

The National Academies Report on Sexually Transmitted Infections: Implications for Clinical Training, Licensing, and Practice Guidelines

Vincent Guilamo-Ramos,^{1,2,3,4} Marco Thimm-Kaiser,¹ Adam Benzekri,¹ Aimee Mead,⁵ Edward W. Hook III,⁶ and Cornelis A. Rietmeijer⁷

¹Center for Latino Adolescent and Family Health, Duke University School of Nursing, Durham, North Carolina, USA; ²Ending the HIV Epidemic Working Group, HIV Medical Association, Arlington, Virginia, USA; ³Panel on Antiretroviral Guidelines for Adults and Adolescents, US Department of Health and Human Services, Rockville, Maryland, USA; ⁴US Presidential Advisory Council on HIV/AIDS, Washington, District of Columbia, USA; ⁵National Academies of Sciences, Engineering, and Medicine, Washington, District of Columbia, USA; ⁶Department of Medicine, University of Alabama at Birmingham, Birmingham, Alabama, USA; and ⁷Rietmeijer Consulting, LLC, Denver, Colorado, USA

Sexually transmitted infections (STIs) represent a sizable, longstanding, and growing challenge and a national public health priority. A recent National Academies report outlines new directions for STI prevention and control, including the adoption of a new sexual health paradigm and broader ownership and accountability for addressing sexual health and STIs among diverse clinical and non-clinical actors. These recommendations have important implications for infectious disease providers with STI and human immunodeficiency virus (HIV) expertise. As part of the envisioned shift toward greater prioritization of sexual health across systems for healthcare and health promotion, STI and HIV specialty providers will need to increasingly take on responsibilities as leaders in the provision of STI-related training; provision of technical assistance; and alignment of clinical training curricula, licensing criteria, and practice guidelines for healthcare generalists.

Keywords. sexually transmitted infections; workforce; STI specialists; healthcare generalists; United States.

Primary responsibility for prevention and treatment of sexually transmitted infections (STIs) in the United States (US) has traditionally been vested in a narrow workforce comprised of infectious disease (ID) clinicians specializing in STIs and the human immunodeficiency virus (HIV), including ID physicians, nurse practitioners, physician assistants, and nurses, as well as public health disease intervention specialists (DISs) involved in contact tracing for selected STIs [1]. This specialty workforce, often based in STI clinics, has long formed the backbone of national efforts to manage the burden of STIs. However, resource allocation to the STI specialty workforce and clinical infrastructure has declined steadily for several decades, contributing to significant increases in STI rates [1–4].

In 2019, the rates of reportable STIs in the US reached an all-time high [5]. Centers for Disease Control and Prevention (CDC) estimates suggest approximately 68 million people—about 1 in 5 Americans—had an STI on any given day in 2018 [6]. Furthermore, >26 million incident STIs have been estimated for 2018 alone [6]. Notably, adolescents and young adults

aged 15–24 years account for nearly half of all new STI cases [1, 6].

Although largely preventable, STIs cause significant and often lifelong morbidities that may only become apparent years after initial acquisition and include chronic pelvic pain; infertility; neurological and rheumatological consequences; and increased risk of HIV infection, genital cancers, ectopic pregnancy, and oral cancers [1]. Congenital or neonatal infection, miscarriage, newborn death, and childhood disability each can result from STIs [1]. While only 4 STIs—chlamydia, gonorrhea, syphilis, and HIV—are reportable to the CDC, >30 infections are regularly transmitted through sexual contact [7]. Given that asymptomatic and unrecognized presentations are common for many STIs and that routine screening is inadequately implemented, STIs are frequently undetected and untreated, substantially increasing the risk of long-term morbidity [1].

In light of the national commitment to reducing health inequities, as outlined in Healthy People 2030 [8], persistent STI disparities among populations underserved by health services and systems are of particular concern. For example, ethnic/racial minorities (including Black, Latino, American Indian/Alaska Native, and Native Hawaiian/other Pacific Islander people), men who have sex with men, and other sexually and gender-diverse people (eg, transgender women) experience a disproportionate share of STIs [1].

Together, STIs represent a sizable, longstanding, and growing public health challenge that requires reconsideration of the national response strategy. For this purpose, the CDC

Received 16 April 2021; editorial decision 27 June 2021; published online 6 July 2021.

Correspondence: V. Guilamo-Ramos, Duke University School of Nursing, 307 Trent Drive, DUMC Box 3322, Durham, NC 27710 (vincent.ramos@duke.edu).

Clinical Infectious Diseases® 2021;73(9):1711–6

© The Author(s) 2021. Published by Oxford University Press for the Infectious Diseases Society of America. All rights reserved. For permissions, e-mail: journals.permissions@oup.com.

https://doi.org/10.1093/cid/ciab609

commissioned a consensus study by the National Academies of Sciences, Engineering, and Medicine (National Academies) in 2019 [1]. The recently released National Academies report outlines recommendations for new directions in STI prevention and control, which would impact much of the US healthcare workforce (please read the full report at: <https://doi.org/10.17226/25955>) [1]. This viewpoint discusses the role of ID STI and HIV expert providers in addressing the recommendations of the National Academies' report.

LIMITATIONS IN STI WORKFORCE CAPACITY

STI prevention, testing, and treatment services often inadequately and inequitably reach populations disproportionately affected by STIs [1]. It is therefore concerning that the current STI and HIV specialty workforce has limited capacity for supporting the significant and rapid scale-up of STI services envisioned by the committee. For example, >200 million Americans live in counties with no practicing ID physician [9], often despite substantial county-level STI burden [10]. This misalignment of workforce and demand is particularly pronounced in the US South, which accounts for approximately 40% of all reported STIs [10] and half of all persons with diagnosed HIV [10], but only 1 in 3 practicing ID physicians in the US [11]. Practice restrictions for nonphysician ID providers specializing in STIs and HIV such as physician assistants and particularly nurse practitioners exist across many states in the US South [12, 13], further limiting the workforce response to the regionally elevated STI burden.

Continuing shortages of ID clinicians entering the workforce emphasize the difficulty of attracting additional specialty providers to strengthen the future STI workforce. In ID practice areas where significantly increasing demands for specialist providers had been projected, such as HIV care, estimates suggest the actual workforce growth is falling short of increasing need [14]. Similarly, there are only 0.8 applicants per open position in ID programs across the US, and approximately 2 in 5 ID programs were unable to fill available training slots in 2019–2020 [9].

Furthermore, the clinical infrastructure that supports STI specialty services has deteriorated. The CDC's annual inflation-adjusted budget for STI prevention, a major funding source for local and regional STI programs, has decreased by 40% since 2003 [2]. Decreases in state funding for STI programming reflect a similar pattern [1]. As a consequence, STI specialty clinics—important providers of free STI services and a safety net for key populations affected by access barriers—have steadily become less available due to clinic closures, reductions in clinic hours, and declining staffing levels [2, 3].

In light of these limitations, the National Academies committee envisions expanding the responsibility for STI prevention and treatment beyond STI and HIV specialty providers

[1]. The report outlines a shift toward broader ownership and accountability for addressing STIs among a wide cadre of clinicians and stakeholders supported by new roles for ID specialists in facilitating and guiding delivery of STI services and sexual health promotion across the healthcare system.

BROADENING OWNERSHIP AND ACCOUNTABILITY FOR STIS AND SEXUAL HEALTH

Diverse clinical and nonclinical actors are well positioned to facilitate and expand STI prevention, testing, and treatment [1]. For a long time, responsibility for addressing STIs has been primarily vested in STI specialists while large segments of the US healthcare workforce, including many primary care providers, do not sufficiently prioritize STIs in routine practice. The report urges abandonment of the traditionally dominant view of STIs as a discrete health outcome, often attributed to individual risk behavior that should be addressed by a highly specialized workforce [1]. Instead, the report recommends the adoption of a holistic perspective on sexual health as an integral component of overall health and well-being shaped by complex social-structural determinants and best addressed as part of routine, comprehensive healthcare and health promotion [1]. To achieve this paradigm shift, sexual health services should be normalized in a range of fields, including primary healthcare, behavioral healthcare, and community-based health promotion.

The proposed shift toward routine sexual health services in primary care settings represents a particularly important opportunity to address STIs at scale given that approximately 8 in 10 adults under the age of 50 years have seen a healthcare provider in the past year [15]. The large existing workforce of healthcare generalists should be leveraged to scale up recommended sexual health services within routine care, including regular documentation of sexual histories (eg, during patient history updates), recommended STI screening (eg, as opt-out instead of opt-in service), administration of available vaccines (eg, for human papillomavirus or hepatitis B virus), evidence-based prevention counseling for individuals at elevated risk of STIs, and administration of STI treatment [1]. Importantly, many of these recommended sexual health activities can easily be performed by primary care nurses, allied health professionals, or by support staff employed in primary care settings. Routine delivery of sexual health services is particularly meaningful for expanding reach toward the priority population for STI prevention, testing, and management—namely, adolescents. Ninety-four percent of adolescents aged 12–17 years have seen a healthcare provider in the past year, with each visit representing an opportunity for delivery of sexual health services [16].

The report also discusses the importance of enabling and supporting service delivery to the full scope of providers' practice, especially for those clinicians and healthcare professionals who currently face regulatory or administrative barriers to the delivery of sexual health services [1]. For example, as highly

trained first-line providers, registered nurses can deliver most aspects of STI prevention and management, including documentation of sexual histories and administration of vaccines, tests, and medications [1]. Furthermore, advanced practice nurses and physician assistants are trained to diagnose STIs, order prescriptions, and initiate treatment [1] and have primary care patient outcomes comparable to those of physicians [17, 18]. These providers deliver a large proportion of direct patient services in primary care, where recommended sexual health services should be routinely integrated, yet practice barriers for nurses and physician assistants remain [12, 19, 20]. For example, the extent to which nurse practitioners and physician assistants can practice independently still varies substantially across states, and restrictive state-level scope-of-practice regulations for registered nurses have been linked to inefficiencies in team-based practice models [12, 19, 21]. Several reports from the National Academies have characterized these practice barriers as obstructive for fully leveraging the approximately 4 million nurses in the US—the largest segment of the healthcare workforce—to reduce health inequities [22], including for sexual health and STIs [1].

Most Americans also have easy and convenient access to retail and community pharmacies [23], which are currently being leveraged to accelerate the rollout of novel coronavirus disease 2019 (COVID-19) vaccinations across the US. This experience could serve as a foundation to enable pharmacists to facilitate access to sexual health services in a similar manner. Although not traditionally considered clinical healthcare providers, pharmacists are considered by the committee to be a potentially important segment of the workforce for increasing access to STI services, especially point-of-care testing and vaccine administration [1].

NEW DEMANDS FOR STI AND HIV SPECIALISTS

To expand the STI workforce to a wider group of clinicians, a comprehensive training and technical assistance infrastructure for healthcare generalists is needed [1]. The committee calls for leadership from the Department of Health and Human Services (HHS), particularly the CDC Division of Sexually Transmitted Disease (STD) Prevention, in developing a national support infrastructure that channels existing STI expertise to general practitioners [1]. Recommendations support the creation of regional and local STI resource centers in coordination with state and local health departments, the STD Clinical Prevention Training Centers, and STI research centers of excellence to form a national network for STI training, technical assistance, and research.

Within this framework, the current STI and HIV specialty workforce is ideally positioned to serve as an important source of expertise at the local and regional levels. The report highlights the value of STI specialty providers as local leaders in delivering

quality STI clinical services, serving as a referral resource for community clinicians who encounter unusual or challenging problems, and supporting ongoing STI workforce development [1]. Additional funding and support are needed to establish STI specialty clinics and workforce as local hubs for training and technical assistance to healthcare generalists.

STI and HIV specialists are also well positioned to contribute sexual health and STI expertise as advocates and consultants to shape policy and practice paradigms. For example, the report emphasizes the need for clinical training curricula, licensing criteria, and practice guidelines for a broad cadre of practitioners to better reflect minimum standards for sexual health and STI services.

IMPLICATIONS FOR CLINICAL TRAINING, LICENSING, AND PRACTICE GUIDELINES

Insufficient knowledge, inadequate training, and absence of explicit protocols represent primary barriers to the delivery of sexual health and STI services in general practice settings [1], indicating that healthcare generalists are often insufficiently prepared for the routine delivery of these services. To improve preparation of healthcare generalists, the committee makes recommendations with implications for clinical training, licensing, and practice guidelines.

Professional Training

Despite the importance of sexual health promotion for individual well-being and overall population health, sexual health- and STI-specific content is often inadequately prioritized in medical and health education curricula for professional training [1]. The committee recommends greater emphasis on sexual health in future training curricula and highlights areas for alignment of health professional training with modern sexual health principles. First, the report calls for a clearer operationalization of sexual health promotion [1]. In this regard, the recognition of sexuality as a normal part of healthy living is imperative, along with the integration of professional education that addresses STIs, HIV, and unplanned pregnancy within one comprehensive sexual health framework. Second, the report outlines minimum sexual health assessments and skills to be incorporated into training curricula. These core elements include a general understanding of STI and HIV epidemiology and surveillance, skills training for basic sexual health assessment, provision of STI prevention counseling, adherence to STI screening and treatment recommendations and guidelines, and skills related to appropriate service delivery to priority populations, such as youth (eg, skills in parental engagement) and sexual and gender minority populations (eg, ensuring affirming care environments) [1]. Third, the report discusses the need to prioritize sexual health in professional training programs for all practitioners who provide services relevant to sexual health promotion, including primary care providers, behavioral health

providers, pharmacists, and other nonclinical public health and social service professionals [1]. Last, the report highlights the importance of addressing bias in sexual health and STI services [1]. Implicit biases among healthcare practitioners exist at similar levels as in the general population and can adversely affect practitioner–client interactions and care outcomes [24, 25], particularly for stigmatized conditions such as STIs [1]. Health professional education is an important opportunity for exposure to counter-stereotypical experiences and to promote cultural competence, responsiveness, and appropriateness in practice [1]. Furthermore, attracting and training a diverse future workforce that is reflective of communities most heavily affected by STIs and other sexual health disparities is imperative for reducing longstanding inequities.

Licensing

The knowledge and skills emphasized in health professional education have traditionally reflected those prioritized by licensing bodies in the relevant disciplines. Licensing bodies for primary care providers and behavioral health specialists are therefore important actors in improving the preparation of healthcare generalists for the routine delivery of sexual health services [1]. The committee recommends that professional organizations and licensing bodies formulate a minimum sexual health skill set as a prerequisite for practitioners in relevant disciplines (ie, primary care physicians, nurses, physician assistants, clinical behavioral health practitioners) that provides a blueprint for professional training curricula [1]. The need to increase emphasis on sexual health skills goes beyond initial licensure; it includes continuing medical education, medical units, and other education requirements [1].

Practice Guidelines

The committee makes 2 recommendations with implications for clinical practice guidelines related to STI prevention, screening, and treatment services. First, the committee recommends that all relevant health professional organizations take a clear stance in supporting broader ownership and accountability for addressing sexual health and STIs among healthcare generalists by revising clinical practice guidelines to more heavily emphasize the importance of routine delivery of sexual health services [1]. Second, the committee recommends more regular updates to the CDC's STI treatment guidelines [1]. These guidelines are being updated at irregular, multiyear intervals despite the dynamic changes in STI epidemiology and available therapeutic options [1]. The timeliness of STI treatment guidelines should be improved to ensure that guidance on up-to-date best practices in STI treatment is easily accessible for providers, particularly nonspecialist healthcare generalists. Specifically, annual guideline updates with comprehensive guideline reviews every 5 years are recommended [1].

The need for frequent revisions to STI treatment guidelines is compounded by the committee's call on the National Institutes of Health to accelerate technological and biomedical innovation of prophylactic, diagnostic, and therapeutic tools for STIs [1]. In particular, priority should be given to the development of inexpensive, rapid, and Clinical Laboratory Improvement Amendments–waived point-of-care diagnostic tests for common STIs; diagnostic tests that distinguish active syphilis from treated infection; and new antimicrobials and vaccines [1]. Funding and support for public–private partnership are explicitly encouraged to accelerate innovation [1].

CONCLUSIONS

STIs represent a sizable, longstanding, and growing public health challenge. Recently renewed prioritization of STIs and sexual health at the national level is therefore important. The HHS STI National Strategic Plan—the first of its kind—was released in December 2020 [26], and several reports commissioned by the National Coalition of STD Directors provide insights into STI infrastructure in the US and the treatment pipeline for gonorrhea, chlamydia, and syphilis [2, 27, 28]. Similarly, recent calls from Congress to establish a federal Office of Sexual and Reproductive Health and Wellbeing indicate growing support for more comprehensive efforts to reduce negative sexual health outcomes, including STIs [29].

The recent National Academies report proposes new directions for STI prevention and control, including the adoption of a new sexual health paradigm and the need for a significant and rapid scale-up of sexual health and STI services. However, the capacity of the current STI specialty workforce to scale up services is limited. Therefore, the report calls for broader ownership and accountability for addressing sexual health and STIs among diverse clinical and nonclinical actors—with important implications for changing demands for STI and HIV specialty providers.

As part of the envisioned paradigm shift toward sexual health, STI and HIV specialty providers will have to increasingly take on responsibilities as leaders in the provision of STI-related training and technical assistance, and in the alignment of clinical training curricula, licensing criteria, and practice guidelines with the new sexual health demands for healthcare generalists. Efforts to broaden ownership and accountability for addressing sexual health and STIs to a wider cadre of professionals will only succeed if the existing expertise of STI and HIV specialists is leveraged to support this ambitious shift.

Recently announced federal plans for a \$1.13 billion investment in the DIS workforce indicate growing momentum for sexual health workforce development [30]. However, several concerns threaten to obstruct implementation of key workforce-focused considerations outlined in the National Academies' report (Table 1). Investments in the STI and broader public health

Table 1. Workforce Implications of Key Considerations Outlined in the National Academies' Report on Sexually Transmitted Infections

1. Given that the current, narrowly defined STI workforce of specialized ID providers and DISs has limited capacity to ensure adequate and equitable reach of STI prevention, testing, and treatment services, novel approaches for expanding and redefining the STI workforce are needed, including adoption of a holistic sexual health paradigm for workforce development.
2. Adoption of a holistic perspective recognizing sexual health as an integral component of overall health and well-being that is best addressed as part of routine, comprehensive healthcare and health promotion requires broader ownership and accountability for provision of STI prevention, testing, and treatment among diverse clinical and nonclinical actors.
3. To fully leverage the available workforce, it is of crucial import to enable service delivery to the full scope of providers' practice, especially for those clinicians and healthcare professionals who are well positioned to facilitate and expand STI prevention, testing, and treatment, but currently face regulatory or administrative barriers to the delivery of sexual health services, such as nurses, physician assistants, and pharmacists.
4. Healthcare generalists (ie, primary care physicians, nurses, physician assistants, clinical behavioral health practitioners) require better preparation for the routine delivery of recommended sexual health and STI services, including through incorporation of minimum standards for sexual health and STI services into professional training, licensing, and practice guidelines.
5. Members of the current STI and HIV specialty workforce (ie, ID physicians, nurse practitioners, physician assistants, and nurses with expertise in STIs and HIV, as well as DISs) are needed as leaders in the provision of STI-related training and technical assistance, advocacy, and consultation in supporting the ambitious shift toward a sexual health paradigm for STI prevention and control.
6. Success in the fight against STIs, including ending the HIV epidemic in the United States, cannot be achieved without sustained, targeted, and adequately prioritized efforts to promote the development of a robust sexual health workforce.

Abbreviations: DIS, disease intervention specialist; HIV, human immunodeficiency virus; ID, infectious disease; STI, sexually transmitted infection.

workforce have declined for several decades [2, 31], and it remains unclear whether the large-scale response to the COVID-19 pandemic marks the beginning of a sustained trend reversal. At the same time, the singular public health focus on mitigating the continuing COVID-19 pandemic represents a threat to adequate prioritization of other pressing public health challenges, such as STIs, particularly given that historically the urgency in responding to steadily increasing STIs rates has been inadequate. In sum, success in the fight against STIs, including ending the HIV epidemic in the US, cannot be achieved without sustained, targeted, and adequately prioritized efforts to promote development of a robust sexual health workforce.

Notes

Acknowledgments. The authors thank all members, reviewers, consultants, and study staff of the National Academies Committee on Prevention and Control of Sexually Transmitted Infections in the United States for their valuable contributions to the manuscript.

Financial support. The National Academies report was supported by the Centers for Disease Control and Prevention (CDC) and the National Association of County and City Health Officials.

Potential conflicts of interest. V. G.-R. reports grants and personal fees from ViiV Healthcare, outside the submitted work (service fee for expert advice provided as member of the Positive Action for Youth Advisory Board and grant for stigma reduction programming among youth living with HIV), and he serves as a member of the US Presidential Advisory Council on HIV/AIDS; the Department of Health and Human Services Panel on Antiretroviral Guidelines for Adults and Adolescents; the CDC/Health Resources and Services Administration Advisory Committee on HIV, Viral Hepatitis and STD Prevention and Treatment; and the Board of Directors of the Power to Decide. V. G.-R. also served as the Vice Chair of the Board of Directors of the Latino Commission on AIDS. All other authors report no potential conflicts.

All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References

1. National Academies of Sciences, Engineering, and Medicine. Sexually transmitted infections: adopting a sexual health paradigm. Washington D.C.: National Academies Press, 2021.

2. National Academy of Public Administration. The STD epidemic in America: the frontline struggle. 2019. Available at: <https://www.ncsddc.org/wp-content/uploads/2019/11/NCSD-Phase-II-Final-Report.pdf>. Accessed 9 April 2021.
3. Leichter JS, Heyer K, Peterman TA, et al. US public sexually transmitted disease clinical services in an era of declining public health funding: 2013–14. *Sex Transm Dis* 2017; 44:505–9.
4. National Coalition of STD Directors. Fact sheet: STD program capacity and preparedness in the United States: results of a national survey, 2009. 2019. Available at: <https://www.ncsddc.org/wp-content/uploads/2019/10/Fact-Sheet-STD-Program-Capacity-and-Preparedness-in-the-United-States-Re....pdf>. Accessed 9 April 2021.
5. Centers for Disease Control and Prevention. Sexually transmitted disease surveillance 2019. 2021. Available at: <https://www.cdc.gov/std/statistics/2019/default.htm>. Accessed 14 April 2021.
6. Kreisel KM, Spicknall IH, Gargano JW, et al. Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2018. *Sex Transm Dis* 2021; 48:208–14.
7. World Health Organization. Sexually transmitted infections (STIs). 2019. Available at: [https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-\(stis\)](https://www.who.int/news-room/fact-sheets/detail/sexually-transmitted-infections-(stis)). Accessed 9 April 2021.
8. US Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Healthy People 2030. 2020. Available at: <https://health.gov/healthypeople>. Accessed 9 April 2021.
9. Walensky RP, McQuillen DP, Shahbazi S, Goodson JD. Where is the ID in COVID-19? *Ann Intern Med* 2020; 173:587–9.
10. Centers for Disease Control and Prevention. NCHHSTP AtlasPlus. Available at: <https://www.cdc.gov/nchhstp/atlas/index.htm>. 2019. Accessed 9 April 2021.
11. Centers for Medicare and Medicaid Services. Medicare physician and other supplier national provider identifier (NPI) aggregate report, calendar year 2017. Available at: <https://data.cms.gov/Medicare-Physician-Supplier/Medicare-Physician-and-Other-Supplier-National-Pro/n5qc-ua94>. Accessed 9 April 2021.
12. Campaign for Action. State practice environment for nurse practitioners. Available at: <https://campaignforaction.org/resource/state-practice-environment-nurse-practitioners/>. Accessed 9 April 2021.
13. Barton Associates. PA state laws—interactive map. Available at: <https://www.bartonassociates.com/locum-tenens-resources/pa-state-laws-map>. Accessed 9 April 2021.
14. Weiser J, Beer L, West BT, Duke CC, Gremel GW, Skarbinski J. Qualifications, demographics, satisfaction, and future capacity of the HIV care provider workforce in the United States, 2013–2014. *Clin Infect Dis* 2016; 63:966–75.
15. National Center for Health Statistics. Percentage of having a doctor visit for any reason in the past 12 months for adults aged 18 and over, United States, 2019. Available at: https://www.cdc.gov/NHISDataQueryTool/SHS_adult/index.html. Accessed 9 April 2021.
16. National Center for Health Statistics. Percentage of having a doctor visit for any reason in the past 12 months for children under age 18 years, United States, 2019. Available at: https://www.cdc.gov/NHISDataQueryTool/SHS_child/index.html. Accessed 9 April 2021.
17. Laurant M, van der Biezen M, Wijers N, Watananirun K, Kontopantelis E, van Vught AJ. Nurses as substitutes for doctors in primary care. *Cochrane Database Syst Rev* 2018; 7:CD001271.

18. Kurtzman ET, Barnow BS. A comparison of nurse practitioners, physician assistants, and primary care physicians' patterns of practice and quality of care in health centers. *Med Care* **2017**; 55:615–22.
19. American Academy of Physician Assistants. Barriers to providing care improving, but more work remains. Available at: <https://www.aapa.org/news-central/2018/07/barriers-providing-care-improving-work-remains/>. Accessed 24 May 2021.
20. Frogner BK, Fraher EP, Spetz J, et al. Modernizing scope-of-practice regulations—time to prioritize patients. *N Engl J Med* **2020**; 382:591–3.
21. Dower C, Moore J, Langelier M. It is time to restructure health professions scope-of-practice regulations to remove barriers to care. *Health Aff* **2013**; 32:1971–6.
22. National Academies of Sciences, Engineering, and Medicine. *The future of nursing 2020–2030*. Washington D.C.: National Academies Press, **2021**.
23. Qato DM, Zenk S, Wilder J, Harrington R, Gaskin D, Alexander GC. The availability of pharmacies in the United States: 2007–2015. *PLoS One* **2017**; 12:e0183172.
24. FitzGerald C, Hurst S. Implicit bias in healthcare professionals: a systematic review. *BMC Med Ethics* **2017**; 18:19.
25. Hall WJ, Chapman MV, Lee KM, et al. Implicit racial/ethnic bias among health care professionals and its influence on health care outcomes: a systematic review. *Am J Public Health* **2015**; 105:e60–76.
26. Department of Health and Human Services, Office of the Assistant Secretary for Health. Sexually transmitted infections national strategic plan for the United States: 2021–2025. **2020**. Available at: <https://www.hhs.gov/sites/default/files/STI-National-Strategic-Plan-2021-2025.pdf>. Accessed 9 April 2021.
27. National Academy of Public Administrators. The impact of sexually transmitted diseases on the United States: still hidden, getting worse, can be controlled. **2018**. Available at: <https://www.ncsddc.org/wp-content/uploads/2018/12/NCSD-Final-Report-12.11.18-1.pdf>. Accessed 12 April 2021.
28. Treatment Action Group. Gonorrhea, chlamydia, and syphilis pipeline report 2019. **2019**. Available at: https://www.treatmentactiongroup.org/wp-content/uploads/2019/03/pipeline_gonorrhea_chlamydia_syphilis_final.pdf. Accessed 12 April 2021.
29. Kelley C. Group of Senate Democrats call on Biden to create Office of Sexual and Reproductive Health and Wellbeing. Available at: <https://www.cnn.com/2021/02/24/politics/senate-democrats-biden-office-of-sexual-and-reproductive-health-and-wellbeing/index.html>. Accessed 9 April 2021.
30. The White House. Fact sheet: Biden-Harris administration to invest \$7 billion from American Rescue Plan to hire and train public health workers in response to COVID-19. **2021**. Available at: <https://www.whitehouse.gov/briefing-room/statements-releases/2021/05/13/fact-sheet-biden-harris-administration-to-invest-7-billion-from-american-rescue-plan-to-hire-and-train-public-health-workers-in-response-to-covid-19/>. Accessed 24 May 2021.
31. Maani N, Galea S. COVID-19 and underinvestment in the public health infrastructure of the United States. *Milbank Q* **2020**; 98:250–9.