13

Biological and Behavioral Risk Factors Associated with STDs/HIV in Women: Implications for Behavioral Interventions

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Women are disproportionately affected by the burden and consequences of STDs, including human immunodeficiency virus (HIV). Of the estimated 19 million cases of STDs that occur annually in the United States (1), about two-thirds are in women (2). Further, both bacterial and viral STDs are associated with negative sequelae in women. Untreated gonococcal and chlamydial infections can produce significant and disproportionate reproductive system morbidity in women, including pelvic inflammatory disease, infertility, ectopic pregnancy, and chronic pelvic pain (2,3). Additionally, about 70% of chlamydia infections and 50% of gonococcal infections are asymptomatic in women, causing a delay in seeking care and an increase in the risk for negative sequelae (3,4).

Genital human papillomavirus (HPV) infection, the most common sexually transmitted viral infection worldwide, can also produce negative sequelae for women. Although most genital HPV infections are transient (i.e., are cleared by a healthy immune system), persistent infection with oncogenic or high-risk types are associated with cervical abnormalities and cervical cancer, while infection with other types can produce genital warts (5). Further, infection with herpes simplex virus, also common in women, can produce painful outbreaks, and in pregnant women, can result in perinatal transmission and serous neonatal infection (3).

HIV/acquired immunodeficiency syndrome (AIDS) has become a significant public health concern for women. An estimated 14 million women are infected with HIV worldwide (2). Further, women between the ages of 18 and 44 years represent the fastest growing population with HIV/AIDS in the United States (6). In 2004, women represented 30% of the 33,132 reported cases of HIV infection and 23% of the 415,195 persons living with AIDS in the United States (7). African-American women are disproportionately affected by STDs, including HIV/AIDS, compared with women in all other ethnic/racial groups. The rate of AIDS diagnosis in African-American women is about 25 times the rate for Caucasian women and four times the rate for Hispanic women (8). In 2001, HIV infection was the leading cause of death for 25–34-year-old African-American women and the third leading cause of death for 35–44-year-old African-American women (8,9).

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Given the statistics and negative sequelae, preventing STDs/HIV in women is an important public health goal (10). A myriad of biological, behavioral, and contextual factors are associated with the burden of STDs in women. This chapter will review the unique biological and behavioral factors associated with the acquisition and transmission of STDs, including HIV, in women and will provide examples of published interventions that target women and focus on these factors.

Unique Factors Related to STD/HIV Risks in Women

Biological Risk Factors

The female reproductive system is susceptible to STDs in several unique ways. Anatomically, it is composed of an array of epithelial cell types, several communicating compartments, and a unique microbiological balance all of which are physiologically influenced by hormonal flux. Furthermore, biological factors that may increase female susceptibility to STDs vary with age.

The cellular morphology of the cervix and vagina vary over a woman's lifetime and are directly influenced by hormonal changes. At birth, maternal estrogen stimulates a stratified squamous epithelial lining in the neonatal vagina, which is susceptible to trichomonas and candidal infections but resistant to chlamydial and gonococcal infections (11). When this maternal estrogen wanes, the stratified squamous epithelium is replaced by a thin, atrophic columnar epithelium, which remains until menarche and which will support the growth of both *Chlamydia trachomatis* and *Neisseria gonorrhea*. At puberty, estrogen stimulation returns to stimulate a thicker, glycogen-containing stratified squamous epithelium that covers the vaginal vault to the squamocolumnar junction on the cervix and also that is less susceptible to chlamydial and gonococcal infections (12).

The cervix consists primarily of dense collagenous connective tissue. The cervical canal consists of columnar epithelium, but the part of the ectocervix that projects into the vagina is covered by stratified squamous, nonkeratinizing epithelium. The columnar epithelium of the cervical canal, or endocervix, may extend out beyond the external os where it forms small patches known as physiological eversion, or ectopy. Cervical ectopy is a common physiological process in adolescence, as well as during pregnancy and in response to hormonal contraceptive use. A larger surface area of columnar epithelium is exposed to potential infectious inoculum when ectopy is present, and so the size of ectopy is believed to correlate with the risk of cervical chlamydial and gonococcal infections (13–15).

With age, the uterus elongates and the squamocolumnar junction migrates into the cervical canal (16). At menopause, a sharp decline in estrogen levels effects atrophic changes in the vagina, with thinning of the epithelium, decreased lubrication, and narrowing and shortening of the vaginal canal. Sexually active postmenopausal women experience less pronounced changes (17).

The estrogen stimulation associated with puberty also affects the vaginal flora. Prepubescent girls have vaginal flora predominately composed of anaerobic rods and cocci and low levels of lactobacilli (12). At puberty, glycogen is deposited on the vaginal epithelium under estrogenic control. The vaginal epithelial cells metabolize the glycogen to form glucose. Lactobacilli that are

part of the normal vaginal flora use the glucose for nutrients and produce lactic acid, which keeps the vagina at an acidic pH. In addition to producing acid, some species of lactobacilli produce hydrogen peroxide (H_2O_2), which may play a crucial role in protecting against overgrowth of pathogens in the vagina, leading to bacterial vaginosis, and which also acts as a natural microbicide with the vaginal ecosystem, especially important in killing HIV. As estrogen declines during menopause, there is also a decline in glycogen production and vascularity in the vagina.

Physiological hormonal changes throughout a woman's lifespan also affect the production and consistency of cervical mucus, which also may serve as a defense against infection (18). Cervical mucus is abundant through the first month of life, becomes scant with loss of maternal estrogen, and becomes copious around puberty. The mucus secreted at adolescence, unlike that of older adolescents or adult women, is easily penetrated by organisms and sperm. Once monthly menstrual cycles are established, maximal secretion and minimal viscosity occurs during midcycle or the periovulatory phase. A thick, viscous cervical mucus acts as a functional barrier against attachment of pathogens to epithelial surfaces and against the ascent of organisms into the uterus and fallopian tubes. It may also provide a substrate for antibacterial enzymes, antibodies, and leukocytes (11). Adolescent girls also experience opening of the endocervical canal at 9 or 10 years of age. Given their immunological naïvetȇ, their easily penetrable cervical mucus, and the opening of the cervical canal, sexually active adolescent girls have major biological predisposition for ascent of pathogens into the upper reproductive tract and a higher incidence of pelvic inflammatory disease (11,18).

Additional biological risk factors associated with risk for STDs in women are related to the type of sexual intercourse and the often asymptomatic nature of STDs in women. Receptive anal intercourse and penile-vaginal intercourse have higher risks for discharge-related STDs and HIV than does oral sex. Additionally, as previously stated, women infected with many STDs as compared with men have minimal or nonspecific symptoms or no symptoms. Symptoms of vaginal discharge that can be associated with gonorrhea, trichomonas, or chlamydial infections are often misinterpreted by women and their health care providers as being caused by yeast infections. Additionally, incorrect treatment with vaginal yeast medications, over-the-counter preparations, or home remedies and douches often delay or confound diagnosis (19). Further, genital ulcer diseases caused by syphilis or genital herpes infections are also not recognized early in many women, either due to lack of symptoms or by the inability to detect lesions on the female genitalia or cervix. Syphilis is more commonly diagnosed in its secondary stage among women, whereas men report more frequently with visible primary stage lesions (20). Finally, women with primary or recurrent genital herpes infections often misinterpret symptoms as being caused by urinary tract infections or by yeast (20).

Since symptoms do not always herald STDs in women, screening should be based on risk. For example, the Centers for Disease Control and Prevention (CDC) (4) recommends yearly screening for *Chlamydia trachomatis* in all sexually active women who are 25 years of age or younger and in all older women with risk factors (e.g., a new partner or multiple partners). Further, since a high prevalence of chlamydia is found in women following treatment due to rein-

fection either from an untreated sexual partner or from a new partner, women with chlamydial infection should be retested three months after treatment (4). Ensuring that all sexual partners are treated before resuming sexual activity is difficult if the male partner has no symptoms or if the threat of violence with disclosure of infection is an issue. Without treatment of all partners, recurrent infection often occurs. Patient-delivered partner therapy recently has been evaluated and can be very effective in decreasing reinfection with gonorrhea and chlamydia, especially among women (21). This is particularly important since symptoms may not be associated with infection and because repeat infections confer an elevated risk of pelvic inflammatory disease (PID) and its sequelae. Similarly, since gonococcal infections among women often are asymptomatic, the U.S. Preventive Services Task Force (22) recommends routine screening of all sexually active women who are at risk. Risk factors include a previous gonorrhea infection, other STDs, new or multiple sex partners, inconsistent condom use, commercial sex work, and drug use.

In addition to the asymptomatic nature of many STDs in women, another factor that contributes to underdiagnoses or delayed diagnoses of STDs in women relates to STD diagnostic test sensitivity. Until the development of very sensitive nucleic acid amplification tests (NAATs), women were at a technical diagnostic disadvantage because available diagnostics for cervical STDs were not extremely sensitive, possibly due to contamination by resident nonpathogenic organisms, or to the presence of cervical mucus or blood (23).

Because women are more biologically susceptible to STDs if exposed than men and are more likely to have unrecognized and untreated infections, short-term and long-term health consequences often result. With inadequate treatment, an estimated 10–45% of women with gonorrhea and 10–30% of women with chlamydia infections may develop PID (24).

Behavioral Risk Factors

Behavioral risk factors that place women at risk for STDs/HIV include early sexual debut and partner characteristics, e.g., multiple partners, concurrent partners, and risky partners. In fact, it is more often the behavior of the male partner than that of the woman that affects a woman's risk (25,26), as most women acquire STDs, including HIV, from heterosexual contact with an infected male partner (25). Additionally, because STDs are often asymptomatic in women and transmission of some STDs, particularly HIV, from men to women is more efficient (10), women who engage in less risky behavior may be at greater risk of becoming infected than men (26). Therefore, the behavioral risk factors for STDs/HIV in women must be discussed with regard to the social and contextual factors that affect women's sexual behavior. Social factors are defined as external factors that impact groups of people similarly, e.g., social and cultural norms, social status, and incarceration history (27). Contextual factors form the environment in which individuals exist and include relationships, victimization, drug abuse, and the exchange of drugs and/or money for sex (27).

Social and cultural norms within groups often influence their behavior in relationships. Gender dynamics (i.e., traditional gender roles for women that allow men to make decisions about sexual behavior) limit the ability of women to protect themselves from and increase their vulnerability to STDs and

HIV (26). Additionally, a sex-ratio imbalance in which women outnumber men (i.e., among African-Americans in the United States) may limit the bargaining advantage of women in male-female relationships and hamper their ability to negotiate protective behaviors like condom use (27). Further, cultural norms that support involvement in subcultures like the exchange of sex and/or money for drugs may increase risky sexual behavior and hinder safe sex practices (28). Women involved in the sex exchange subculture are subject to violence; victimization; and higher risk sexual behaviors like multiple and risky sexual partners, and a higher frequency of unprotected sex (27).

Poverty plays a significant role in the susceptibility of women to STDs and HIV. Poverty is associated with poorer health status, substance use, increased levels of and chronic stress, violence, and limited access to health care (29–32). The available literature also suggests that lower income couples hold more traditional values about gender roles (33,34), increasing a woman's dependence on her male partner and limiting her ability to protect herself (27).

Sexual networks, sets of individuals who are linked directly or indirectly through sexual behavior (35), can influence a woman's STD and HIV risk. Within sexual networks, partner concurrency (i.e., overlapping sexual relationships) fosters the transmission of STDs. Therefore, women who are in sexual networks that have high concurrent sexual partnerships are at greater risk for STDs, including HIV (35). Differences in sexual networks have been used to explain differences in the STD/HIV rates between African-American and Caucasian women (36). African-American women tend to be in racially segregated sexual networks with higher partner concurrency rates due to lower marriage rates and younger age at sexual debut (35).

Incarceration history is also a factor in the STD/HIV rates in women. Women with a history of incarceration also report engaging in more high-risk behavior such as injecting drug use and unprotected sex prior to their incarceration (37–39). Further, women with a history of incarceration may turn to substance abuse to mute the trauma of incarceration (27).

The meaning and nature of the relationship in which sex occurs affects a woman's risk for STDs/HIV. Research (26,40,41) has shown that gender roles within a relationship can influence sexual behavior and risk for STDs. Gender roles for women are often related to connection and caring for other (27). Therefore, women may engage in risky behaviors like drug use to strengthen the bond between them and their partners (42), and/or to create or maintain relationships (43). Further, relationship power, i.e., relationship control and decision-making power (44) can significantly affect sexual protective behaviors like the ability to negotiate condom use and actual condom use in relationships. More often men have decision power over sexual behavior issues and control over condom use. Women are often unable to make an independent decision to use condoms (26).

Research has also shown that past victimization, e.g., history of child sexual abuse (45); substance abuse, including injection drug use (46–48); alcohol and crack cocaine use (49,50); and mental health problems, e.g., depression (51,52), are related to STD/HIV risk behavior in women. Past victimization can influence a women's decision to engage in high-risk sexual behavior (27). Further, these factors are often interrelated and more prevalent in populations that are disproportionately affected by STDs like African-American and Hispanic women (27).

Behavioral Risk Factors in Lesbians

Sexual orientation is characterized by behavior (gender of sex partners), affective (attraction or desire), and cognitive (identify) dimensions (53). Women use terms like heterosexual, bisexual, or lesbian to describe their sexual orientation, while researchers use terms like women who have sex with women (WSW), women who have sex with men (WSM), or women who have sex with both men and women (MSMW) to describe the sexual behavior of women (53). Approximately 2.3 million women in the United States describe themselves, i.e., their sexual orientation, as lesbian (54). There are few studies on the prevalence of STDs/HIV in lesbians and fewer on the STD/HIV risk behaviors of this population. Results from studies on the prevalence of STDs/HIV in lesbians show that lesbians have an unusually high prevalence of bacterial vaginosis and that the transmission of STDs like trichomoniasis, genital herpes, HPV, and HIV has been reported in this population (53–55). The available literature on STD/HIV risk behaviors in lesbians suggest that sexual practices like digital-vaginal or digital-anal contact with shared penetrative sex toys between women provide an environment for STD transmission to occur (54). These studies also show limited knowledge of the potential for STD transmission between lesbians (54).

Despite the evidence on STDs/HIV among lesbians, there is a paucity of literature on prevention interventions in this population. Given the statistics, however, prevention interventions are necessary for women who describe themselves as lesbians. Based on results from the literature, interventions targeting this population should include education of risk for STD transmission between women, incorporate themes of personal responsibility, target the range of sexual practices (i.e., digital-vaginal penetration and use of vaginally insertive sex toys in lesbians), be framed in terms of sexual enjoyment and healthy sexuality, and emphasize respect for one's body and sexual choices (54).

STD/HIV Prevention Interventions that Target Women

Behavioral interventions seek to increase knowledge, change attitudes, and promote the adoption of safer behaviors, and develop environmental conditions that support positive behavior change (56). Successful STD/HIV interventions, then, have a multifactor approach at different social and structural levels, target behaviors that involve contact with core group members or high-risk activity, include a condom promotion component, develop and implement structural and ecologic changes that foster the adoption of STD/HIV prevention practices, and have strong leadership at political and public health levels that affect the targeted community (56). Published STD/HIV prevention interventions for women have focused on improving knowledge, self-efficacy, and risk-reduction behavior (57). While individual-level constructs like knowledge, self-efficacy, and risk perception are important, STD/HIV prevention efforts that focus on women must also include a recognition of the unique biological and behavioral risk factors that make women more susceptible to STDs (57) and the social and contextual factors that affect women's sexual behavior (58). Further, because of the rates and unique issues related to STD/HIV acquisition and transmission in ethnic minority women, interventions targeting these populations should also be culturally specific (40,

57,59–61). There is debate in the literature about the meaning of "culturally specific"; definitions range from incorporating discussions on cultural values, customs, traditions, racial/ethnic pride, and/or cultural barriers to adopting safer sex behaviors into interventions (25,57,61), to providing ethnicity-specific educational resources, and having ethnically matched facilitators (57).

Based on the available literature, the most efficacious prevention interventions specifically targeting women have involved theory-based skills training strategies, e.g., Social Learning Theory (62); focused on relationship and negotiation skills, and included multiple contacts (63). Almost all of the published STD/HIV prevention interventions have promoted consistent use of male condoms as the desired prevention strategy (25). Effective interventions for promoting condom use have used a randomized control study design; emphasized gender-power dynamics; been peer-led; and presented in multiple sessions (40).

The following section will outline the evidence on the effectiveness of and provide examples of published interventions to reduce risk factors for STDs/HIV in women. These examples do not include studies that have male participants. The discussion is organized by the level of the intervention (i.e., individual, group, or community).

Individual Level

Most of the published interventions targeting individual women are brief and single-session, have focused on risk-reduction education including activities to strengthen risk-reduction behavior skills (e.g., correct condom use, sexual communication training, problem solving skills); and included exercises to promote the development of positive attitudes, beliefs, and intentions about positive behavioral change and reinforcement of support for behavioral change efforts (58). While these types of interventions offer brevity, they are often limited in the amount of individualized skill-building they provide (25).

Scholes et al. (64) developed a theory-based tailored minimal self-help intervention to increase condom use among young women. The intervention was based on social science theory and included individually tailored materials (i.e., a self-help magazine-style booklet, *Insights*; a tailored booster feedback newsletter, *Extra Insights;* and a safe sex kit with male and female condoms, a condom carrying case, and condom-use instructions). The control condition was usual care. The primary study outcomes were proportion of sexually active women who used condoms with any partner, proportion of sexually active women who used condoms with a nonprimary partner, and the average percentage of total episodes of intercourse during which condoms were used; all measured for the prior three months. Women in the intervention group reported significantly greater condom use overall with recent primary partners, higher proportion of intercourse episodes in which condoms were used, more condom use discussions with a partner, and higher condom use self-efficacy with primary partners than women in the control condition.

Additionally, Bryan and colleagues (65) developed a multicomponent, one-session condom promotion intervention targeting sexually active college women. The intervention consisted of videotaped segments, lectures and audience participation, and skill-building exercise intervention; and addressed women's perceptions about sexuality, beliefs about STDs, and self-efficacy for

condom use. The control group received a stress management session. The intervention produced increased intentions among participants to use condoms immediately post-intervention, and reported increased condom use at last intercourse six weeks and six months post-intervention.

Schilling et al. (38) report on an individual level intervention for decreasing STD transmission. This study examined the use of patient-delivered partner treatment with azithromycin to prevent repeat chlamydia infection in women. The goal was to determine whether repeat infection with *Chlamydia trachomatis* could be reduced by providing women with doses of azithromycin for their male sex partners. This randomized, multicenter controlled trial included two study conditions: patient-delivered partner treatment (women asked to deliver azithromycin to their male sex partners) or self-referral (women asked to refer their sex partners for treatment). Results showed that the risk of reinfection was lower among women in the patient-delivered partner treatment condition but the difference was not statistically significant.

Group Level

There are many published small-group interventions targeting women. These interventions typically involve a substantial amount of contact with participants, usually draw on constructs of social-cognitive and reasoned-action theories; attempt to increase participants' knowledge about STD/HIV prevention, strengthen behavior-change motivation, and teach STD/HIV risk-reduction skills (58). They are also typically tailored to address the needs of the targeted group.

Shain et al. (66,67) describe two different trials of a behavioral intervention to prevent gonorrhea and chlamydia in minority women. Project SAFE (66) was a theory-based, culture-specific, behavioral, risk-reduction intervention designed to reduce chlamydia and gonorrhea infection in low-income African-American and Mexican-American women. The intervention consisted of three small-group, multicomponent, three to four hour sessions delivered to five or six participants by a race- and gender-matched trained facilitator. The intervention condition was adapted from the AIDS Risk Reduction Model (68), and included elements of the several social and psychological theories including the Health Belief Model (69), self-efficacy theory (62), decision-making models (70), and diffusion theory (71). The control condition was standard STD counseling. The main outcome variable was chlamydial or gonorrheal infection. Results showed that the rates of subsequent chlamydial or gonorrheal infection in the intervention group were significantly lower than in the control group at both the 6- and 12-month follow-up periods.

Project Safe 2 (67) included a second intervention arm, five optional monthly support groups following the standard intervention, and additional follow-up at 1 year, 18 months, and 2 years post-intervention. With Project Safe 2, investigators sought to confirm results from the original study, examine long-term efficacy of the new intervention by including a two-year follow-up period, determine whether the efficacy changes over time, and determine the additional benefits of the optional support groups. The main outcome was subsequent chlamydia or gonorrhea infection. Results showed that adjusted subsequent chlamydial or gonorrhea infection rates were higher in the control condition than in the other two conditions. Additionally, women

who participated in the support groups had the lowest adjusted infection rates in year 1 and cumulatively. Further, women in the intervention conditions were significantly less likely to have repeat infection than women in the control condition.

Eldridge et al. (72) developed an intervention targeting women entering court-ordered inpatient substance abuse treatment. The intervention was a four-session behavioral skills training condition that provided skill-building training for sexual negotiation and condom use; the control condition was a three-hour HIV education session (25,72). Women in the intervention group had significantly improved prevention attitudes, more positive expected partner reaction, and improved sexual communication and condom use skills as compared with women in the control condition. There was improvement with regard to the number of partners, frequency of risky acts, and number of drugs used in both the intervention and control groups. Results from the study, however, should be interpreted with regard to the attrition rate at follow-up; the follow-up assessment response rate was 49%.

Baker et al. (2003) compared the effectiveness of two different intervention, skills treatment (ST) and health education (HE), for reducing new STD infections in heterosexual women. The ST condition was based on the relapse prevention model (73), a model that includes traditional approaches to skills training and skills to support the initiation and long-term maintenance of safer sex behavior change. This condition included didactic presentations, discussion, and role-play group exercises to practice safer sex skills. The HE condition included didactic presentations on women's health with a focus on sexual health and nonstructured discussion sessions. Both conditions were delivered in 16 weekly two-hour group sessions with 5 to 10 participants per group. The main outcomes were new STD acquisition and self-reports of sexual behavior. Study results showed that participants in the ST condition were significantly less likely to be diagnosed with an STD and demonstrated superior risk reduction skills at 12-month follow-up compared with participants in the HE condition. Further, participants in both conditions had a significant reduction in self reports of risky sexual behavior immediately following the intervention and at 12-month follow-up. Based on study results, the ST intervention was superior to the HE intervention in reducing new STD acquisition.

Van Devanter et al. (2) assessed the effectiveness of a STD/HIV behavior change intervention on increasing use of the female condom. The WINGS (Women in Group Support) project was a randomized trial of an education, skills-training, and support-group intervention for women at high risk for STD/HIV infection. The intervention was composed of six weekly group sessions in which women received information about STDs/HIV; skills training in communication, goal setting, and use of the male condom; and information about the female condom, a video demonstration on its use, live demonstration of female condom use, and the opportunity to practice using the condoms. The control condition was a one-hour session that included a nutrition video on healthy food choices. Women in the intervention group had more positive attitudes toward the female condom, demonstrated increased skills in female condom use, and were more likely to use the female condom and say that they intended to use it than women in the control group. Women in the control group also increased their use of the female condom from baseline.

Community Level

Community-level interventions targeting women include a focus on structural/policy interventions to assist women in reducing their STD/HIV risks (25,74). These types of interventions may be more cost-effective than individual or group level interventions because they reach a large number of women (25). Additionally, they may produce a generalization of empowerment among participants to other community issues (25).

Lauby et al. (75) describe a community-level HIV prevention intervention for inner-city women. The goal of the intervention was to modify community norms, attitudes, and behaviors concerning condom use among community women. The intervention was based on the Transtheoretical Model of Behavior Change (75) and included three components: a media campaign, outreach, and community mobilization. The media campaign involved the use of flyers, brochures, posters, and newsletters to relay role-model stories of women in different degrees of readiness to use condoms; these stories described how women overcame barriers to condom use and progressed to more consistent condom use. The outreach was stage-based and included one-on-one or group-level contact to provide prevention messages, encourage and reinforce behavior change, and distribute condoms and role model stories. The community mobilization component involved the recruitment of peers as volunteers to provide HIV information, referral, condoms, and role model stories. The comparison condition was the usual HIV prevention programs available in the matched communities. Results showed that women in the intervention communities were more likely to report ever using condoms post-intervention with main partners than women in the comparison communities.

Sikemma et al (76) developed a multi-site community level intervention for women living in 18 low-income housing developments in five U.S. cities. Participants from housing developments randomized to the intervention condition received peer-led small-group workshops and community events while participants from housing developments in the comparison condition received HIV informational brochures, free condoms, and order forms to obtain additional condoms. The major outcome was assessment of HIV risk behavior in the housing developments at baseline and one-year post-intervention. The proportion of women reporting unprotected intercourse declined and the percentage of intercourse occasions for which condoms were used increased for women in the intervention condition as compared to women in the control condition (76). Additionally, women in the intervention condition scored higher on the AIDS knowledge measure and were more likely to report having a condom at home or on her person than women in the comparison condition.

Conclusion

This chapter highlights the unique biological and behavioral factors related to the acquisition and transmission of STDs/HIV in women and provides examples of published interventions that target women. Additional research is needed to determine the most effective gender- and race/ethnicity-appropriate theories and interventions for STD/HIV prevention in women (26). This research should continue to examine the role of social and contextual factors

(e.g., mental health issues, past childhood sexual abuse, incarceration history, and substance abuse associated with women's sexual behavior), how these factors are associated with STD/HIV acquisition and transmission, and appropriate methods for addressing these factors in STD/HIV prevention. Additional research is also needed on barriers and facilitators of early testing for STDs/HIV (26) so that the negative sequelae associated with these infections in women may be avoided. Further, additional research is needed on specific populations of women who remain disproportionately affected by STDs/HIV (i.e., high-risk ethnic minority women, despite the plethora of interventions conducted in this group). Women in these populations may have complicated life experiences associated with their ability to practice safer sex that may require additional support and different types of interventions (10). Effective interventions in this population may include structural level interventions like incarceration reform and organized substance abuse treatment and support.

Further research should be conducted on successful interventions to determine in which populations of women they are most successful, if they can be shortened and adapted for different populations of women and women in different environments and still maintain their effectiveness, and whether they will maintain their effectiveness over longer periods of time. Interventions are also needed for pregnant women, as research (77) has shown that pregnant women remain sexually active and therefore at risk for STDs/HIV throughout their pregnancy. These women, however, are often excluded from behavioral intervention trials, and few interventions have been developed for this population (66,78). Further, because the behavior of the male partner is usually the significant factor in STD/HIV risk for women, interventions targeting heterosexual men are needed. There is a paucity of published interventions and a general lack of attention to STD/HIV interventions for heterosexual men (10). This oversight might reinforce traditional gender roles that sexual safety is a woman's concern (10), and put men at risk and increase women's risk for STDs/HIV. Finally, there is a clear need to translate and disseminate research on effective interventions for women into practice. Few effective interventions have been translated into practice, as effective translation is often impeded by lack of funding for implementation and lack of field-based support (56). In order to have a significant impact on STD/HIV rates in women, effective interventions must be developed that are sustainable, cost-effective, and translatable within the current public health infrastructure (79).

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