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Young Adult Women and Correlates of Potential Adoption of Pre-exposure Prophylaxis (PrEP): Results of a National Survey

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Abstract

We examine potential use of pre-exposure prophylaxis (PrEP) among young adult women, based on nationally representative random-digit dial telephone household survey of 1,453 US women. Our analyses showed that, as compared to women of 30–45 years old, young women of 20–29 years old experienced stronger social influences on PrEP uptake. However, as compared to older women, young women did not report higher potential PrEP uptake or adherence, despite their greater risk of HIV. For PrEP to be an effective method of prevention for young adult women, interventions are needed to increase HIV risk awareness.

Keywords

Health belief model; HIV/AIDS; PrEP; prevention; survey; women

INTRODUCTION

Young adults in the U.S. have increased risk of contracting sexually transmitted infections (STIs), including HIV. Thus, approximately 50% of all STIs incident in 2008 occurred among persons 15 to 24 years old, suggesting that STIs are disproportionately acquired at young age [1]. Similar patterns apply specifically to HIV. As compared to other age groups, young people aged 20 to 29 years old accounted for the highest number (14,388), percentage (30.7%), and rate (35 per 100,000 population) of new HIV diagnoses in 46 US states in the year 2010 [2]. Moreover, out of total of 49,273 new diagnoses of HIV in the year 2011, 8,054 estimated new diagnoses occurred in people aged 20 to 24 years old, which represents the highest rate of new diagnoses (36.4 per 100,000 population) as compared to other age groups [3]. In contrast, adults aged 35 to 39 years old accounted for 5,285 estimated new diagnoses or 27 new HIV diagnoses per 100,000 population in 2011 [3].

Importantly, similar age distribution of HIV risk exists specifically among women. For example, among US women, those aged 13 to 29 years old had the highest incidence of HIV (36%) in 2009 [4]. The increased risk of HIV in young US adults is closely connected to higher engagement in sexual risk-related behaviors. Thus, the highest percentage of women reporting sexual risk behaviors in 2006–2010 – e.g., five or more opposite sex partners in the past 12 months, sex in exchange for money or drugs, sex partner who injects illicit drugs, -- was among those aged 20–24 years old [5].

In sum, among US women, younger women have increased risk of HIV. Although consistent condom use is an effective method of HIV prevention, it has been insufficient to reduce the incidence of HIV infection [6]. Young women in particular may experience heightened socio-psychological barriers to condom use, such as low self-esteem, perceived lack of control over condom use, low relationship bargaining power, or the history of physical and sexual abuse [7–10]. Recently, pre-exposure prophylaxis (PrEP) emerged as a new prevention method available to individuals at increased risk of HIV. PrEP involves administering antiretroviral agents, in the form of oral pills or microbicide gels, creams or films, to HIV-negative individuals in order to decrease the risk of HIV infection [11].

To date, PrEP use and adherence have mostly been studied within the context of randomized controlled trials and among the populations at risk of HIV, such as men who have sex with men (MSMs), commercial sex workers, or injection drug users [12]. Several studies involved specifically sexually active young women but focused on hypothetical or actual use and acceptability of vaginal microbicides [13–16] rather than oral PrEP. A recent study examined potential acceptability of oral PrEP among several populations, including young women in Uganda, Botswana, and South Africa [17], but did not include women in the U.S.

To summarize, few studies examine uptake, adherence, and acceptability of oral PrEP among young U.S. women and more research is needed, especially given that Truvada has recently been approved as the first oral PrEP medication in the U.S. This paper focuses on potential oral PrEP uptake and adherence among young U.S. women. Specifically, we explore socio-demographic correlates of potential PrEP uptake and adherence among unmarried black and white U.S. women aged 20 to 29 years old, as compared to those aged 30 to 45 years old. In the absence of extensive empirical research on the use of oral PrEP in women, we drew on the Health Belief Model, or HBM [18], as a general theoretical framework, which allowed generating initial hypotheses. This model was selected since it has been widely used to explain sexual risk-reduction behaviors in general [19] and HIV prevention, in particular [18]. HBM implies that, when concerns health behaviors, individuals make their decisions, relying on cost-benefit analysis – i.e., they weigh the benefits and effectiveness of preventive behaviors, such as taking PrEP, against the potential severity and the personal risk of contracting the undesirable health condition or illness, such as HIV. According to HBM, these perceptions of risks and benefits will vary by sociodemographic characteristics, such as women's age. Therefore, since HBM assumes that individuals who have higher perceived risk of HIV infection would be more likely to engage in HIV preventive behaviors, we hypothesize that, in general, since younger women have higher risk of HIV than older women, they will also have higher potential uptake of and adherence to the oral PrEP.

METHODS

Data Collection

This paper is based on data collected for our larger study – “Social Health of African-American and White Women” (SHAWL). Among US women, African-American females are disproportionately affected by HIV [20] and the study was designed to examine socio-behavioral factors that could account for this fact. Between October 2006 and May 2007, we conducted a nationally representative random-digit dial telephone household survey of US African-American and white women. For inclusion were eligible African-American and white women aged 20 to 45 years old and unmarried or not currently in a relationship equivalent to marriage. The details of sampling procedure, which employed a dual-frame design, have been described in our earlier publication [21]. The response rate of 49% is comparable to other random-digit dial telephone surveys on sexual risk [22]. A total of 1,453 women (1,042 African-American and 411 white) was interviewed. Each interview lasted for an average of 50 minutes and was conducted using computer-assisted telephone interviewing (CATI) technology. Participants received \$ 50 to answer fixed-response questions about their socio-demographic and health status, sexual history, beliefs, and behaviors, as well as questions about potential PrEP uptake and adherence. The institutional review boards at Emory University and Macro International, a research company that administered the survey, approved all study procedures.

Measures

PrEP variables.—Our key outcome variables were potential PrEP uptake and adherence. Potential PrEP uptake was constructed as a dichotomous variable and assessed by asking women, “If there was a pill that you could take once a day, every day, to PREVENT getting HIV, and if this pill caused mild side effects, such as nausea, headaches, and rashes in a small number of people, would you take the pill?” Similarly, potential PrEP adherence was measured as an answer to a question whether participants would remember to take such pill every day for two months.

As our additional outcome variables, we included social factors that may influence potential PrEP adherence, namely: peer norms supportive of PrEP (separately, for male and female peers), physician recommendation for PrEP, embarrassment of requesting PrEP from a doctor, and a hypothetical cost of PrEP at \$200 per year. All items were constructed as dichotomous variables based on Yes/No answers. Finally, we included two variables measuring potential impact of PrEP on sexual behavior; these variables were assessed by asking the following two questions: 1) “If you took the pill do you think you would be less likely to use condoms during sex?” and 2) “If you took the pill do you think you would have sex with more partners?”

Sociodemographic characteristics.—The key sociodemographic variable of interest was age coded as “1” for participants 20 to 29 years old and “0” – for 30–45 years old. We also included participants’ household income, employment status (qualitative variable with the following categories – “full time”, “part-time/seasonal,” and “unemployed”) as well as

the following dichotomous variables: education (coded as “1” for education level of any college or higher), immigrant status, and past year economic hardship.

Sexual risk variables—included past year concurrent sexual partnerships as well as experience of intimate partner violence (IPV), which was measured as a dichotomous variable coded as “1” if participants experienced during their lifetime any type of psychological, physical, or sexual violence.

Statistical Analyses

All analyses were conducted in STATA 12, using survey commands to account for complex sample design. First, we conducted bivariate analyses, calculating prevalence and crude odds ratios, to examine whether our outcome variables (potential PrEP uptake, adherence, social factors influencing PrEP uptake, and potential impact of PrEP on sexual behavior) differed by age groups. As a second step, we adjusted the above models by other sociodemographic variables, including race, education, employment status, household income, immigration status, and economic hardship. Finally, for our key outcome variables of interest – potential PrEP uptake, adherence, and those social influences on PrEP uptake that were significant in the adjusted models – we reran these models, including interactions of age with other sociodemographic and sexual risk variables.

RESULTS

The mean age of women in our sample was 30.5 years old, with 595 women being aged between 20 and 29 years old and 858 women – between 30 and 45 years old. Out of 1453 women who completed the survey, 1392 (96.8%, sample weighted) answered the question about potential PrEP uptake and 1436 (98.4%, sample weighted) – about potential adherence to PrEP.

Bivariate and Adjusted Analyses

Our bivariate and adjusted analyses are reported in Table 1. The bivariate analyses showed that, even though, potential PrEP uptake and adherence did not statistically significantly differ by the two age groups (20–29 v. 30–45 years old), the impact of social factors on potential PrEP uptake was affected by age. In particular, young women (20–29 year old) were more likely to think that many of their girlfriends would take PrEP (79.7% v. 70.1%; OR=1.68; $p<0.05$). Also, as compared to older women, young women were 2.09 times as likely to take PrEP if recommended by healthcare provider ($p<0.001$). Finally, young women were 44% less likely than older women to report that they would be less inclined to use condoms if taking PrEP (20.2% v. 31.1%; OR=0.56; $p<0.01$). These analyses remained significant when adjusted for race, education, employment, income, economic hardship, and immigration status.

Analyses of Interaction Terms

Our further analyses reported in Table 2 represent logistic regression models, adjusted for sociodemographic variables, where age is included as interaction terms with race, concurrency, and IPV. These analyses were conducted for the following outcome variables:

potential PrEP uptake, adherence, and social influences on PrEP uptake - healthcare provider impact, girlfriends' impact and the influence of embarrassment. These results provide a more nuanced understanding of potential PrEP use among young women.

Whereas earlier analyses showed that young women are more likely to report that they would take PrEP if recommended by healthcare provider, the interaction of age and race showed that this relationship mostly held for white women. Even though young white women were three times as likely as older white women to report the impact of healthcare provider on potential PrEP uptake ($p < 0.01$), there was no statistically significant difference among the young and older black women. The impact of age on the feeling of embarrassment to ask doctor for PrEP also varied by race. When age*race interaction term was included, only white women showed statistically significant impact of younger age on the feeling of embarrassment (aOR=0.41; 95% CI=0.19; 0.92), whereas for black women age did not have a statistically significant impact.

The impact of age also varied by women's concurrency status – i.e., having concurrent partners in the past year. Among women of 20–29 years old, those women who had concurrent partners in the past year were 7.53 times as likely to report potential PrEP adherence than those women without concurrent partners ($p < 0.001$); this relationship did not obtain among women of 30–45 years old. Among women of 20–29 years old, those women who had concurrent partners in the past year were 89% less likely to report being embarrassed to ask doctor for PrEP than women who did not have concurrent partners ($p < 0.001$); this relationship did not obtain among women of 30–45 years old.

Finally, the impact of age varied by women's IPV status. Our previous analyses showed that women of 20–29 years old are less likely than women of 30–45 years old to report being embarrassed to ask doctor for PrEP. Among women of 20–29 years old, those women who experienced IPV are 82% less likely to report being embarrassed to ask doctor for PrEP than women who did not have IPV experience ($p < 0.001$), but this relationship did not obtain among women of the older age group. Even though for both age groups, those women who experienced IPV were more likely to report potential PrEP uptake than women with no IPV experience, this relationship was stronger for younger women (aOR=3.22; $p < 0.001$ v. aOR=1.92; $p < 0.01$).

DISCUSSION

We found that there were statistically significant age differences in social influences on PrEP uptake. Thus, younger women experienced stronger social influences on PrEP uptake – they were more likely to report potential PrEP uptake if recommended by healthcare provider and they believed that many of their peers would take PrEP. Young women were also less likely to believe that they would discontinue condom use if taking PrEP. Yet, contrary to our expectations, we did not find statistically significant differences in potential PrEP uptake or adherence among women of 20–29 as opposed to 30–45 years old. Even though younger women in the US experience greater risk of HIV infection [1–4], this greater risk does not translate into greater intention to use PrEP or to adhere to this treatment, despite our predictions made based on the Health Belief Model [18]. This finding can be explained by

low HIV risk awareness among young people in the US uncovered by research [23] – young women in our sample, as in the general US population, may not be particularly concerned about becoming HIV-positive. We can thus conclude that in order for PrEP to be an effective method of HIV prevention among young people, its introduction and scaling up among young at-risk populations should be accompanied by education programs aimed to increase HIV risk awareness. PrEP is better understood not just as biomedical but as bio-behavioral method [24] and its successful introduction may require multilevel interventions aimed not only at individual-level uptake and adherence but also concerned with change in community-level HIV risk-awareness and norms [24].

Importantly, however, our findings suggest that, as expected by HBM, when young women experience additional HIV risk factors, they may be more likely to take PrEP and to adhere to treatment. Thus, we found that those young women who had concurrent sexual partners were approximately eight times as likely to report potential PrEP adherence as those who did not. Similarly, young women who experienced IPV were significantly more likely to report potential PrEP uptake than those who did not. This leads us to conclude that, among young women, those women who experience several HIV risk factors will be most likely candidates for PrEP.

Finally, we found that age can have different effects within different ethnic/racial groups, especially when concerns potential social influences on PrEP uptake. Even though young white women were more likely to report the impact of healthcare provider on potential PrEP uptake, there was no statistically significant difference among the young and older black women. Our findings in a related paper [25] showed that, corresponding to their higher risk of HIV, black women were overall more likely to report potential PrEP uptake and more likely to take PrEP when recommended by healthcare provider than white women. Perhaps, for young white women who tend to see their risk of HIV as low, the recommendation of healthcare provider to take PrEP may make bigger difference. More qualitative studies are needed, however, to uncover different social dynamics related to PrEP uptake and adherence among young women of different ethnic backgrounds.

The above findings also stress the importance of risk perceptions suggested by the HBM. To recapitulate, HBM assumes that the individuals weigh *perceived* personal risks of contracting a disease against the benefits of risk-reduction strategies. When risks exist but individuals do not perceive their severity, they are not likely to engage in preventive behaviors. Even though younger US women have significantly higher incidence of HIV compared to older women, they may not be aware of their increased risk of HIV just based on their age group. However, HIV risk perception increases, as well as intention to take PrEP, as young women experience additional risk factors, such as concurrent sexual partners or IPV.

CONCLUSION

We have examined potential use of PrEP among young adult US African-American and white women based on random-digit dial telephone household survey. The hypotheses for this study were generated based on the Health Belief Model. Even though several

shortcomings of HBM were noted in the literature, such as insufficient attention to social norms [19], this model represented a well-tested theoretical framework useful in the absence of extensive research on the use of oral PrEP among women. Our analyses showed that, as compared to women of 30–45 years old, young women of 20–29 years old experienced stronger social influences on PrEP uptake. However, as compared to older women, young women did not report higher potential PrEP uptake or adherence, perhaps due to inadequate HIV risk perception. Those younger women in our study who experienced additional risk factors, such as IPV or concurrent sexual partners, were more likely to report potential PrEP uptake or adherence than those who did not.

To conclude, PrEP is a promising new method of HIV prevention. Its introduction among young women may require multi-level interventions aimed to increase HIV risk-awareness. Among young US women, those who experience multiple HIV risks will be best candidates for PrEP. Our findings also suggest that healthcare providers should play important role in PrEP promotion, but their impact may differ for women with different ethnic backgrounds. More studies are needed to understand different socio-cultural dynamics related to PrEP among young people of different ethnic backgrounds. This study had several limitations discussed in earlier publications [21, 25], with major one being that our analyses concerned potential rather than actual PrEP uptake and adherence with participants answering questions about a hypothetical PrEP pill before Truvada has been approved as the first oral PrEP medication in the U.S. Further studies are needed that will explore PrEP uptake and adherence specifically among young women.

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Age as determinant of potential PrEP uptake, social influences, and impact on sexual behavior among female participants in a national random-digit dial telephone survey in the US

Table 1:

	Age 20–29		Age 30–45		Crude Analyses		Adjusted for SES [/]	
	% Yes	95% CI	% Yes	95% CI	OR	95% CI	aOR	95% CI
Potential Uptake of PrEP								
Would you take the pill?	63.5	(56.02; 70.4)	59	(53.5; 64.2)	1.21	(0.83; 1.78)	1.51 [*]	(1.01; 2.26)
Potential Adherence to PrEP								
Do you think you could remember to take pill every day for 2 months?	77.4	(70.2; 83.2)	84.3	(79.8; 88.0)	0.64	(0.39; 1.03)	0.68	(0.43; 1.07)
Potential Social Influences on PrEP Uptake								
Do you think many of your girlfriends would take the pill?	79.7	(72.9; 85.2)	70.1	(64.6; 75.0)	1.68 [*]	(1.07; 2.65)	2.22 ^{***}	(1.43; 3.47)
Do you think many men would take the pill?	66.2	(59.0; 72.7)	62	(56.3; 67.4)	1.2	(0.81; 1.77)	1.12	(0.73; 1.71)
Would you be more likely to take the pill if a health care provider recommended the pill?	82.2	(76.4; 86.9)	68.9	(63.5; 73.8)	2.09 ^{***}	(1.36; 3.22)	2.27 ^{***}	(1.44; 3.57)
Would you be embarrassed to ask your doctor to give you such a pill?	7.3	(4.8; 11.0)	12	(8.9; 16.1)	0.58	(0.33; 1.01)	0.49 [*]	(0.27; 0.90)
Pretend the cost of taking the pill for one year was \$200. Would this cost prevent you from taking the pill?	32.5	(25.7; 40.2)	30.2	(25.4; 35.3)	1.12	(0.75; 1.68)	1.05	(0.67; 1.67)
Potential Impact of PrEP on Sexual Behavior								
If you took the pill do you think you would be less likely to use condoms during sex?	20.2	(15.1; 26.7)	31.1	(26.4; 36.2)	0.56 ^{**}	(0.37; 0.86)	0.54 ^{**}	(0.34; 0.85)
If you took the pill do you think you would have sex with more partners?	4.1	(2.3; 7.2)	6.4	(3.9; 10.2)	0.63	(0.29; 1.37)	0.85	(0.35; 2.05)

* p 0.05,
 ** p 0.01,
 *** p 0.001

[/] Adjusted for race, education, employment, income, economic hardship, and immigration status

Table 2.

Potential PrEP uptake, social influences, and impact on sexual behavior among female participants in a national random-digit dial telephone survey in the US: Interactions of age with race, concurrency, and IPV [†]

	Potential PrEP Uptake		Potential PrEP Adherence		Girlfriends		Healthcare Provider		Embarrassment	
	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI	aOR	95% CI
Age* race interaction										
Black, 20–29 years old	1.34	(0.80; 2.24)	0.64	(0.36; 1.15)	2.31**	(1.29; 4.15)	1.19	(0.66; 2.14)	0.72	(0.33; 1.58)
Black, 30–45 years old	ref.		ref.		ref.		ref.		ref.	
White, 20–29 years old	1.6	(0.94; 2.75)	0.69	(0.38; 1.28)	2.19**	(1.23; 3.88)	3.02***	(1.68; 5.42)	0.41*	(0.19; 0.92)
White, 30–45 years old	ref.		ref.		ref.		ref.		ref.	
Age* concurrency										
Concurrent, 20–29y.o.	1.28	(0.49; 3.34)	7.53***	(2.53; 22.4)	1.02	(0.39; 2.71)	1.31	(0.52; 3.26)	0.11***	(0.03; 0.37)
Nonconcur., 20–29y.o.	ref.		ref.		ref.		ref.		ref.	
Concurrent, 30–45 y.o.	1.88	(0.85; 4.13)	1.02	(0.36; 2.95)	1.78	(0.74; 4.28)	2.86*	(1.12; 7.32)	1.42	(0.50; 4.07)
Nonconcur., 30–45 y.o.	ref.		ref.		ref.		ref.		ref.	
Age* IPV interaction										
IPV, 20–29years old	3.22***	(1.68; 6.20)	0.75	(0.34; 1.64)	1.66	(0.78; 3.51)	1.11	(0.52; 2.40)	0.18***	(0.07; 0.50)
No IPV, 20–29years old	ref.		ref.		ref.		ref.		ref.	
IPV, 30–45 years old	1.92**	(1.17; 3.13)	1.31	(0.69; 2.49)	1.52	(0.85; 2.74)	1.47	(0.87; 2.49)	0.78	(0.38; 1.61)
No IPV, 30–45 years old	ref.		ref.		ref.		ref.		ref.	

[†] All models are adjusted for race, education, employment, income, economic hardship, and immigration status

* p 0.05,

** p 0.01,

*** p 0.001