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Challenges to HIV service delivery and the impacts on patient care during COVID-19: perspective of HIV care providers in Guangxi, China

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ABSTRACT

The COVID-19 pandemic has brought immense challenges on the health system including HIV care service. Based on online survey data of 1,029 HIV care providers in Guangxi, China, we assessed their perspectives on the challenges for HIV service delivery and perceived impacts of such challenges on patient care during the COVID-19 outbreak. Multivariate regression analysis was conducted to test the association between specific challenges and patient care outcomes controlling for socio-demographics of HIV care providers. The prominent impacts of COVID-19 on patient care outcomes included “not being able to make follow-up visits on time”, “not being able to get ARV refills timely”, and “compromised ART adherence”. Patient care outcome was significantly associated with “not being able to go to work due to quarantine and traffic restriction”, “no overall arrangement”, “no guideline for HIV service”, “conflicts between HIV care and response to COVID-19”, and “clinics were overwhelmed by COVID-19 care”. In response to dual epidemics of COVID-19 and HIV, policy makers may consider the potential impact of large-scale preventive strategies (e.g., lockdowns) on HIV care, assist healthcare providers to navigate shifting tasks and resetting priorities effectively, and develop clear guidelines and clinic-level arrangements to best serve both COVID-19 and HIV patients.

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Challenges to HIV service delivery; patient care outcomes; COVID-19; HIV care provider; China

Introduction

The coronavirus disease 2019 (COVID-19) has swept across the globe causing significant mortality and morbidity and bringing immense challenges on the health system including HIV care service (Chenneville et al., 2020). A shift of resource allocation in the health system (i.e., prioritizing COVID-19 response) and large scale quarantine/lockdowns have severely impacted health providers' delivery of HIV service and patients' access to treatment and care (International AIDS Society, 2020). One survey conducted among 19 countries in Central and Eastern Europe reported that HIV clinics were normally operating in only six of these countries (~32%) during the pandemic. In 11 countries (~58%), health providers had dual duties for HIV and COVID-19 care (Kowalska et al., 2020). One study conducted among people living with HIV (PLWH) in Atlanta, the United States suggested that responses to COVID-19 such as social distancing were associated with increased cancellations of HIV care appointment (Kalichman

et al., 2020). Routine healthcare visits and non-urgent care have been delayed. In addition, supportive services (e.g., face-to-face counseling), prevention services, and outreach services have also been temporarily suspended in many HIV clinics (Krakower, 2020; Mhango et al., 2020; Qiao et al., 2020). Lockdowns have exacerbated HIV-related stigma and deferred PLWH in seeking HIV care in African countries (International Treatment Preparedness Coalition, 2020). In addition, reduced affordability of medical expenses and unavailability of transportation prevented PLWH from obtaining antiretroviral and prophylactic drugs (Amimo et al., 2020).

These challenges to HIV service delivery and substantial interruptions to HIV care may adversely impact patient care outcomes. Hogan and colleagues (Hogan et al., 2020) developed statistical models to estimate additional loss of life over the next 5 years in low – and middle-income countries (LMICs) and predicted that the interruption to antiretroviral therapy (ART) could result in the greatest impact on patient care outcomes

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and numbers of death due to HIV in over 5 years might increase by up to 10% compared to the scenario without the COVID-19 pandemic.

COVID-19 hit China in early December 2019 with a peak time of confirmed cases from January to March 2020 (Dong & Bouey, 2020). In response to the COVID-19 outbreak, China declared nation-wide travel restrictions and lockdowns as well as implemented “home-quarantines” to force social distancing in communities (Goldman, 2020). These mandatory measures continued through the middle of March 2020 in many regions of China (Goldman, 2020). Confronted with rapidly increasing medical needs for COVID-19, most hospitals in China diverted their healthcare resources for the outbreak, limiting services for other medical conditions including HIV/AIDS. Healthcare providers in HIV clinics may be reassigned to other medical sections in response to the demand of COVID-19 prevention and care (National Center of AIDS/STD Control and Prevention China, 2020). At the same time, the travel restrictions also hindered PLWH from visiting the HIV clinics for treatment and care. These challenges in HIV service may affect patient care outcomes (e.g., medication adherence and retention) (Xie, 2020).

Researchers and health organizations have conducted surveys to assess the current situations and health needs among PLWH in China during the COVID-19 outbreak (Chen et al., 2020; Guo et al., 2020; Sun et al., 2020). However, most of these surveys did not collect data from HIV care providers. Few studies have quantified the specific challenges of HIV service delivery and patient care outcomes from the perspectives of front-line healthcare providers. There is a lack of evidence for the associations of the patient care outcomes with different HIV service challenges. Surveys among HIV care providers can supplement studies based on PLWH’s reports. HIV care providers can offer insights regarding care at the clinic level that PLWH may not have the firsthand knowledge. Given their experience of working with many HIV patients, HIV care providers may provide a comprehensive picture regarding the service challenges and their impact on patient care outcomes. Therefore, we collected data from HIV care providers in China to investigate HIV service challenges and patient care outcomes during the COVID-19 outbreak. We also aimed to identify the HIV service challenges that were significantly associated with patient care outcomes during this public health crisis.

Method

Participants and procedure

Cross-sectional data were collected via anonymous online survey from a convenience sample of HIV care

providers in Guangxi Zhuang Autonomous Region (“Guangxi”). Guangxi is one of the regions that suffer from the fastest growth of the HIV epidemic in China. By 2018 Guangxi had over 86,000 PLWH, ranking as the third in terms of number of HIV/AIDS cases among all provinces in mainland China (Guangxi Center of Disease Control and Prevention, 2018). The online survey was conducted from April through May 2020 when the peak time of confirmed COVID-19 cases had passed in China. The survey, about 15 min in response time, assessed participants’ perceived challenges for delivering HIV care service and observed patient HIV care outcomes during the COVID-19 outbreak (January to March 2020). We employed SO JUMP system technology, a widely used Chinese online survey tool similar to Amazon Mechanical Turk in data collection (Tam et al., 2020). The eligibility criteria for participants included: (1) currently providing HIV-related care and services; (2) 18 years of age or older; (3) residing in Guangxi.

To recruit participants, personnel in Guangxi Center for Disease Control and Prevention (Guangxi CDC) reached out to eligible HIV care providers by email inviting them to participate in the anonymous online survey. Participants were also encouraged to share the survey link with their colleagues. Online informed consent was presented at the beginning of the survey. The study protocol was approved by the Institutional Review Boards at both University of South Carolina in the United States and Guangxi CDC in China. A total of 1,280 HIV care providers consented and responded to the online survey. Data from 251 participants were excluded due to identifying themselves as someone from outside of Guangxi ($n = 63$), or their responses were considered as random or careless answers ($n = 76$) or outliers on multiple questions ($n = 112$), yielding a final sample size of 1,029 in the current study.

Measures

Demographics. HIV care providers were asked about their demographic information including age, gender (male or female), residence, marital status (unmarried, unmarried cohabitating, married/remarried, separated, divorced, and widowed), and education level (middle school, high school, college, Bachelor’s degree, and Master’s degree or higher). Occupational information was also collected including profession (nurse, lab personnel, CDC staff, physician, and other), professional ranking (no ranking, entry level, middle level, and senior level), administrative title (no administrative title, department leader, hospital/CDC director, and other), and level of institutional affiliation (province/city, county, and township).

HIV service challenges. HIV service challenges were assessed by a self-developed scale comprised of eight items about perceived difficulties and barriers of delivering HIV care services during the COVID-19 pandemic (e.g., “Lack of adequate personal protection equipment or resources” and “Shortage of personnel because some colleagues have been assigned to fight against COVID-19”). Participants rated items on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A total score was calculated with a higher score indicating a higher level of HIV service challenges. This scale had good internal consistency in the current study (Cronbach’s $\alpha = .87$).

Perceived patient HIV care outcome. Perceived patient HIV care outcome was assessed by a self-developed 5-item scale regarding the aspects in which HIV patients could be affected by COVID-19 pandemic. Sample items include “HIV patients could not get anti-retroviral drugs (ARVs) refill timely” and “HIV patients could not maintain regular follow-up service”. Participants rated items on a five-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). A sum score of the scale was calculated with a higher total score indicating a poorer HIV care outcome. The scale showed a good internal consistency in our sample (Cronbach’s $\alpha = 0.86$).

Data analysis

Descriptive analysis was performed to delineate demographic and occupational background of the sample as well as participants’ perceptions on HIV service challenges and patient HIV care outcome during the COVID-19 outbreak. For the descriptive purpose, we dichotomized individual items of HIV service challenges and patient HIV care outcome by combining “agree” or “strongly agree” into “yes” and other responses into “no”. Bivariate analyses were conducted to explore how socio-demographics and HIV service challenges were associated with perceived patient HIV care outcome, using Pearson’s correlation for continuous variables and ANOVA for categorical variables. Multivariate linear regression was employed to analyze the association between each item of HIV service challenges and composite measure of perceived patient HIV care outcome. Demographic variables identified to have a significant association with perceived patient HIV care outcome in bivariate analysis were entered into the multivariate regression model as covariates. Categorical variable (e.g., profession) was dummy coded in the regression model. Variance inflation analysis was conducted to test multicollinearity of individual items of HIV service challenges. SAS 9.4 (SAS Institute Inc., Cary, NC, US) was used for all the statistical analyses.

Results

Sample characteristics

The characteristics of the sample are presented in Table 1. Among the 1029 participants, the mean age was 38.4 years old (SD=9.2), 61.6% were female, and 47.7% had a college education. Regarding the profession, 21.3% were physician, 18.6% were nurse/lab personnel, and 37.6% were CDC staff. In terms of professional ranking, 31.8% has no ranking, 37.5% were entry level, and 30.8% were middle level or above. Regarding institutional affiliation, 16.6% affiliated to province/city level, 31.7% affiliated to county level and 51.8% affiliated to township level HIV care facilities. About 26.7% were department leader/hospital/CDC leader. On average, these HIV care providers had worked in the health system for 15.2 years and in the HIV care field for 6.2 years.

HIV service challenges and patient care outcome

In terms of HIV service challenges they had encountered, 72.3% of the participants reported a lack of adequate personnel protection equipment or resources, 59.5% claimed a shortage of personnel because some colleagues had been reassigned to COVID-19 care, 52.1% perceived no overall personnel arrangement regarding HIV service provision in their clinics during this pandemic, 51.7% argued that they could not go to

Table 1. Descriptive demographics of the participants ($n=1,029$).

Items	N (%)
Age (mean, SD)	38.4 (9.2)
Gender	
Male	395 (38.4)
Female	634 (61.6)
Educational level	
Middle/high school	186 (18.1)
College	491 (47.7)
Bachelor and above	352 (34.2)
Profession	
Physician	219 (21.3)
Nurse/lab personnel	191 (18.6)
CDC staff	387 (37.6)
Other	232 (22.5)
Professional ranking	
No ranking	327 (31.8)
Entry level	386 (37.5)
Middle level or above	316 (30.8)
Institutional affiliation level	
Province/city level	170 (16.6)
County level	326 (31.7)
Township level	533 (51.8)
Administrative title	
No title	610 (59.3)
Department leader/hospital/CDC director	229 (26.7)
Other	1145 (14.1)
Years of working in health system (mean, SD)	15.2 (9.5)
Years of engaging in HIV care services (mean, SD)	6.2 (5.2)

work because of self-quarantine or traffic restrictions, and 48.7% admitted a conflict between COVID-19 task and HIV service task. Around one fourth of the participants thought that their hospitals or clinics were overwhelmed with COVID-19 care and had no capacity to maintain HIV services during COVID-19 outbreak.

Regarding the impacts of COVID-19 on patient HIV care outcome, 60.4% of the HIV care providers perceived that HIV patients could not receive regular follow-up service, 50.4% thought that HIV patients could not get ART refill timely, 43.1% believed that ART adherence would be compromised, 34.7% estimated potential accelerated disease progression or opportunistic infection among HIV patients due to lack of HIV care, and 22.1% anticipated an increasing mortality rate among HIV patients due to the lack of treatment.

Association of patient care outcome with demographics and HIV service challenges

As shown in Table 2, bivariate correlates of perceived patient HIV care outcome included age ($r=-0.07$,

Table 2. Bivariate associations of perceived patient care outcome (PCO) with demographics and HIV service challenges.

Items	PCO Score Mean (SD)	Bivariate Statistics*	P value
Age		$r=-0.07$	0.02
Gender			
Male	15.2 (5.9)	$F=4.91$	0.03
Female	14.3 (6.3)		
Educational level			
Middle/high school	14.2 (6.1)	$F=1.57$	0.21
College	14.5 (6.2)		
Bachelor and above	15.1 (6.1)		
Profession			
Physician	14.6 (6.0)	$F=6.89$	<.001
Nurse/lab personnel	13.4 (6.3)		
CDC staff	15.7 (6.0)		
Other	14.1 (6.1)		
Professional ranking			
No ranking	14.6 (6.1)	$F=0.85$	0.43
Entry level	15.0 (6.3)		
Middle level or above	14.4 (6.0)		
Institutional affiliation level			
Province/city level	14.8 (6.0)	$F=0.31$	0.73
County level	14.4 (6.3)		
Community level	14.8 (6.1)		
Administrative titles			
No titles	14.6 (6.2)	$F=2.88$	0.06
Department leader/hospital/CDC director	15.3 (6.1)		
Other	13.8 (6.0)		
Years of working in health system		$r=-0.07$	0.02
Years of engaging in HIV care services		$r=0.03$	0.33
HIV service challenges		$r=0.68$	<.001

Note: * Pearson's correlation coefficient for continuous variables; F-value for ANOVA test of categorical variables.

$p=0.02$), gender ($F=4.91$, $p=0.03$), professional position ($F=6.89$, $p<.001$), years of working in health system ($r=-.07$, $p=0.02$), and HIV service challenges ($r=0.68$, $p<.001$). Table 3 depicts the results of multivariate regression analysis. Controlling for demographic covariates, poor perceived patient HIV care outcome was significantly associated with "not being able to go to work due to self-quarantine or traffic restriction" ($\beta=0.77$, $p<.001$), "no overall arrangement regarding how to carry out HIV services during this pandemic" ($\beta=0.74$, $p<.001$), "no guideline" ($\beta=0.36$, $p=.002$), "conflicts between HIV care and response to COVID-19" ($\beta=0.70$, $p<.001$), and "clinics were overwhelmed with COVID-19 care" ($\beta=0.51$, $p<.001$). Demographic covariates (age, gender) were not significantly associated with perceived patient HIV care outcomes in the final regression model. Variance inflation analysis did not suggest multicollinearity among the individual items of HIV service challenges (VIF values ranged 1.69–2.43).

Discussion

The current study was one of the first efforts to investigate HIV service challenges and patient HIV care outcomes among PLWH in China during the COVID-19 pandemic from the perspectives of HIV care providers.

Table 3. Multivariate regression for the association between each type of HIV service challenges and perceived patient care outcome.

Items*	B	Std. Error	t	p	95% Confidence Interval	
1 Could not get to work because of self-quarantine or traffic restrictions	0.77	.11	7.01	.000	0.55	0.98
2 Lack of adequate personal protection equipment or resources	0.23	.12	1.82	.069	-0.02	0.48
3 No overall arrangement regarding how to carry out HIV services during this pandemic	0.74	.14	5.27	.000	0.46	1.01
4 No guidelines	0.36	.12	3.09	.002	0.13	0.59
5 There is conflict between COVID-19 task and HIV service task	0.70	.12	5.65	.000	0.45	0.94
6 Shortage of personnel because some colleagues have been assigned to fight against COVID-19	0.24	.13	1.92	.055	-0.01	0.49
7 The hospitals/clinics are overwhelmed with COVID-19 care and have no capacity for HIV patients	0.51	.14	3.78	.000	0.25	0.78
8 Medical staff were unable to provide HIV service because of suspected/confirmed infection of COVID-19	0.09	.13	0.74	.458	-0.15	0.34

Note: *Significant socio-demographic covariates in Table 2 were adjusted, including age, gender, years of working in health system, and profession.

Challenges of delivering HIV service appear to have profoundly affected perceived patient HIV care outcomes during the early phase of the COVID-19 pandemic. Poor perceived patient HIV care outcome was significantly associated with quarantine and traffic restriction, lack of overall clinic-level arrangement, lack of guidelines or navigation to address job conflicts between HIV care and COVID-19 care, and limited capacity of clinics for an overwhelming number of COVID-19 patients.

HIV care providers' concerns over patient care outcomes heavily focused on retention in care and medicine adherence. Over 50% of the HIV care providers perceived that their patients could not get ARVs refilled timely. Our finding is generally in accordance with the extant studies among HIV patients showing that ARVs refill and medicine adherence were prevalent problems for HIV care during the outbreak (Guo et al., 2020; UNAIDS, 2020). Specific attention and sufficient effort should be paid to this aspect of HIV care during the pandemic, particularly for populations who are already vulnerable to suboptimal adherence.

It is notable that several challenges of policy and organizational preparedness were related to negative perceived patient care outcomes from the perspectives of HIV care providers. For instance, the travel restriction and quarantine prevented many healthcare providers from returning to work from hometown after the national Chinese New Year holidays. Other organization-level challenges during the COVID-19 outbreak included the lack of organizational preparedness of HIV clinics in terms of overall plan and arrangement ("no overall arrangement"), training and navigation support ("no guidelines", "conflicts between HIV care and response to COVID-19"), and infrastructure preparedness ("clinics were overwhelmed with COVID-19 care").

This unique finding underlines the need of improving organizational resilience and preparedness during a public health crisis such as COVID-19. Resilience and preparedness of a health organization can be attributed to some common traits of the organization such as crisis awareness, the ability to foresight, learning capacity, and communication within the organization (Ruiz-Martin et al., 2018). Policy environment and external resources can also make tremendous impacts on health organizations' ability to be flexible and return to a state of normalcy after an adverse event. In response to dual epidemics of COVID-19 and HIV, policy makers need to consider the needs of healthcare providers in order to best serve patients, including safe and effective transportation during lockdown. Leaders of HIV clinics may want to work with administrators to provide

training and protocols to assist health providers to navigate shifting tasks and priorities effectively, and develop clear guidelines and clinic-level arrangements based on existing resources to best serve both COVID-19 and HIV patients. Effective and regular communication with providers is also important to provide support, reduce uncertainty, and enhance confidence.

As a long-term plan, we need to build up a mechanism to effectively assess, monitor, and enhance organizational resilience in HIV-related institutes via regular evaluation (e.g., annual certification) and tailored training for managers at various levels. More studies on organizational resilience in HIV care context are needed in terms of adapting assessment instruments, identifying facilitators and barriers at various socioecological levels, and developing evidence-based interventions for front-line healthcare providers.

Our study is subject to several limitations. First, the cross-sectional study design limited our ability for causal inference and only provided a view of challenges in a specific period of the pandemic. Longitudinal studies are needed to examine the long-term impacts of HIV service challenges on patient care outcomes. Second, the perceived patient HIV care outcomes were assessed based on HIV care providers' observations and perceptions rather than clinical charts or medical records. The measurement might be subject to recall bias and social desirability bias. Third, due to the brevity of the online survey, data were not available on some other factors that may contribute to the association between HIV service challenges and patient HIV care outcomes such as factors at individual level (e.g., optimism of HIV care providers) and institutional level (e.g., leadership of the HIV clinics, resources and support obtained from the government, existing facility infrastructure). Finally, our results need to be cautiously interpreted within the specific context. In Guangxi, the majority of PLWH are living in rural regions, with low educational attainment, and get infected via sexual transmission. Therefore, HIV prevention and care delivery may be more challenging because of the relatively poor healthcare infrastructure, shortage of healthcare providers, and conservative cultural context. The PLWH in Guangxi might be more vulnerable for poor HIV care outcomes compared to other regions in China or elsewhere during the COVID-19 outbreak.

Conclusion

Despite these limitations, the current study was one of the first empirical studies that links HIV service challenges to patient care outcomes from the perspectives of HIV care providers and provides a nuanced look at

what factors may be most significantly associated with these perceived patient HIV care outcomes. Compared to the lack of personal protective equipment and shortage of personnel caused by high demands and burden to health system during the pandemic, challenges at policy level and institution level were more relevant to the negative impacts on patient care outcomes. Our findings suggest that it is crucial to comprehensively consider how national level responses to COVID-19 pandemic may impact on healthcare delivery for HIV/AIDS and other medical conditions. It is also urgent to improve organizational preparedness and resilience of HIV service facilities so that the healthcare systems and facilities will be able to provide timely and effective support to HIV care providers in terms of training, guideline, logistics, and clinic-level arrangements in response to future public health emergencies.

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
Disclosure statement

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References

- Amimo, F., Lambert, B., & Magit, A. (2020). What does the COVID-19 pandemic mean for HIV, tuberculosis, and malaria control? *Tropical Medicine and Health*, 48(1), 32. <https://doi.org/10.1186/s41182-020-00219-6>
- Chen, F. F., Tang, H. L., & Lyu, P. (2020). [Research progress of the impact of COVID-19 outbreak on people living with HIV]. *Zhonghua Liu Xing Bing Xue Za Zhi*, 41(0), E074. <https://doi.org/10.3760/cma.j.cn112338-20200603-00803>
- Chenneville, T., Gabbidon, K., Hanson, P., & Holyfield, C. (2020). The impact of COVID-19 on HIV treatment and research: A Call to Action. *International Journal of Environmental Research and Public Health*, 17(12), 4548. <https://doi.org/10.3390/ijerph17124548>
- Dong, L., & Bouey, J. (2020). Public mental health crisis during COVID-19 pandemic, China. *Emerging Infectious Diseases*, 26(7), 1616–1618. <https://doi.org/10.3201/eid2607.200407>
- Goldman, D. (2020). China suppressed Covid-19 with AI and big data. *ASIA Times*. <https://asiatimes.com/2020/03/china-suppressed-covid-19-with-ai-and-big-data/>
- Guangxi Center of Disease Control and Prevention (Producer). (2018, July 7). Know your status, embrace health. . <http://www.gxcdc.com/zxdt/2018/1204/9594.html>
- Guo, W., Weng, H. L., Bai, H., Liu, J., Wei, X. N., Zhou, K., & Sande, A. (2020). [Quick community survey on the impact of COVID-19 outbreak for the healthcare of people living with HIV]. *Zhonghua Liu Xing Bing Xue Za Zhi*, 41(5), 662–666. <https://doi.org/10.3760/cma.j.cn112338-20200314-00345>
- Hogan, A. B., Jewell, B. L., Sherrard-Smith, E., Vesga, J. F., Watson, O. J., Whittaker, C., Hamlet, A., Smith, J. A., Winskill, P., Verity, R., Baguelin, M., Lees, J. A., Whittles, L. K., Ainslie, K. E. C., Bhatt, S., Boonyasiri, A., Brazeau, N. F., Cattarino, L., Cooper, L. V., ... Hallett, T. B. (2020). Potential impact of the COVID-19 pandemic on HIV, tuberculosis, and malaria in low-income and middle-income countries: A modelling study. *The Lancet Global Health*. [https://doi.org/10.1016/S2214-109X\(20\)30288-6](https://doi.org/10.1016/S2214-109X(20)30288-6)
- International AIDS Society. (2020). *The COVID-19 and HIV: A tale of two pandemics*. https://covid19andhivreport.iasociety.org/?utm_source=IAS&utm_campaign=d5e0dab615-daily-delegate-7-july&utm_medium=email&utm_term=0_58c4aa5b50-d5e0dab615-103434229
- International Treatment Preparedness Coalition (Producer). (2020, April 21). Perspectives from Recipients of Care during the COVID-19 Pandemic. https://cquin.icap.columbia.edu/wp-content/uploads/2020/04/CCQUIN-ITPC-RoC-Perspectives_MASTER-FINAL21April.pdf
- Kalichman, S. C., Eaton, L. A., Berman, M., Kalichman, M. O., Katner, H., Sam, S. S., & Caliendo, A. M. (2020). Intersecting Pandemics: Impact of SARS-CoV-2 (COVID-19) protective Behaviors on people living with HIV, Atlanta, Georgia. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 85, 66–72. <https://doi.org/10.1097/QAI.0000000000002414>
- Kowalska, J. D., Skrzat-Klapaczynska, A., Bursa, D., Balayan, T., Begovac, J., Chkhartishvili, N., Gokengin, D., Harxhi, A., Jilich, D., Jevtovic, D., Kase, K., Lakatos, B., Matulionyte, R., Mulabdic, V., Nagit, A., Papadopoulos, A., Stefanovic, M., Vassilenko, A., Vasylyev, M., ... Horban, A. (2020). HIV care in times of the COVID-19 crisis - Where are we now in Central and Eastern Europe? *International Journal of Infectious Diseases*, 96, 311–314. <https://doi.org/10.1016/j.ijid.2020.05.013>
- Krakower, D. (2020, July 6–10). *Impact of COVID-19 on HIV preexposure prophylaxis care at a Boston community health center*. Paper presented at the 23rd International AIDS Conference (AIDS 2020: Virtual).

- Mhango, M., Chitungo, I., & Dzinamarira, T. (2020). COVID-19 Lockdowns: Impact on facility-based HIV Testing and the Case for the Scaling Up of home-based Testing services in Sub-Saharan Africa. *AIDS and Behavior*, 24, 3014–3016. <https://doi.org/10.1007/s10461-020-02939-6>
- National Center of AIDS/STD Control and Prevention China. (2020). In face of the COVID-19 pandemic, HIV healthcare providers have the courage to take on the role in fighting on the front line.
- Qiao, S., Li, Z., Weissman, S., Li, X., Olatosi, B., Davis, C., & Mansaray, A. B. (2020). Disparity in HIV service interruption in the outbreak of COVID-19 in South Carolina. *AIDS and Behavior*, 1–9. <https://doi.org/10.1007/s10461-020-03013-x>
- Ruiz-Martin, C., López-Paredes, A., & Wainer, G. (2018). What we know and do not know about organizational resilience. *International Journal of Production Management and Engineering*, 6(1), 11–28. <https://doi.org/10.4995/ijpme.2018.7898>
- Sun, S., Hou, J., Chen, Y., Lu, Y., Brown, L., & Operario, D. (2020). Challenges to HIV care and psychological health during the COVID-19 pandemic among people living with HIV in China. *AIDS and Behavior*, 1. <https://doi.org/10.1007/s10461-020-02903-4>
- Tam, C. C., Sun, S., Yang, X., Li, X., Zhou, Y., & Shen, Z. (2020). Psychological distress among HIV healthcare providers during the COVID-19 pandemic in China: Mediating roles of institutional support and resilience. *AIDS and Behavior*. <https://doi.org/10.1007/s10461-020-03068-w>
- UNAIDS. (2020). Survey shows that many people lack multi-month HIV treatment in Latin America. https://www.unaids.org/en/resources/presscentre/featurestories/2020/june/20200624_hiv-treatment-latin-america
- Xie, M. (2020). A medication shortage crisis: People living with HIV in the “locked down” city during the COVID-19 outbreak in China.