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The Use of Online Posts to Identify Barriers to and Facilitators of HIV Pre-exposure Prophylaxis (PrEP) Among Men Who Have Sex with Men: A Comparison to a Systematic Review of the Peer-Reviewed Literature

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Abstract

Pre-exposure prophylaxis (PrEP) remains an under-utilized HIV prevention tool among men who have sex with men (MSM). To more comprehensively elucidate barriers and facilitators to PrEP use among US MSM, we conducted a systematic review of peer-reviewed published articles and content analysis of online posts about PrEP. We searched peer-reviewed databases (Medline, Web of Science, Google Scholar) using MESH headings and keywords about PrEP and/or HIV prevention from 2005 to 2015. We included original studies among MSM in the US that reported on barriers, facilitators, or other factors related to PrEP use. We also searched online posts and associated comments (news articles, opinion pieces, blogs and other social media posts) in diverse venues (Facebook, Slate Outward, Huffington Post Gay Voices, Queerty, and My PrEP Experience blog) to identify posts about PrEP. We used content analysis to identify themes and compare potential differences between the peer-reviewed literature and online posts. We identified 25 peer-reviewed articles and 28 online posts meeting inclusion criteria. We identified 48 unique barriers and 46 facilitators to using PrEP. These 94 themes fit into six overarching categories: (1) access (n = 14), (2) attitudes/beliefs (n = 24), (3) attributes of PrEP (n = 13), (4) behaviors (n = 11), (5) sociodemographic characteristics (n = 8), and (6) social network (n = 6). In all categories, analysis of online posts resulted in identification of a greater number of unique themes. Thirty-eight themes were identified in the online posts that were not identified in the peer-reviewed literature. We identified barriers and facilitators to PrEP in online posts that were not identified in a systematic review of the peer-reviewed literature. By incorporating data both from a systematic review of

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Compliance with Ethical Standards

Conflicts of interest Alisse Hannaford declares that she has no conflict of interest. Madeleine Lipshie-Williams declares that she has no conflict of interest. Julia Arnsten declares that she has no conflict of interest. Jessica Rizzuto declares that she has no conflict of interest. Phillip Cohen declares that he has no conflict of interest. Damon Jacobs declares that he has no conflict of interest.

Ethical Approval Our research did not involve human participants or animals.

peer-reviewed articles and from online posts, we have identified salient and novel information about barriers to and facilitators of PrEP use. Traditional research approaches may not comprehensively capture current factors important for designing and implementing PrEP related interventions.

Keywords

Pre-exposure prophylaxis; HIV; Men who have sex with men; Barriers to care

Introduction

Pre-exposure prophylaxis (PrEP), the use of antiretroviral medications by HIV-uninfected individuals to prevent infection before potential HIV exposure, is an underutilized prevention tool among men who have sex with men (MSM) in the United States (US). The Centers for Disease Control and Prevention estimate that 25% of sexually active adult MSM in the US, have indications for PrEP to prevent HIV acquisition [1]. However, recent estimates indicate that only 100,000 men have initiated PrEP since 2012, less than a quarter of eligible individuals [2]. Reasons for slow PrEP uptake among MSM are complex and occur at the level of the individual, the provider, the community, and the health system. While previous publications have identified potential and actual factors affecting PrEP use [3, 4], we are not aware of any published studies that have systematically identified and synthesized barriers to and facilitators of PrEP among US MSM. Understanding these factors is necessary to inform interventions to accelerate PrEP uptake in the US.

Given the time lag between conducting research and final publication and the rapidly changing context of PrEP in the US among MSM [5, 6], the peer-reviewed literature may not capture novel and emerging barriers to and facilitators of PrEP use. Reviewing online posts, such as blogs, Facebook groups, and special interest news sites geared towards the MSM community may circumvent some limitations of traditional systematic review for this rapidly evolving topic [6]. Further, online posts are written from a lens other than that of the researcher, and are a rich source of data to understand everyday perceptions (and misperceptions) of topics that are often stigmatized, such as sex, HIV, and PrEP [7]. Incorporating data from online posts allows us to learn from user-generated exchanges of ideas that connect large numbers of individuals who are thinking about, discussing, using, and experiencing PrEP in real time [8].

We sought to gain a holistic view of barriers to and facilitators of PrEP use among gay, bisexual, and other MSM by synthesizing data from both peer-reviewed literature and online posts from MSM targeted websites. We hypothesized that content analysis of online posts about PrEP would identify factors not found through systematic review of the peer-reviewed literature and that we would identify novel modifiable factors that could influence future PrEP implementation.

Methods

We first conducted a systematic review and qualitative analysis of peer-reviewed published articles, and then conducted a systematic content analysis of user-generated online posts about PrEP. Finally, we compared results from the two systematic qualitative analyses.

Systematic Review of Peer-Reviewed Published Articles

Our systematic review of peer-reviewed published articles is reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A formal protocol was developed and submitted to PROSPERO, which included our key questions, search strategy, and inclusion and exclusion criteria (CRD42016032828).

Literature Search and Abstract Selection—Peer-reviewed abstracts were identified from Pubmed, Web of Science, and Embase from January 1, 2005 to July 1, 2015, using the following keywords and phrases: ‘preexposure prophylaxis,’ ‘HIV infections/prevention and control,’ ‘biomedical HIV prevention,’ ‘barrier,’ ‘awareness,’ ‘stigma,’ ‘adherence,’ ‘health knowledge, attitudes, practice,’ ‘patient acceptance of health care,’ and ‘social stigma’. Potentially eligible abstracts were downloaded into Endnote and searched according to inclusion and exclusion criteria to finalize selection.

Selection of Peer-Reviewed Articles for Full Text Review—One author (AH) conducted the literature search and compiled the abstracts into Endnote. Two authors (AH and MLW) independently screened all titles and abstracts to identify peer-reviewed articles for full text review. An article was considered eligible for full review if it: (1) was an original collection of data; (2) took place in the United States; (3) included participants identified as MSM and contained MSM-specific analyses; (4) assessed patient perspectives about, or factors associated with, PrEP use or intent to use; and (5) was published in English. A full text review was then conducted on every peer-reviewed article that either reviewer deemed eligible after reading the title and abstract. Each full article was selected for inclusion or exclusion in the final review based on the same selection criteria as were used in the abstract phase. To avoid missing any barriers or facilitators, we did not exclude articles based on methodological quality.

Data Abstraction and Content Analysis—Two authors (AH and MLW) independently extracted information from the included articles using a tool which included the following items: study characteristics (objective, design, sample size) and participant characteristics (population and age group) [9]. Qualitative data about barriers to and facilitators of PrEP use were analyzed using inductive content analysis [10]. Using this method, the two reviewers created an initial codebook which was iteratively updated as novel themes emerged. Once all text had been coded, the entire research team met to organize codes and themes into categories. In instances where two codes fell under a single theme, separate codes were collapsed. Similarly, codes identified as containing more than one theme were separated. Next, the team organized codes and themes into categories within two broad groups: barriers and facilitators. Themes were considered barriers if they were likely to decrease PrEP use, and facilitators if they were likely to increase PrEP use; some themes were coded as both.

For example, the theme *side effects of PrEP* was separated into side effects present (barrier) and side effects well-tolerated (facilitator). Using the final coding scheme, all peer-reviewed articles were analyzed to determine the presence or absence of each theme in each article or post. Dedoose [11], a web-based qualitative management and analysis software, was used for all analyses.

Systematic Content Analysis of User-Generated Online Posts

Search Strategy and Online Post Selection—We defined online posts as information shared on the Internet through forums such as blogs, articles, or Facebook groups. Popular MSM targeted websites and blogs were selected based on team knowledge and initial web searches. Sites included were “My Prep Experience”, “Slate Outward”, “Huffington Post Queer Voices”, and “Queerty”. Two authors (AH and MLW) searched each website in August 2015 for articles containing the terms “PrEP” or “HIV prevention” that were published between July 1, 2014 and July 1, 2015. All articles meeting these criteria, as well as the respective comments sections, were reviewed. If the comments section included more than 100 comments, we limited our review to the first 100 comments. Data was also collected from a single Facebook group, “PrEP Facts: Rethinking HIV Prevention and Sex.” This moderated group hosted discussions and comments about PrEP among 18,000 members. We searched this group for posts between January 1, 2015 and July 1, 2015 that discussed or mentioned facilitators or barriers to PrEP. This specific group was selected because of its large number of users and high posting activity. While we initially intended to include posts from 12 months of activity of this group, due to the large volume of posts, we shortened the data collection period. For all online sources, an article, blog, or comment was eligible for inclusion if it: (1) was posted online from July 1, 2014 to July 1, 2015, (2) reported or responded to an individual’s perspective about, or factors associated with, PrEP use or intent to use, (3) was written in English, and (4) was considered likely to refer to the United States.

Data Abstraction and Qualitative Analysis—We used the same method of abstraction and qualitative analysis as described above for our systematic analysis of peer-reviewed articles. In brief, two reviewers independently extracted information from the included online posts, and then used inductive content analysis to identify and organize themes. Finally, the presence or absence of a theme identified in the peer-reviewed literature was compared to the presence or absence of a theme identified in the online posts.

Results

Search Results

Peer-Reviewed Articles—Our search of indexed databases identified 813 unique abstracts. Of these, 776 were excluded during abstract review. The remaining 47 articles were reviewed in full, and 25 met inclusion criteria (Fig. 1; Table 1). The included articles used focus groups, open-ended and structured individual interviews, surveys, or a mix of these three approaches. Five articles used focus groups, 12 used individual interviews, and 12 used surveys. Our search did not identify any longitudinal studies; all included articles reported only cross-sectional data.

Online Posts—We identified 28 eligible online articles, excluding Facebook posts, before we reached thematic saturation. Of these articles, 14 were identified from My Prep Experience, 5 were identified from Slate Outward, 7 were identified from Huffington Post Queer Voices, and 2 were identified from Queerty (Table 2). The Facebook page *PrEP Facts: Rethinking HIV Prevention and Sex*, had such a high volume of posts (approximately 5000 in 1 year) that we reached thematic saturation after analyzing posts from a 7 month period from January 1, 2015 through July 1, 2015.

Thematic Analysis of Barriers and Facilitators

Overall, we identified 94 unique themes, including 48 barriers to and 46 facilitators of PrEP use (Table 3). These 94 themes fit into six overarching categories: (1) *access* (n = 14), (2) *attitudes/beliefs* (n = 24), (3) *attributes of PrEP* (n = 13), (4) *behaviors* (n = 11), (5) *sociodemographic characteristics* (n = 8), and (6) *social network* (n = 6). The *access* category contained themes pertaining to an individual's ability to obtain PrEP medication or to obtain knowledge or other information about PrEP (e.g., cost, insurance). The *attitudes/beliefs* category contained themes pertaining to an individual's opinions about PrEP use (e.g., stigma, decreased anxiety during sex). The *attributes of PrEP* category contained themes pertaining to inherent characteristics of the medication or of how the medication is taken (e.g., side-effects, daily dosing). The *behaviors* category contained themes pertaining to behaviors that might increase or decrease PrEP uptake, or that could change because of PrEP use (e.g., having many partners, sporadic condom use). The *sociodemographic characteristics* category contained themes pertaining to whether sociodemographic characteristics might affect PrEP uptake (e.g., age, being 'out'). Lastly, themes fit into the *social network* category if the identified barrier or facilitator pertained to social relationships that might impact PrEP uptake (e.g. having an HIV positive partner, knowing someone on PrEP). Representative quotes for each barrier and facilitator found in the online posts are in Table 4 (For a complete list see Supplemental Table 1).

The largest number of unique barriers was within the *attitudes/beliefs* category (n = 15), followed by *access* (n = 9), *attributes of PrEP* (n = 4), *behaviors* (n = 2), *sociodemographic characteristics* (n = 2) and *social network* (n = 1). The *attitudes/beliefs*, *attributes of PrEP*, and *behaviors* categories were tied for the greatest number of facilitators (n = 9), followed by *sociodemographic characteristics* (n = 6), *social network* (n = 5), and *access* (n = 5) (Fig. 2).

In all six categories analysis of online posts resulted in identification of a greater number of unique themes (Fig. 3). There were an additional 38 themes present in the online posts that were not present in the peer-reviewed literature, 13 of which were categorized in the *attitudes/beliefs* category. Examples included barriers such as PrEP perpetuates stigma of homosexuality and HIV, acquaintances will assume promiscuity with PrEP usage, and less concern about HIV in younger generations (Table 3).

Both the peer-reviewed articles and the online posts reported barriers to PrEP, such as cost, lack of PrEP awareness, and actual or perceived side effects. However, online posts provided more nuanced, and often more concrete information about specific barriers. For example, online posters wrote paragraphs detailing individual experiences with poorly informed

providers (highlighting lack of PrEP awareness among providers), and offered explanations as to *why* it was difficult to adhere to PrEP, such as the perception of PrEP users as being promiscuous (Table 4).

With respect to facilitators, while peer-reviewed articles described factors that may already be increasing PrEP uptake, the online posts provide a starting point for new outreach interventions. Quotes from online posts were often from individuals who were passionate PrEP advocates, and this advocacy resulted in discussion of how PrEP could have a positive impact on the sexual health of gay, bisexual, and other MSM. This impact was not identified in the peer-reviewed literature.

A key finding of this analysis was that online posts themselves appeared to be facilitators of PrEP adoption. The moderated Facebook PrEP support group, in particular, was conducive to education, information, and peer-to-peer support, and served as a source of solutions to barriers identified within its community of over 18,000 individuals. Examples of solutions included pragmatic suggestions for navigating the health care system, recommendations of PrEP knowledgeable primary care physicians, details about how to navigate insurance issues and obtain assistance for PrEP costs, and discussions about which clinics are supportive of PrEP use in different areas of the country, and even globally (See Supplemental Table 1). In addition, social support was provided within this group and through spin-off support group pages, as was access to information (such as non-English resources).

Discussion

In this study, we identified novel barriers to and facilitators of PrEP in online posts that were either not prominent or not present in our systematic review of the published literature, supporting the hypothesis that traditional research approaches may miss factors salient for designing and implementing PrEP-related interventions. To our knowledge, this is the first systematic review of barriers to and facilitators of PrEP adoption among MSM in the United States, as well as the first content analysis of online posts examining factors influencing PrEP use. Overall, our study identified 94 unique themes, including 48 barriers to and 46 facilitators of PrEP use (Table 3). We found that the factors fit into six overarching domains: access ($n = 14$), attitudes/beliefs ($n = 24$), attributes of PrEP ($n = 13$), behaviors ($n = 11$), sociodemographic characteristics ($n = 8$), and social network ($n = 6$). We identified a broad range of potentially modifiable factors likely important for PrEP uptake interventions to address. Examples of facilitators to increase access to PrEP included trust in healthcare providers and ease of accessing PrEP through non-traditional prescription methods such as online ordering, while barriers included uninformed and judgmental primary care physicians. Individuals on PrEP noted that they had decreased anxiety and stress during sexual encounters and that taking the medication felt empowering. Barriers relating to an individuals attitudes and beliefs about PrEP included concerns about risk compensation, concerns that increased PrEP uptake would mean decreased resources for other types of HIV prevention methods, concerns around PrEP's effectiveness, and challenges to adherence. Addressing these barriers and highlighting facilitators in dissemination interventions may be appropriate behavioral targets to help increase PrEP adoption for MSM at high risk of HIV acquisition in the US.

In all six categories, analysis of online posts resulted in identification of a greater number of unique themes. Across all categories, 38 themes were identified in the online posts that were not identified in the peer-reviewed literature. For example, while both online posts and peer-reviewed articles identified barriers such as cost, lack of knowledge of PrEP, and insurance coverage, only the online posts revealed important facilitators such as sensitively trained trustworthy providers, and online ordering and delivery of PrEP. Review of online posts identified an additional 13 themes in the attitudes/beliefs category that were not present in the peer-reviewed articles, including barriers such as PrEP perpetuates stigma of homosexuality and HIV, acquaintances will assume promiscuity with PrEP usage, and less concern about HIV in younger generations. Many of the reported barriers to PrEP were present in both the peer-reviewed literature and the online posts, however, the online sources often provided more nuanced and concrete information. For example, online posters detailed their interactions with their insurance companies and with poorly informed providers (highlighting lack of PrEP awareness among providers) explaining specifically why they encountered problems with PrEP uptake (Table 4; Supplemental Table 1).

There are several possible reasons why the online posts revealed different information. Selection bias is particularly relevant in published studies relating to sexuality [65, 66], and prior studies have shown that adolescents and younger individuals are often missing from HIV research. Inclusion of online posts may help compensate for these shortcomings, and takes advantage of a previously untapped resource by allowing under-represented populations to contribute to research findings and having their “voices” heard. Additionally, the temporal context of data from online posts differs from formal research studies in two ways; prior studies have shown that MSM reporting their activities on a daily basis have increased reliability compared to biweekly surveys [67], and online posts encourage updates by the author, allowing the data to evolve.

Another issue addressed is social desirability and volunteer biases that often exist in research studies. Several studies have verified that subjects who engage in high-risk sexual behavior are less prone to social desirability when data are collected via non-human interfaces (e.g. computer assisted interviews) [68, 69]. Online posts provide anonymity, allowing sensitive and nuanced themes to be discussed [70]. Online, posters felt comfortable writing about how they are still very much afraid of HIV. While both online posts and peer-reviewed articles identified that having an HIV positive partner was a facilitator, through the online posts we also learned that having an HIV positive partner could be a barrier to telling friends and family that an individual was on PrEP so as to not give away the HIV status of their partner. A key finding of this analysis was that online posts themselves appeared to be facilitators of PrEP adoption. Online posters are willing to share experiences, whether positive or negative, which in this analysis helped further describe the physical and emotional experience of using PrEP [7]. Interestingly, online posts appeared to trigger others to share their experiences, continually expanding upon the depth of this resource [71]. These personal accounts may help motivate non-PrEP users to seek out the medication by conveying positive experiences; comments such as those that discuss reduction or elimination of anxiety related to acquiring HIV after starting PrEP. Similarly, some comments may hinder PrEP uptake by affirming negative beliefs of the pharmaceutical industry. Such a close and honest visualization of

these issues is challenging to glean with other methods, but the anonymity afforded by these methods may temper social desirability.

Our analyses have important implications for developing interventions to increase PrEP adoption. Attempts to increase PrEP use by addressing barriers identified only through traditional research approaches (e.g. solicited surveys, cohort studies, qualitative studies) may potentially miss major ‘real life’ barriers. Studying online posts allowed for a more multifaceted understanding of common factors associated with PrEP use, which may better enable elucidation of modifiable targets for behavioral interventions. Although a few studies exist on the role of primary care providers in implementing PrEP [72], many posters and participants described how their primary care providers were often not knowledgeable about PrEP or discussed being stigmatized by providers in diverse geographic settings, highlighting the need for uptake interventions in primary care settings. Additionally, these online posts provide the nuanced data needed to elucidate appropriate behavioral targets and inform interventions. Posting of negative experiences in trying to obtain PrEP often led to rapid resolutions either from other posters sharing provider talking points and lists of other providers, or from PrEP navigators who provided their own information in real-time. Support was also provided through spin-off support group pages and links to other resources. “Interventions” such as these can be easily scaled up and become self-sustaining through creation of virtual support groups.

Looking past these platforms as a source of data, it is imperative that we continue to promote resources that may help individuals access care. Recognizing the existence of these new forms of communication suggests new opportunities to disseminate accurate information and empower communities with new knowledge and tools to overcome barriers and support behavior change. However, further intervention research is needed to better understand how to support and sustain behavior change in online settings.

The current study has several limitations. Eligible peer-reviewed articles or online posts during our selected time period may have been missed, and new ones may have emerged which we were not able to incorporate. For some online posts, we could not analyze the author’s motivations or intent when the text was unclear. Finally, because all of the online posts were written by individuals who had likely heard of or had some level of PrEP knowledge, while many participants surveyed in the peer-reviewed articles were often unaware of PrEP, novel barriers among individuals who had not been exposed to information about PrEP may not have been identified from online posts.

In summary, we found that by extracting data both from a systematic review of peer-reviewed articles and from online posts about a specific health topic, we were able to identify an unprecedented amount of information about barriers to and facilitators of a relatively new HIV prevention technology, and demonstrated a model for integrating different types of data. Individuals are increasingly accessing health information through the Internet including social media, and leveraging information from these online platforms will be essential to rapidly obtain actionable data for new and existing health issues, as well as to help diffuse accurate information and support behavior change. This model can be used to inform interventions and policy to increase uptake of PrEP and thus prevent new HIV

infections. In other industries, online “infoveillance” approaches are widely used to understand consumers’ perceptions and to develop marketing strategies to influence consumer behaviors [73, 74], and employing such strategies to improve health is a natural extension of this approach. Furthermore, as the field of online data mining and analysis grows, and we learn to better use automated text analysis and machine learning approaches, this research model will be increasingly relevant especially to HIV and other stigmatized health conditions [75, 76].

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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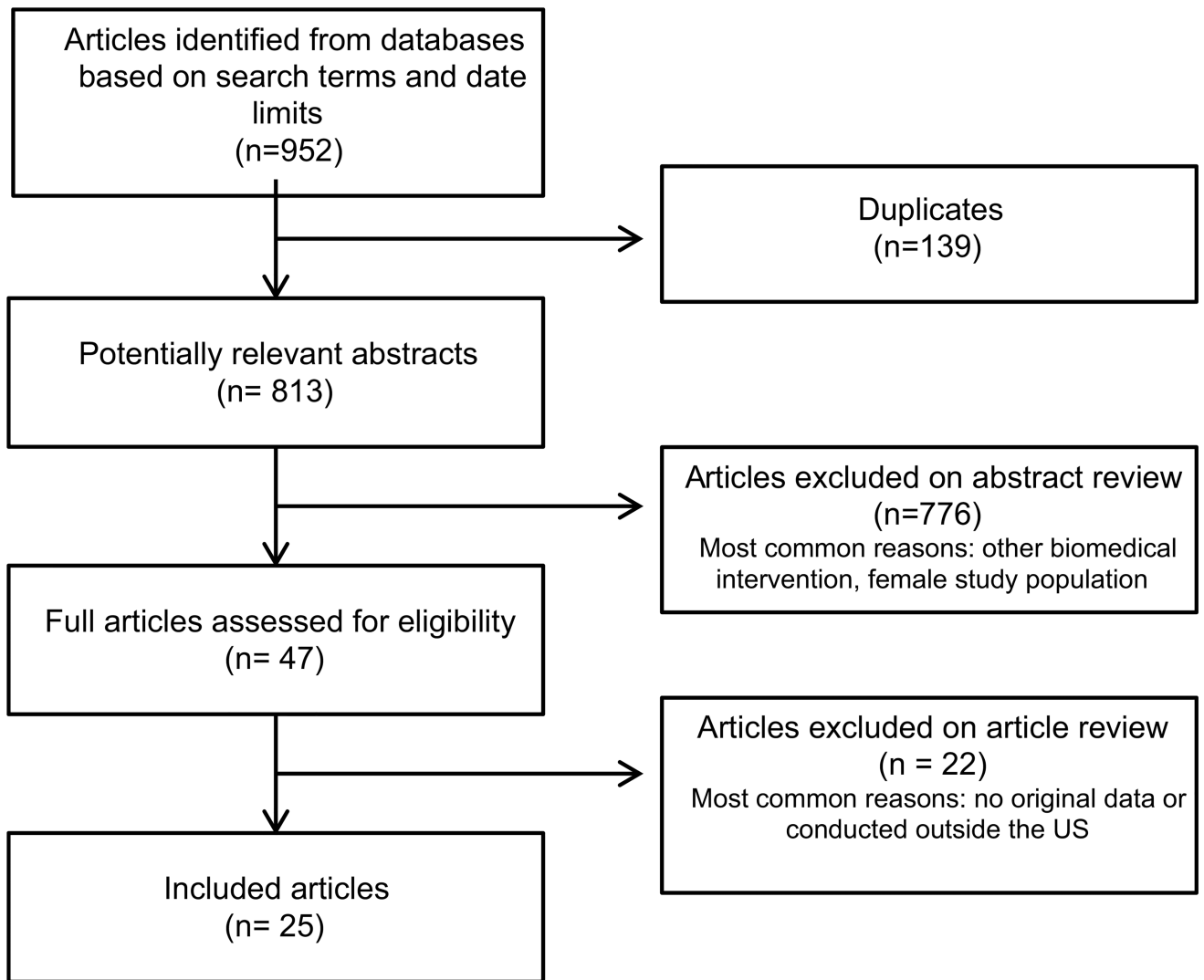


Fig. 1. Peer-reviewed literature article selection flow chart

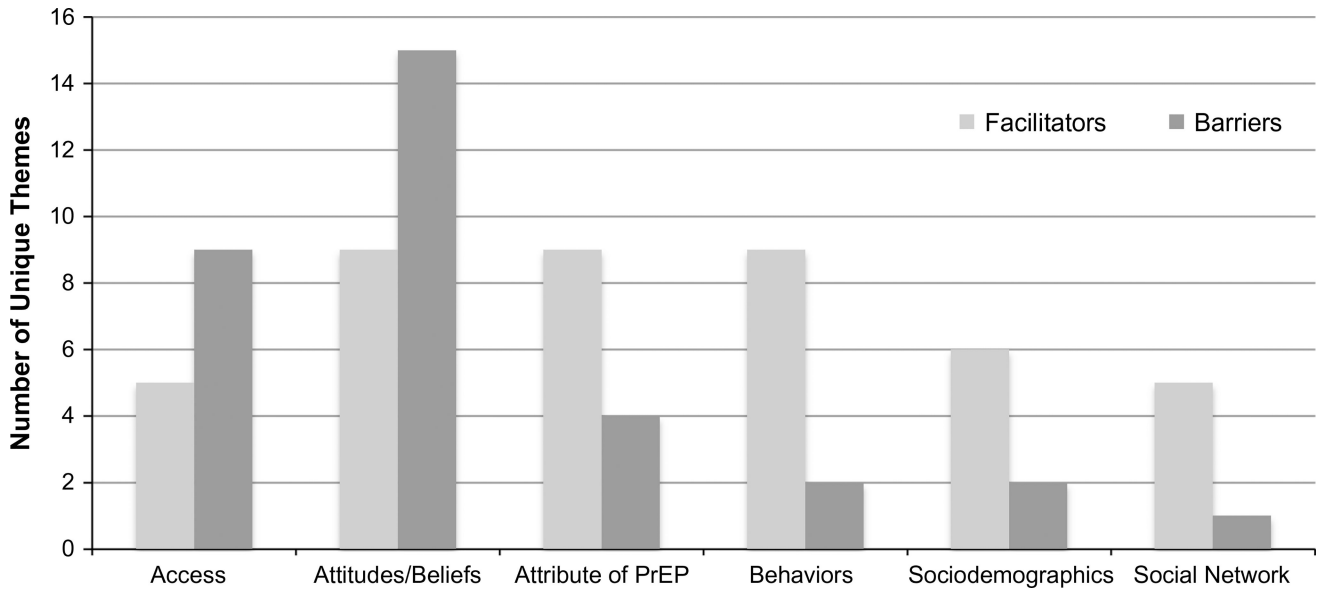


Fig. 2. Number of unique barrier and facilitator themes identified in peer-reviewed articles or online posts, by category

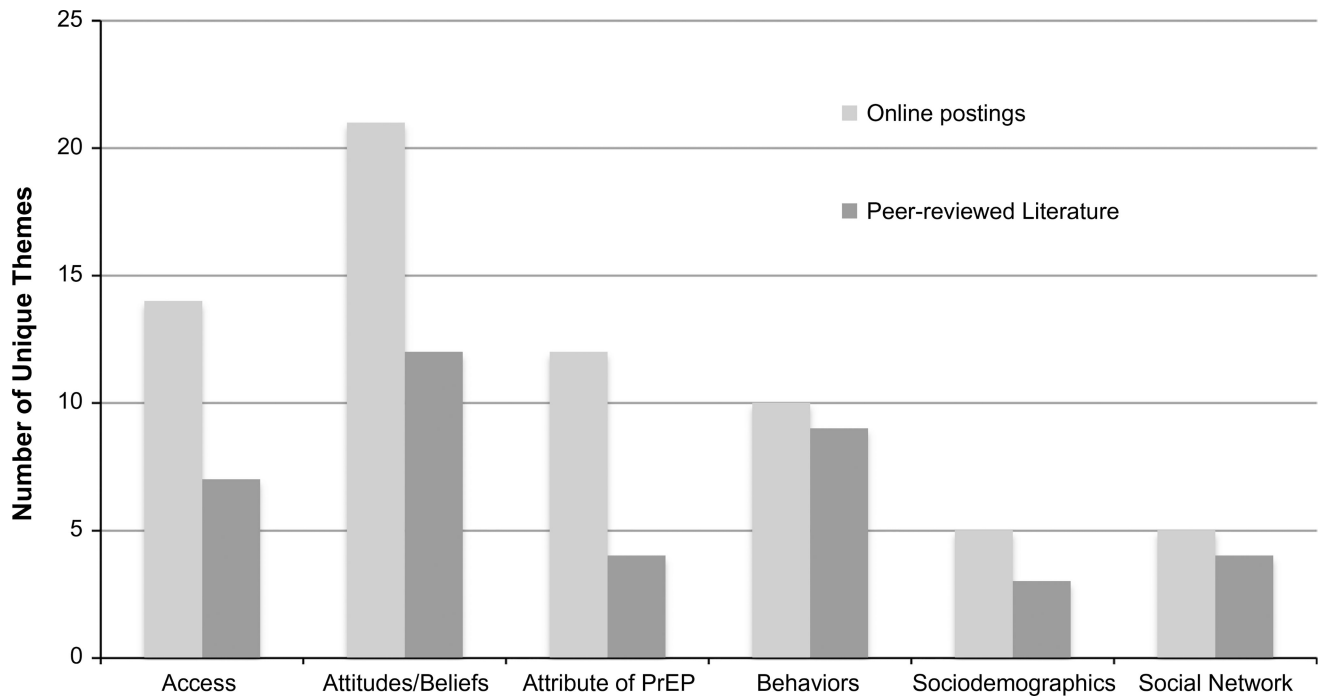


Fig. 3. Number of unique themes identified in peer-reviewed articles or online posts, by category

Table 1

Peer-reviewed articles

Author, Publication year	Location of data collection	Study objective	Study design	Sample size
Al-Tayyib, AA., 2014 [12]	Denver, CO	To assess knowledge of PrEP, willingness to use PrEP, and potential changes in risk behavior among HIV-negative participants reporting sexual activity with a male partner	Secondary analysis of National HIV Behavioral Surveillance System Surveys	503
Bauermeister, JA., 2013 [3]	National	To assess awareness of PrEP and PrEP-related beliefs regarding side effects, accessibility, and affordability among young MSM	Online survey	1507
Brooks, RA., 2012 [13]	Los Angeles, CA	To identify key themes relating to acceptability and future adoption of PrEP among HIV-negative MSM in serodiscordant relationships	Qualitative interviews and brief interviewer-administered survey	50
Brooks, RA., 2011 [14]	Los Angeles, CA	To identify factors that might facilitate or impede future adoption of PrEP among MSM in serodiscordant relationships	Qualitative semi-structured interviews	50
Cohen, SE., 2015 [15]	San Francisco, CA, Miami, FL and Washington, DC	To assess PrEP delivery and predictors of enrollment in a program offering 48 weeks of PrEP, among MSM and transgender women (TGW)	Interviewer-administered questionnaire	557
Eaton, LA., 2014 [16]	<i>Unspecified city in South Eastern, US</i>	To assess PrEP knowledge and use, health care access experiences, race-based medical mistrust, sexual partners and behaviors, and drug and alcohol use, among Black MSM	In-person survey	398
Fuchs, JD., 2013 [17]	National; 21 HIV Vaccine Trials Network 505 trial sites	To assess intention to use PrEP among participants in an HIV vaccine efficacy trial	Online survey	376
Galindo, GR., 2012 [18]	Alameda, Los Angeles, and San Francisco, CA	To examine acceptability of individual daily PrEP, and assess potential barriers to community uptake, among MSM and TGW	Qualitative semi-structured interviews	30
Gilmore, HI., 2013 [19]	San Francisco, CA	To understand individual and contextual factors influencing PrEP use in iPrEx trial (phase III clinical trial to determine safety of tenofovir/emtricitabine) participants	Focus groups and qualitative in-depth interviews	52
Golub, SA., 2013 [20]	New York, NY	To examine facilitators and barriers to PrEP use and adherence and their association with PrEP acceptability, among MSM and TGW	Interview and computer-administered survey	184
Golub, SA., 2013 [21]	New York, NY	To examine associations between anticipated stigma	Online survey	305

Author, Publication year	Location of data collection	Study objective	Study design	Sample size
		and HIV testing behaviors among MSM and TGW		
Hosek, SG., 2013 [22]	New York, NY	To examine feasibility of a combination prevention intervention for young HIV-negative MSM	Focus groups and computer assisted self-interviews as participants completed a trial of PrEP (emtricitabine/tenofovir).	58
Krakower, DS., 2012 [23]	National	To assess PrEP awareness, interest and experience among at-risk MSM before and after iPrEx trial results (demonstrating that oral PrEP reduced the risk of HIV acquisition among high-risk MSM) were released to the public	Internet-based survey	4956
Rucinski, KB., 2013 [24]	New York, NY	To understand current PrEP knowledge and use among MSM	Online survey	329
Kubicek, K., 2015 [25]	Los Angeles, CA	To examine young MSM of color's awareness and perceptions of PrEP and rectal microbicides	Focus group	53
Mimiaga, ML., 2014 [26]	Boston, MA	To explore perceived influences of sexual relationships on promoting and inhibiting PrEP use among high-risk MSM who report regular drug use	Qualitative semi-structured interviews	40
Meyers, K., 2014 [27]	New York, NY	To report the willingness of a racially-ethnically diverse cohort of young MSM to use long-acting injectable PrEP	Computer-assisted self-interviews	197
Mustanski, B., 2013 [28]	Chicago, IL	To assess interest in PrEP use under various conditions of side-effects, dosing, and effectiveness in young MSM	Audio computer assisted self-interview	171
Perez-Figueroa, RE. 2015 [29]	New York, NY	To examine attitudes and perceptions toward PrEP uptake among young MSM	Qualitative semi-structured interviews	100
Saberi, P., 2012 [30]	San Francisco, CA	To examine serodiscordant and seroconcordant male couple's PrEP awareness, concerns regarding health care providers offering PrEP to the community, and correlates of PrEP uptake by the HIV-negative member of the couple	Mixed methods (qualitative interviews and quantitative survey)	328
Smith, DK., 2012 [31]	Atlanta, GA	To elicit attitudes about and service access preferences for daily oral antiretroviral PrEP from urban, Black, young men and women at risk for HIV transmission	Focus group	77
Snowden, JM., 2014 [32]	San Francisco, CA	To assess prevalence and correlates of seroadaptive behaviors and conventional risk reduction among MSM	Secondary data analysis of National HIC Behavioral Surveillance system surveys	455
Taylor, WS., 2014 [33]	Boston, MA	To identify targets for behavioral interventions to improve adherence to PrEP, among MSM who had been prescribed and used PrEP in the context of a clinical trial	Focus groups	39

Author, Publication year	Location of data collection	Study objective	Study design	Sample size
Tripathi, A., 2013 [34]	Columbia, SC	and high-risk MSM who had not previously used PrEP To explore sociodemographic and behavioral factors associated with PrEP adoption among HIV seronegative MSM and heterosexual partners	Self-administered survey	89
Whiteside, YO. 2011 [35]	Ryan White HIV/AIDS Clinic, SC	To assess self-perceived risk of HIV infection and attitudes about PrEP among sexually transmitted disease clinic attendees	Self-administered survey	405

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Table 2

Online posts

Source (type)	Name of Article	#of articles included
My prep experience (Blog)	Bill. (September 7, 2014). Bill's "Pretty Epic" PrEP Experience [36]	14
	Brandon., Shane. (February 23, 2015). Gay Couple Don't Take "No" for an Answer and Successfully Appeal Insurance Denial for PrEP [37]	
	"Chicago doctor". (December 1, 2014). Chicago doctor: "I don't always use condoms. And I don't always top. I will not give this up" [38]	
	Dakota. (November 22, 2015). Alabama firefighter, paramedic and "pitcher" goes on PrEP [39]	
	Greg. (November 6, 2015). Physician with Poz Partner Chooses PrEP [40]	
	Hickman, Dwayne. (April 7, 2015). Take control of your sexual health, and don't be afraid to ask questions [41]	
	Jeremy. (September 14, 2014). SF Gay-mer Jeremy on why he's on PrEP [42]	
	K.W. (June 19, 2014). Personal Story: I finally got up the courage to seek PrEP in April 2013 [43]	
	Matthew. (January 13, 2015). The peace of mind is tremendous [44]	
	Nguyen, Tuan. (October 2015, 2014). That Was Easy! Tuan Shares His No Drama PrEP Experience [45]	
	P, Michael. (May 28, 2015). Without the constant fear of HIV infection, I can engage in sex with the love of my life [46]	
	Richard. (July 22, 2014). After Finally Getting PrEP Green Light, Still Disheartened [47]	
	Todd. (October 9, 2015). I am disappointed that people are not yelling from the rooftops about this medication! [48]	
	Wilson, C. (July 21, 2015). PrEP is my wake up call to a reality that I need to protect myself and stop putting my life in others' hands [49]	
Slate Outward (specific interest editorial/news space)	Lowder, Bryan J. (December 5, 2014). Twenty-One Attempts at Swallowing Truvada [50]	5
	Stern, Mark Joseph. (May 22, 2014). "I Have Learned Not to Underestimate the Stigma": Peter Staley on Truvada, Condoms, and HIV Prevention [51]	
	Stern, Mark Joseph. (September 10, 2014). The Infant Terrible of AIDS Activism Reaches a New Low [52]	
	Stern, Mark Joseph. (January 6, 2014). There is a Daily Pill that prevents HIV. Gay men should take it [53]	
	Stern, Mark Joseph. (July 14, 2014). WHO Suggests All Gay Men Take Anti-HIV Drugs. That's Fantastic News [54]	
Huffington Post Queer Voices (specific interest editorial/news space)	Argentum, Jaga N.A. (July 21, 2014). World Health Organization Recommends PrEP: Prevention or Perpetuating Stereotypes? [55]	7
	Ebert, Matthew. (December 1, 2014). World AIDS Day 2014: Young, Old, Black, White, MSM [56]	
	Eigo, Jim. (June 9, 2014). The Neverending Epidemic: And How We Can End It [57]	
	Grant, Robert. (October 28, 2014). The City of Love Could Lead the Way Toward Ending HIV Transmission [58]	
	Lunievicz, Joseph. (October 8, 2014). Context and the Blue Pill of Prevention [59]	
	Shapiro, Lisa. (December 1, 2014). The Most Celebrated, Mistrusted Little Pill in the World [60]	
	Wong, Curtis M. (June 10, 2015). Why The HIV Prevention Drug, PrEP, Remains So Divisive Among The LGBT Community [61]	
Queerty (News and entertainment site)	Mark. (July 19, 2014). Ten Reasons This Little Blue Pill Could Save Your Life Five Sexy Gay Men On HIV PrEP Explain Why They Are Taking The Pill [62]	2

Source (type)	Name of Article	#of articles included
	Smith, Rob. (July 28, 2014). Question: Is It Finally The Right Time For HIV Negative Guys To Start PrEP? [63]	
Facebook	PrEP Facts: Rethinking HIV Prevention and Sex [64] Comments sections included	n/a

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Table 3

Barriers to and facilitators of PrEP use identified in the peer-reviewed literature and the online posts

B/F	Theme	Peer reviewed articles	Online posts
Access			
F	Doctors who are sensitive to race and poverty	–	X
F	Specialized roll out for marginalized populations	–	X
F	Trust in provider	–	X
F	Can get PrEP from a friend	–	X
F	Being able to order PrEP online and have it be delivered	–	X
B	Cost	X	X
B	Lack of access to PrEP	X	X
B	Not enough public education on PrEP	X	X
B	Too much of a hassle/difficult to attain PrEP	X	X
B	Insurance issues	X	X
B	PCP not educated enough about PrEP	X	X
B	Lack of knowledge of PrEP	X	X
B	Prescription not ready on time	–	X
B	Lack of access to healthcare	–	X
	Total	7	14
Attitudes/beliefs			
F	PrEP decreases anxiety/stress during sexual encounters	X	X
F	PrEP is empowering, takes HIV protection into your own hands	X	X
F	Perceived high risk of contracting HIV	X	X
F	High degree of HIV knowledge	X	–
F	Being comfortable discussing HIV	X	–
F	Public figure/organization endorses PrEP	–	X
F	Condoms are also flawed	–	X
F	PrEP fights HIV stigma	–	X
F	PrEP is a viable/effective tool among others and for some people	–	X
B	Feeling stigmatized	X	X
B	Unable to talk to doctor about sex behavior	X	X
B	Concern about PrEP effectiveness	X	X
B	Satisfied with current method of HIV prevention	X	X
B	Distrust of pharmaceutical companies/medical system	X	X
B	Concern about developing drug resistant HIV strains limiting treatment options	X	X
B	Concern that PrEP could decrease HIV education	X	–
B	Concern about using a biomedical approach to HIV prevention	–	X
B	Perception of promoting condomless sex	–	X
B	Public figures/organizations anti-prep	–	X
B	Public has inadequate understanding of the science behind PrEP	–	X
B	Fear of HIV	–	X
B	PrEP perpetuates stigma of homosexuality and HIV	–	X

B/F	Theme	Peer reviewed articles	Online posts
B	Others assume promiscuity	–	X
B	Less concern about HIV in current generation	–	X
	Total	12	21
Attribute of PrEP			
F	Access to support services (regular HIV testing, sexual health care, counseling)	X	X
F	If used with condoms adds a second layer of protection against HIV	X	X
F	If there was an option of a non-daily dose	X	–
F	PrEP allows you to be sex positive	–	X
F	PrEP is effective	–	X
F	Effective even with missed doses	–	X
F	Well tolerated	–	X
F	More effective than condoms	–	X
F	Can use PrEP only for high risk period	–	X
B	Side effects of PrEP	X	X
B	Drug interaction	–	X
B	Long commitment	–	X
B	Doesn't protect against other STDs	–	X
	Total	4	12
Behaviors			
F	Existing practice of condomless sex	X	X
F	Substance use	X	X
F	Having many partners	X	X
F	Do not have to serosort partners if using PrEP	X	X
F	Being on a daily routine schedule/having a daily reminder	X	X
F	Sporadic condom use with desire for HIV protection	X	X
F	Having sex with both men and women	X	–
F	Having a prior false positive HIV test result	–	X
F	Can fill Rx using preferred name (not legal name)	–	X
B	Sexual behavior change while being on PrEP	X	X
B	Difficulties with adherence	X	X
	Total	9	10
Sociodemographics			
F	Prior STD treatment or PEP use	X	–
F	Older age	X	–
F	High HIV prevalence in community	–	X
F	Being "out"	–	X
F	Having an occupational need for HIV protection	–	X
F	Preference for insertive over receptive intercourse	–	X
B	Higher socioeconomic status	X	–
B	Lack gay male identity	–	X
	Total	3	5

B/F	Theme	Peer reviewed articles	Online posts
Social network			
F	Knowing someone on PrEP	X	X
F	Having an HIV positive partner	X	X
F	Support from partner and community	X	X
F	Facilitates the conversation about HIV	–	X
F	Abusive, consent-challenged relationship	–	X
B	Lack of support from partner	X	–
	Total	4	5

B/F denotes whether the theme was determined a barrier (B) or facilitator (F). Codes are marked with an X to indicate whether they were present in the online posts or the peer-reviewed articles (or both)

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Table 4

Selected list of barriers and facilitators identified in online posts: representative quotes

B/F	Theme	Exemplary quote
Access		
F	Specialized roll out marginalized populations	“[There] are individuals who don’t access regular care, are discriminated against, tend to distrust the healthcare system, and don’t connect themselves to the AIDS epidemic either personally or publicly. They will need outreach to connect them to care. They will need education to help them see the need for care. They will need skills to help them with adherence” [59]
F	Trust in provider	“Had an appointment today with [a doctor] and they were amazing. So long as my lab work is fine I should be on PrEP in no time... They don’t judge and will answer any questions you have” [64]
B	PCP not educated enough about PrEP	“Many of my first attempts at receiving PrEP were shot down by doctors who just weren’t educated about it or honestly being judgmental about it and not prescribing it” [64]
Attitudes/beliefs		
F	PrEP decreases anxiety/stress during sexual encounters	“I have been on PrEP for 11 months and the anxiety I have had about getting HIV through sex has been reduced by 100%” [62]
F	Condoms are also flawed	“If safe sex with condoms worked, we would not have the continued spread of HIV among gay men, so that argument is a FAILURE” [63]
B	PrEP perpetuates stigma of homosexuality and HIV	“Anyone who engages in risky sexual behavior should take extra precautions, be it through PrEP or otherwise. While I’m certain that the WHO acknowledges this, their message nevertheless helps perpetuate the falsehood of HIV being a gay disease” [55]
Attribute of PrEP		
F	PrEP allows you to be sex positive	“‘The virus is the problem,’ he said, adding: ‘People can and should have as much as sex as they want to have. We need to focus on how we can attack the virus as opposed to sex-shaming people or trying to police the quantity of sex that they have or the quality of sex that they have or who they have sex with’ [61]
B	Long commitment	“And there’s no end-game, you just take it forever” [60]
Behaviors		
F	Existing practice of condomless sex	“You cannot count of condom use all the time.’ It would be like asking the heterosexual community to wear them for thirty years to halt population growth. How many couples would be able to maintain it? But that’s what MSM are expected to do 100% of the time. Even with the risk of HIV disease it can’t be done-human nature” [56]
B	Difficulties with adherence	“Guys can’t even remember to wear condoms, but they’ll remember to take a pill they really don’t need every day. Yep, this should help to make things less complicated (sarcasm)” [63]
Sociodemographics		
F	Being “out”	“It’s going to have to come from within the younger generation. And frankly, it starts with the Truvada whores. What a beautiful movement. Here are the guys who are coming out. Coming out has been the secret ammo for the LGBT movement from Day 1. Whether it was coming out as gay or lesbian, or HIV positive, or having AIDS, or now just announcing how you’re protecting yourself against HIV/AIDS” [51]
Social network		
F	Facilitates the conversation about HIV	“PrEP has at least started a conversation about how gay men want to have sex and why” [62]

Complete list of representative quotes available in Supplemental Table 1