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Short Summary:

A pre- and post-COVID-19 framework is introduced and used to examine STD prevention and control efforts highlighted at the 2020 STD Prevention Conference.
Background

The STD Prevention Conference occurs every two years, bringing together experts from government, academia, medicine, industry, and beyond. The Conference is a place where advancements in STD diagnostics, treatments, and program science are unveiled alongside earnest conversations about the prevention and control challenges facing the field of STDs in the 21st century. Planning for the 2020 Conference began in late 2018—organized around the theme “2020 Vision: Disrupting Epidemics and Dismantling Disparities.” The theme spoke both to an interest in reducing the overall STD burden and to an interest in reducing that burden in such a way that centers health equity—ambitious but reasonable goals for a new decade.

However, on March 11, 2020, the World Health Organization declared COVID-19 a global pandemic, and it became quickly apparent that the “2020 Vision” for STD progress would be impacted—if not completely upended—by the unprecedented challenges presented by this new global crisis. Nevertheless, Conference organizers pressed onward, hosting the first fully-virtual STD Prevention Conference during September 14–24, 2020. Although Conference topics and presenters were generally selected before most people understood the toll that COVID-19 would take on the United States, it was notable that nearly every scientific session, plenary, and debate included reference to the shifting landscape of STD prevention in light of COVID-19 and to the effect that COVID-19 was having on the collective work of epidemic disruption and health equity.
As the Conference approached, we wondered whether the pre-pandemic approach to STD prevention and control would languish or flourish in the face of a new, global pandemic. To better understand how COVID-19 impacted efforts to disrupt STD epidemics, we constructed a framework and undertook a systematic review of content presented at the Conference. First, we divided presentations into three overarching categories as follows: 1) sociocultural, behavioral, and program science; 2) surveillance, epidemiology, and health services research; and 3) laboratory and clinical science. We then reviewed all scientific abstracts and content presented at conference sessions without abstracts—including plenaries, mini-plenaries, and symposia—by category, assessing whether the content contributed best to STD prevention and control in a pre-pandemic or post-pandemic landscape. Studies relevant to the pre-pandemic landscape included those studies completed before the onset of the COVID-19 pandemic using methods that were supported by the pre-pandemic STD infrastructure, including traditional STD care in clinic settings, traditional STD surveillance by laboratory and provider report, and traditional STD Program work to interrupt disease transmission and prevent adverse sequelae. Alternatively, studies relevant to the post-pandemic landscape included those that were conducted during the COVID-19 pandemic with relevant modifications to study design as well as those completed in the pre-pandemic era but which performed traditional STD functions in novel ways that added value during the pandemic.

In this special issue of *Sexually Transmitted Diseases*, manuscripts were invited from a selection of authors who presented topics at the Conference that captured parts of this framework. Below, we summarize some of the emerging themes by category.
**Sociocultural, behavioral, and program science**

Though we are still learning about the multifarious impacts of the COVID-19 pandemic on STDs, one thing is clear. COVID-19 has certainly provided an opportunity to innovate in the way we deliver key programmatic components to achieve STD prevention and control. Clinical education offers one example of the rapid pivot required in the face of COVID-19. As Bauer et al. (1) describe in this issue in “Leveraging E-Learning Infrastructure in Times of Rapid Change: Use of the National STD Curriculum in the Era of COVID-19,” the authors successfully used an existing e-learning platform to continue to educate clinical and pre-clinical audiences about STD diagnosis and management.

While the use of learning technology opened new doors in 2020, improving access to interactive clinical trainings, STD Programs nationwide shifted their attention from STD increases to the novel coronavirus pandemic. Pandemic mitigation efforts closed clinics and limited services. As Berzkalns et al. (2) describe in “Decreases in Reported STI Cases During the Time of COVID-19 in King County, Washington: Decreased STI Transmission or STI Screening?,” despite an increase in telemedicine visits, total clinic visits were 55% lower in Spring 2020 during state pandemic closure than the same period in 2019. The authors argue that a decline in the diagnosis of asymptomatic disease was likely a contributor to the precipitous decline in reported cases of gonorrhea and syphilis during the first half of 2020; as might be expected, mean weekly case counts returned to pre-pandemic levels when the state of Washington re-opened. The Conference highlighted other programmatic lessons that continue to be salient in a post-COVID-19 world including fostering non-traditional public health partnerships, the gravity of clear communication, and the importance of building public trust.
At the behavioral level, STD researchers continued to focus on sexual behaviors and other behaviors that may increase the risk of STD acquisition and transmission, including substance use. Drame et al. (3) describe pre-pandemic increases in substance use among females diagnosed with early syphilis in “Evaluation of Drug Use-Related Behaviors among Females Diagnosed with Early Syphilis in New York State (excluding New York City), 2013–2018.” Because individual behaviors do not exist in a vacuum, researchers continue to explore the role of other social ecological contributors to STD transmission, including physical and social environments. As Jennings et al. (4) describe in “Sex, Drugs and the Internet – A Perfect Storm for HIV/STI Transmission among Black Gay and Bisexual Men (MSM),” while individual-level sexual and substance use behaviors are important, the venues where sex partners meet and the syndemic of substance use and STDs are critical to understanding the context in which racial disparities in STD rates exist for men who have sex with men.

Finally, there was an emphasis by conference presenters on taking a holistic approach—not only in the way sexual health and STD prevention are approached but also by taking into consideration the intersectionality of identities and approaches to healthcare, public health programs, and across the entire STD field.

**Surveillance, epidemiology, and health services research**

Conference presentations highlighted the role of case-based and sentinel surveillance systems in identifying and mitigating STD concerns—be those population-level concerns like outbreaks, which require urgent response, or individual-level concerns like missing treatment information, which also require rapid intervention. Using surveillance data for its primary purpose—“data to
action”—Smith et al. (5) of the Illinois Department of Health used case report data on gonorrhea diagnosis and treatment to monitor for potential episodes of gonorrhea treatment failure. The authors describe the effort involved in such a program and their failure-finding yield in the manuscript, “Development and Evaluation of a Procedure to Identify Possible Gonorrhea Treatment Failure Cases in Illinois.”

In the midst of the COVID-19 pandemic, the Conference also enabled participants to see clearly that standard methods of surveillance—backed by decades of infrastructure and experience—were stumbling in the face of competing priorities. Surveillance for syphilis, in particular, suffered palpable losses as investigators typically assigned to interview case-patients were instead pulled into the throes of COVID-19 contact tracing. Conference presentations shone light on important but “less traditional” sources of STD information, including vital statistics data, electronic health record data, and data collected for alternative purposes, including hospital discharge data traditionally used for syndromic surveillance and emergency preparedness planning. As STD Programs performed acrobatic routines in 2020 to estimate disease burden and describe characteristics of persons diagnosed with STDs, these less-explored sources of data provided hope that we may be able to maintain a pulse on STDs and their sequelae in the face of uncertainty.

Slutsker et al. (6) of the New York City Department of Health & Mental Hygiene used national Vital Statistics data to identify almost 1,300 neonatal herpes deaths in the United States during a 23-year period. In their manuscript, “Assessing the Burden of Infant Deaths Due to Herpes Simplex Virus, Human Immunodeficiency Virus, and Congenital Syphilis—United States, 1995–
2017,” the authors lay out a methodology for using death certificates to better understand the most severe outcomes of these three perinatal pathogens. This provides a rare glimpse into the burden of neonatal herpes, which is not a nationally notifiable condition. At the California Department of Public Health, Burghardt et al. (7) explored the utility of using a statewide hospital dataset available through the local emergency preparedness unit to conduct potential surveillance for neurosyphilis. In the manuscript, “Neurosyphilis Surveillance: Exploring the Use of Multiple Data Sources to Better Understand Morbidity in California,” the authors use a series of diagnostic codes to identify likely cases of neurosyphilis and compare the demographics of these identified cases to the demographics of case data reported to the state STD surveillance system. Though the data sources were not linkable at the time of the analysis, the effort highlights the role that multiple data sources may play as full investigations of syphilis remain challenging in times ahead.

Though the Conference certainly highlighted the promise of “big data,” Mauk et al. (8) offered a cautionary tale when it comes to mining data sources not designed specifically to capture and report STD diagnoses. In their manuscript, “Can Diagnostic Codes in Health-Care Claims Data Identify Confirmed Chlamydial and Gonococcal Infections? A Retrospective Cohort Study, 2003–2017,” the authors use a large, commercial claims database to validate whether ICD-9 and -10 codes can be used to detect positive chlamydia and gonorrhea lab results. Their finding—that agreement was not high between lab-detected cases of disease and appropriate diagnostic codes—leaves many in the field wondering how surveillance advancements relying upon administrative data may fare.
Other scientific work at the Conference pointed to sizeable disruptions in epidemiologic studies which were investigating issues ranging from the natural history of disease to vaccine effectiveness research. Additionally, health services research—the study of how and in what modes STD care is best delivered—highlighted that there is space for many successful forms of care and that care models can be adapted in response to crises such as COVID-19. Many talks focused on the lessons already learned through COVID-19, including patients’ desires to limit healthcare interactions when unnecessary, patients’ strong desires to approach care with a “one stop shopping” lens, and the need to meet patients where they are and acknowledge the true care-seeking limitations that many patients face. In that vein, Dang et al. (9) lay out in their manuscript, “Paired Testing of Sexually Transmitted Infections with Urine Pregnancy Tests in Incarcerated Women,” what may be seen as a high-yield “win” for meeting patients where they are and providing a screening opportunity that is likely to both disrupt epidemics and dismantle disparities through the identification and treatment of STDs among incarcerated women facing a high burden of disease.

**Laboratory and clinical science**

One of the earliest indicators of pandemic-induced disruptions involved a marked decrease in STD testing during Spring 2020. These initial declines were likely due to clinic and laboratory closures and other reductions in sexual health services resulting from stay-at-home orders. As the pandemic continued throughout 2020, limitations in laboratory supplies and testing kits further exacerbated the problem of accurately accounting for STD cases. In addition to the more widely recognized concerns that reduced STD testing leads to poorer individual health and disease...
transmission, reduced clinic visits also limit the ability of laboratories to gather essential isolates for antibiotic resistance surveillance.

Preliminary 2019 antibiotic resistant gonorrhea surveillance data were shared at the Conference, highlighting the way in which U.S. laboratory systems were structured for resistance detection in a pre-pandemic landscape. Using this pre-pandemic gonococcal surveillance infrastructure, Reimche et al. (10) describe a detailed study of isolates characterized by genomic sequencing in their manuscript, “Genomic Analysis of the Predominant Strains and Antimicrobial Resistant Determinants Within 1,479 Neisseria gonorrhoeae Isolates from the U.S. Gonococcal Isolate Surveillance Project in 2018.” This study represents the largest genomic analysis of U.S. gonococcal isolates from a surveillance program reported to date. The diversity of these isolates and their associated antimicrobial resistance markers were analyzed across demographic and geographic populations. Most sequence types identified in this study had been previously reported in analyses of U.S. isolates. Notably, ST9363—which was shown to be the predominate sequence type in 2017—continues to persist in 2018. It may be some time before we fully understand the effects of reduced testing during parts of 2020 on surveillance activities.

Another major theme among laboratory-associated presentations involved the development and evaluation of methods for testing and characterizing STD pathogens. In the manuscript by Marra (11) “Alternatives to the Cerebrospinal Fluid Venereal Disease Research Laboratory Test for Neurosyphilis Diagnosis,” the diagnostic performance of different assays for neurosyphilis were compared using specimens collected from a study conducted at the University of Washington. Several presentations focused on collection of specimens in non-clinic settings. Some of these
studies faced challenges with supplies and delivery of collection kits during the COVID-19 pandemic. Although interest in such “at home” specimen collection kits for STD testing spiked during the pandemic, previous data presented by researchers including Norelli et al. (12) in their manuscript “Scaling Up CareKit: Lessons Learned from Expansion of a Centralized Home HIV and STI Testing Program,” reveal relatively low return rates and temper some of the pandemic-induced enthusiasm laid on home-collection kits. Interwoven in the concept of more accessible testing is the development of rapid point-of-care (POC) tests. In their manuscript “Where Are We With Point-Of-Care STI Testing?,” Gaydos et al. (13) describe the performance of several FDA-cleared POC assays. POC tests are well suited for use with self-collected specimens and usually offer fast result turnaround. Currently, there are no FDA-approved rapid STD tests available for use in the home setting (i.e. “self-testing”); however, regulatory waivers that allow such tests to be performed outside of the traditional clinical laboratory could substantially improve access to testing. Footman et al. (14) in their manuscript “A Review of Implementation of STI Screening Techniques in Clinical Settings,” describes a decision tree for use by clinics and laboratories to assess the implementation of POCs versus tests that occur in higher complexity laboratories. An understanding of patient populations and testing logistics underpin the decisions to implement POCs for clinical use.

Finally, several clinical trials presented at the Conference occurred before the pandemic and some trials set to begin in 2020 were delayed (15). For those studies that intended to enroll patients from a traditional STD clinic population, new protocols may need to be developed that take into account limited clinical operations, workforces diverted to the COVID-19 response, and developments such as telehealth models for sexual health services.
Summary

It is too early to know with any certainty how permanent the changes inspired (or inflicted) by the COVID-19 pandemic might be on the STD field, but our content review demonstrated that there is ample adaptation in the way the field is diagnosing and monitoring disease, delivering STD care, and intervening at the individual and population levels to disrupt epidemics and dismantle disparities. In some cases, the pandemic may have catalyzed actions already occurring in the field. For instance, the development of POC tests and potential implementation of testing in new settings such as pharmacies may have large impacts well after the pandemic subsides. It will be crucial to evaluate progress made (and lessons learned) coming out of the pandemic in the upcoming years.

Though our ‘pre-pandemic’ and ‘post-pandemic’ framework was rudimentary, it identified areas where innovation already exists and needs to be nurtured, as well as areas where more innovation would be beneficial. Not only do advancements allow us to continue preventing and controlling STDs in the face of an ever-changing social context and health care infrastructure, but demonstrating flexibility can also serve us well in preparation for life’s next major disruption.

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References


2. Berzkalns et al. Decreases in reported STI cases during the time of COVID-19 in King County, Washington: Decreased STI transmission or STI screening?


4. Jennings et al. Sex, Drugs and the Internet – A Perfect Storm for HIV/STI Transmission among Black Gay and Bisexual Men (MSM)?


11. Marra CM. Alternatives to the Cerebrospinal Fluid Venereal Disease Research Laboratory Test for Neurosyphilis Diagnosis.


13. Gaydos CA, Manabe YC, Melendez JH. Where Are We With Point-Of-Care STI Testing?
