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Review article

Addressing HIV/Sexually Transmitted Diseases and Pregnancy Prevention Through Schools: An Approach for Strengthening Education, Health Services, and School Environments That Promote Adolescent Sexual Health and Well-Being



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A B S T R A C T

Adolescents' health behaviors and experiences contribute to many outcomes, including risks for HIV, other sexually transmitted diseases, and unintended pregnancy. Public health interventions and approaches addressing risk behaviors or experiences in adolescence have the potential for wide-reaching impacts on sexual health and other related outcomes across the lifespan, and schools are a critical venue for such interventions. This paper describes a school-based program model developed by the Centers for Disease Control and Prevention's Division of Adolescent and School Health for preventing HIV/sexually transmitted diseases, unintended pregnancy, and related health risk behaviors and experiences among middle and high school students. This includes a summary of the theoretical and evidence base that inform the model, and a description of the model's activities, organized into three key strategies (sexual health education, sexual health services, and safe and supportive environments) and across three cross-cutting domains (strengthening staff capacity, increasing student access to programs and services, and engaging parent and community partners). The paper also outlines implications for adolescent health professionals and organizations working across schools, clinics, and communities, to address and promote adolescent sexual health and well-being.

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IMPLICATIONS AND CONTRIBUTION

This paper describes a school-based, theory- and research-driven program model developed by the Centers for Disease Control and Prevention's Division of Adolescent and School Health for preventing HIV/sexually transmitted diseases, unintended pregnancy, and related health outcomes among U.S. adolescents. It includes strategies, activities, and key implementation considerations for adolescent health professionals.

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Youth's experiences and behaviors during adolescence impact their current health and set the stage for their health into adulthood [1]. Experiences and behaviors during childhood and adolescence greatly influence longer term health and wellbeing

[2,3] including sexual health-related outcomes [4], which makes adolescence a critical time for health interventions. Sexual risk behavior in adolescence contributes to unintended pregnancy, risk for HIV, and other sexually transmitted diseases (STDs) [1]. Although prevalence of most sexual risk behaviors and experiences among adolescents in the U.S. has decreased from 2009 to 2019 [1], STD rates among U.S. youth aged 15–19 have increased from 2014 to 2018 [5]. Although it is estimated that youth ages 15–24 make up just over one quarter of the sexually active population, youth in this age group account for half of the 20 million new sexually transmitted infections that occur in the U.S. each year [5]. Adolescents are identified as a particularly high-risk group for STDs due in part to the barriers they may face accessing STD prevention and management services (e.g., inability to pay, lack of transportation, confidentiality concerns with parents/guardians). Other health behaviors such as high-risk substance use, victimization from violence, and poor mental health and suicide-related experiences are shown to co-occur with and contribute to risk for HIV/STDs and unintended pregnancy among adolescents [1]. Recent trend data from 2009 to 2019 illustrate that several violence victimization, mental health, and suicide-related behaviors and experiences among U.S. adolescents have grown worse [1].

Given the prevalence of such behaviors and experiences, public health professionals must identify opportunities to effectively reach adolescents with the knowledge, skills, services, and support they need to enhance their health behaviors and outcomes. Fortunately, schools are particularly well-suited for improving the health trajectories of adolescents, including reducing risk behaviors, for three main reasons. First, each year schools serve more than 56 million U.S. youth across key years of their social, physical, and intellectual development [6,7]. Second, schools often have both internal staff (e.g., health educators, school counselors, nurses) and partners in the community (e.g., health and mental health providers) with knowledge of health risk and protective behaviors and have infrastructure to support a varied set of public health interventions and approaches. Third, schools provide a venue for direct health education for students, through designated health curricula, courses, or content integrated across multiple subject areas. Finally, many schools offer a range of health services, connect students to health and social services outside of the school, provide opportunities for reaching and engaging parents, and help students develop connectedness with peers and adults [8].

The Centers for Disease Control and Prevention's (CDC) Division of Adolescent and School Health (DASH) has worked for over three decades with education and public health agencies, national nongovernmental organizations, youth-serving organizations, and families and communities to support healthy behaviors among youth. Over the past 10 years, DASH has worked with these partners to develop and refine a school-based model to prevent HIV, other STDs, unintended pregnancies, and related risk behaviors among adolescents and to help them become healthy, successful adults [9,10]. This school-based program model is currently being funded and implemented among 28 local education agencies (LEAs) (school districts) and LEA consortia (groups of LEAs collaboratively working with CDC funding) across the U.S., reaching approximately two million middle and high school students. This translates to approximately 8% of all U.S. middle and high school students [11]. Research on previous iterations of the model indicates that it has been effective in decreasing adolescent sexual risk behaviors

(e.g., ever having sex, having four or more sexual partners), violence victimization, and substance use [12,13].

In this paper, we present the theoretical foundations that informed this school-based program model, and describe the strategies, domains, and activities that make up the model for preventing HIV/STDs, unintended pregnancy, and related risk behaviors among adolescents. Finally, we offer considerations for adolescent health professionals, working with and in schools, who wish to implement these strategies to promote health and wellbeing among their students.

Theoretical Foundation

Behavioral and social science theories offer a foundation for understanding the kinds of strategies that are likely to improve knowledge and behavior change related to sexual health [14]. Ecological Systems Theory and associated ecological perspectives on health promotion suggest that behavior change is most likely when interventions are designed to affect individual, organizational, and environmental factors linked to the desired behavior [15–17]. Ecological Systems Theory considers the interaction between the individual and the settings in which they are nested to be fundamental in human development and behavior change. For example, a student's ability to learn and acquire skills for avoiding risky health behavior may be a consequence not only of the instruction they receive, but also the extent to which they feel safe and connected to their teachers and peers in the classroom and in school [15]. Although a variety of other behavior theories inform individual elements within the program model, these ecological perspectives formed the primary theoretical foundation for the program. They offer an ideal framework for considering the key needs and opportunities for implementing a school-based program, where schools have the opportunity to impact individual behaviors and are also connected to and dependent on community and societal factors. In line with the ecological perspectives, the school-based HIV/STD, unintended pregnancy, and related risk behavior prevention program model is grounded in the perspective that sexual health promotion and risk reduction approaches may be most effective when activities to improve individual level knowledge and skills are combined with additional activities that address relationship (e.g., parent-child communication), community (e.g., availability of sexual health services [SHS] and positive youth development [PYD] opportunities), and societal (e.g., policy) level factors [18–21].

Program Model: Strategies, Domains, and Activities

As shown in [Figure 1](#), the school-based HIV/STD, unintended pregnancy, and related risk behavior prevention program model relies on a program lead in each LEA to champion and coordinate activities. The program model is organized into three strategy areas: sexual health education (SHE), SHS, and safe and supportive environments (SSE). These strategies and their associated activities are described in detail later in this section.

The model also includes three domains, or types of work, that are integrated within and across each of the three strategies (SHE, SHS, and SSE) ([Figure 1](#)). These domains represent key opportunities for interventions that can help shape or influence students' health and behaviors, including (1) strengthening staff capacity [22–24]; (2) increasing student access to programs and services [25,26]; and (3) engaging parent and community partners [27,28]. Strengthening staff capacity refers to improving

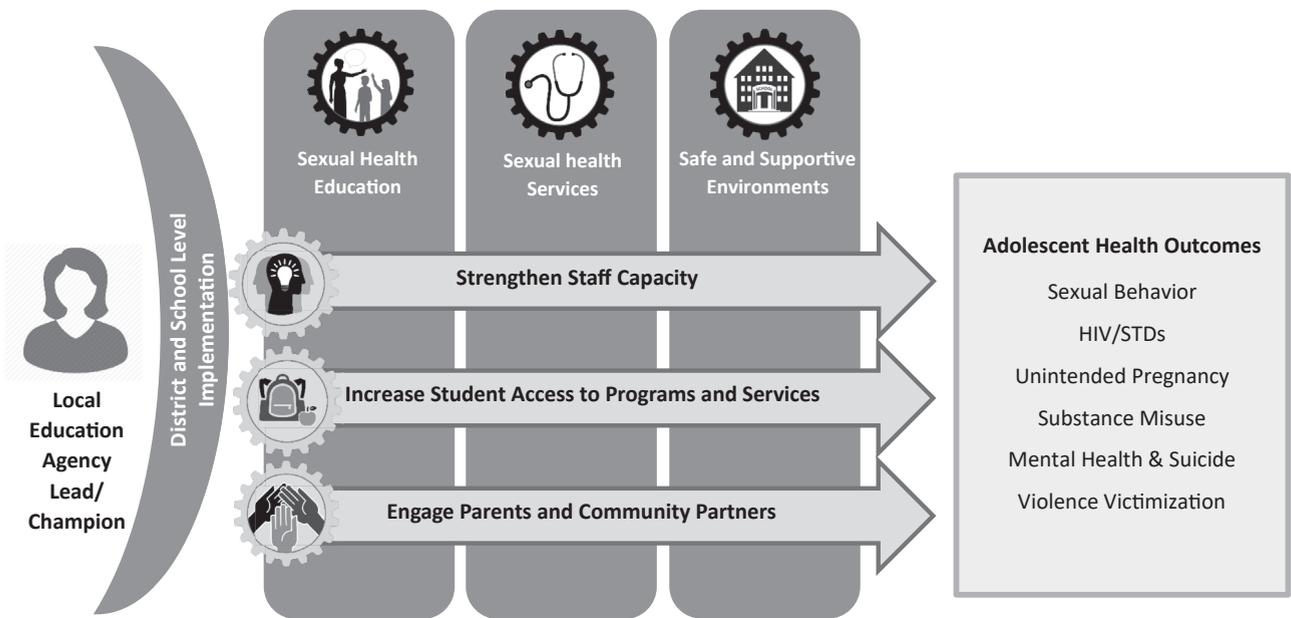


Figure 1. School-based program model developed by the Centers for Disease Control and Prevention's Division of Adolescent and School Health for preventing HIV/STDs, unintended pregnancy, and related health risk behaviors and experiences among adolescents. STD = sexually transmitted disease.

self-efficacy, knowledge and skills, and behaviors of school staff (e.g., teachers, nurses, administrators) in delivering health promotion strategies for adolescents through tailored professional development and training experiences. Increasing student access to programs and services involves ensuring access to and receipt of health education, resources, initiatives, and services both within the school and community. Finally, engaging parent and community partners is an important part of effectively and sustainably implementing school-based health promotion strategies. Work in this domain is designed to incorporate key stakeholders into intervention activities; for example, connecting students with PYD programs in the community and supporting parents and caregivers to engage in positive parenting practices. Taken together, these strategies, domains, and implementation activities are believed to influence student health and behaviors.

Across the program model as a whole, activities from these three domains are designed to impact a set of short-term and intermediate outcomes designed to move the longer-term outcomes of delayed onset of sexual activity, decreased sex without a condom, increased contraceptive use, decreased risk behaviors that place adolescents at higher risk of adverse health outcomes (e.g., substance use, violence, and poor mental health), reduced HIV and other STD infection, decreased unintended pregnancy rates, and increased student academic success. The full set of outcomes, with short-term outcomes organized by strategy focus, are provided in [Table 1](#).

Sexual health education

SHE, as part of a comprehensive health education curricula framework, uses a systematic, evidence-informed approach to equip youth with functional information and skills needed to prevent or reduce HIV/STDs, and unintended pregnancy. Grounded in theoretical and scientific evidence as well as practice-

based guidance, SHE emphasizes planned, sequential learning across grades pre-kindergarten to 12th by using medically accurate, developmentally appropriate, and culturally driven learning strategies, content, and skills [29]. Research suggests that effective school health education programs are associated with reductions in adolescent risk behaviors and improved academic performance [30,31]. Well-designed and implemented school-based HIV/STDs prevention programs can decrease sexual risk behaviors among school age youth, including delaying first sexual intercourse, reducing the number of sex partners, decreasing the number of times adolescents have unprotected sex, and increasing condom use [32,33]. The school-based program model promotes a range of activities that support and strengthen SHE in schools. This includes activities that strengthen teachers' ability to deliver sexual health effectively, increase students' access and receipt of effective SHE, and engage parents and communities in the selection, implementation, and improvement of SHE in schools as outlined in [Table 2](#).

In addition to curricular content and skills needed to address adolescent sexual health outcomes, quality SHE also requires well-trained and supported teachers who can create safe and inclusive learning environments and are skilled in effective pedagogy. Research suggests that teachers' instructional competency (i.e., essential knowledge and skills) is key to improved delivery [34–37]. For example, studies demonstrate that higher levels of student achievement are associated with teachers using a variety of teaching strategies (e.g., instructional differentiation), demonstrating organization, fostering safe classroom environments, setting clear expectations for learning and behavior, exhibiting enthusiasm for the content, building relationships with students, and treating students with care, fairness, and respect [34–36,38,39]. One effective strategy for strengthening teacher instructional competency is through professional development. Data suggest improvements in teachers' implementation of classroom instruction [40–42] and increases in

Table 1

Short-term, intermediate, and long-term outcomes for the activities recommended for the school-based program model developed by the Center for Disease Control and Prevention's Division of Adolescent and School Health for preventing HIV/STDs and unintended pregnancy and related health risk behaviors and experiences among adolescents

Strategy area	Short-term outcomes	Intermediate outcomes	Long-term outcomes
Sexual health education	<ul style="list-style-type: none"> • Teacher ability to teach sexual health education effectively • Student receipt of effective sexual health education 	<ul style="list-style-type: none"> • Student knowledge, skills, and behaviors to avoid and reduce sexual risk behaviors 	<ul style="list-style-type: none"> • Delayed onset of sexual activity • Decreased sex without a condom • Increased use of contraceptives
Sexual health services	<ul style="list-style-type: none"> • Access to on-site and off-site sexual health services • Delivery of on-site sexual health services • Referrals for sexual health services to community providers 	<ul style="list-style-type: none"> • Student awareness of sexual health services needs and services • Student HIV testing • Student STD testing • Student reproductive healthcare visits 	<ul style="list-style-type: none"> • Decreased risk behaviors that place adolescents at higher risk of adverse health outcomes including substance use, violence, and mental illness • Reduced HIV infection and other STDs
Safe and supportive environments	<ul style="list-style-type: none"> • Teacher implementation of best classroom management practices for safe and supportive environments • Student participation in positive youth development activities 	<ul style="list-style-type: none"> • Access to confidential SHS in accordance with state laws • Parental monitoring • Parent/student communication about sexual health information and services • Student connectedness to school 	<ul style="list-style-type: none"> • Decreased unintended pregnancy rates • Increased student academic success

Note: Some intermediate and long-term outcomes are linked to multiple strategy areas (e.g., “student awareness of sexual health services needs and services” is an intermediate outcome linked to both sexual health education and sexual health services strategy areas and activities. SHS = sexual health services; STD = sexually transmitted disease.

time teachers spend teaching health topics, as well as their self-efficacy toward teaching [43,44], following professional development training [45]. Furthermore, research on mentoring programs, a specialized approach to professional development, has been linked to positive effects on instructional delivery, including teaching strategies and classroom management, and student achievement among beginning teachers [46–48]. Given this, the program model supports several activities to strengthen staff capacity for teaching SHE; these range from identifying and approving teacher instructional competencies, to providing annual training and support through activities such as observation, coaching, and mentoring. All related activities are described in greater detail in Table 2.

The program model also includes several activities to increase student access to and receipt of quality SHE, including establishing a scope and sequence (S&S), implementing skill-based health education course requirements, selecting or developing instructional programs that meet the sexual health needs of lesbian, gay, bisexual, transgender, and questioning (LGBTQ) adolescents, and other activities described in Table 2. Improving student access to and receipt of quality SHE curriculum is necessary in order for adolescents to practice, adopt, and maintain skills and behaviors that prevent or reduce HIV/STDs and unintended pregnancy, among other outcomes. Several key characteristics are associated with effective curricula including sequential implementation across grade levels (i.e., kindergarten to 12th); use of content that is medically accurate, developmentally appropriate, and culturally inclusive; an emphasis on skill building; use of relevant and engaging instructional tools, delivery by qualified and trained teachers; focus on developing and practicing healthy behaviors within safe school environments; and integrating family and community partners [33,49–55].

Effective planning in health education can accelerate student learning and achievement, and education plans or resources which frame curricula are critical to successful implementation [56]. Research from curriculum planning and instruction describes S&S charts and similar unit/lesson planning documents as effective resources for assessing, planning, and designing instruction [57,58]. One essential planning resource is the health

education S&S [59], a document outlining the breadth and arrangement of key health topics and concepts across grade levels (scope), and the logical progression of essential health knowledge, skills, and behaviors to be addressed at each grade level (sequence) from pre-kindergarten to the 12th grade [59].

Moreover, to reach public health priorities outlined by the U.S. Department of Health and Human Services' *Healthy People 2030* initiative, improvements in the number of schools that provide health education on sexual health topics including HIV/STDs and unintended pregnancy prevention is needed through policy implementation and monitoring. Specifically, attention to state or local policies, laws, or mandates shaping course requirements and instructional time for SHE must be addressed and strengthened to ensure program sustainability [60,61]. School Health Advisory Councils (SHACs) can play an important role in assessing and prioritizing the SHE needs in their district and work with school boards to approve and implement evidence-based curricula [62,63].

Parents and community partners are essential in supporting and engaging in SHE. Data show that most U.S adults and parents support SHE delivered through schools [64,65], and as such, their support can be leveraged to aid its implementation. Through roles on an SHAC or similar school-based decision-making team/committee, parents and community partners can also be directly involved in making recommendations on sexual health curricula, services, and policies or practices that promote the health of all students and staff [66–69]. Furthermore, when SHE programs are designed to facilitate students' engagement with their parents, through take-home assignments or activities, research shows improvements in parent-adolescent communication as well as parental monitoring, both of which are linked to lower sexual risk behavior among youth [27]. The school-based program model describes various implementation activities to increase parent and community partner engagement in SHE (Table 2).

Sexual health services

Preventive sexual health services are important, and school and community-level sexual health promotion activities can include those to increase student access to specific services like HIV and STD testing and contraception and condom provision, as

Table 2
Activities for local education agencies to support HIV, other STD, and pregnancy prevention

Strategy	Domain	Activity
Sexual health education	Strengthening staff capacity	Identify and approve a list of instructional competencies to be demonstrated by those teaching skill-based health and sexual health education in middle and high school Develop and implement a technical assistance plan that incorporates teacher observation, coaching, peer mentoring, and other methods to improve an individual teacher's sexual health education instruction Provide training at the local education agency once per year to ensure school health and sexual health education teachers have content knowledge, comfort, and instructional competencies to effectively implement approved school health and sexual health education instructional programs
	Increasing student access to programs and services	Establish, adopt, and implement a skill-based health education course requirement, which includes sexual health education content, for all students attending middle and high schools in the district Develop and approve a health education scope and sequence that delineates sexual health education learning outcomes for all students in middle and high schools in the district Develop, revise, or select a sexual health education instructional program consistent with the approved scope and sequence (referenced above), and inclusive of instructional lessons, student learning activities, resources, and student assessment Develop, revise, or select health education instructional programs for students in elementary grades that align with the priorities for health education and sexual health education established in the health education scope and sequence Incorporate specific changes to existing instructional programs to better meet the needs of LGBTQ adolescents Strengthen student assessment instruments to more accurately assess student mastery of health education knowledge and skills Develop, update, and foster use of teaching tools and resources (e.g., lesson pacing guide, specific lesson plans) for teachers to continuously improve delivery of the identified sexual health education instructional program
	Engaging parents and community partners	Establish and maintain a School Health Advisory Council that regularly provides district-level advice and guidance to improve health and sexual health education programs for students and health and sexual health education instruction for staff Integrate strategies to actively engage parents in sexual health education instructional programs
SHS	Strengthening staff capacity	Provide training and professional development to school and/or health service staff to support SHS activities annually
	Increasing student access to programs and services	Assess district and priority school capacity to implement activities to increase student access to SHS Incorporate skill-based instruction to students on accessing school-based and community SHS into sexual health education lessons annually Increase student access to and use of SHS through either on-site provision or referral to community-based sexual health providers depending on district/schools' health services infrastructure. For on-site health services, improve student use and quality of SHS provided by School-Based Health Centers. For referral-based health services, establish or improve use of a referral system to link sexually active students to community providers for SHS by using the referral system toolkit to implement the seven core components of a referral system Implement school-wide, student-planned marketing campaigns that promote recommended health services for teens and selected school SHS programs Conduct school-based STD screening events. Implement or improve a condom availability program
Safe and supportive environments	Engaging parents and community partners	Disseminate SHS-related materials for parents
	Strengthening staff capacity	Provide professional development to teachers on classroom management annually
	Increasing student access to programs and services	Provide professional development to all school staff on supporting LGBTQ adolescents annually Implement mentoring, service learning, and/or other positive youth development programs for students, and/or connect students to such community-based programs Establish or enhance student-led clubs that support LGBTQ adolescents (often known as Gay-Straight Alliances or Genders and Sexualities Alliances)
	Engaging parents and community partners	Disseminate resources to parents/caregivers on parental monitoring and parent-adolescent communication (generally and specifically about sex) Disseminate resources specifically relevant to parents of LGBTQ students Implement and/or connect parents to skill-building parenting programs

LGBTQ = lesbian, gay, bisexual, transgender, and questioning; SHS = sexual health services; STD = sexually transmitted disease.

well as more broad preventive measures like conducting sexual risk assessments, creating adolescent-friendly clinical environments, and providing counseling about preventive behaviors [70]. Quality adolescent SHS can help reduce adolescents' risk

behavior and prevent negative sexual health outcomes like unintended pregnancy, STDs, and HIV [71–73]. Despite national guidelines and recommendations for routine provision of SHS for adolescents [71,74–79], many young people do not have

preventive care visits [80,81]. Even among those who do, missed opportunities for SHS are common. For instance, confidentiality and developmentally appropriate care are critical to adolescent SHS [82–87], yet young people do not often receive time alone with their provider [81,88] and report concerns about the confidentiality of their care [89]. These issues may contribute to low SHS use among adolescents and provide an opportunity for educating parents and caregivers on the importance of adolescents having time alone with healthcare providers. As outlined in Table 2, the school-based program model includes activities that improve school and health services staff's ability to support SHS, increase student access and use of SHS, and strengthen communication about SHS with parents and caregivers.

Findings from a previous iteration of the CDC-funded program model suggest that school staff, including health services staff, need training to improve their self-efficacy and comfort providing or referring students to SHS [90]. Furthermore, professional development trainings have been shown to change school staff's beliefs and self-efficacy for addressing sexuality topics with their students in the classroom, and these trainings may also better help staff identify student sexual health needs and connect students to services. Trainings to develop staff comfort, capacity, and expertise in best practices and core areas of adolescent sexual health have improved clinical services, including in school-based health centers (SBHCs) [23]. Professional development is also a key component of quality improvement programs and interventions for health clinic and school health staff [91]. Building on this, DASH's program model supports schools to provide training and professional development to school and/or health service staff annually to help support their other SHS activities (Table 2).

In addition, the program model developed by DASH supports a full range of activities—from direct provision of onsite SHS to helping students learn about, find, and connect to services in the community—to increase students' access to SHS (Table 2). Researchers have explored several ways schools can directly increase students' access to important SHS. For example, schools with clinical infrastructure such as SBHCs can directly provide a range of comprehensive health services to adolescents; SBHCs can be particularly useful for their ability to reach underserved populations [92] and their provision of confidential services such as SHS [93,94]. Schools that cannot provide SHS on school grounds can establish processes to link students to adolescent-friendly providers in the community. This has been found effective in several studies. For example, one recent study found that high school students in a large Florida school district were more likely to get tested for HIV or STDs when referred by school staff [90]. Similarly, another school-based referral program, Project Connect, found an increase in sexually active students' receipt of sexual and reproductive health services following a program in which school nurses referred students to clinics providing quality adolescent SHS in the community [25,95,96]. Even schools that do not typically provide SHS onsite may be able to implement school-based STD screening programs, which have been conducted in school districts across the U.S. and have been found feasible and efficient for identifying students with STDs and treating them quickly [10]. In one recent study, a school-based STD screening program was associated with sustained reduction of the prevalence of Chlamydia among adolescents [97].

Research also provides examples of other school-based efforts to increase students' access to services and lower risk behaviors. For example, condom availability programs (CAPs) can increase condom use among students and may be particularly effective

for adolescents who exhibit greater risk behaviors (i.e., report earlier initiation of sex, frequent sex, more sex partners). Studies have found these students more likely to have used a CAP-provided condom than students with less risk behavior [98–100]. In addition, schools can raise student awareness and encourage use of needed SHS through both skill-based education on where and how to access SHS, as well as campaigns to promote SHS. Both approaches can help ensure students know where to find services, which is important given that research shows awareness of clinic locations is a key factor related to adolescents' use of SHS [101]. A recent review of sexual health campaigns found that several resulted in increases in STI testing and condom use [102]. One recent pilot test of an adapted “GYT: Get Yourself Tested” social marketing campaign implemented in a high school was linked to increased HIV and STD testing at a local clinic and student awareness of services [103].

In addition to helping students access services through direct provision of services or referral to community-based providers, schools can also help increase adolescents' access to services by engaging their parents in ways that may support their access to needed services. Although research is clear that adolescents need access to confidential services, researchers have also advocated for involving parents in some aspects of adolescent clinical care [28,104]. As an example, in the Project Connect intervention, school-distributed resources for parents were associated with increased parental monitoring and communication [105], which has been linked to reduced risk behavior among adolescents [106]. Similar dissemination of SHS-related materials for parents is one of the strategies for parent engagement that is supported in the program model developed by DASH (Table 2).

Safe and supportive environments

SSE is a strategy that focuses on promoting school and family-level protective factors [107]. The three specific protective factors DASH's SSE activities target are school connectedness, parental monitoring, and parent-adolescent communication (both generally and specifically about sex), which each promote behaviors that reduce HIV and other STDs among young people (e.g., delayed sexual initiation or condom use) [30,106,108–110] and promote positive sexual health outcomes long-term as well [105,106]. School connectedness, parental monitoring, and parent-adolescent communication are also linked to reductions in behaviors and experiences associated with adolescent sexual risk (e.g., substance use, violence victimization, and perpetration) [107] and increases in behaviors and experiences known to be protective against sexual risk (e.g., academic achievement) [32]. Consistent with ecological systems theory, this strategy not only directly contributes to HIV and other STD prevention, but also establishes a context necessary for other prevention approaches (such as SHE and SHS) to be effective [30,106,108–112]. The school-based program model includes activities that strengthen teachers' ability to create safe and supportive classroom environments for all students, connect youth with PYD programs and activities, and communicate with parents about ways to monitor and communicate effectively with their teens.

One key programmatic activity for increasing school connectedness is leveraging professional development of school staff to improve the school environment. Effective class management has been linked to greater school connectedness [113,114] as well as improved effectiveness of classroom-based interventions, such as SHE [115]. However, teachers need

foundational skills to be able to ensure effective classroom management [115] and have reported a need for trainings to gain strategies for this [116]. Specifically, training staff on classroom management and addressing the needs of students at disproportionate risk for negative school climate experiences, such as LGBTQ adolescents, can be particularly important. Many health and education organizations identify professional development for school staff as a best practice to improve school connectedness and safety for LGBTQ adolescents specifically [24]. Due to social stigma, LGBTQ students are more likely to report experiencing violence at school and having lower school connectedness when compared to their non-LGBTQ peers [117,118], and professional development designed to improve school staff's understanding of and ability to support LGBTQ adolescents has shown effectiveness in changing school staff's beliefs and self-efficacy in supporting these students [119,120].

Beyond staff trainings, student programs such as mentoring, service learning, and other PYD programs can also increase school connectedness as part of the SSE strategy. Mentoring and service-learning [121,122], and PYD programs more generally have shown a range of benefits across a variety of health and academic outcomes [123–125]. For example, gay-straight alliances or genders and sexualities alliances (GSAs), which incorporate key principles of PYD, are associated with lower rates of risk behaviors associated with sexual health (e.g., violence victimization, alcohol use, illicit drug use, prescription drug misuse, suicidal behavior) among both LGBTQ and heterosexual adolescents [26,126,127].

Schools can also positively influence protective factors within the family environment, including parent-adolescent communication and parental monitoring [109,128–131]. Schools can influence these family-level protective factors by providing information to parents that can help improve their parenting practices [105], implementing or connecting parents to relevant parenting programs in the community [132–135], or engaging parents through designated activities built into students' curriculum or activities, such as SHE programs that include activities designed to help parents build their capacity to talk to their teens about sex [136]. In implementing this aspect of the program model, DASH has focused on dissemination of existing resources to parents that support parent adolescent communication and parental monitoring, such as CDC's resources on positive parenting practices [137].

Considerations for Adolescent Health Professionals and Organizations

The above school-based model of HIV/STD, unintended pregnancy, and related risk prevention and its activities were developed to highlight evidence-based ways to impact adolescent health outcomes via school settings. In line with leading educational frameworks (e.g., the Whole School, Whole Community, Whole Child model) [138], activities are situated within a social ecological framework that moves beyond solely individual, student-level intervention points to address multi-level intervention opportunities through activities designed to impact individual students and school staff, their relationships, and their broader communities, all of which are interdependent and must be addressed to improve health [15,16]. Such a model requires collaborations between LEAs and adolescent health organizations in the community. For example, referring students outside of the school for SHS requires the presence of adolescent-friendly

health service providers in the community [25,95,96]. Adolescent health professionals can partner with their local educational leaders to implement the SHE, SHS, and SSE activities described above, and can also provide other cross-cutting implementation support. This includes developing and implementing relevant school health policies and staff professional development; raising awareness of students, parents, and community members; and establishing evaluation programs to monitor the implementation and impact of activities.

Many school districts are already leading school-based models of HIV/STD, unintended pregnancy, and related risk prevention that include collaborative partnerships with local health providers and adolescent health practitioners. For example, as a key part of their implementation of the program model described in this paper, education agencies funded through CDC-DASH (a full list of CDC-DASH funded partners is available at: https://www.cdc.gov/healthyyouth/partners/funded_locals.htm) work to foster collaborative partnerships, including those with local health departments and community clinics, as well as national, state, and local agencies and organizations that serve adolescent populations more broadly. Education agencies leverage funding through mechanisms such as government, private, or corporate grants or in-kind labor, materials, or other resources to maximize project outcomes through strategic partnerships. Other school districts may organically rely on such partnerships through recognition of need and the mutual goal of promoting adolescent health. There may also be potential for such a school-based model to be initiated and coordinated by others in the community such as a local health department or other adolescent health services organization, in partnership with LEAs.

There are many ways that adolescent health professionals and other community partners can support the specific school-based activities outlined above. For example, schools can establish and maintain an active SHAC or similar advisory council that includes community representatives to link schools to community resources, inform SHE curriculum, and support all sexual health promotion activities more broadly. Community providers and health departments can also provide clinical and population health expertise to advise school leaders on issues such as reporting requirements and maintaining patient confidentiality for sensitive services. Health departments are often experienced in community outreach and engagement [139] and the provision of clinical services for students, either on school property or off site. Community providers can provide schools with a place to refer students for youth-friendly prevention resources and services. Local providers may also enhance classroom-based lessons and other school programs to prevent HIV, other STDs, and teen pregnancy. As respected health experts, providers are also uniquely positioned to influence parents and community members which can result in greater awareness and buy-in for sexual health promotion within communities [140–143]. Finally, youth-serving community organizations are critical partners for schools as they often lead or provide substantial support for the implementation of programs that strengthen safe, supportive environments for students including mentoring, service learning, and PYD programs within communities. For example, community-based organizations that provide support for LGBTQ youth can support schools in establishing or strengthening their GSAs by providing professional development to staff advisors and linking adolescents with resources and services. Many of the strategies and activities of this program model may have broad utility and

could be applied in schools or school districts as feasible and appropriate.

LEAs, schools, and other organizations engaged in the promotion of school-based adolescent sexual health can find more information on the program model at the CDC/DASH Healthy Youth website [144], including detailed descriptions of all recommended activities in the program model as well as a variety of resources to aid school districts in their implementation efforts [10]. As more adolescent health organizations or LEAs adopt, implement, and evaluate the strategies and activities of this school-based program model, evidence for preventing HIV/STDs, and unintended pregnancy among adolescents effectively, equitably, and sustainably will grow and improve our ability to improve the health and wellbeing of all youth.

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