Underdiagnosis of Depression in HIV

Who Are We Missing?

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OBJECTIVE: To determine the sociodemographic and service delivery correlates of depression underdiagnosis in HIV.

DESIGN: Cross-sectional survey.

PATIENTS/PARTICIPANTS: National probability sample of HIV-infected persons in care in the contiguous United States who have available medical record data.

MEASUREMENTS AND MAIN RESULTS: We interviewed patients using the Composite International Diagnostic Interview (CIDI) survey from the Mental Health Supplement. Patients also provided information regarding demographics, socioeconomic status, and HIV disease severity. We extracted patient medical record data between July 1995 and December 1997, and we defined depression underdiagnosis as a diagnosis of major depressive disorder based on the CIDI and no recorded depression diagnosis by their principal health care provider in their medical records between July 1995 and December 1997. Of the 1,140 HIV Cost and Services Utilization Study patients with medical record data who completed the CIDI, 448 (37%) had CIDI-defined major depression, and of these, 203 (45%) did not have a diagnosis of depression documented in their medical record. Multiple logistic regression analysis revealed that patients who had less than a high school education ($P < .05$) were less likely to have their depression documented in the medical record compared to those with at least a college education. Patients with Medicare insurance coverage compared to those with private health insurance ($P < .01$) and those with ≥ 3 outpatient visits ($P < .05$) compared to <3 visits were less likely to have their depression diagnosis missed by providers.

CONCLUSIONS: Our results suggest that providers should be more attentive to diagnosing comorbid depression in HIV-infected patients.

KEY WORDS: depression; HIV; diagnosis.
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Depression is a common comorbidity in patients with chronic medical diseases,[1–5] and HIV is no exception.[6] Depression is one of the most prevalent psychiatric conditions among HIV-infected patients.[6–9] The 12-month prevalence of depression among HIV-infected patients in care is estimated to be as high as 36%.[6,10] Despite the advent of highly active antiretroviral therapy, depression is the most common psychiatric consequence of HIV diagnosis.[7,11] Depression adds to the burden of disease experienced by patients with HIV, and may contribute to difficulties with medication adherence and other self-care skills, as well as increased risk of morbidity and mortality.[12,13]

Despite its prevalence, depression is commonly underdiagnosed and consequently undertreated in the general medical population.[14–16] In primary care, physicians miss between one half and two thirds of patients who screen positive for depression using accepted scales.[16,17] Providers often view depression as an expected reaction to a medical illness,[17] age, or declining functional status due to a major medical disease.[18] Depression is more commonly missed in older patients,[18–20] African Americans,[21] the uninsured, and the poor.[22]

The underrecognition of depression among chronically ill patients with existing medical comorbidities can lead to adverse consequences, including poorer adherence[23] and functional decline.[24,25] Depressive symptoms are linked to inadequate treatment adherence across several chronic diseases, including diabetes mellitus,[26] coronary disease,[27] and asthma.[28] Moreover, untreated depression might lead to self-medication of depressive symptoms with alcohol or illicit drug use, which also can be associated with poorer HIV treatment adherence.[29,30]

However, the extent to which depression is underdiagnosed in HIV-infected patients and the types of patients who are at the greatest risk for not having their depression diagnosed or recognized by their provider is less well known. To investigate the extent of underdiagnosis of depression among patients with HIV infection, we examined a nationally representative population of HIV-infected patients in care. Using a comprehensive diagnostic instrument, we estimated the proportion of HIV patients with major depression who had not been diagnosed by their principal health care providers by comparing patient interviews with their medical records. We also examined the relationship between sociodemographic and service delivery variables with the underdiagnosis of depression in this population.

METHODS

Study Sample and Subjects

The HIV Cost and Services Utilization Study (HCSUS) collected extensive data from patient interviews and medical records in a multistage national probability sample of HIV-infected adults receiving care in the contiguous United States from 1996 to 1998.[31,32] The reference population consists of persons at least 18 years of age with known HIV infection who made at least 1 visit for regular or ongoing care to other than a military, prison, or emergency facility between January 5 and February 29, 1996, except for 1 city where sampling began and ended 2 months later. In the first stage of sampling, we randomly selected urban and rural counties that together contained nearly 70% of all acquired immunodeficiency syndrome (AIDS) cases in the United States. In the second stage, we randomly selected 58 institutional or individual physicians known to care for patients with HIV infection (known providers) in urban areas and 28 in rural areas, who had been identified by local physicians or public health officials. Using data from the American Medical Association Master File, we randomly sampled approximately 4,000 physicians in relevant specialties, among whom 87 physicians (other providers) in urban areas and 23 in rural areas had confirmed in a screening survey that they cared for eligible patients. In the third stage, we randomly selected anonymous patients (identified by unique codes) from lists of all eligible patients seen at the outpatient or inpatient services of participating providers during January and February 1996. In the first 2 stages, we set sampling rates proportionate to providers' caseloads (i.e., number of HIV-infected patients in their panel). In the third stage, we set sampling rates to equalize the probability of selection within subgroups while increasing the overall sampling rate for women and members of private staff-model health maintenance organizations. Overall, 4,042 subjects were eligible for enrollment, and 2,864 completed the baseline interview between January 1996 and April 1997. The first follow-up interview (stage 2) included 2,466 individuals interviewed between December 1996 and July 1997 (representing 69% of the surviving baseline sample). The second follow-up interview (stage 3), conducted between August 1997 and January 1998, included 2,267 individuals.

Those responding to both the first and second follow-up interviews completed the Composite International Diagnostic Interview Short Form (CIDI-SF), a mental health screening instrument.[33,34] The CIDI-SF contains questions on the key symptoms of mood and anxiety disorders derived from the full-length Composite International Diagnostic Interview (CIDI) survey developed by the World Health Organization, a highly structured interview that provides diagnoses of Axis I disorders, including depression, based on *Diagnostic and Statistical Manual of Mental Disorders,* Fourth Edition (DSM-IV) criteria.[35] Based on the CIDI-SF, a positive screen for mood disorder (depression or dysthymia) or anxiety disorder (panic or generalized anxiety disorder)

occurring within the past year was determined using previous scoring methods.[33,34] For example, a respondent had a positive screen for depression if he or she experienced at least 3 symptoms relating to feelings of sadness or at least 3 symptoms relating to feelings regarding loss of interest in activities within the past year.

Those screening positive for any mood or anxiety symptoms and a small sample of patients screening negative based on the CIDI-SF in the first follow-up interview completed the Mental Health Supplement, which includes the full-length CIDI. A total of 1,489 patients completed the Mental Health Supplement interview shortly after the first follow-up survey in 1997 (on average, 11 days after the first follow-up survey).[34] The CIDI structured interview format includes the same symptoms as the CIDI-SF; however, it allows for the determination of clinically significant psychopathological symptoms of depression that are not attributed to physical illness or alcohol or drug use.[34] Hence, unlike the full-length CIDI, the CIDI-SF may not be able to rule out depressive symptoms attributed to medical or substance use disorders. For the full-length CIDI, the reliability (agreement) for a depression diagnosis has been reported to exceed 85%, and the concordance with clinician interview was 0.84 for depressive disorders.[35] In contrast, the sensitivity and specificity of the CIDI-SF in the HCSUS sample was estimated to be 0.61 and 0.80, respectively. Hence, because the CIDI-SF is not considered a structured diagnostic tool, patients screening positive on the CIDI-SF were considered to have "depressive symptoms." Patients given a diagnosis based on the full-length CIDI were considered to have probable depression (i.e., depressive symptoms not attributed to substance use or physical illness).

Data Collection

Patient Data. Centrally trained personnel from the National Opinion Research Center (Chicago, Ill) used computer-assisted personal interviewing to conduct in-person interviews. All interviewers completed 4 to 5 days of training, including general interviewer training, HIV background, and the HCSUS instrument, including the Mental Health Supplement.[31,34] We conducted 92% of interviews in person and 8% by telephone. Interviews lasted approximately 120 minutes. We ascertained demographic, socioeconomic status, and health-related data from the patient baseline interview. For all patient interviews, we evaluated the survey instruments by checking for respondent burden and internal consistency within the surveys. The percent missing overall remained constant throughout each of the surveys, and we found that similar frequencies of missing values occurred at the beginning and end of each survey (<1% were missing in the last 20 questions in the survey), indicating that respondent fatigue was minimal.

Medical Record Information. We abstracted medical records of patients who completed the Mental Health

Supplement. When interviewed, patients were asked for the names and contact information of all providers they had seen for most of their HIV treatment as well as providers they had seen for most of their other medical care (e.g., general medical providers, gynecologists), and verified that investigators had permission to contact the providers. Hence, these providers included any HIV specialists and general internists the patients may have seen. From identified providers, we requested by mail photocopies of all inpatient and outpatient medical records from July 1, 1995 through December 31, 1997 (close to the time of the Mental Health Supplement). We used follow-up mailings and telephone prompts to elicit records from nonresponders, followed by visits in person by field representatives if these methods were unsuccessful. We collected medical record data for 1,140 of the 1,489 Mental Health Supplement interview respondents (77%).

Photocopied medical records were delivered to the National Opinion Research Center (Chicago, Ill), where professional data abstractors examined the charts using a medical data abstraction form. Abstractors recorded any evidence of a depression diagnosis between July 1, 1995 through December 31, 1997 from the progress notes, problem lists, or correspondence information of the principal provider. All participants provided informed consent, and the HCSUS study was reviewed by the Rand Human Subjects Committee as well as by local institutional review boards at each site.

Sampling Weights

The weighting scheme for HCSUS is described elsewhere.[31] In brief, we constructed a baseline analytic weight for each respondent to adjust the sample to represent the entire reference population, not just the proportion directly represented by the sample. Each weight, which can be interpreted as the number of persons represented by that respondent, is the product of a sampling weight, which adjusts for differential sampling probabilities. We weighted the data to adjust for: 1) nonresponse; 2) multiplicity (those who went to the provider more than once during the sampling time frame had a greater chance of being sampled); 3) the likelihood of region, provider, and person being selected; and 4) availability of follow-up and medical record data. The sum of the baseline weights is an estimate of the size of the target population represented by HCSUS. The weights employed in this analysis take into account attrition of respondents not successfully interviewed at the second follow-up and those without medical record data. Weighted results are adjusted for design effect.

Data Analysis

The analysis for this study includes HCSUS patients who completed the Mental Health Supplement and who had medical records available. We estimated the underdiagnosis of depression as a diagnosis of major depression based on *DSM-IV* criteria from the CIDI in 1997, and the absence of

evidence of a depression diagnosis in the principal care providers' medical record covering the entire time period (July 1995 through December 1997) of the medical record data collection. We developed multivariate models to determine the probability of a missed depression diagnosis (underdiagnosis); that is, a patient with depression based on a CIDI diagnosis from the Mental Health Supplement interview who did not have a diagnosis of depression recorded by their providers in their medical record.

We used unadjusted and adjusted (multiple) logistic regression models to determine which patient and provider factors are independently associated with the failure to diagnose depression. We derived our independent variables from previous research regarding the underuse of needed care in the HCSUS population.[32,36,37] Patient-reported factors derived from interview data thought to influence the detection of depression by providers included gender, age, race/ethnicity, education, and HIV exposure group.[19–22] Socioeconomic variables that also might influence depression recognition included household income, health insurance, and geographic region from which the patient was sampled.

We defined health insurance based on the primary type of coverage at the time of the second follow-up interview. Because respondents could report more than 1 insurance type, we hierarchically categorized insurance based on the likely first or primary payer of medical services. Respondents reporting that they were insured under Medicare were assigned as having Medicare, regardless of whatever other insurance they currently had. Next, those without Medicare who had private insurance were categorized as having private insurance. We differentiated private insurance plans by asking patients whether their private plan was a health maintenance organization or not a health maintenance organization (e.g., fee-for-service). Respondents with Medicaid only were categorized as having Medicaid (hence, did not have any other type of insurance payer). Those without any insurance were categorized as uninsured.

We also included disease severity, including patient-reported lowest-ever CD4 cell count (per mm^3) and number of AIDS-related comorbidities at the time of the baseline interview (conditions included *Candida*, herpes, cervical dysplasia, lymphoma, cryptosporidiosis, cytomegalovirus, histoplasmosis, mycobacterium avium complex, tuberculosis, *Pneumocystis carinii* pneumonia, >2 episodes of bacterial pneumonia, >2 episodes of salmonella, meningitis or other brain infections, or fungal infections). Number of AIDS-related comorbidities was categorized as 0, 1, 2, 3, or 4 or more.

For provider factors, we included HIV patient load, or number of HIV-infected patients seen by each provider selected for HCSUS at the time of the baseline survey, which we categorized as less than 100, 100 to 499, and >499 patients. HIV patient load is an indicator of the provider's propensity to treat HIV-infected patients in particular as opposed to treating a more diverse patient mix (e.g., general medical patients). Provider detection of

depression also might be associated with increased number of contacts with providers over several years, because providers potentially would have more opportunities to recognize the depression. Hence, as measure of provider contact, we assessed the number of patient-reported outpatient visits within the past 6 months of baseline as an indicator of utilization (categorized as 0–2, 3–5, 6–8, and ≥9 visits). We included a second multiple regression model adding the number of outpatient visits, to determine whether number of contacts was a key explanatory factor in the underdiagnosis of depression (i.e., explaining the association between key independent variables such as insurance and depression underdiagnosis). Additional multiple regression models were run in which we added the number of outpatient mental health visits (0, 1–5, >5 visits).

Because previous studies often have relied on brief screening instruments to detect depressed patients in non–mental health specialty settings,[38] we repeated the analysis among a larger sample of patients who screened positive for depressive symptoms based on the CIDI-SF from the second follow-up interview.[33]

The authors of this manuscript warrant that we have no conflicts of interest, financial or nonfinancial, involving this study. In addition, none of the study sponsors had a direct role in the conduct of this study, including the design and collection, analysis, interpretation, and reporting of the data in this manuscript, as well as the decision to submit this study for publication. All authors had full access to the data presented in this study.

RESULTS

Of the 1,140 HCSUS patients with medical records available and who completed the Mental Health Supplement, 448 had major depression based on the CIDI, representing 47,385, or 37% of the HIV-infected population in care. Of those with depression, 24% were women, 41% were nonwhite, and 6% were age 50 years and older at baseline (Table 1). About one fourth had less than a high school education, 25% were exposed to HIV through injection drug use, and 16% were exposed through heterosexual contact. Almost half earned less than $10,000 at baseline, 24% were uninsured, 18% had Medicare, 29% were insured under Medicaid, and about 12% had HMO insurance as their primary health insurance. Of the 448, 15% were seen by providers who cared for fewer than 100 patients at the time of the HCSUS baseline interview.

Of the patients reporting depression based on their interview, only 203 (weighted % = 46%) had evidence in the principal providers' medical record of a diagnosis of depression. Based on the unadjusted logistic regression results, patients over the age of 25 years were more likely to have their depression diagnosis missed in the medical chart ($P < .05$). Those with less than a high school education compared to those with at least a college

education were also more likely to have their depression underdiagnosed ($P < .05$; Table 2). Unadjusted logistic regression results also revealed that patients living in the Midwest or South were more likely to have their depression missed ($P < .05$). Those with 3 or more outpatient visits were less likely to have their depression diagnosis missed by their provider ($P < .05$).

After adjusting for demographic, socioeconomic, and provider variables (Table 2), depression was still more likely to be underdiagnosed in patients with less than a high school education compared to those with at least a college education ($P < .05$). Patients with Medicare as their primary coverage were less likely to have their depression diagnosis missed in the medical chart than patients with private insurance coverage ($P < .01$). Adding number of outpatient visits to the multivariate model produced similar effect sizes for education and Medicare. After further adjusting for number of outpatient visits, low education was still associated with a missed diagnosis ($P < .05$) and patients with Medicare were still less likely to have their diagnosis missed ($P < .01$). In addition, those with 3 or more outpatient visits were also less likely to have their depression diagnosis missed ($P < .05$). There was no change in the results when mental health visits were added to the multivariate models (data not shown).

We repeated the multivariate analyses among a larger sample of patients who screened positive for depressive symptoms in the second follow-up interview based on the CIDI-SF. Of the 2,267 who completed the second follow-up interview, 1,874 had medical records available. Of the 1,874, 538 screened positive for depressive symptoms based on the CIDI-SF, and of those, 299 (55%) had a depression diagnosis in the medical record. Based on this sample, similar results were found for education and insurance: patients with less than a high school education ($P < .05$) were more likely to have their depression missed by providers and those with Medicare were less likely to have their diagnosis missed ($P < .05$). Similar to the results of the univariate analyses shown in Table 2, patients over the age of 25 years ($P < .05$), and who lived in the Midwest or South ($P < .01$) were more likely to have a depression diagnosis missed in the medical record. However, in this sample, we also found that patients of providers who typically see fewer than 100 HIV-infected patients were less likely to have their depression diagnosis missed in the medical record (Appendix A).

DISCUSSION

Our results, based on a nationally representative sample of HIV patients in care, suggest that providers should be more aware of the potential for comorbid depression in HIV-infected patients, particularly among those with less than a high school education.

Over a third (37%) of our sample was depressed based on a structured clinical interview (CIDI). This prevalence is higher than reported frequencies of primary care patient

Table 1. Baseline Demographics of HCSUS Participants with Major Depression with and without a Diagnosis Recorded in the Medical Chart

	Total Sample		Medical Chart Diagnosis		No Medical Chart Diagnosis	
	n	Weighted %	*n*	Weighted %	*n*	Weighted %
Total	448	100	203	46	245	54
Gender						
Male (reference)	317	76	177	76	140	76
Female	131	24	68	24	63	24
Race						
White (reference)	272	59	157	61	115	57
African American	100	22	46	19	24	26
Latino	58	14	34	16	54	12
Other	18	5	8	4	10	5
Age, y						
18–25 (reference)	23	5	14	5	9	5
26–40	292	66	54	66	138	67
41–49	111	23	65	24	46	21
≥50	22	6	12	5	10	7
Region						
Northeast (reference)	96	24	49	22	47	26
Midwest	63	13	28	11	35	15
South	130	30	69	30	61	30
West	159	33	99	37	60	29
Education						
College or greater (reference)	80	19	47	21	33	16
Some college	134	29	81	31	53	26
High school	128	28	66	27	62	30
Less than high school	106	24	51	21	55	28
HIV exposure group						
Men – sex with men (reference)	235	54	138	58	97	51
Injection drug use	105	25	55	24	50	26
Heterosexual	81	16	38	14	43	18
Transfusion/other	27	5	14	5	13	5
Income, $						
≥40,000 (reference)	57	13	29	12	28	14
10,001–40,000	173	39	94	38	79	40
0–10,000	218	48	122	50	96	46
Health insurance						
Private (reference)	68	18	36	16	32	19
None	106	23	56	23	50	25
Medicare	84	18	56	23	28	11
Medicaid	131	29	68	27	63	31
HMO	59	12	29	11	30	14
CD4 cell count						
≥500/mm^3 (reference)	44	12	25	11	19	12
200–500/mm^3	177	38	94	38	83	39
50–199/mm^3	155	34	86	34	69	34
<50/mm^3	72	16	40	17	32	15
AIDS diagnoses, *n*						
0 (reference)	90	22	43	18	47	26
1	98	22	54	22	44	22
2	82	18	44	18	38	19
3	53	12	28	12	25	12
≥4	125	26	76	30	49	21
HIV patients seen by provider, *n*						
>499 (reference)	118	22	70	24	48	19
100–499	290	63	152	61	138	67
<100	40	15	23	15	17	14
Outpatient visits, *n*						
0–2 (reference)	87	18	32	10	55	26
3–5	101	23	57	24	44	21
6–8	115	27	55	23	60	33
≥9	145	32	101	43	44	20

HCSUS, HIV Cost and Services Utilization Study.

Table 2. Logistic Regression Results: Probability of Missed Depression Diagnosis in Medical Chart Among HCSUS Participants with Depression Based on the Mental Health Supplement

N = 448	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI) Adding Number of Outpatient Visits
Gender			
Male (reference)	1.00 —	1.00 —	1.00 —
Female	0.92 (0.67 to 1.26)	0.49 (0.22 to 1.09)	0.45 (0.20 to 1.03)
Age, y			
18–25 (reference)	1.00 —	1.00 —	1.00 —
26–40	2.32 (1.10 to 4.88)*	1.32 (0.56 to 3.11)	1.15 (0.46 to 2.86)
41–49	2.42 (1.28 to 4.57)†	1.16 (0.49 to 2.76)	0.96 (0.39 to 2.34)
≥50	3.89 (1.13 to 13.4)*	1.76 (0.63 to 4.93)	1.39 (0.44 to 4.39)
Race			
White (reference)	1.00 —	1.00 —	1.00 —
African American	1.41 (0.91 to 2.21)	1.41 (0.77 to 2.57)	1.51 (0.73 to 3.12)
Latino	0.81 (0.49 to 1.33)	0.72 (0.34 to 1.53)	0.71 (0.32 to 1.56)
Other	1.45 (0.81 to 2.62)	1.55 (0.48 to 4.97)	1.48 (0.58 to 3.82)
Education			
College or greater (reference)	1.00 —	1.00 —	1.00 —
Some college	1.26 (0.65 to 2.42)	1.44 (0.70 to 2.97)	1.45 (0.70 to 2.99)
High school	1.57 (0.87 to 2.83)	2.03 (0.99 to 4.18)	2.14 (0.98 to 4.64)
Less than high school	1.91 (1.01 to 3.66)*	2.68 (1.22 to 5.88)*	2.50 (1.19 to 5.25)*
HIV exposure			
Men – sex with men (reference)	1.00 —	1.00 —	1.00 —
Injection drug use	1.20 (0.88 to 1.62)	1.41 (0.74 to 2.69)	1.59 (0.76 to 3.31)
Heterosexual	1.56 (0.96 to 2.53)	1.95 (0.73 to 5.18)	2.15 (0.79 to 5.83)
Transfusion/other	0.95 (0.34 to 2.67)	0.87 (0.27 to 2.82)	0.94 (0.28 to 3.19)
Income, $			
>40,000 (reference)	1.00 —	1.00 —	1.00 —
10–40,000	0.76 (0.44 to 1.29)	0.75 (0.38 to 1.47)	0.73 (0.37 to 1.44)
0–10,000	0.75 (0.45 to 1.27)	0.63 (0.32 to 1.23)	0.51 (0.26 to 1.01)
Health insurance			
Private/non-HMO (reference)	1.00 —	1.00 —	1.00 —
None	0.82 (0.46 to 1.46)	0.91 (0.41 to 2.03)	0.95 (0.39 to 2.29)
Medicare	0.51 (0.26 to 1.02)	0.34 (0.17 to 0.70)†	0.33 (0.15 to 0.75)†
Medicaid	0.94 (0.56 to 1.58)	0.85 (0.42 to 1.74)	0.95 (0.41 to 2.23)
Private-HMO	1.16 (0.44 to 3.04)	1.12 (0.57 to 2.19)	0.96 (0.45 to 2.04)
Region in U.S.			
Northeast (reference)	1.00 —	1.00 —	1.00 —
Midwest	1.85 (1.09 to 3.14)*	1.54 (0.48 to 4.92)	1.62 (0.48 to 5.45)
South	1.55 (1.04 to 2.30)*	0.74 (0.31 to 1.78)	0.72 (0.29 to 1.77)
West	0.99 (0.62 to 1.59)	0.62 (0.28 to 1.39)	0.75 (0.34 to 1.66)
CD4 cell count			
≥500/mm³ (reference)	1.00 —	1.00 —	1.00 —
200–500/mm³	0.94 (0.49 to 1.81)	1.11 (0.48 to 2.58)	1.14 (0.46 to 2.80)
50–199/mm³	0.90 (0.43 to 1.91)	1.44 (0.64 to 3.24)	1.34 (0.56 to 3.22)
<50/mm³	1.04 (0.52 to 2.07)	1.12 (0.44 to 2.87)	1.20 (0.42 to 3.40)
AIDS diagnoses, n			
0 (reference)	1.00 —	1.00 —	1.00 —
1	0.68 (0.41 to 1.13)	0.65 (0.38 to 1.14)	0.63 (0.36 to 1.10)
2	0.71 (0.39 to 1.29)	0.74 (0.40 to 1.38)	0.90 (0.46 to 1.78)
3	0.63 (0.28 to 1.41)	0.65 (0.27 to 1.55)	0.67 (0.23 to 1.93)
≥4	0.49 (0.24 to 0.97)*	0.54 (0.25 to 1.17)	0.57 (0.25 to 1.27)
Provider HIV patients, n			
≥500 (reference)	1.00 —	1.00 —	1.00 —
100–499	1.23 (0.89 to 1.72)	1.19 (0.74 to 1.92)	1.28 (0.74 to 2.22)
<100	0.85 (0.47 to 1.54)	0.63 (0.29 to 1.38)	0.64 (0.27 to 1.50)
Outpatient visits, n			
0–2 (reference)	1.00 —	1.00 —	1.00 —
3–5	0.37 (0.17 to 0.80)*	—	0.29 (0.13 to 0.68)†
6–8	0.56 (0.34 to 0.93)*	—	0.53 (0.30 to 0.93)*
≥9	0.19 (0.10 to 0.37)‡	—	0.17 (0.08 to 0.34)‡

* P < .05.
† P < .01.
‡ P < .001.
HCSUS, HIV Cost and Services Utilization Study.

populations (14%)[39] and similar to the frequencies reported for patients with serious medical conditions including post-myocardial infarction, cancer, or stroke/transient ischemic attack (33%–39%).[38–42]

Yet we estimated that only 46% of depressed patients in our sample were recognized as depressed by their health care providers. This finding is similar to the results of previous research in general medical patient populations[16,17,19] that reported that less than half of depressed patients were recognized as depressed by their providers.

Our results suggesting an association between less education and depression underdiagnosis are consistent with previous research.[22] We believe that there are 2 primary clinical implications in regard to this finding. First, patients with low education also may have a lower health literacy, particularly "mental health literacy," which refers to the knowledge and beliefs about mental disorders that would aid in the recognition, management, and prevention of mental illness.[43,44] For example, patients with less education may not consider their depressive symptoms as signs of a potentially serious illness warranting treatment. Second, both limited education and low health literacy have been shown to be associated with poorer treatment adherence.[45,46] Some providers might hesitate to initiate depression treatment for their less-educated patients if they assume that they are less likely to adhere to such treatment.[45]

We were surprised to find that compared to patients with private health insurance, those with Medicare as their primary insurance were less likely to have their depression underdiagnosed. This association was not explained by a greater provider contact (number of visits). Perhaps Medicare, seen more as an "entitled" public health insurance program than Medicaid, might prompt providers to recognize and treat symptoms. Moreover, Medicare providers might be more attuned to the needs of patients with chronic conditions and aware of national guidelines for depression screening and treatment. In contrast, patients with private insurance might be well off enough to afford private psychotherapy or counseling outside of their physicians, and such care might not be recorded by their medical providers.

When we repeated the analysis on a larger sample that screened positive for depressive symptoms based on the CIDI-SF, we also found that patients whose providers who typically see fewer than100 HIV-infected patients were less likely to have their depression diagnosis missed in the medical record. Perhaps providers with a lower HIV patient load provide more comprehensive care to a more diverse patient mix, and hence, might be a part of a team-based comprehensive care service and are subsequently more aware of depression screening and treatment guidelines. Such practices also might have services to assist their patients in applying for public insurance coverage such as Medicare. Although we were not adequately powered to examine correlates of depression diagnosis by practice features (e.g., Ryan White–funded clinics), the impact of

clinic, health plan, and payer (e.g., Medicare, Ryan White) characteristics warrants future investigation.

We also were surprised to find little association between age and race with underdiagnosis of depression based on the full-length CIDI after adjustment. Yet in the CIDI-SF sample, the association between age (26 and older) and region (Midwest and South) and depression underdiagnosis remained after adjustment. Our results based on the full-length CIDI, while not statistically significant after adjustment, also suggest these trends. Although occurring less frequently in older patients, depression has been found to be under-recognized in older patients in previous studies.[18] Perhaps providers of older patients and those from the Midwest or South assume that the depressive symptoms are attributed to HIV or other medical conditions.

The results from the CIDI-SF sample provide additional clues regarding the patient and provider characteristics associated with depression underdiagnosis. Nonetheless, we preferred to emphasize the results based on an established DSM-IV–based diagnostic tool (e.g., CIDI), in order to rule out any ambiguity due to depressive symptoms that might be attributed to alternative causes such as medical comorbidity or substance use, which are usually ruled out with a full structured interview (e.g., full-length CIDI). Moreover, in the HCSUS sample, the positive predictive value for depression based on the CIDI-SF was 0.41 compared to the full-length CIDI,[34] suggesting that a number of patients screening positive on the CIDI-SF might not be considered depressed based on a structured clinical interview. The potential trade-off with using the full-length CIDI sample is a smaller sample size because a greater number of patients screened positive for depressive symptoms based on the CIDI-SF. Hence, we had less power in the full-length CIDI sample to reject the null hypothesis. However, the similar findings for education, insurance, older patients, and those living in the Midwest or South suggest that greater attention to the potential adverse impact of unrecognized depression is warranted for these groups.

Despite the important treatment implications of assessing depression underdiagnosis, findings from this study need to be interpreted with caution. First, patients may have been receiving care for depression without the knowledge of their provider, or the provider may have failed to document depression despite knowledge of the condition. Some clinicians have deliberately substituted an alternative diagnosis (e.g., fatigue) for a depression diagnosis, because of the potential for a psychiatric diagnosis to jeopardize reimbursement or patient benefits.[47] Nonetheless, we studied a nationally representative sample of patients receiving care for recognized HIV infection, and the insurance ramifications of a depression diagnosis might be a moot issue within a patient population with recognized HIV infection. In addition, we did not examine antidepressant medication use and hence may have missed patients whose providers treated depressive symptoms yet did not

record a formal diagnosis. Still, this failure in documentation may reflect a lack in the quality of depression care. Although the consequences for the patient in these cases are less severe than complete failure to diagnose, these represent significant diagnostic failures in themselves.

The underdiagnosis and subsequent undertreatment of depression may result in a number of adverse outcomes, including significant preventable psychiatric morbidity, poor treatment adherence,[23] and functional decline.[25] Depressive symptoms have consistently been found to be associated with poorer adherence to treatment across several chronic diseases,[26–28] including HIV infection.[23] Among general medical populations, both major and subthreshold depressive disorders have been found to be associated with cognitive impairment, greater morbidity,[19,25] mortality,[20] and suicide.[48]

Evidence suggests that the undertreatment of depression is also common among HIV-infected patients,[49–51] and in particular, older HIV-infected individuals.[52] For HIV-infected patients, some providers often assume that depressive symptoms are the inevitable reaction to the HIV diagnosis or HIV dementia,[52] or may have little time to manage the depression due to competing acute medical problems associated with HIV infection.[53] Untreated depression in HIV-infected patients may lead to self-medication with alcohol, drugs, or with alternative therapies such as St. John's Wort, which can reduce the blood level of the protease inhibitor indinavir.[54]

Hence, greater efforts are needed to identify and treat HIV-infected patients with depression. The United States Preventive Services Task force has recommended screening patients at elevated risk for depression, including those with chronic illnesses such as HIV infection.[55] When coupled with provider feedback and treatment protocols, screening for depression can improve outcomes for these patients.[55] Moreover, research has shown that treatment of co-occurring depression with antidepressant medication[56] and psychotherapy[57] is effective and can improve health outcomes for many patients with HIV infection.[58,59] Therefore, strategies for reducing underdiagnosis of depression, including the use of standardized screening instruments at clinic visits[38,55] are needed to increase effective detection and treatment of depression in HIV clinic settings.

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APPENDIX A

Logistic Regression Results: Probability of Missed Depression Diagnosis in Medical Chart
*Among HCSUS Participants with Depression Based on CIDI-SF Results**

N = 538	Adjusted OR (95% CI)
Gender	
Male (reference)	1.00 —
Female	0.65 (0.36 to 1.17)
Age, y	
18–25 (reference)	1.00 —
26–40	3.88 (1.79 to 8.42)[†]
41–49	3.84 (1.73 to 8.54)[†]
≥50	8.74 (2.54 to 30.14)[‡]
Race	
White (reference)	1.00 —
African American	1.34 (0.71 to 2.50)
Latino	0.83 (0.46 to 1.47)
Other	2.02 (0.97 to 4.17)
Education	
College or greater (reference)	1.00 —
Some college	1.70 (0.72 to 4.02)
High school	2.00 (0.89 to 4.49)
Less than high school	2.81 (1.15 to 6.89)[§]
HIV exposure	
Men – sex with men (reference)	1.00 —
Injection drug use	1.48 (0.96 to 2.30)
Heterosexual	1.89 (0.90 to 3.95)
Transfusion/other	0.78 (0.29 to 2.13)
Income, $	
>40,000 (reference)	1.00 —
10–40,000	0.60 (0.30 to 1.22)
0–10,000	0.58 (0.25 to 1.32)
Health insurance	
Private/non-HMO (reference)	1.00 —
None	0.47 (0.19 to 1.17)
Medicare	0.26 (0.10 to 0.68)[†]
Medicaid	0.62 (0.24 to 1.57)
Private–HMO	0.94 (0.28 to 3.16)
Region in U.S.	
Northeast (reference)	1.00 —
Midwest	3.50 (1.61 to 7.63)[†]
South	2.02 (1.14 to 3.57)[§]
West	1.15 (0.56 to 2.34)
CD4 cell count	
≥500/mm^3 (reference)	1.00 —
200–500/mm^3	1.03 (0.48 to 2.20)
50–199/mm^3	1.02 (0.43 to 2.47)
<50 /mm^3	0.91 (0.39 to 2.12)
AIDS diagnoses, n	
0 (reference)	1.00 —
1	0.78 (0.43 to 1.42)
2	0.68 (0.32 to 1.43)
3	1.65 (0.70 to 3.89)
≥4	0.99 (0.50 to 1.96)
HIV patients seen by provider, n	
≥500 (reference)	1.00 —
<100	0.47 (0.24 to 0.93)[§]
100–499	0.85 (0.51 to 1.42)

APPENDIX A (continued)

N = 538	Adjusted OR (95% CI)
Outpatient visits, *n*	
0–2 (reference)	
3–5	0.75 (0.37 to 1.55)
6–8	0.58 (0.32 to 1.05)
≥9	0.39 (0.24 to 0.65)[‡]

* Among the 2,267 HCSUS patients completing second follow-up survey, 1,874 (83%) had medical records available. Of the 538 patients reporting depression, 299 (55%) had a depression diagnosis in the medical record.

[†] *P < .01.*

[‡] *P < .001.*

[§] *P < .05.*

HCSUS, HIV Cost and Services Utilization Study.