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## Preferences for HIV Treatment Formulations among Young Adults with HIV in the United States

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**Running head:** ART Preferences among YWH

**Keywords:** Young adults; antiretroviral therapy; preference; rank; long-acting injectable; socioeconomic barriers

## **Introduction**

In the US, youth and young adults with HIV (YWH) experience significant disparities regarding HIV clinical outcomes<sup>1-5</sup>. Compared to older people with HIV (PWH), YWH have lower rates of antiretroviral therapy (ART) initiation<sup>5</sup>; suboptimal ART adherence<sup>5-7</sup>, retention in care<sup>8</sup>, and virologic suppression<sup>9-11</sup>; and higher rates of virologic failure<sup>12</sup> and secondary transmission events<sup>13,14</sup>. Various barriers pose obstacles to HIV care engagement and ART adherence among YWH including pill fatigue, stigma, and mental health and substance use challenges<sup>15-17</sup>.

Currently, long-acting ART (LAART), such as long-acting injectables (LAIs), may help overcome daily adherence challenges by mitigating oral pill challenges and pill fatigue, improving patient satisfaction, and circumventing HIV stigma<sup>18,19</sup>. Studies exploring the

acceptability of LAART among YWH show that many expressed enthusiasm for alternatives to daily oral ART, particularly LAIs and skin patches<sup>15</sup>. However, the need for consistent clinical monitoring, virologic suppression prior to LAART initiation, and LAIs administration in clinical settings may present considerable drawbacks to equity in the scale-up of alternative ART formulations<sup>18,20,21</sup>.

YWH will be directly impacted by decisions surrounding future developments in ART formulations<sup>18</sup>. With notable changes in the side effect profile and ease of dosing of modern ART, YWH have experiences with ART adherence that may differ from older PWH. Additionally, given the health disparities experienced by YWH, their attitudes toward new ART formulations, and their viewpoints on future formulations is critical to better understand how they assign preferences to different ART formulations<sup>15,18</sup>. Therefore, the study goal was to examine preferences for ART formulations among YWH in the US.

## **Methods**

### **Study Design**

We conducted a cross-sectional online survey with youth and young adults (18–29 years old) with HIV (YWH) in the United States. This study was a secondary data analysis to describe preferences for different ART formulations and to explore characteristics related to those preferences. All participants provided consent and the study was approved by the University of California, San Francisco Institutional Review Board.

### **Recruitment and Participants**

Between April–August 2021, we recruited participants using social media posts, dating site ads, and clinics that serve YWH. Potential participants completed the online screening

survey or called or texted the study mobile phone and were screened by the study coordinator<sup>22</sup>.

Eligible participants were: 18–29-year-olds, living in the US, with HIV, able to complete the survey in English, and willing to give consent. Participant age was verified with an uploaded or text-messaged photo ID showing their name and date of birth, and HIV status was verified with a photo of their antiretroviral medication vial or laboratory report or provider letter showing their name and HIV status or viral load. Eligible participants were consented and sent a unique link to complete the Qualtrics survey by text or email. Therefore, all study activities were conducted remotely<sup>23</sup>. Upon survey completion, participants received \$40 via cash transfer mobile app or e-gift card based on their preference.

## Measures

### *Demographics and Socio-economic status*

Demographic variables included participant age, current gender identity, race/ethnicity, sexual orientation, and US geographic region (Midwest, Northeast, South, West). Socio-economic status items included educational attainment, perceived financial stability (I have enough money to live comfortably; I can barely get by on the money I have; I cannot get by on the money I have), living situation, and health insurance status.

### *ART Options*

Participants were asked to rank seven ART formulations (oral daily medications; LAIs given monthly, bimonthly, or every six months; implants; patches; daily gummies) from most to least preferred (1–7). These options were included based on ART formulations that are currently available, those that are under development, and those that participants in prior research had noted as their preference<sup>15</sup>. We also asked participants, if they were to receive LAIs, to rank

where they would prefer to receive injections (current HIV clinic, local pharmacy, mobile van, at home, or some other place).

### *Analysis*

First, we characterized the sample by describing respondents' demographics and socioeconomic factors using frequencies, means, percentages, medians, and interquartile ranges. We then described rankings of each product from 1 (most preferred) to 7 (least preferred) using percentages and numbers for each product ranking and calculating the mean ranking for each product. Next, we examined characteristics associated with the products with the highest ranking. The outcome for this analysis was a binary variable for each product ranked highest versus not. For example, if oral daily ART was ranked number one, the variable would be coded as 1 but if it was ranked 2–7 this variable would take the value of 0. We used unadjusted log binomial models to estimate a prevalence ratio (PRs)<sup>24,25</sup> and 95% confidence intervals for the association between each demographic and socio-economic characteristic and ranking each product first.

### **Results**

Among 271 YWH, most respondents identified as Black non-Latinx (68%) or Latinx (18%), were cis-gender men (84%), and had a median age of 26 (interquartile range 24-28; **Table 1**). Most were living in their own place (57%), had public health insurance (52%), said they could barely get by on the money they had (56%), and had a high school education, GED or less (41%).

Most ranked daily oral pills (34%) or every six-month injections (34%) as their most preferred product (**Supplementary Figure 1, <http://links.lww.com/QAI/B992>**). Other products

were ranked first less often including daily gummies (12%), six-month implants (10%), patches every few months (3%) and injections monthly (3%) and every two months (3%). When asked to rank preferences for places to receive ART injections, 59% ranked their current HIV clinic where they scheduled appointments as their first choice followed by their home (26%). Fewer respondents ranked other places first including no preference (6%), a local pharmacy (4%), and a mobile van (4%).

We did not observe race/ethnicity, age, gender, geographic region, or living situation to be associated with ranking daily oral pills or every six-month injections as the most preferred products (**Table 1**). However, those who said they could not get by on the money they had were less likely (PR=0.57) to rank every six-month injections as their most preferred product versus those who had enough money to live comfortably. Similarly, those who had a public health insurance plan were less likely to rank injections as their top preference (PR=0.61) compared to those with private health insurance. Finally, those who had completed high school, a GED, or less were more likely (PR=1.48) to rank daily oral pills as their most preferred product, and less likely to prefer six-month injections (PR=0.68) versus those with a bachelor's degree or higher.

## **Discussion**

In this study, both oral daily ART and every six-month injections were ranked the highest by a majority of YWH and daily oral gummies were the third highest ranked formulation. Our results align with findings from previous studies which showed high interest in LAIs among YWH<sup>18</sup>. These findings are also consistent with previous research showing that familiarity with daily ART is an important reason why PWH will prefer to remain on this formulation despite potential adherence challenges<sup>20</sup>. Even though gummies represent a currently non-existent

formulation, prior qualitative research has also reported an interest in this formulation<sup>15</sup>. Finally, most respondents ranked their current HIV clinic as their preferred location to receive LAIs followed by their home. These non-clinic-based delivery of LAIs have been associated with lower healthcare costs and greater patient satisfaction in other areas of research<sup>26,27</sup>.

Preference rankings for top-ranked ART formulations did not vary by race/ethnicity, age categories, gender, geographic region, or living situation. However, socioeconomic variables related to higher financial stability, private health insurance, and higher education were associated with ranking six-month injections as most preferred. Furthermore, lower education was correlated with a greater preference for daily oral ART. These findings suggest that greater financial stability, healthcare coverage, and educational access may mitigate barriers that deter YWH from initiating LAIs. Similar to prior research with older PWH<sup>28</sup>, we noted interest in LAIs increased as the injection frequency decreased. In a prior study of YWH<sup>29</sup> who struggled to maintain a suppressed viral load, it was noted that participants welcomed LAIs and expressed interest in a frequency of every 1 or 2 months.

Our study has some limitations. Due to the sample size, our statistical power was limited in detecting additional differences across sub-groups and findings may not be generalizable to all YWH. Our data are self-reported and capture participants' theoretical preferences; therefore, they may be subject to social desirability bias and may change over time. These data were captured cross-sectionally and therefore, we cannot establish causality. Additionally, the results are unadjusted estimates and do not account for confounding. Finally, some formulations were hypothetical (e.g., gummies) and may not have been as relatable as oral ART.

Socioeconomic barriers, such as education, financial stability, and health insurance, that are also associated with health literacy<sup>30</sup>, are likely to impact the uptake and persistence with



newer ART formulations. Interventions designed to improve these barriers may increase willingness to try newer ART formulations and address barriers to HIV care. Future research should examine non-clinic-based delivery of LAIs, such as home administration, which may improve equitable implementation of these promising regimens<sup>21,31</sup>. Additionally, future studies should focus on discrete choice experiments and in-depth qualitative interviews to better understand the preferences of YWH. Research on the perception of YWH regarding novel advancements in HIV therapies can help address health disparities experienced by this population and help achieve the Ending the HIV Epidemic goals<sup>32</sup>.

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**Supplementary Figure 1.** Preference rankings for different HIV treatment formulations among young adults with HIV in the United States (n=270).\*

\*Missing 1 with no data on preference

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**Table 1.** Overall demographics of sample and unadjusted Prevalence Ratios and 95% Confidence Intervals (CIs) for the association between socioeconomic characteristics and first-place rankings of daily oral ART and every 6-month injections.

	Overall	Daily oral pills ranked first		Injections every 6 months ranked first	
	Demographics	(n=92)		(n=91)	
	N (%)	Unadjusted Prevalence Ratio (95% CI)	p-value	Unadjusted Prevalence Ratio (95% CI)	p-value
<b>Race/ethnicity*</b>					
Latinx	48 (18.1)	0.85 (0.47, 1.53)	0.585	1.13 (0.66, 1.93)	0.652
Black non-Latinx	180 (67.7)	0.92 (0.58, 1.47)	0.742	0.83 (0.52, 1.33)	0.450
Other non-Latinx	38 (14.3)	1	-	1	-
<b>Age</b>					
18–24 years	79 (29.1)	1		1	
25–29 years	192 (70.9)	1.11 (0.76, 1.62)	0.593	1.03 (0.71, 1.50)	0.860
<b>Gender*</b>					
Cisgender man	227 (84.4)	1		1	
Other**	42 (15.6)	0.75 (0.44, 1.28)	0.293	1.06 (0.68, 1.66)	0.791
<b>Financial Stability *</b>					
I cannot get by on the money I have	60 (21.1)	1.21 (0.72, 2.03)	0.475	<b>0.57 (0.33, 0.99)</b>	<b>0.046</b>

I can barely get by on the money I have	149 (56.2)	1.13 (0.72, 1.78)	0.585	0.82 (0.56, 1.21)	0.322
I have enough money to live comfortably	56 (22.6)	1	-	1	-
<b>Health Insurance*</b>					
None	35 (13.1)	1.14 (0.65, 1.98)	0.645	0.71 (0.41, 1.22)	0.220
Public plan (Medicaid/Medi-Cal or Medicare)	139 (52.1)	1.25 (0.86, 1.82)	0.243	<b>0.61 (0.43, 0.87)</b>	<b>0.007</b>
Any private insurance (own, student, spouse, parent)	93 (34.8)	1	-	1	-
<b>Living Situation*</b>					
Unhoused	13 (4.8)	1.71 (0.55, 5.36)	0.355	0.86 (0.37, 1.99)	0.717
Acquaintance place	16 (5.9)	0.95 (0.54, 1.66)	0.855	0.90 (0.62, 1.30)	0.559
Group place	87 (32.2)	1.2 (0.41, 3.49)	0.738	0.70 (0.29, 1.67)	0.416
Own place	154 (57.0)	1	-	1	-
<b>Education</b>					
High school or GED or less	111 (41.0)	<b>1.48 (0.94, 2.32)</b>	<b>0.092</b>	<b>0.68 (0.44, 1.06)</b>	<b>0.088</b>
Some college, less than a bachelor's degree	102 (37.6)	0.91 (0.54, 1.52)	0.725	0.95 (0.63, 1.42)	0.799
Bachelor's degree or higher	58 (21.4)	1	-	1	-
<b>Geographic region</b>					
South	134 (49.4)	0.83 (0.52, 1.31)	0.416	1.09 (0.70, 1.72)	0.695
West	65 (24.0)	1.14 (0.71, 1.83)	0.584	0.81 (0.46, 1.41)	0.455
Northeast	26 (0.6)	0.73 (0.35, 1.52)	0.400	0.66 (0.30, 1.48)	0.318



Midwest	46 (17.0)	1	-	1	-
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Bold:  $p \leq 0.10$

\*Missing: Race (5), Gender (2), Financial Stability (6), Health Insurance (4), Living Situation (1), product rankings (1)

\*\* Other gender includes gender non-binary, woman, Trans man/Transgender Man/FTM, Trans woman/Transgender Woman/MTF , Genderqueer, Genderfluid, or Gender variant, Questioning or unsure of gender identity and other gender

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