HHS Public Access

Author manuscript

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Published in final edited form as:

J Acquir Immune Defic Syndr. 2017 April 01; 74(4): 439–453. doi:10.1097/QAI.0000000000001279.

Gender differences in tobacco use among persons living with HIV/AIDS: A systematic review and meta-analysis

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Abstract

Background—Persons living with HIV/AIDS (PLWH) smoke at higher rates than other adults and experience HIV-related and non-HIV-related adverse smoking consequences. The current study conducted a systematic review to synthesize current knowledge about gender differences in smoking behaviors among PLWH.

Methods—Over three thousand abstracts from MEDLINE were reviewed and seventy-nine publications met all of the review inclusion criteria (i.e., reported data on smoking behaviors for PLWH by gender). Sufficient data were available to conduct a meta-analysis for one smoking variable: current smoking prevalence.

Results—Across studies (n=51), the meta-analytic prevalence of current smoking among female PLWH was 36.3% (95% CI=28.0%-45.4%) and male PLWH was 50.3% (95% CI=44.4%-56.2%; meta-analytic OR=1.78, 95% CI=1.29-2.45). When analyses were repeated just on United States (U.S.) studies (n=23), the prevalence of current smoking was not significantly different for female PLWH (55.1%, 95% CI=47.6%-62.5%) compared to male PLWH (55.5%, 95% CI=48.2%-62.5%; meta-analytic OR=1.04, 95% CI=0.86-1.26). Few studies reported data by gender for other smoking variables (e.g., quit attempts, non-cigarette tobacco product use) and results for many variables were mixed.

Discussion—Unlike the general U.S. population, there was no difference in smoking prevalence for female versus male PLWH (both >50%) indicating that HIV infection status was associated

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Prior Presentations: Data from this paper has been accepted for presentation at the 2017 meeting of the Society for Research on Nicotine and Tobacco.

Conflicts of Interest For the other authors, none were reported.

with a greater relative increase in smoking for women than men. More research is needed in all areas of smoking behavior of PLWH to understand similarities and differences by gender in order to provide the best interventions to reduce the high smoking prevalence for all genders.

Keywords

smoking; tobacco; gender; HIV/AIDS; review; meta-analysis

INTRODUCTION

Tobacco use is well-known to have numerous, serious health consequences and is a leading cause of mortality in the United States (U.S.) and around the world[1,2]. As HIV/AIDS treatment has advanced over time, smoking has had an increasing impact on the health and longevity of persons living with HIV/AIDS (PLWH). Tobacco has emerged as a leading killer among PLWH[3] who smoke at two to three times the rate of the general adult population in the U.S.[4]. The negative impact of smoking on PLWH includes HIV-related complications (e.g., increased viral load, pneumonia), non-HIV medical illnesses (e.g., non-HIV/AIDS-related cancers), and greater mortality[5-9]. Women with HIV/AIDS face additional gender-specific consequences of smoking including adverse fetal-related outcomes (e.g., low birth weight, preterm birth) and early natural menopause[10-12]. Quitting smoking reduces HIV-related symptom burden[13], causes of mortality related to HIV and AIDS such as bacterial pneumonia[6,14], and cardiovascular morbidity[15].

Gender differences in tobacco use exist in the general population. In the U.S., men are more likely than women to report current use of cigarettes and other tobacco products[16,17] and nicotine dependence[18]. Men also report smoking more cigarettes per day (CPD) than women[19,20]. While the prevalence of smoking has decreased over time, women have shown less of a decrease in smoking than men[16]. While men and women do not differ in their interest in quitting smoking[1], there is evidence that women have greater difficulty maintaining smoking abstinence[20-23] (see also[24]) especially when quitting “cold turkey”[20,25]. When using pharmacotherapy, women appear to be less successful quitting with transdermal nicotine patch[26,27] and more successful using varenicline compared to transdermal nicotine patch[28]. Further, women metabolize nicotine more quickly[29], experience greater withdrawal symptoms[30-32], and report greater perceived risks of quitting smoking[33] than men. Together, men and women in the general population differ in a number of smoking-related behaviors, and it is important to understand whether these differences are similar or different in subgroups of smokers who are disproportionately impacted by smoking such as PLWH.

Smoking has serious health consequences for PLWH, especially for women with HIV/AIDS[10-12]. In addition, women in the general population appear to have more difficulty quitting smoking. It is important to identify differences in smoking behaviors for women versus men with HIV/AIDS in order to understand the best way to target efforts to reduce the consequences of smoking for all PLWH. The purpose of the current study was to conduct a systematic literature review to determine what is known about gender differences in smoking behaviors among PLWH. The goals of the review were to synthesize current

knowledge, compare gender patterns to what is known in the general population, and identify areas in need of more research.

METHODS

Systematic review

A MEDLINE search was conducted on February 13, 2016 to identify papers examining gender and smoking among PLWH using search terms related to smoking ("smoking", "cigarettes", "tobacco", "nicotine") and HIV ("HIV", "AIDS"). Abstracts from the MEDLINE search were individually examined by at least two authors to determine whether they met the inclusion criteria. Full texts were obtained and examined if it was not clear whether the paper met the inclusion criteria from the abstract. Additional publications were identified from the reference lists of papers included in the review and review papers on smoking and HIV[4,34,35].

In order to be included in the review, studies had to include (1) persons with HIV and/or AIDS, (2) both men and women, and (3) information about one or more aspects of smoking for men and women separately (e.g., smoking prevalence, desire to quit smoking). Exclusion criteria included: (1) being published in a language other than English, (2) not having a full text available, (3) study samples that were all or nearly all (i.e., >95%) male or female, (4) a small sample size (i.e., <30 participants), and (5) a sample where a specific number of smokers and non-smokers were recruited into the sample (for analysis of smoking prevalence). Information gathered from eligible publications included the country where the study occurred, sample size (overall and by gender), and data on smoking behavior for men versus women including statistics and p-values for the comparisons of smoking behavior for men versus women. Smoking behaviors included prevalence of current or lifetime smoking, nicotine dependence, motivation to quit, quit attempts, use of non-cigarette tobacco products, and quit outcomes. See Table 1 for a list of data gathered from studies.

The MEDLINE search yielded 3,082 abstracts and 376 full texts were examined from the abstract list. Abstracts were excluded if the paper did not examine smoking behavior of PLWH. The main reasons for excluding full text articles were that smoking data were not presented for men and women separately, the sample consisted of all or nearly all men or women, and/or there was no full text available (e.g., an abstract of a poster conference). Seventy-nine publications met all of the inclusion criteria to be included in the review. See Figure 1 for the PRISMA flowchart and Table 1 for a summary of the study characteristics and list of assessed outcomes.

Meta-analysis

We conducted random-effects meta-analyses to estimate meta-analytic prevalence of current smoking among women and men and to summarize odds ratios (OR) for the comparison of odds between women and men. Studies that included the current smoking prevalence data for men and women were included in the meta-analysis (see Tables 1 and 2). We used the R program Metafor for all analyses[36], and employed an inverse variance weighting method. We first conducted the analyses for all studies that documented the prevalence of current

smoking for women and men (n=51). Because the largest number of studies came from the U.S., we then limited the sample to studies conducted in the U.S. (n=23) and repeated the analyses.

RESULTS

Smoking prevalence (Table 2)

See Table 2 for prevalences of lifetime/ever, current, former, and never smoking for PLWH presented by gender. Across all studies that could be included in the meta-analysis (see Table 1), the prevalence of current smoking among women was 36.3% (95% CI=28.0%-45.4%) and among men was 50.3% (95% CI=44.4%-56.2%). For both women and men, the residual heterogeneity of effect sizes was large. For women, Q_{52}=2322.94, p<0.001, and I^2=99.45%. For men, Q_{52}=3604.18, p<0.001, and I^2=99.51%. When comparing women and men (referent = women), the meta-analytic OR was 1.78 (95% CI=1.29-2.45), indicating that averaged across investigations men had 78% greater odds of current smoking than women (Figure 2). Considering the high degree of residual heterogeneity (Q_{52}=1508.67, p<0.001, and I^2=98.92%), this OR should be interpreted as a weighted expected estimate across studies, without drawing conclusions about its representativeness for any one given study.

When selecting for studies conducted in the U.S. the meta-analytic prevalence of current smoking among women was 55.1% (95% CI=47.6%-62.5%), and among men was 55.5% (95% CI=48.2%-62.5%). For both women and men, the residual heterogeneity of effect sizes was large. For women Q_{22}=453.39, p<0.001, and I^2=96.52%. For men, Q_{22}=931.21, p<0.001, and I^2=98.54%. When comparing women and men (referent = women), the meta-analytic OR was 1.04 (95% CI=0.86-1.26), indicating a failure to reject the null hypothesis that across studies, women and men did not differ in their odds of current smoking (Figure 3). Considering the high degree of residual heterogeneity (Q_{22}=110.41, p<0.001, and I^2 =86.52%), this OR should be interpreted as a weighted expected estimate across studies, without drawing conclusions about its representativeness for any one given study.

Among studies that reported the prevalences of smoking for men and women with HIV and men and women in the general population, current smoking prevalences were higher and former smoking prevalences were lower for men and women with HIV (see Table 2). One study[37] that included transgender participants also reported a higher current smoking prevalence for transgender PLWH compared to men or women from the general population.

Other aspects of smoking or tobacco use

Nicotine dependence/addiction—Two studies used the Fagerström Test for Nicotine Dependence[38] to examine moderate or strong dependence on nicotine in PLWH by gender[39,40], a third study used the Modified Fagerström Tolerance Questionnaire[41], and a fourth study defined dependence by either the time to first cigarette in the morning (<30 minutes) or CPD (>20)[42]. While there was no significant gender difference in the report of moderate/strong nicotine dependence in 509 adults in France (men 60.9%; women 58.2%; OR=1.12, 95% CI=0.61-2.06)[39], a lower percentage of women (47.8%) than men (60.0%)

reported moderate/strong nicotine dependence in a sample of 1094 U.S. adults (OR=1.5, 95% CI=1.0-2.2, p<0.05)[40]. There was no difference in the average level of nicotine dependence in 167 U.S. adults (men M=4.8, SD=2.2; women M=5.1, SD=2.0; p=0.17)[41]. Finally, among 3,019 French adults[42], HIV-infected men who have sex with men were more likely to report strong nicotine dependence than general population men (63.7% versus 49.0%; OR=1.37, 95% CI=1.24-1.51). In that study, heterosexual men with HIV and women with HIV were not more likely to report strong nicotine dependence than men or women in the general population, respectively.

Cigarettes per day (CPD)—Some studies found no gender differences in CPD[41,43-45] while other studies reported a greater number of CPD smoked by men compared to women[40,46]. In one study of PLWH in New York (U.S.), more men (25.9%) than women (14.8%) reported smoking ≥20 CPD (p=0.03)[41]. Beachler and colleagues[47] found that women with and without HIV reported a similar number of CPD (<1 CPD, 54% versus 52%; 1-9 CPD, 31% versus 31%; 10-19 CPD, 13% versus 14%; 20 or more CPD, 2% versus 3%; no significance test reported) while more men with HIV, compared to men without HIV, appeared to report smoking high numbers of CPD (<1 CPD, 68% versus 82%; 1-9 CPD, 12% versus 10%; 10-19 CPD, 11% versus 5%; 20 or more CPD, 10% versus 3%; no significance test reported).

Smoking history—There were no gender differences in the age of smoking initiation for 267 PLWH in New York (U.S.) (men M=16.6 years old, SD=6.3; women M=15.9, SD=4.3; p=0.34)[41] or for 1,815 adults from Brazil (men M=16.9 years old; women M=16.5; p=0.61)[44]. One additional study found no gender difference in pack years (men M=24.0, SD=17.6, women M=24.0, SD=20.7)[48].

Change in smoking after HIV diagnosis—Three studies examined changes in smoking behavior after an HIV diagnosis with mixed results[44,49,50]. There was no gender difference in cutting down or quitting smoking following an HIV diagnosis among 2,864 PLWH in the U.S.[49] and no difference in starting smoking following an HIV diagnosis among 966 PLWH in Brazil[44]. In a study of 2,973 PLWH in China[50], women were more likely than men to report quitting smoking following an HIV diagnosis (30.3% versus 18.4%, p<0.01). There were no gender differences with regard to increasing smoking or decreasing smoking after their diagnosis.

Motivation to quit—Studies consistently found no differences in motivation to quit smoking for male and female PLWH[39-41,46,51-54].

Abstinence self-efficacy and beliefs about smoking—Shuter and colleagues found no gender differences in overall abstinence self-efficacy[41,55], abstinence self-efficacy related to specific situations (e.g., positive affect/social situations, negative affect)[41], or beliefs about smoking-related risks (e.g., looking older) and benefits (e.g., weight control)[56]. Tesoriero and colleagues[40] also found no gender differences in general smoking knowledge (e.g., risk of lung cancer is higher among smokers) and HIV-related smoking knowledge (e.g., smoking is a serious health concern for HIV positive individuals).

Quit attempts and outcomes—In a sample of PLWH in San Francisco, California (U.S.), a greater proportion of men than women reported a lifetime quit attempt (81% versus 40%; p<0.001)[46]. Other studies found no gender differences in the proportion of men versus women who reported a quit attempt over one year[40], two years[57], or five years[58]. There were also no gender differences in the number of past-year or lifetime quit attempts among PLWH in New York (U.S.)[41]. Over a 14 year period, a similar number of men and women reported quitting smoking (26.6% versus 24.7%) and relapsing to smoking after quitting (11.8% versus 11.9%)[59].

Use of non-cigarette tobacco products—Two papers examined the use of non-cigarette tobacco products by gender among PLWH in the U.S. entering smoking cessation treatments[41,60]. In the first study[60], 23.2% of men and 17.7% of women reported polytobacco use (i.e., use of cigarettes plus at least one other tobacco product "every day or some days"; p=0.19). In the second study[41], men and women did not differ in their reported use of pipes (5.8% versus 4.2%, p=0.78), cigars (18.1% versus 13.2%, p=0.28), chewing tobacco (2.9% versus 1.7%, p=0.69), or snuff (0.7% versus 0.0%; p=1.00).

Smoking cessation treatment

Use of Treatments—One study found that women were not significantly more likely than men to report lifetime use of any type of smoking cessation pharmacotherapy (OR=1.27, 95% CI=0.71-2.28)[51]. A second study[41] found gender differences in the use of some smoking cessation treatments: more women than men reported past use of nicotine replacement therapy (68.3% versus 55.6%, p<0.05), varenicline (28.5% versus 17.4%, p<0.05), and acupuncture (24.4% versus 11.8%, p<0.01) while there were no differences in the use of bupropion, quit line, group counseling, individual counseling, or a website.

Treatment Completion and Adherence—In clinical trials of smoking cessation treatment for PLWH, gender was not associated with adherence to study medication (varenicline or nicotine replacement therapy)[61-63], number of counseling calls completed[61], or number of study appointments completed[64]. One study of brief counseling and nicotine replacement therapy reported that women were more likely to complete treatment than men (64.3% versus 25.0%; p=0.023)[65]. A trial of transdermal nicotine patch for smoking cessation in 444 PLWH found that gender was not a moderator in the relationship between greater social support and greater adherence to transdermal nicotine patch[66].

Treatment Outcomes—Among five smoking treatment studies — mostly of pharmacotherapy and counseling— that examined quit outcomes by gender[62,64,66-68], none found significant gender differences in abstinence rates. One feasibility pilot study of a web-based intervention and transdermal nicotine patch[62] found a trend toward a higher quit rate for women versus men (11.7% versus 2.7%; p=0.08) and may have been underpowered to find a statistically significant difference. Interestingly, female participants who completed all 8 web-based sessions and who visited all of the web pages showed high rates of quitting (30.8% and 40%, respectively).

DISCUSSION

Tobacco use is the most important preventable cause of excess mortality in adults worldwide[1,2] with serious additional health risks for PLWH[7,9]. Gender differences in smoking behaviors have been found in general population samples[16,20], and women with HIV face gender-specific consequences of smoking[10-12]. The purpose of this paper was to synthesize published data on gender differences in smoking behaviors for PLWH. A systematic review was conducted to examine a range of smoking behaviors and a meta-analysis compared the prevalence of current smoking for female versus male PLWH.

The largest amount of data available on gender and smoking for PLWH was for current smoking prevalence. Men and women with HIV/AIDS reported current smoking prevalences that were very high and much higher than men and women in the general population, consistent with other findings[4]. Even though men reported higher smoking prevalences than women when all global data were considered, the prevalences of current smoking for male PLWH and female PLWH were both greater than 50% and not statistically different from each other when considering U.S. data. Although men are more likely than women to report current smoking in the general U.S. population (men 16.7%; women 13.6%)[16], this difference is not manifest in the subsample of U.S. adults with HIV, suggesting that the added relative risk of smoking for people with HIV is greater for women than for men. Whereas there is a continued need for targeted efforts to reduce smoking among all persons with HIV, women with HIV may demonstrate disproportionate health disparities related to smoking due to the greater relative difference in smoking between those with HIV and the general population for women (55.1% versus 13.6%) compared to men (55.5% versus 16.7%).

PLWH report high rates of current and past use of alcohol and other drugs[124,125]. Alcohol and substance abuse is related to higher smoking prevalences and lower quit rates for the general population[126,127] and for PLWH[37,43,121]. In this review, two studies examined smoking prevalence in samples of current/past injection drug users[101,110] and reported similar smoking rates for men and women (91.3% versus 90.0%[101]; 73.4% versus 77.9%[110]). The majority of the other studies (n=56) reported some aspects of alcohol and/or drug use behavior in their samples; however, no study examined the relationship of alcohol/drug use/abuse to gender differences in smoking behavior. It may be useful for future studies to examine how gender differences in smoking prevalence and other smoking-related behaviors differ for PLWH with and without alcohol and drug use/abuse.

Few studies examined gender differences in smoking-related behaviors other than smoking prevalence, suggesting the need for more research on gender for all aspects of smoking. Mixed results were reported for several smoking variables (e.g., CPD, quit attempts). For some of these variables, differences by gender have been found in general population samples. For example, U.S. women were more likely to report making a quit attempt than men (45.8% versus 41.5%; OR=1.19, 95% CI=1.13-1.26)[69]. Due to the small number of studies and the mixed results, it is not clear yet if men and women with HIV demonstrate differences in these smoking variables. Future examinations of smoking behavior by gender

will help clarify where gender differences do and do not exist and how strategies tailored by gender may be useful for prevention and intervention programs.

While some gender differences were suggested for certain smoking variables, no gender differences were found for other variables (e.g., quit motivation, use of non-cigarette tobacco products). A lack of gender differences have also been found in general population samples in some cases (e.g., motivation to quit smoking[70]) while differences have been reported for other variables. For example, U.S. men are more likely than U.S. women to use non-cigarette tobacco products[17], but this difference does not appear to be seen among PLWH, likely due to the higher rates of tobacco use by women with HIV compared to women in the general population. More research on non-cigarette tobacco products would be beneficial, especially alternative nicotine-delivery products that have shown recent increases in use (e.g., e-cigarettes[71]).

Successful smoking cessation sustained over time is critical for reducing smoking-related consequences and disease. Whereas no differences in quit outcomes were found for the studies that examined data by gender, overall quit rates were generally very low with the large majority of men and women being unable to abstain from smoking over time. In general, there is a need for more efficacious and effective smoking treatments for PLWH[72-75]. More data by gender on smoking variables would help to inform efforts to develop smoking interventions that improve quit outcomes for both men and women. For example, women in the general population are less likely than men to have success when quitting without pharmacotherapy[20,25]. In this review, women with HIV were equally or more likely than men to report the use of pharmacotherapies. The greatest number of women reported using nicotine replacement therapy, similar to general population samples[69]; however, varenicline shows a greater advantage over transdermal nicotine patch for women compared to men in the general population[28]. Women with HIV may benefit from information about the relative efficacy of different pharmacotherapies to quit smoking. No studies were identified that examined a number of smoking-related variables that may impact cessation success (e.g., cravings and withdrawal[76]) and would be additional useful areas of future research.

There are a number of limitations to the current work. First, the criteria for inclusion in the review led to the exclusion of papers in languages other than English, not accessible online, or published in the form of a conference abstract. Second, data on most smoking behaviors came from a small number of studies and from a limited number of countries. Consequently, meta-analysis could only be conducted on current smoking prevalence. As more researchers examine gender differences in other smoking behaviors of PLWH, a clearer picture of these behaviors for men and women will emerge and can then be applied to efforts to help men and women with HIV to quit smoking. Third, very few studies reported data on persons who identified as transgender. More research is needed to examine differences in smoking behaviors of PLWH who identify as transgender compared to PLWH who identify as cisgender.

CONCLUSIONS

PLWH smoke at very high rates compared to the general population and female gender is associated with a greater difference in smoking prevalence between PLWH and the general population. Little is known about the smoking behavior of transgender PLWH or gender differences in smoking behaviors related to cessation success such as withdrawal symptoms. A more detailed understanding of gender differences among PLWH relating to specific smoking behaviors and not limited to simple prevalence statistics would help to inform smoking cessation interventions for all PLWH. Further, more research on smoking interventions with an emphasis on gender would help to ensure that interventions are optimized for both men and women PLWH.

ACKNOWLEDGMENTS

None

Sources of Support: This work was supported in part by awards R01-DA036445, R01-CA192954, and R34-DA037042 from the National Institutes of Health. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute on Drug Abuse, the National Cancer Institute, or the National Institutes of Health.

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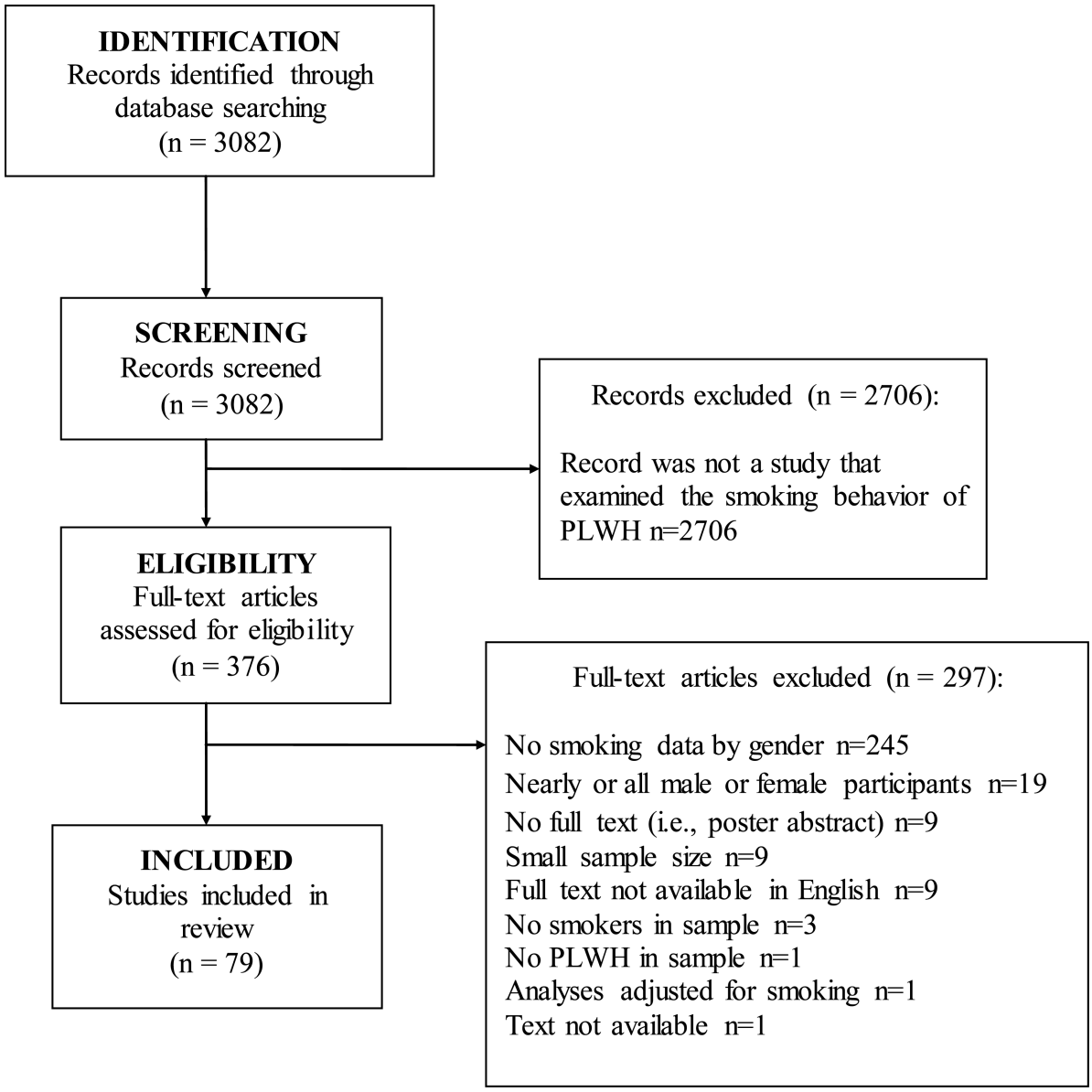

Figure 1.
PRISMA figure for literature search.

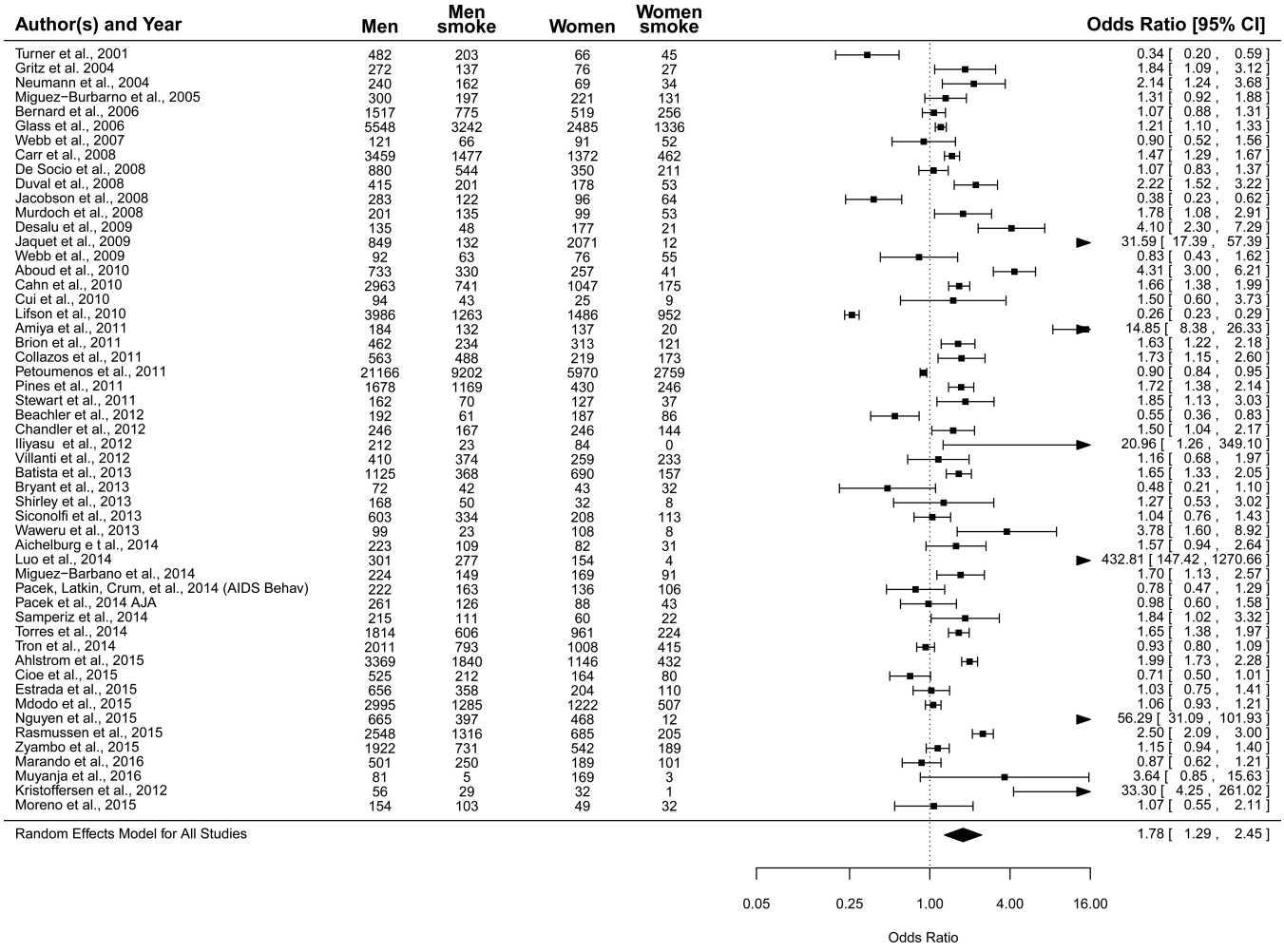

Figure 2.

Forrest plot for smoking prevalence for persons living with HIV/AIDS by gender for all eligible studies (referent = women; n=51).

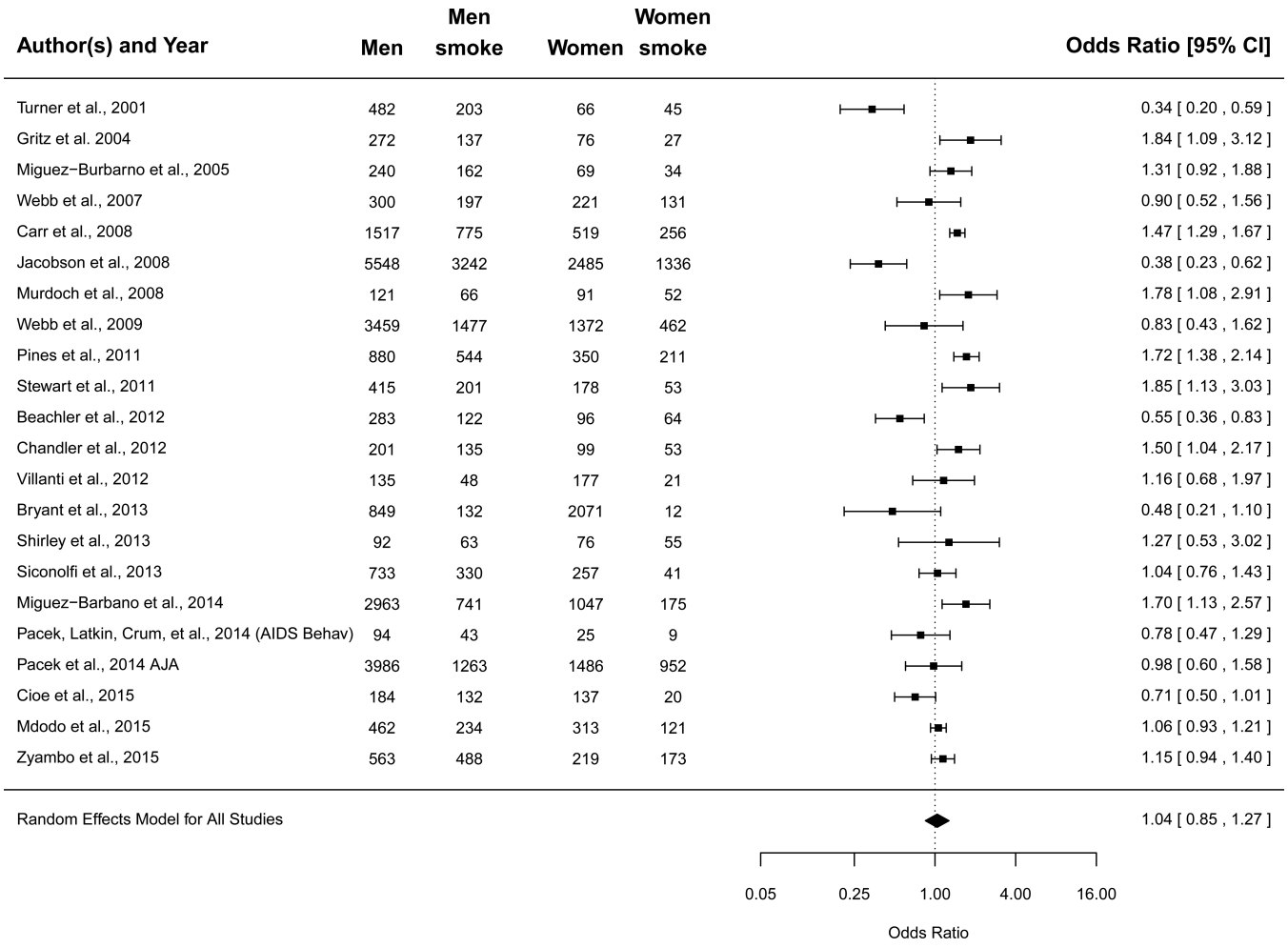

Figure 3.

Forrest plot for smoking prevalence for persons living with HIV/AIDS by gender for studies conducted in the United States (referent = women; n=23).

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Table 1

ing variables that included data presented by gender.

Study[a]	Sample Size[b]	% Male	Smoking Prevalence	Nicotine Dependence	CPD	Smoking History	Post-Diagnosis Smoking	Motivation, Self-Efficacy, Beliefs about smoking	Tobacco Products	Quit Attempts	Smoking Treatment[c]
HCSUS	2864	77					X				
PCHIS	548	88	X*								
--	228	83			X			X		X	
--	348	78	X*		X						
--	309	78	X*		X						
--	521	58	X*								
NRS CO3 Aquitaine Cohort	2036	75	X*								
--	417	82									X
SHCS	8033	69	X*								
NCI-AAC	2795	82	X								
NRS CO3 Aquitaine Cohort	509	74		X				X			
--	212	57	X*								
SMART	4831	72	X*								
SIMONE	1230	72	X*								
--	593	70	X*								

Study[a]	Sample Size[b]	% Male	Smoking Prevalence	Nicotine Dependence	CPD	Smoking History	Post-Diagnosis Smoking	Motivation, Self-Efficacy, Beliefs about smoking	Tobacco Products	Quit Attempts	Smoking Treatment[c]
NHLS	379	75	X*								
UNC-CFAR	300	67	X*								
--	312	43	X*								
IeDEA	2920	29	X*								
--	254	79						X			
--	168	55	X*								
REATE, HEART-UK	990	74	X*								
RAPID II	4010	74	X*								
--	119	79				X					
NRS CO3 Aquitaine Cohort	2223	77								X	
SMART	5472	73	X*								
--	1094	62		X	X			X		X	
--	321	57	X*					X			
--	775	60	X*								
--	782[i]	72	X*								
D:A:D	27136	78	X*								
ASD	2108	80	X*								

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Study[a]	Sample Size[b]	% Male	Smoking Prevalence	Nicotine Dependence	CPD	Smoking History	Post-Diagnosis Smoking	Motivation, Self-Efficacy, Beliefs about smoking	Tobacco Products	Quit Attempts	Smoking Treatment[c]
--	150	66						X			
--	289[k]	56	X*								
MACS, WIHS	379 (HIV), 266 (non-HIV)	57	X*		X						
--	492	50	X*								
--	88	64	X*								
--	296	72	X*								
--	145	49									X
--	60	53						X			
NHBS	669[l]	61	X*								
--	1815	62	X*		X	X	X				
--	115	63	X*								
--	3166	79	X								
--	40	48									X
--	200	84	X*								
ROAH	811[m]	74	X*								
--	474	70							X		
--	207	48	X*								

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Study[a]	Sample Size[b]	% Male	Smoking Prevalence	Nicotine Dependence	CPD	Smoking History	Post-Diagnosis Smoking	Motivation, Self-Efficacy, Beliefs about smoking	Tobacco Products	Quit Attempts	Smoking Treatment[c]
--	305	73	X[*]								
--	774	56									X
--	455	66	X[*]								
FILTERS	393	57	X[*]								
BEACON	358[n]	62	X[*]								
BEACON	267[n]	60						X			X
NSDUH	349	75	X[*]								
--	272	53						X			
--	138	55									X
--	275	78	X[*]								
--	2775	65	X[*]								
ANRS-Vespa2	3019	67	X[*]	X							
REACH	296	72								X	
--	4515	75	X[*]								
SUN	689	76	X[*]								
--	860[o,p]	76	X[*]								

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Study[a]	Sample Size[b]	% Male	Smoking Prevalence	Nicotine Dependence	CPD	Smoking History	Post-Diagnosis Smoking	Motivation, Self-Efficacy, Beliefs about smoking	Tobacco Products	Quit Attempts	Smoking Treatment[c]
MMP, NHIS	4217 (HIV), 27731 (GP)	71 (HIV), 48 (GP)	X*								
--	203	76	X*								
--	1133	59	X*								
--	333	82	X								
DHCS, CGPS	3233 (HIV), 12932 (GP)	79	X*								
SHCS	4833	73								X	
--	127	84									X
UAB 1917 HCC	2464	75	X*								
LHS	247	89									X
--	444	64									X
DHIVA	690	73	X*								
--	250	32	X*								
--	267	54			X	X		X	X	X	X
--	2973	63					X				

rches sur le Sida et les Hépatites Virales; ASD, Adult and Adolescent Spectrum of HIV Disease Project; BEACON, Being Active & Connected Study; BHC, Bristol ay; CPGS, Copenhagen General Population Study; CREATE, Cardiovascular Risk Evaluation and Antiretroviral Therapy Study; D:A:D, Data Collection on ; DHCS, Danish HIV Cohort Study; DHIVA, Dietitians in HIV Study; FILTERS, Florida International Liaison for Transdisciplinary and Educational Research on HCSUS, HIV Cost and Services Utilization Study; HEART-UK, HEART-UK/Unilever CVD risk assessment study; IeDEA, International epidemiological Database ; MACS, Multicenter AIDS Cohort Study; MMP, Medical Monitoring Project; NCI-ACC, National Cancer Institute's AIDS Cancer Cohort Study; NHBS, National HIS, National Health Interview Survey; NHLS, Nutrition for Healthy Living Study; NSDUH, National Survey on Drug Use and Health; PCHIS, Pulmonary APID II, Registry and Prospective Analysis of Patients Infected with HIV and Dyslipidemia; REACH, Research on Access to Care in the Homeless study; ROAH,

Research on Older Adults with HIV; SHCS, Swiss HIV Cohort Study; SIMONE, SIndrome Metabolica ONE Study; SMART, Strategies for Management of Antiretroviral Therapy Study; SUN, Study to Understand the Natural History of HIV and AIDS in the Era of Effective Therapy Study; UAB 1917 HCC, University of Alabama 1917 HIV Clinic Cohort; U.K., United Kingdom; UNC-CFAR, University of North Carolina Center for AIDS Research (UNC-CFAR) HIV Clinical Cohort Study; U.S., United States; WIHS, Women Interagency HIV Study

[*] Included in meta-analysis (i.e., presented data on current smoking by gender)

[a] Name of parent study from which data were taken for the analyses if one was reported

[b] Samples are of adults unless otherwise noted with superscripts

[c] Including use of treatments, treatment adherence, treatment completion, and smoking outcomes

[d] Adult factory workers

[e] Benin, Côte d'Ivoire, Mali

[f] Argentina, Brazil, Chile, Colombia, Ecuador, Peru, Venezuela

[g] Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Lithuania, Luxembourg, Morocco, New Zealand, Norway, Peru, Poland, Portugal, Russia, South Africa, Spain, Switzerland, Thailand, United Kingdom, United States, Uruguay

[h] U.S., Puerto Rico, South Africa, Kenya

[i] Australia, Denmark, The Netherlands, Belgium, Italy, U.K., Switzerland, France, U.S.

[j] Co-infected with hepatitis C virus

[k] Low-income African-American adults

[l] Adults with past-year injection drug use

[m] Adults age 50 years and older

[n] Former or current injection drug users

[o] Full sample n=895, smoking data were presented for 860 participants

[p] Adults without past cardiovascular disease

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Table 2

Prevalence of lifetime smoking, current smoking, former smoking, and never smoking for male and female persons living with HIV/AIDS.

Author	Group	Lifetime/Ever Smoking (%)	Current Smoking (%)	Former Smoking (%)	Never or Non-Smoking (%)	Significant Comparisons[a]
Turner et al., 2001[77]	HIV Men		42.1			2, OR=3.0; 95% CI=1.7-5.3
	HIV Women		68.2			
Gritz et al., 2004[43]	HIV Men		50.4	19.1	30.5	1, OR=1.90, 95% CI=1.08-3.33
	HIV Women		34.8	7.6	57.6	
Neumann et al., 2004[45]	HIV Men		67.5			1, p<0.01
	HIV Women		49.3			
Miguez-Burbarno et al., 2005[78]	HIV Men		65.7	~11.0	~24.0	Not reported
	HIV Women		59.3	~13.0	~27.0	
Benard et al., 2006[79]	HIV Men		51.1			4, OR=0.93, 95% CI-0.76-1.14
	HIV Women		49.3			
Glass et al., 2006[80]	HIV Men		58.4			Not reported
	HIV Women		53.8			
Mbulaiteye et al., 2006[81]	HIV Men	69[b]				Not reported
	HIV Women	55[b]				
	HIV MSM	60[b]				
Webb et al., 2007[35]	HIV Men		54.8			4, p=0.52
	HIV Women		56.7			
Carr et al., 2008[82]	HIV Men		42.7			Not reported
	HIV Women		33.7			
De Socio et al., 2008[83]	HIV Men		61.8			Not reported
	HIV Women		60.2			
Duval et al., 2008[84]	HIV Men		48.2	17.8	34.0	1, p<0.001
	HIV Women		30.3	16.3	53.4	
Jacobson et al., 2008[85]	HIV Men		43.3			Not reported
	HIV Women		66.7			
Murdoch et al., 2008[86]	HIV Men		67.2			1, p=0.015

Author	Group	Lifetime/Ever Smoking (%)	Current Smoking (%)	Former Smoking (%)	Never or Non-Smoking (%)	Significant Comparisons[a]
	HIV Women		53.5			
Desalu et al., 2009[87]	HIV Men	42.2	35.6		57.8	1, p<0.001 (LS)
	HIV Women	13.6	11.9		86.4	
Jaquet et al., 20 09[88]	HIV Men	46.2	15.6			1, p-values not reported
	HIV Women	3.7	0.6			
Webb et al., 2009[89]	HIV Men		68.5			4, p=0.52
	HIV Women		72.4			
Aboud et al., 2010[90]	HIV Men		45.0			Not reported
	HIV Women		16.0			
	GP Men		*13.4*			
	GP Women		*12.7*			
Cahn et al., 2010[91]	HIV Men		25.0			1, p<0.001
	HIV Women		16.7			
Cui et al., 2010[48]	HIV Men		45.7	22.3	31.9	Not reported
	HIV Women		36.0	8.0	56.0	
Lifson et al., 2010[92]	HIV Men		42.8	26.8	30.4	1, p<0.001
	HIV Women		34.2	19.6	46.2	
Amiya et al., 2011[53]	HIV Men		72.0			1, OR=9.20, 95% CI=3.80-22.26
	HIV Women		15.0			
Brion et al., 2011[93]	HIV Men		50.7			1, p=0.001
	HIV Women		38.7			
Collazos et al., 2011[94]	HIV Men		87.6			1, p=0.005
	HIV Women		79.7			
Petoumenos et al., 2011[95]	HIV Men		46.1	24.8	29.1	1, p-values not reported
	HIV Women		38.3	18.3	43.4	
Pines et al., 2011[96]	HIV Men		69.7	8.0	22.3	Not reported
	HIV Women		57.2	7.9	34.9	
Stewart et al., 2011[97]	HIV Men		43.2			1, OR=1.87, 95% CI= 1.14-3.06
	HIV Women		28.9			
Beachler et al., 2012[47]	HIV Men		32.0		68.0	Not reported

Author	Group	Lifetime/Ever Smoking (%)	Current Smoking (%)	Former Smoking (%)	Never or Non-Smoking (%)	Significant Comparisons[a]
	HIV women		46.0		54.0	
	Non-HIV men		*18.0*		*82.0*	
	Non-HIV women		*48.0*		*52.0*	
Chander et al., 2012[98]	HIV Men		67.9			1, p<0.05
	HIV Women		58.5			
Iliyasu et al., 2012[100]	HIV Men		10.8	24.5	64.6	1, p<0.001
	HIV Women		0.0	1.2	98.8	
Kristoffersen et al., 2012[99]	HIV Men		51.8			4, p=0.11
	HIV Women		3.1			
Villanti et al., 2012[101]	HIV Men		91.2		8.8	Not reported
	HIV Women		90.0		10.0	
Batista et al., 2013[44]	HIV Men		32.5	25.0	42.5	1, p<0.001
	HIV Women		22.9	27.5	49.6	
Bryant et al., 2013[102]	HIV Men		58.3	15.3	26.4	4, p-value n.s.
	HIV Women		74.4	9.3	16.3	
Buchacz et al., 2013[103]	HIV Men	59.3				1, p=0.001
	HIV Women	51.1				
Shirley et al., 2013[104]	HIV Men		29.8	39.9	30.3	4, p=0.71
	HIV Women		25.0	37.5	37.5	
Siconolfi et al., 2013[105]	HIV H Men		71.9			1, p<0.001
	HIV MSM		36.8			
	HIV H Women		55.9			
Waweru et al., 2013[106]	HIV Men		23.3			Not reported
	HIV Women		7.4			
Aichelburg et al., 2014[107]	HIV Men		48.9			Not reported
	HIV Women		37.8			
Luo et al., 2014[108]	HIV Men		90.4, 0.3, 1.7[c]			1, p<0.001[d]
	HIV Women		2.6, 22.1, 0.0[c]			
Miguez-Barbano et al., 2014[109]	HIV Men		66.5[e]			1, p<0.03[g]

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Author	Group	Lifetime/Ever Smoking (%)	Current Smoking (%)	Former Smoking (%)	Never or Non-Smoking (%)	Significant Comparisons[a]
	HIV Women		53.9[f]			
Pacek, Latkin, Crum, et al., 2014[110]	HIV Men		73.4			4, p=0.34
	HIV Women		77.9			
Pacek et al., 2014[111]	HIV Men		48.3	16.9	34.9	3, p=0.025
	HIV Women		48.9	10.2	40.9	
Samperiz et al., 2014[112]	HIV Men		61.4	25.6	13.0	4, p-value n.s.
	HIV Women		61.7	23.3	15.0	
Torres et al., 2014[113]	HIV Men		33.4	22.9	43.6	1, p<0.001
	HIV Women		23.3	25.8	50.9	
Tron et al., 2014[42]	HIV H Men		32.8	38.2	29.0	HIV men versus HIV women: Not reported; 5,p=0.001 6,p=0.002
	HIV MSM		41.8	24.6	33.6	
	HIV Women		41.2	28.0	30.7	
	GP Men		*29.2*			
	GP Women		*22.9*			
Ahlstrom et al., 2015[114]	HIV Men		54.6	18.3	27.1	Not reported
	HIV Women		37.6	13.2	49.1	
Cioe et al., 2015[115]	HIV Men		40.4			2, p=0.04
	HIV Women		48.8			
Estrada et al., 2015[116]	HIV Men		54.8			4, p=0.81
	HIV Women		53.9			
Mdodo et al., 2015[37]	HIV Men	65.2[h]	42.9[h], 40.9[i]	22.3[h]		4,p=0.34 (M versus W, p=0.14 (T versus W) 5,p<0.001 6,p<0.001
	HIV Women	56.9[h]	41.5[h], 34.6[i]	15.4[h]		
	HIV Transgender		33.9[h]			
	GP Men	*49.2*[h]	*23.3*[i]	*25.7*[h]		
	GP Women	*36.4*[h]	*18.0*[i]	*18.5*[h]		
Moreno et al., 2015[117]	HIV Men		45.5[j], 21.4[k]		33.1	4, p=0.31
	HIV Women		34.7[j], 30.6[k]		34.7	

J Acquir Immune Defic Syndr. Author manuscript; available in PMC 2018 April 01.

Author	Group	Lifetime/Ever Smoking (%)	Current Smoking (%)	Former Smoking (%)	Never or Non-Smoking (%)	Significant Comparisons[a]
Nguyen et al., 2015[118]	HIV Men		59.7	15.6	24.7	1, p<0.01
	HIV Women		2.6	0.9	96.6	
O'Cleirigh et al., 2015[119]	HIV Men		Not reported			1, p=0.005[l]
	HIV Women		Not reported			
Rasmussen et al., 2015[120]	HIV Men		51.6	19.4	28.9	Not reported
	HIV H Men		42.0	16.7	41.3	
	HIV MSM		51.4	0.2	28.5	
	HIV Women		29.9	15.9	54.1	
	GP Men		*19.6*	*34.4*	*46.0*	
	GP Women		*19.2*	*34.4*	*46.4*	
Zyambo et al., 2015[121]	HIV H Men		39.0	24.9	36.0	1 (CS), MH versus W, OR=1.8, 95% CI=1.3-2.6; MSM versus W, OR=1.5, 95% CI=1.1-1.9[m]
	HIV MSM		39.5	22.9	37.5	
	HIV Women		34.9	15.9	49.3	3 (FS), MH versus W, OR=2.3, 95% CI=1.5-3.2; MSM versus W, OR=1.7, 95% CI=1.2-2.4[m]
Marando et al., 2016[122]	HIV Men		49.9	14.4	30.9	4, p=0.79
	HIV Women		53.4	12.2	29.1	
Muyanja et al., 2016[123]	HIV Men	44.4	6.2			4, p=0.06 (CS) 3, p<0.001 (LS)
	HIV Women	8.3	1.8			

Note: data from general population (GP) samples or samples of men and women without HIV are presented in italics

Key: CPD, cigarettes per day; CS, current smoking; FS, former smoking; GP, general population; H, heterosexual; LS, lifetime smoking; M, men; MSM, men who have sex with men; T, transgender; W, women

1, significant difference in smoking prevalence for men with HIV compared to women with HIV or significant differences in distribution of smoking status for men with HIV compared to women with HIV: greater current smoking prevalence for men with HIV compared to women with HIV

2, significant difference in smoking prevalence for men with HIV compared to women with HIV or significant differences in distribution of smoking status for men with HIV compared to women with HIV: greater current smoking prevalence for women with HIV compared to men with HIV

3, significant difference in smoking prevalence for men with HIV compared to women with HIV or significant differences in distribution of smoking status for men with HIV compared to women with HIV: differences in lifetime, former, or never smoking

4, no significant difference in smoking prevalence or distribution of smoking prevalences for women with HIV versus men with HIV.

5, significant difference in smoking prevalence for men with HIV compared to GP men or significant differences in distribution of smoking status for men with HIV compared to GP men: greater smoking prevalence for men with HIV than GP men

6, significant difference in smoking prevalence for women with HIV compared to GP women or significant differences in distribution of smoking status for women with HIV compared to GP women: greater smoking prevalence for women with HIV than GP women

7, significant difference in smoking prevalence for MSM with HIV compared to GP MSM or significant differences in distribution of smoking status for MSM with HIV compared to GP MSM: greater smoking prevalence for MSM with HIV compared to GP MSM

[a] Significant comparisons of the smoking prevalence of HIV men versus HIV women; HIV men versus GP men; and HIV women versus GP women are labeled by outcome (1-7, see below). If the comparison was for one or some of the smoking statuses but not all, the smoking status that the statistic refers to is labeled (e.g., CS, FS). Statistics may have been calculated for the percentage of men or women who reported a smoking status. If so, that p-value is presented and the percentage of smokers within gender was calculated by the authors.

[b] Percent who reported smoking 10 or more cigarettes per day (lifetime)

[c] Cigarettes only, chewing tobacco only, cigarettes and chewing tobacco, respectively

[d] Greater prevalence of cigarette smoking for men versus women; greater prevalence of chewing tobacco use for women versus men

[e] Nonmentholated cigarettes 22.3%, mentholated cigarettes 44.2%

[f] Nonmentholated cigarettes 11.8%, mentholated cigarettes 42.0%

[g] Greater prevalence of nonmentholated cigarette smoking for men versus women; similar prevalence of mentholated cigarette smoking for women versus men

[h] Weighted prevalence, n=3981

[i] Adjusted for age, gender, race/ethnicity, education level, and poverty level. HIV n=4207, GP n=27603

[j] Prevalence of current daily smoking

[k] Prevalence of current occasional smoking

[l] While the smoking prevalences were not reported in the text, it was reported in text that smokers were more likely to be male than female

[m] Adjusted for “clinically relevant” variables

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