Baseline and Acquired Comorbidities in Patients Initiating ART in the HOPS, 2008-2018

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BACKGROUND

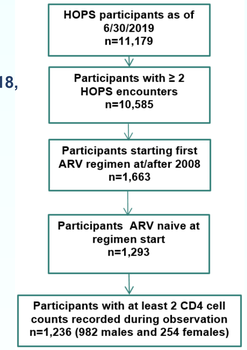
- **Among persons living with HIV (PLWH), the presence of preexisting physical and psychiatric comorbidities at initiation of antiretroviral therapy (ART) and the rate at which they develop may be related to aging, metabolic changes, medication, or socioeconomic factors.**

METHODS

Study Population

- **We studied ART-naïve participants in the multi-site HIV Outpatient Study (HOPS) initiating ART from 2008-2018 with ≥ 2 CD4 cell count determinations measured after ART initiation ("baseline").**

Figure 1: Selection steps, the HIV Outpatient Study, 2008-2018, N = 1,236



- **Variables of interest included demographic factors, HIV risk group, ART type and comorbid conditions: lipid disorders, diabetes, kidney, lung and non-hepatitis liver disease, hepatitis-C, cardiovascular disease (CVD), non-AIDS cancer and mental health diagnoses documented as of ART-start until last HOPS encounter (end of observation).**
- **Comorbidities were determined using abstracted data collected by routine medical records review: lab records, treatments (where applicable), and documented diagnoses.**
- **Participants with evidence of such outcomes from at least one of the three data sources were classified as having that outcome, except for cardiovascular disease, diabetes, and dyslipidemia, for which evidence was required from at least two of the three sources.**

Statistical Methods

- **Yates-corrected chi-square analyses were used to test for changes in burden of comorbidity by sex during observation. Poisson regression models were used to evaluate associations between outcomes by sex, baseline age, obesity and CD4 cell count, further adjusting for race, payor, and individual person-time observation.**

Table 1: Characteristics at baseline of participants by sex, the HIV Outpatient Study, 2008-2018, (N = 1,236)

Baseline characteristic*	N (%)	Female sex	Male sex	P-value†
Overall	1,236 (100.0)	254 (20.6)	982 (79.4)	
Started ART 2008-2012	794 (64.2)	176 (69.3)	618 (62.9)	0.07
Started ART 2013-2018	442 (35.8)	78 (30.7)	364 (37.1)	
Age < 30 years	393 (31.8)	62 (24.4)	331 (33.7)	0.012
Age 30-39 years	332 (26.9)	69 (27.2)	263 (26.8)	
Age 40-49 years	310 (25.1)	69 (27.2)	241 (24.5)	
Age ≥ 50 years	201 (16.3)	54 (21.3)	147 (15.0)	
White, non-Latinx	423 (34.2)	21 (8.3)	402 (40.9)	< 0.001
Black, non-Latinx	538 (43.5)	162 (63.8)	376 (38.3)	
Latinx race/ethnicity	216 (17.5)	58 (22.8)	158 (16.1)	
Other/Unknown race/ethnicity	59 (4.8)	13 (5.1)	46 (4.7)	
MSM HIV risk	719 (58.2)	0 (0.0)	719 (73.2)	< 0.001
Heterosexual HIV risk	406 (32.8)	223 (87.8)	183 (18.6)	
PWID HIV risk	45 (3.6)	10 (3.9)	35 (3.6)	
Other HIV risk	66 (5.3)	21 (8.3)	45 (4.6)	
Private insurance	521 (42.2)	53 (20.9)	468 (47.7)	< 0.001
Public insurance	547 (44.3)	180 (70.9)	367 (37.4)	
No insurance	167 (13.5)	21 (8.3)	146 (14.9)	
Public clinic	674 (54.5)	192 (75.6)	482 (49.1)	< 0.001
Private clinic	562 (45.5)	62 (24.4)	500 (50.9)	
High school education or less‡	409 (33.1)	151 (59.4)	258 (26.3)	< 0.001
Any college‡	389 (31.5)	55 (21.7)	334 (34.0)	
Some post-grad‡	83 (6.7)	3 (1.2)	80 (8.1)	
Education not entered‡	355 (28.7)	45 (17.7)	310 (31.6)	
Alcohol: none‡	550 (44.5)	155 (61.0)	395 (40.2)	< 0.001
Alcohol: < 7/week‡	522 (42.2)	77 (30.3)	445 (45.3)	
Alcohol: 7-14/week‡	93 (7.5)	8 (3.2)	85 (8.7)	
Alcohol: > 14/week‡	71 (5.7)	14 (5.5)	57 (5.8)	
Current/prior smoker	659 (53.3)	147 (57.9)	512 (52.1)	0.12
Substance use‡	410 (33.2)	82 (32.3)	328 (33.4)	0.79
Body mass index < 25 kg/m^2	609 (49.3)	96 (37.8)	513 (52.2)	< 0.001
Body mass index 25 to < 30 kg/m^2	359 (29.0)	56 (22.0)	303 (30.9)	
Body mass index ≥ 30 kg/m^2	268 (21.7)	102 (40.2)	166 (16.9)	
INSTI regimen	434 (35.1)	80 (31.5)	354 (36.1)	< 0.001
PI+NNRTI regimen	2 (0.2)	1 (0.4)	1 (0.1)	
NNRTI regimen	468 (37.9)	77 (30.3)	391 (39.8)	
PI regimen	277 (22.4)	86 (33.9)	191 (19.4)	
Non (PI, NNRTI, INSTI) regimen	55 (4.4)	10 (3.9)	45 (4.6)	
Baseline CD4: median (IQR)	375 (191-554)	360 (201-583)	379 (188-549)	0.63
Hypertension	299 (24.2)	64 (25.2)	235 (23.9)	0.74
Dyslipidemia	394 (31.9)	67 (26.4)	327 (33.3)	0.042
Cardiovascular disease	114 (9.2)	22 (8.7)	92 (9.4)	0.82
Diabetes	61 (4.9)	18 (7.1)	43 (4.4)	0.11
Kidney disease	37 (3.0)	9 (3.5)	28 (2.9)	0.71
Impaired glucose control	52 (4.2)	12 (4.7)	40 (4.1)	0.78
Lung disease (non-cancer)	54 (4.4)	16 (6.3)	38 (3.9)	0.13
Cancer (non-AIDS, non-skin)	27 (2.2)	7 (2.8)	20 (2.0)	0.65
Liver disease (non-hepatitis)	14 (1.1)	3 (1.2)	11 (1.1)	1.00
Hepatitis-C	93 (7.5)	35 (13.8)	58 (5.9)	< 0.001
Depression	312 (25.2)	91 (35.8)	221 (22.5)	< 0.001
Anxiety	171 (13.8)	33 (13.0)	138 (14.1)	0.74
Bipolar disorder	81 (6.6)	20 (7.9)	61 (6.2)	0.42
Psychosis/schizophrenia	18 (1.5)	8 (3.1)	10 (1.0)	0.018

Abbreviations: ART, antiretroviral therapy; INSTI, integrase strand transfer inhibitor; IQR, interquartile range; MSM, men who have sex with men, NNRTI, non-nucleoside analog reverse transcriptase inhibitor; PI, protease inhibitor; PWID, persons who inject drugs.
*Closest to start of first antiretroviral regimen.
†Yates-corrected chi-square test.
‡At first HOPS encounter.

Figure 2: Percent of participants with selected comorbidities at baseline and end of observation by sex, the HIV Outpatient Study, 2008-2018, N = 1,236

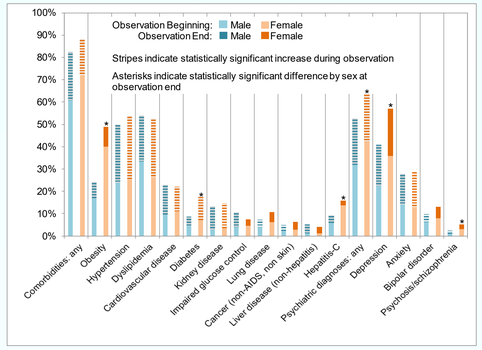
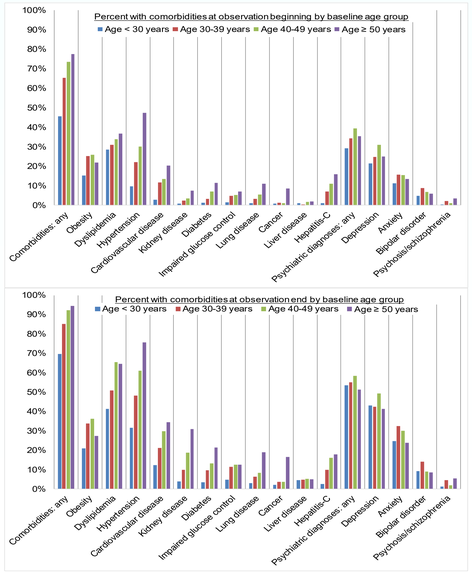


Figure 3: Percent of participants with selected comorbidities at baseline and end of observation, by baseline age group, the HIV Outpatient Study, 2008-2018, N = 1,236



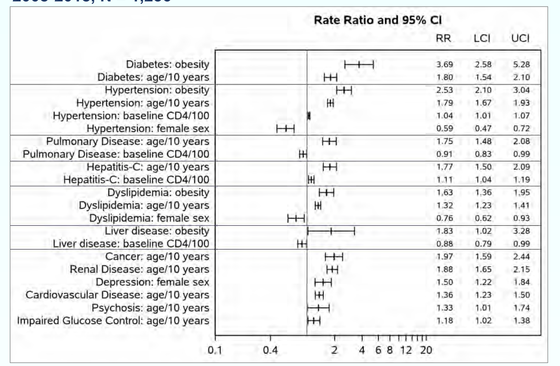
RESULTS, Baseline

- **There were 1,236 participants, 982 (79%) male and 254 (21%) female (Figure 1), median age 36 years, 66% non-white, 44% publicly-insured, 53% with smoking history, 33% with substance use history, and 22% with body mass index > 30 kg/m^2 (Table 1).**
- **The baseline CD4 count was 379 cells/mm^3 for males vs. 360 cells/mm^3 for females (Table 1).**
- **Females were more likely to be older, Black or Hispanic, have public insurance, receive care at a public clinic, and have less formal education (all P < 0.05, Table 1).**
- **At baseline, the percent of participants with any comorbidities increased with age. However, obesity was higher among persons 30-49 years of age, compared with those < 30 or ≥ 50 years of age. The percent of participants with any psychiatric diagnoses or specifically depression was highest among those 40-49 years of age (Figure 3).**

RESULTS, End of observation

- **Participants were followed for a median of 4.9 years, with males: 4.6 years (interquartile range [IQR] = 2.4-7.1), and females: 6.1 years (IQR=3.1-8.3).**
- **Compared with baseline, overall there were statistically significant increases over time by sex for multiple comorbidities, including dyslipidemia, hypertension, CVD, renal disease, diabetes, depression, and anxiety (all P<0.05, Figure 2).**
- **Females were more likely than males to have obesity (Rate Ratio [RR] 2.02, 95% Confidence Interval [95%CI]: 1.71-2.39), diabetes (RR 2.00, 95%CI: 1.43-2.80), hepatitis-C (RR 1.74, 95%CI: 1.23-2.46), depression (RR 1.40, 95%CI 1.23-1.59), and psychosis (RR 2.09, 95%CI: 1.08-4.05) (Figure 2).**
- **95% of persons ≥ 50 years of age had any comorbidity, and persons in this age group had higher percentages of many specific comorbidities (Figure 3).**
- **In multivariable Poisson regression models, multiple comorbidities were associated with increasing age; depression was more likely to occur among females, and baseline obesity was associated with diabetes, hypertension, dyslipidemia and liver disease (Figure 4).**

Figure 4: Multivariable Poisson regression to assess associations between clinical outcomes and predictor variables: sex, baseline age, obesity and CD4 cell count, adjusted for race, payor, and individual person-time observation, the HIV Outpatient Study, 2008-2018, N = 1,236



Abbreviations: CD4/100, CD4 cell count per 100 cells/mm^3; LCI, lower confidence interval; RR, rate ratio; UCI, upper confidence interval. Note: Only associations with P < 0.05 are shown.

CONCLUSIONS

- **HOPS participants starting ART over the past decade already had a significant burden of physical and psychiatric comorbidities at baseline.**
- **Predominant among these comorbidities were acquired metabolic conditions such as obesity and dyslipidemia, as well as psychiatric conditions, all of which complicate the long term management of PLWH.**
- **In multivariable analyses, female HOPS participants were more likely than male participants to have a diagnosis of depression, but less likely to have a diagnosis of either hypertension or dyslipidemia, after adjusting for race/ethnicity and payor.**
- **With advancing age, PLWH who initiate ART experience a clinically significant increase in the burden of chronic non-HIV comorbidities that warrants continued surveillance, prevention, and treatment.**

The findings and conclusions from this presentation are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

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