Antiretroviral therapy experience, satisfaction, and preferences among a diverse sample of young adults living with HIV

Chadwick K. Campbell[a], Karine Dubé[b], John A. Sauceda[a], Samuel Ndukwe[b] and Parya Saberi[a]

[a]Center for AIDS Prevention Research, Department of Medicine, University of California San Francisco, San Francisco, CA, USA; [b]UNC Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

ABSTRACT

Youth and young adults living with HIV (YLWH) have a high HIV infection rate and suboptimal oral medication adherence. Biomedical researchers hope that long-acting antiretroviral therapy (LAART) modalities can help those who struggle with daily oral adherence. While adults living with HIV have expressed interest in LAART, little research has explored perspectives of YLWH. This study explores ART experiences and perspectives on LAART through qualitative interviews with twenty diverse YLWH (18–29) in the United States. Data were analyzed using framework analysis. Most participants were satisfied with their current ART yet had experienced side effects or had struggled with daily adherence. Preferences for improving daily oral ART included making pills smaller and reformulating ART into flavored chewable gummies. Most expressed enthusiasm for LAART, although needle aversion and previous injection drug use were potential barriers for some. Approximately half were interested in an ART patch, though its visibility and fear of stigmatization was concerning. Few expressed interest in implantable ART, calling it unappealing. Although younger people are most likely to benefit from these advancements in HIV treatment, additional research is needed to identify gaps in uptake and to further explore perspectives of YLWH to improve the success of new treatment modalities.

ARTICLE HISTORY
Received 18 February 2021
Accepted 29 October 2021

KEYWORDS
HIV; youth and young adults living with HIV; antiretroviral therapy; satisfaction; qualitative interview

Introduction

Youth and young adults living with HIV (YLWH), approximately 13–29 years of age, are among the groups least likely to be aware of their HIV serostatus (Kahana et al., 2016; Zanoni & Mayer, 2014). In 2018, the first and second highest HIV infection rates were among young adults between the ages of 25–29 and 20–24 years old, respectively (Centers for Disease Control and Prevention, 2020). While antiretroviral therapy (ART) uptake and sustained HIV viral load suppression among YLWH have improved, the overall rate of virologic suppression remains suboptimal (Beer et al., 2017). Low levels of ART adherence among YLWH can lead to drug resistance, transmission of drug-resistant virus, and poor health outcomes, among other negative consequences.

Barriers to optimizing HIV treatment adherence include a range of factors that are structural, such as lacking access to healthcare, challenges with filling prescriptions, inadequate transportation to doctor appointments or to collect medications, and interpersonal factors, such as social isolation and problems with family, work, or school (Centers for Disease Control and Prevention, 2019; Granich et al., 2017; Lall et al., 2015; Rudy et al., 2009). For others, physical symptoms, forgetting to take medications, not wanting to be reminded of their diagnosis, needing a break from ART, and HIV stigma are consistently associated with poor ART adherence (MacDonell et al., 2011; MacDonell et al., 2013; Rao et al., 2007). While these barriers are well-documented, what is less understood is the degree to which they exacerbate disparities among YLWH.

Researchers are hoping that long-acting ART (LAART) modalities (e.g., Injectables, implants) can reduce or eliminate the need for oral ART and improve ART adherence (Flexner, 2018; Kanazawa et al., 2020; Nyaku et al., 2017; Weld & Flexner, 2020). Adults living with HIV have generally expressed interest in and willingness to accept alternatives to daily oral ART (Dubé, Eskaf, et al., 2020). However, less is known about YLWH and their perceptions of these potential treatment options. Prior data show that half of YLWH express concerns about the potential side effects of LAART (Weld et al., 2019; Williams et al., 2013). Nevertheless, research also suggests that YLWH are enthusiastic about long-acting injectable ART (LAI-ART) versus a daily pill, particularly among those who struggle with

CONTACT Chadwick K. Campbell Chadwick.Campbell@ucsf.edu

medication adherence (Simoni et al., 2019; Weld et al., 2019).

There are numerous factors that contribute to the ways YLWH perceive newer ART formulation, including the history of injection drug use, experience with injectable or implantable contraceptives, length of time on oral ART, race, and gender (Dubé, Campbell, et al., 2020; Saberi et al., 2020; Simoni et al., 2019; Weld et al., 2019; Williams et al., 2013). As LAART rolls out, YLWH, particularly those who struggle with medication adherence, will be ideal candidates for these treatment options. Thus, there is a critical need for a greater understanding of youth's perceptions, concerns, and interests in these treatment modalities. To better understand these perspectives, this paper describes findings from qualitative interviews with a diverse group of YLWH in the United States exploring their ART experiences and their perceptions of newer ART delivery options.

Methods

In the Youth4Cure study (https://youth4cure.ucsf.edu), we conducted semi-structured one-on-one qualitative interviews with YLWH (18–29 years old) to explore the perceptions, motivations, and barriers to participation in HIV cure research. In addition to domains specific to HIV cure-related research, we asked participants about their experiences with ART, their perceptions of their current treatment, and how their treatment experiences could be improved.

We purposively (Coyne, 1997) recruited participants to achieve diversity of race, ethnicity, gender, and geographic location in the US. Participants were recruited by contacting previous study participants who had given consent to be contacted for future research, through peer referral, and by contacting staff at organizations serving YLWH. Eligible participants were 18–29 years old, living with HIV, English-speaking, and living in the US and had access to a mobile telephone and/or a computer connected to the internet. We verified age and HIV status by asking participants to text message a photograph of an identification card to validate the date of birth and a proof of HIV status (a letter of diagnosis, laboratory results, or HIV medication prescription).

Interviews were conducted virtually by the principal investigator and co-author (PS), using a Health Insurance Portability and Accountability Act (HIPAA)-compliant video-conference service. All participants provided verbal consent prior to beginning the interviews. Interviews lasted 45–60 min and all participants received a $40 e-gift card. We recruited participants until three co-authors (PS, KD, and CC), who listened to each interview, agreed that saturation (Guest et al., 2006, 2020) had been reached. Analysis was guided by framework analysis (Gale et al., 2013), a systematic process of thematic analysis in which the entire interdisciplinary team is involved in coding and developing an analytical framework. Using the agreed upon framework, the first author charted the data into a framework matrix, which involved summarizing the data into a priori and emergent categories.

Results

We interviewed a diverse sample of 20 YLWH between the ages of 18–29 years. They were 60% male, 25% female, and 15% nonbinary/genderqueer, and represented a range of sexual identities including gay (50%), bisexual (30%), heterosexual (10%), queer (5%), and pansexual (5%). On average, 85% of participants had been living with HIV for 4.5 years (range = 10 months – 8 years), and the remaining 15% were diagnosed at birth. Nearly all (95%) reported being on ART and having an undetectable HIV viral load.

We asked YLWH about their experiences with ART since being diagnosed with HIV, and what would improve their experiences with treatment. In addition to their suggestions, we elicited participant perspectives on LAART. Exemplary quotes are displayed in Table 1 (treatment experiences), and Table 2 (treatment improvement and new technologies).

Treatment experiences

Side effects

Over one-third of participants reported side effects from previous ART or when they first started their current HIV medications. Most participants were prescribed more than one ART regimen since being diagnosed, largely due to self-reported side effects. At the time of the interview, only a few participants reported mild side effects that they attributed to ART, and nearly all expressed that they were satisfied with their current medications.

ART adherence

For a few participants, adherence challenges and fear of the consequences of ART non-adherence were a major source of anxiety. One woman who was diagnosed at birth attributed her previous adherence challenges to treatment fatigue. "having adherence issues in the past … , Being so tired of taking medicine … , it's just so much. I've been taking medicine my entire life." (25-year-old Black female). While other participants mentioned being "bored" or "tired" of their medications, most reported rarely or never missing a dose.

Table 1. Representative quotes: treatment experiences.

		Age	Race/ Ethnicity	Gender	Years since diagnosis
Experienced side effects	"I haven't had really much side effect … the only real side effect was with the first two I was on … it would give me insomnia … I'm on [ART name] now and get really weird dreams … "	23	White	Female	3
	"I don't know if it's since I started medication, or if the virus has taken a toll on my body, I have seen a huge difference in my energy, I don't have the stamina to go day by day … it made me so lethargic than what I used to be."	26	Multi	Gender-Queer	8
	"I am on a one-pill a day regimen … Since 2012, I was first put on [ART name], I had one of the worst side effects. I broke into rash, from my head to my feet, like blistery, it was very bad … 2013 to 2016, I was then put on [ART name]. I had some of the worst migraines, and CAT Scans, and then from [ART name], I was put on [ART name], and those migraines were gone."	29	White	Gender-Queer	8
Current treatment perceptions	"I don't have any side effects … I just take one a day … there is nothing too crazy about it."	23	Black	Male	2
	"I've been feeling great! I just feel like any other person … all I do is wake up and take 2 pills in the morning and go about my day."	23	Latinx	Male	2
	"I don't really know. I've been so accustomed to taking the pill. I just pop a pill. 'It's not a big deal to me [one pill a day]. I was on 3 pills a day. I've been through the cross-fires and the experiments in the early stages."	24	Black	Female	Since birth
Adherence	"It's just a constant reminder to always remember to take it … Maybe in 1 month I'll miss it once or twice … I'm usually on top of my game … I take it all the time … Sometimes with youth, we do need a reminder to take medication."	23	Black	Male	2
	"Just being away from my medicine made me nervous about mistake again because I just want to be alright you know."	29	White	Male	8
	"Default … I've been on HIV meds for so long now, it's like automatic in the morning."	23	White	Male	Since birth
	"Recently I've had to start setting reminders, there's just so much going on … I'm using this app called [app name] for taking my medications on time … it's pretty comprehensive."	29	Black	Male	8
	"They can be difficult at times … sometimes you're in a rush and you forget … that little thing can throw you off … if I'm traveling, I need to remind myself to pack my meds … It's a little thing you can forget so easily but it's so important."	23	Latinx	Male	2

Some used weekly pill boxes, mobile apps, or alarms on their phones as reminders. Others described taking medications for so long that it had become "routine" or "automatic." Although, for some, even after years of taking ART, when they were out of their daily routine (e.g., On vacation, at someone else's house), it was still easy to forget their medications.

Improvements to treatment experience

Long-acting antiretrovirals

Injectables. Most participants expressed enthusiasm for the possibility of having a periodic injection of ART. They viewed injectables as having the potential to make life easier by allowing them to live without having to remember to take medications – potentially improving medication adherence. Preferences for the amount of time between injections varied, with some expressing excitement for ART that lasts one month and others expressing that a 3–6-month interval would be ideal. Several participants highlighted social benefits such as traveling without their medications, not worrying about someone seeing their ART, or not worrying about the need for high levels of oral ART adherence. However, this enthusiasm was diminished for some due to a fear of needles. One participant discussed their aversion to needles as tied to their history of injecting drugs, and how injecting ART would not be optional as needles were connected to his previous drug use.

ART patches. Approximately half of the participants expressed interest in the possibility of using LAART patches. The existence of patches for contraception and smoking cessation gave them a reference point to think about this as a viable strategy. The perceived advantage was similar to injectables in that they would no longer have to worry about taking an oral pill every day. However, some participants expressed concern about the visibility of the patch to others, which could be stigmatizing and lead others to ask uncomfortable questions.

ART implants. YLWH were the least interested in receiving ART through an implant. A small group of participants suggested that an implant that could not be seen by others and that could be simply changed periodically would be appealing. However, most were not comfortable with what would be a foreign object being placed inside their bodies, and worried about potential side effects. Similar to patches, several associated the idea with contraception, and one young woman emphasized that she was also unwilling to use contraceptive implants because of "potential complications". Though, participants were not specific about

Table 2. Representative quotes: treatment improvements.

	Exemplary Quotes	Age	Race/ Ethnicity	Gender	Years since diagnosis
Long-Acting ART Injectables	*Positive Perspectives* "You can take a shot now that can last a whole month … I think that's cool … If I'm traveling somewhere, I don't have to worry about packing my meds … It would make everyday activities a little easier."	23	Latinx	M	2
	"My wish list … would be for an injectable that actually works … that's long-standing … it lasts for 3 to 6 months, long-standing, stays in our system, and the results show if our system is accepting the medicine."	25	Black	F	Since birth
	"I go [to see my doctor] every 6 months now. If I were to go every month, it would still be better than worrying if I took my medicine today … just the responsibility of taking my medicine every day … I would rather just go see my doctor every month."	29	White	M	8
	Negative Perspectives				
	"I'm very scared of needles … I have a fear of needles, I'm always scared when the needles come towards me … I don't like the idea of being injected with anything."	23	Black	M	8
	"I would rather have a pill. I never like injecting medicines, I'm not a big fan of needles."	27	Asian	M	6
	"Given my own drug use [history], I wouldn't want to use needles."	26	Multi	Gender-queer	8
Patches	*Positive Perspectives*				
	"I have the patch for birth control and that works pretty well."	23	White	F	3
	"Like a patch … something that could help you with the medication it would be pretty amazing … You know how some patch are like for birth control?' … Would want to change every week to 1 month."	26	N/A	F	7
	Negative Perspectives				
	"I wouldn't do like a patch, just because what if you're swimming, people would have questions."	29	White	M	8
	" … patches … I feel those are chemically structured things that could have an imbalance to give off a side effect at any moment."	25	Multi	M	1
Implants	*Positive Perspectives*				
	"It would be nice to have an implant and not have to have it showing … I wouldn't mind having it changed every 6 months."	20	N/A	M	1
	"Yeah, 'cuz I thought birth control, they send it in a little space ship, like Galactica … absolutely, especially if there was Galactica going on in my body, absolutely, yes!"	27	Multi	Nonbinary	5
	Negative Perspectives "I don't know about implant … I don't even get the birth control implant because of the complications and stuff … I would worry about the implant but that's what research is for … I would do a patch."	25	Black		
F Since birth					
	" … if I had something implanted into my body, it would give me some anxiety, something implanted from the outside, so it's kinda like a personal thing, it might not hurt, but it would be a synthetic thing inside my body."	28	Asian	M	3
	"I would never implant anything in my body, I can't do that."	29	White	M	4
	"Implants would like … you have to consider other worries, like how long does it maintain, and for certain situations, your implant will not work, or lose its effect. With a pill, you take it or not take it, and you don't have other elements you are not worried about. It's simpler."	27	Asian	M	6
Other treatment improvement ideas	"Gummies! Make pills into gummies. It would break the typical ritual of pill swallowing to something you don't even have to think … [flavored] would be ideal, but I guess flavorless would be okay."	26	Multi	Gender-queer	8
	"I love chewing daily vitamins and stuff … and if it was a nice taste, I wouldn't mind taking it every day … give gummy bears"	20	N/A	M	1
	"I have to cut the pill in half to take it because if not it gets stuck in my throat."	25	Black	F	Since Birth
Satisfied with current regimen	"I'm so used to taking my medicine that I don't have a problem."	23	Black	F	Since birth
	"I feel like there's nothing to improve currently because I'm pretty [content] with it."	23	Multi	M	Since birth

what they perceived to be the potential complications of implants.

Other ART improvements

When considering what might improve their treatment experience, some participants focused on making changes to the pills themselves. A number of participants suggested that changing pills into chewable flavored gummies would make it a more pleasant experience. Here, the existing use of gummies for other therapeutics and vitamins served as a reference point. Others expressed that they would like smaller pills as their current medications were large and difficult to swallow. Finally, three of the four participants who were diagnosed at birth expressed being accustomed to their current ART regimens, noted anxiety about making substantial changes to their regimens. Since they felt that taking a daily pill was not a problem, they didn't see the need to make changes to the way they took ART.

Discussion

Our qualitative study findings can inform the development of new ART therapeutics and ensure that uptake and acceptability are not hindered by unmet needs and challenges of YLWH, including having less experience with ART, struggling with oral adherence, navigating the transition into autonomous adulthood, and worrying about stigma and disclosure (Griffith & Agwu, 2017; MacDonell et al., 2013; Rao et al., 2007; Yehia et al., 2013). Interestingly, while most participants expressed having little to no trouble adhering to their ART regimen by using adherence reminders (e.g., Weekly pill boxes, alarms), they also described previous difficulties with adherence which led to anxiety about possibly missing doses in the future. Consistent with previous studies (Franco et al., 2002; MacDonell et al., 2011; MacDonell et al., 2013; Shubber et al., 2016), YLWH described ART non-adherence as a function of being out of their regular routines (e.g., On vacation, sleeping at a friend's house), forgetting, and experiencing treatment fatigue. Despite reported adherence challenges and side effects, emerging data show that PLWH will choose to remain on daily oral ART as it is most familiar and its effectiveness is known (Dubé, Campbell, et al., 2020) . Indeed, participants who were perinatally infected felt that taking medications was routine and questioned whether it was worth trying new ART. As noted by MacDonell et al. (2013), perinatally-infected YLWH have much more experience with ART and are likely to have, at some point been prescribed less tolerable regimens. For one woman in our study, taking one pill a day is "not a big deal" compared to the three pill a day regimen she had previously experienced (Table 1). Some participants thought that the oral medications could be improved by making pills smaller, or by being formulated into flavored chewable gummies.

Reflecting the scientific advances in ART, most participants were not experiencing side effects attributed to their current ART regimen. Experiences of side effects with oral daily ART may cause some PLWH to be concerned about the potential side effects of LAI-ART (Simoni et al., 2019). Others have reported that they would weigh the likelihood of additional side effects or long-term negative health outcomes before switching to LAART (Dubé, Eskaf, et al., 2020) . In this study, few YLWH raised concerns about the potential side effects of LAI-ART. Given the high level of interest in LAI-ART in our sample, our findings echo the previous research suggesting that YLWH who are more interested in LAI-ART expressed fewer concerns than those who were less interested (Weld et al., 2019). The most common barrier to LAI-ART in our sample was needle aversion. Consequently, a number of participants expressed that getting regular injections would not be an acceptable alternative, with one individual expressing concerns related to his previous experience with injection drug use. This is in line with prior findings suggesting that a fear of needles and drug use histories can be a barrier to LAI-ART (Simoni et al., 2019).

We explored the acceptability of theoretical frequencies of injections in our sample of YLWH, which interestingly, varied. Some expressed enthusiasm for the possibility of a treatment that "can last a whole month," while others felt that it would be ideal if treatment lasted 3–6 months. Indeed, there have been variations in the frequency of injections and acceptability of those frequencies across other published studies, which have implications for switching from daily oral ART. Some younger PLWH may be more receptive of higher frequency injections, compared to older PLWH (Simoni et al., 2019), which perhaps implies a preference for more regular clinical contact. Though, Weld et al. (2019) found that, among YLWH, interest in LAI-ART increased as the frequency of injections decreased. Saberi et al. (2020) found that those under 50 were more likely to prefer injections that last 6 months, while those 50 and over were willing to accept injections monthly or bimonthly. Overall, data suggest there is no clear pattern of preference for the frequency of injections and that new research is warranted.

Other forms of LAART including subdermal implants and patches were less popular among our participants. While a few did express enthusiasm about these options, for others, these modalities raised concerns about having a foreign object in their bodies or stigma from a visible patch. In both cases, some expressed concerns about possible side effects. These perspectives add to quantitative findings in which PLWH preferred injectable ART over implants (Dandachi et al., 2020; Weld et al., 2019). However, it is worth noting that these modalities are familiar as some participants referenced patches and implants used for smoking cessation and contraception. As a result of their familiarity, some YLWH may be more receptive to these alternatives.

Our findings are limited by the relatively small sample of YLWH. While we recruited a diverse sample, additional studies are necessary to capture broader, more representative samples to gain more generalizable results. Despite their limitations, these findings offer significant perspectives of a diverse sample of YLWH, from different regions of the US, on newer treatment modalities. Further, our findings include the perspective of YLWH across a wide range of time living with HIV, from those diagnosed at birth to those who had been diagnosed within the previous year. Given the health disparities experienced by this younger age group, their perceptions, concerns, and preferences about new treatment modalities are critical to understand. Additional research is needed to further explore perspectives to improve the success of new treatment modalities, increase viral suppression rates, and prevent onward transmission among YLWH, each of which contribute to the goals of the US plan to end the epidemic (US Department of Health & Human Services, 2019).

Acknowledgements

We would like to thank our participants for generously sharing their experiences and perspectives to our study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by National Institute of Mental Health [grant number R21MH122280].

ORCID

Karine Dubé http://orcid.org/0000-0003-3458-1539

References

Beer, L., Mattson, C. L., Bradley, H., & Shouse, R. L. (2017). Trends in ART prescription and viral suppression among HIV-positive young adults in care in the United States, 2009–2013. *Journal of Acquired Immune Deficiency Syndromes*, *76*(1), e1. https://doi.org/10.1097/QAI.0000000000001427

Centers for Disease Control and Prevention. (2019). *Understanding the HIV care continuum*. https://www.cdc.gov/hiv/pdf/library/factsheets/cdc-hiv-care-continuum.pdf

Centers for Disease Control and Prevention. (2020, May). *HIV Surveillance Report, 2018 (Updated)*. Vol. 31. Retrieved October 15, 2020 http://www.cdc.gov/hiv/library/reports/hiv-surveillance.html

Coyne, I. T. (1997). Sampling In qualitative research. Purposeful and theoretical sampling; Merging or clear boundaries? *Journal of Advanced Nursing*, *26*(3), 623–630. https://doi.org/10.1046/j.1365-2648.1997.t01-25-00999.x

Dandachi, D., Dang, B. N., Lucari, B., Swindells, S., & Giordano, T. P. (2020). Acceptability and preferences for long-acting antiretroviral formulations among people with HIV infection. *AIDS Care*, *33*(6), 81–89. https://doi.org/10.1080/09540121.2020.1764906

Dubé, K., Campbell, D. M., Perry, K. E., Kanazawa, J. T., Saberi, P., Sauceda, J. A., Poteat, T., & Evans, D. (2020). Reasons people living with HIV might prefer oral daily antiretroviral therapy, long-acting formulations, or future HIV remission options. *AIDS Research and Human Retroviruses*, *36*(12), 1054–1058. https://doi.org/10.1089/aid.2020.0107

Dubé, K., Eskaf, S., Evans, D., Sauceda, J., Brown, B., Averitt, D., Martel, K., Meija, M., & Campbell, D. (2020). The dose response: Perceptions of people living with HIV in the United States on alternatives to oral daily antiretroviral therapy. *AIDS Research and Human Retroviruses*, *36*(4), 324–348. https://doi.org/10.1089/aid.2019.0175

Flexner, C. (2018). Antiretroviral implants for treatment and prevention of HIV infection. *Current Opinion in HIV and AIDS*, *13*(4), 374–380. https://doi.org/10.1097/COH.0000000000000470

Franco, M., Diego, R., Claudio, A., Giampietro, G., Giampaolo, Q., Gary Antezana, C., Laura, R., & Fredy, S. (2002). Simpler regimens may enhance adherence to antiretrovirals In HIV-infected patients. *HIV Clinical Trials*, *3*(5), 371–378. https://doi.org/10.1310/98B3-PWG8-PMYW-W5BP

Gale, N. K., Heath, G., Cameron, E., Rashid, S., & Redwood, S. (2013). Using the framework method for the analysis of qualitative data In multi-disciplinary health research. *Bmc Medical Research Methodology*, *13*. https://doi.org/11710.1186/1471-2288-13-117

Granich, R., Gupta, S., Hall, I., Aberle-Grasse, J., Hader, S., & Mermin, J. (2017). Status and methodology of publicly available national HIV care continua and 90-90-90 targets: A systematic review. *PLoS Medicine*, *14*(4), e1002253. https://doi.org/10.1371/journal.pmed.1002253

Griffith, D. C., & Agwu, A. L. (2017). Caring for youth living with HIV across the continuum: Turning gaps into opportunities. *AIDS Care*, *29*(10), 1205–1211. https://doi.org/10.1080/09540121.2017.1290211

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, *18*(1), 59–82. https://doi.org/10.1177/1525822X05279903

Guest, G., Namey, E., & Chen, M. (2020). A simple method to assess and report thematic saturation In qualitative research. *PLoS ONE*, *15*(5), e0232076. https://doi.org/10.1371/journal.pone.0232076

Kahana, S. Y., Jenkins, R. A., Bruce, D., Fernandez, M. I., Hightow-Weidman, L. B., Bauermeister, J. A., & Interventions, A. M. T. N. F. H. A. (2016). Structural determinants of antiretroviral therapy use, HIV care attendance, and viral suppression among adolescents and young adults living with HIV. *PLoS ONE*, *11*(4), e0151106. https://doi.org/10.1371/journal.pone.0151106

Kanazawa, J. T., Saberi, P., Sauceda, J. A., & Dubé, K.. (2020). The LAIs Are Coming! Implementation Science Considerations for Long-Acting Injectable Antiretroviral Therapy in the United States: A Scoping Review. *AIDS Research and Human Retroviruses*, *37*(2), 75–88. https://doi.org/10.1089/aid.2020.0126

Lall, P., Lim, S. H., Khairuddin, N., & Kamarulzaman, A. (2015). An urgent need for research on factors impacting adherence to and retention In care among HIV-positive youth and adolescents from key populations. *Journal of the International AIDS Society*, *18*, 19393. https://doi.org/10.7448/IAS.18.2.19393

MacDonell, K. E., Naar-King, S., Huszti, H., & Belzer, M. (2013). Barriers to medication adherence In behaviorally and perinatally infected youth living with HIV. *AIDS and Behavior*, *17*(1), 86–93. https://doi.org/10.1007/s10461-012-0364-1

MacDonell, K. E., Naar-King, S., Murphy, D. A., Parsons, J. T., & Huszti, H. (2011). Situational temptation for HIV medication adherence In high-risk youth. *AIDS Patient Care and STDs*, *25*(1), 47–52. https://doi.org/10.1089/apc.2010.0172

Nyaku, A. N., Kelly, S. G., & Taiwo, B. O. (2017). Long-acting antiretrovirals: Where are we now? *Current HIV/AIDS Reports*, *14*(2), 63–71. https://doi.org/10.1007/s11904-017-0353-0

Rao, D., Kekwaletswe, T., Hosek, S., Martinez, J., & Rodriguez, F. (2007). Stigma and social barriers to medication adherence with urban youth living with HIV. *AIDS Care*, *19*(1), 28–33. https://doi.org/10.1080/09540120600652303

Rudy, B. J., Murphy, D. A., Harris, D. R., Muenz, L., & Ellen, J. (2009). Patient-related risks for nonadherence to antiretroviral therapy among HIV-infected youth In the United States: A study of prevalence and interactions. *AIDS Patient Care and STDs*, *23*(3), 185–194. https://doi.org/10.1089/apc.2008.0162

Saberi, P., Esaf, S., Sauceda, J., & Dubé, K.. (2020). Perceptions of HIV Virologic Control Strategies Among Younger and Older Age Groups of People Living with HIV in the United States: A Cross-Sectional Survey. *AIDS Research and Human Retroviruses*, *36*(7), 606–615. https://doi.org/10.1089/aid.2020.0023

Shubber, Z., Mills, E. J., Nachega, J. B., Vreeman, R., Freitas, M., Bock, P., Nsanzimana, S., Penazzato, M., Appolo, T., & Doherty, M. (2016). Patient-reported barriers to adherence to antiretroviral therapy: A systematic review and meta-analysis. *PLoS Medicine*, *13*(11), e1002183. https://doi.org/10.1371/journal.pmed.1002183

Simoni, J. M., Beima-Sofie, K., Mohamed, Z. H., Christodoulou, J., Tapia, K., Graham, S. M., Ho, R., & Collier, A. C. (2019). Long-acting injectable antiretroviral treatment acceptability and preferences: A qualitative study among US providers, adults living with HIV, and parents of youth living with HIV. *AIDS Patient Care and STDs*, *33*(3), 104–111. https://doi.org/10.1089/apc.2018.0198

US Department of Health and Human Services. (2019). *What is "ending the HIV epidemic: A plan for America"*.

Weld, E. D., & Flexner, C. (2020). Long-acting implants to treat and prevent HIV infection. *Current Opinion in HIV and AIDS*, *15*(1), 33. https://doi.org/10.1097/COH.0000000000000591

Weld, E. D., Md Sohel, R., Dallas, R. H., Camacho-Gonzalez, A. F., Ryscavage, P., Gaur, A. H., Chakraborty, R., Swindells, S., & Flexner, C. (2019). Interest of youth living with HIV In long-acting antiretrovirals. *Journal of Acquired Immune Deficiency Syndromes*, *80*(2), 190. https://doi.org/10.1097/QAI.0000000000001896

Williams, J., Sayles, H. R., Meza, J. L., Sayre, P., Sandkovsky, U., Gendelman, H. E., Flexner, C., & Swindells, S. (2013). Long-acting parenteral nanoformulated antiretroviral therapy: Interest and attitudes of HIV-infected patients. *Nanomedicine: Nanotechnology, Biology, and Medicine*, *8*(11), 1807–1813. https://doi.org/10.2217/nnm.12.214

Yehia, B. R., Kangovi, S., & Frank, I. (2013). Patients In transition: Avoiding detours on the road to HIV treatment success. *Aids (London, England)*, *27*(10), 1529–1533. https://doi.org/10.1097/QAD.0b013e328360104e

Zanoni, B. C., & Mayer, K. H. (2014). The adolescent and young adult HIV cascade of care in the United States: Exaggerated health disparities. *AIDS Patient Care and STDs*, *28*(3), 128–135. https://doi.org/10.1089/apc.2013.0345