.03	<.001	4.49-5.62	3.79	<.001	3.71-3.87
CPS (reference: none to mild [0-2])						
Moderate to moderately severe (3-4)	1.57	<.001	1.50-1.64	1.73	<.001	1.72-1.75
Severe to very severe (5-6)	1.19	<.001	1.12-1.25	1.44	<.001	1.42-1.46
Years (reference: 2001-2005)						
2006-2008	1.01	.73	0.96-1.05	0.92	<.001	0.92-0.93
2009-2010	0.94	.01	0.89-0.98	0.82	<.001	0.81-0.83
Metropolitan-area nursing home	0.92	.01	0.87-0.98	1.00	.62	0.99-1.01
Nursing home's state (reference: California)						
Florida	0.93	.07	0.85-1.01	1.02	.01	1.01-1.04
Georgia	1.06	.24	0.96-1.18	1.14	<.001	1.11-1.16
Illinois	0.86	.00	0.78-0.94	0.91	<.001	0.90-0.93
Louisiana	1.20	.00	1.07-1.34	1.40	<.001	1.37-1.44
Massachusetts	1.05	.41	0.94-1.16	1.16	<.001	1.13-1.18
Maryland	0.92	.15	0.81-1.03	1.05	<.001	1.02-1.08
North Carolina	0.86	.01	0.78-0.96	1.04	<.001	1.02-1.06
New Jersey	0.90	.05	0.80-1.00	0.99	.27	0.97-1.01
New York	1.05	.21	0.97-1.13	1.06	<.001	1.04-1.08
Ohio	0.84	<.001	0.77-0.91	0.78	<.001	0.77-0.80
Pennsylvania	0.90	.02	0.82-0.99	0.99	.25	0.97-1.01
Texas	1.14	<.001	1.05-1.23	1.30	<.001	1.27-1.32
Virginia	0.88	.03	0.78-0.99	1.04	.00	1.01-1.06
Constant	0.82	.02	0.68-0.97	2.35	<.001	2.24-2.47

Abbreviations: ABS, aggressive behavior scale; AD, Alzheimer's disease; AOR, adjusted odds ratio; CPS, cognitive performance scale; HIV, human immunodeficiency virus.

Note: The numbers in regression analysis are slightly different from those in Table 2, because some variables have missing values. Dementia was identified by using the resident assessment (minimum data set) diagnosis checkboxes of "Alzheimer's disease" and "dementia other than Alzheimer's disease."

Similar to a Canadian study,[26] we observed greater APS medication use for HIV+ vs HIV- residents, although we found this only occurred for HIV+ residents younger than 65 years. We speculate that it is possible that NHs have less familiarity caring for these younger HIV residents (99% of whom have non-AD dementia), leading to greater use of APS medications. While combined use of APS medication and ART is associated with adverse effects beyond those observed with APS medication or ART alone,[16] we lacked data on ART use, limiting our ability to understand the frequency of combined use. Still, the study findings highlight the necessity to better prepare NHs and their staff for the expected increasing numbers of aging persons with HIV who will need NH care in the next decade.[2,27] Considering this, research aimed at understanding the characteristics of NHs with comparable (lower) APS medication use for HIV+ and HIV- residents is needed to assist in the development of interventions and to inform best practices. Also of interest is whether best practices and higher quality are associated with caring for higher volumes of HIV+ residents (whether "practice makes perfect").[28-30]

As shown in other research[31] and related to the above, we found significant differences in the odds of APS medication use by state. For example, compared to NH residents in California, those in Ohio had lower odds of APS medication use while those in Louisiana had higher odds. In addition, we found lower odds of APS medications for younger residents residing in metropolitan-area NHs. Given these findings and the above discussion, future research is recommended that examines how resident, NH, and market (geographic) characteristics are associated with NH care for persons with HIV.

In agreement with previous research,[32] residents in NHs after the FDA's initial black box APS medication warning generally had lower adjusted odds for APS medication use than NH residents in prior years. However, compared to NH residents in 2001 to 2005, we found greater effect sizes for years 2009 to

2010 (after the extended black box warning that included conventional APS medications) than we observed for years 2006 to 2008. While we cannot discount the possibility that this finding may reflect other efforts to reduce APS medication use in NHs,[33] it suggests the 2009 FDA warning may have influenced APS medication prescribing among NH residents with dementia.

There are some study limitations. We were unable to provide a complete profile of long-stay residents with HIV since we lacked CD4 cell count, viral load, and HIV treatment data. Also, our use of secondary data may limit the sensitivity and specificity of our dementia diagnoses, especially our attempt to differentiate types of dementia. In addition, we controlled for the severity of cognitive impairment using the CPS. The CPS is not a substitute for performance-based cognitive testing, and for those with HIV, it may be an insensitive measure of cognition function (as is its correlate, the Mini-Mental State Examination).[34] Also, while our findings suggest potential differential care, we cannot form conclusions on the appropriateness of APS medication prescribing without additional clinical data relating to the indication for APS medication use. Additionally, much of what is known about the safety and efficacy of APS medications in persons with HIV has been extrapolated from randomized clinical trials of APS medication use in older patients with dementia—it may not be applicable to individuals (particularly younger persons) with HIV. Furthermore, the redaction by some states of HIV diagnoses on NH MDS assessments may have resulted in some underidentification of HIV. However, multivariable findings were essentially the same when we included data from the eight states that did not redact HIV diagnoses. Last, given the complexities in accessing and analyzing MAX data, this study reflects prevalence and care in years 2001 to 2010. Nonetheless, this study is the most current reflection of NH prevalence and care for HIV+ residents and the only one, to our knowledge, that compares persons with and without HIV in US NHs.

CONCLUSION

Using population-based data on long-stay NH residents, this study contributes to our understanding of HIV in NHs. It also raises concern about potential differential quality of care for younger HIV+ residents with dementia. Given the aging of persons with HIV in the United States and their increasingly likely need for NH care, study findings contribute evidence needed to ensure high-quality care for younger and older HIV+ NH residents.

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Conflict of Interest: Miller, Cai, Daiello, and Wilson have no possible conflicts of interest.

Author Contributions: S.C.M. and S.C. designed the study. I.B.W. acquired the data. S.C. performed the data analysis. S.C.M. drafted the article. All authors participated in the analysis and helped draft the article. All authors critically revised, commented, and approved the final article.

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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

Figure S1. Selection of human immunodeficiency virus (HIV)–Medicaid beneficiaries. Base sample of Medicaid beneficiaries likely living with HIV in 14 states, 2001 to 2010.