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Empowering Communities: Harnessing Technology for HIV Literacy and Triple Zero Goals

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ABSTRACT

Background: The COVID-19 pandemic provides a unique opportunity to reinvigorate efforts to achieve the Triple Zero HIV goal by 2030-zero new cases, zero deaths from AIDS, and zero stigma. This scoping review explores technology, including social media and big data, in increasing HIV literacy and community engagement. It is crucial to prioritize the Triple Zero HIV targets, which involve the eradication of new HIV infections, AIDS-related deaths, and the stigma associated with HIV, amidst the COVID-19 epidemic. This study aimed to rigorously investigate and identify new technology-driven therapeutics to eliminate HIV, AIDS-related fatalities, and social discrimination by 2030.
Subjects and Method: A systematic review was conducted by searching articles from PubMed and ResearchGate is an article published from 2015 to present. The keywords were “HIV education technology” and “community engagement.” Articles covering technology-based HIV literacy and community engagement were selected., and other databases were searched extensively for this scoping review. The search included "HIV education technology” “Community engagement” and "Big data in HIV prevention”. The articles were selected by PRISMA flow diagram method.
Results: A total of 8 studies was included in this review. This study revealed innovative approaches to HIV education through technology, including mobile applications and social media campaigns. These tools provide easily accessible information, reducing stigma and discrimination. Big data and predictive analytics can target interventions effectively. The post-COVID-19 era allows for community mobilization through social media campaigns and virtual support groups, fostering solidarity and access to care. According to our analysis, mobile apps and social media campaigns are novel HIV education methods. These tools make knowledge accessible, decreasing stigma and discrimination. Big data and predictive analytics target interventions. Community mobilization through social media campaigns and virtual support groups promotes solidarity and care post-COVID-19.
Conclusion: Technology, heightened health awareness, and community engagement can drive progress toward the Triple Zero goal of HIV by 2030, creating a world with no new cases, no AIDS deaths, and no stigma. This opportunity arises in the wake of the COVID-19 pandemic, which offers new avenues for HIV prevention and care.

Keywords: HIV/prevention, social media, community health, post-pandemic care, health education.

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BACKGROUND

The HIV (Human Immunodeficiency Virus) targets the human immune system and has the potential to lead to AIDS (Acquired Immunodeficiency Syndrome), which is caused by a gradual decline in the immune system caused by infection with a type of retrovirus known as HIV. The quality of life of HIV patients, as with other long-term illnesses, must be considered. The quality of life of HIV patients is one of the levels of success of HIV therapy, and the application of ARV (Anti-Retro Viral) therapy is considered successful if the quality of life of patients with HIV is good. A person's subjective feeling about his or her well-being based on his or her current life experiences as a whole is known as quality of life. The lives of HIV patients can be influenced by many factors. (Purwaningsih and Widayatun, 2008)

HIV/AIDS cases are growing very quickly throughout the world. It is estimated that around 40 million people have been infected and more than 20 million people have died (Jakti and Wibowo, 2019). Where teenagers and young adults who are facing changes in habits and life trends create a higher risk of exposure to HIV. This transition includes sexual activity, changing roles between family and friends, adopting parental roles and responsibilities, and exposure to limitations with health facilities. As a result, compared with the older population, this population is less likely to know about their HIV status and receive treatment. Their risk of HIV-related death is also higher than that of older populations (Zanoni and Mayer, 2014) .

Since the year 2000, several worldwide declarations and promises, in addition to specific goals and targets, have been issued by world leaders and governments in an effort to combat the HIV/AIDS epidemic. More or less in a generic sense. Nevertheless, the United Nations General Assembly Special Session on HIV and AIDS (UNGASS) in 2001 specifically included targets to reduce the prevalence of HIV by 25 percent by the end of the year 2010, as well as to increase the access of young people to information, skills, and services related to HIV prevention by up to 95 percent in the same year (Idele et al., 2014).

The biggest challenges for HIV sufferers are social stigma and discrimination, both of which have a negative effect on quality of life and treatment outcomes. Erving Goffman, a sociologist, described stigma as "an attribute that connects a person to an undesirable stereotype, leading others to reduce the sufferer from a complete and ordinary person to a tainted and ostracized person." Views and discrimination not only fuel the spread of the epidemic, but also influence patients in responding to and living with HIV/AIDS through social isolation, emotional stress and coping, and denial of social and economic resources (Tran et al., 2019) .

Social media, which is a broad digital platform, has the potential to reduce stigma and discrimination in society. As many as 50% of the world's population is estimated to have a cell phone and 42% use the

internet (World Internet Users Statistics and 2023 World Population Stats, no date). Where this population is dominated by young people (12-17 years: 81%) and young adults (18-29 years: 89%) (Three Technology Revolutions Pew Research Center, no date) .

This shows the high use of social media in the world population, especially in the younger generation. So, it is very possible for the elimination of stigma and prevention of HIV/AIDS to be spread through this young generation. Considering that the population of teenagers and young adults in the world is greater than the older generation (What is the World Population?, no date). In addition, social media can be an alternative when psychological treatment is limited. Of course, this can be an effective way to achieve the Triple Zero goal.

Utilizing the extensive reach of social media is in line with the increasing digital interconnectedness, providing exceptional opportunities to educate, diminish societal prejudice, and the encourage HIV testing among the technologically proficient younger demographic worldwide. Utilizing technology shows potential in addressing disparities in psychological assistance, particularly in locations with little resources. Utilizing these developments might accelerate progress towards attaining the 'Triple Zero' objectives-eliminating new cases, eradicating AIDS-related deaths, and erasing stigma—by 2030 in the battle against HIV/AIDS.

Leveraging the advancements in technology holds promise for achieving the 'Triple Zero' objectives-eliminating new cases, eradicating AIDS-related deaths, and erasing stigma-by 2030 in the battle against HIV/AIDS, with the aim of addressing disparities in psychological assistance, particularly in resource-limited locations.

SUBJECTS AND METHOD

1. Study Design

The scoping review study employed a literature search across databases, including PubMed and ResearchGate. Keywords and MeSH terms such as "HIV infections/prevention and control," "Health Education," and "Big data in HIV prevention" were utilized. The focus was on articles published from 2015 until present (2024).

2. Inclusion Criteria

The inclusion criteria consisted of articles pertaining to HIV education, technology, community participation, and big data in HIV prevention, specifically focusing on publications from 2015 to the present. Studies were chosen based on their importance in contributing to a modern comprehension of HIV-related activities, guaranteeing relevance to the current technological and sociological context. In addition, the inclusion criteria took into account the methodological rigor of the studies, with the goal of including high-quality research that would strengthen the overall reliability of the scoping review.

3. Exclusion Criteria

The exclusion criteria were applied during the screening process, omitting publications that did not meet the specified criteria for relevance to HIV education, technology, community engagement, and big data in HIV prevention.

4. Data Extraction

The analysis process involved extracting and considering the conclusions or results of the published research. The extraction focused on qualitative insights, excluding numerical data from the research results.

5. Data Sythesis

The synthesis involved a thorough examination of the 22 chosen publications, integrating insights from the scoping review. Manual searches on relevant article refe-

rences were also conducted to enhance the comprehensiveness of the data synthesis.

RESULTS

The process of searching for articles to be synthesized and the process of reviewing and selecting articles using the PRISMA Flow Diagram are presented in Figure 1. The initial search process resulted in 131 articles from PubMed and 118 articles from ResearchGate. After removing 158 duplication articles, 91 articles were generated, subsequently, after the process of eliminating article duplication, the next step was to check the relevance of the title and the study design used to generate 33 articles. After checking articles according to inclusion criteria and exclusion criteria, 28 articles were obtained. However, 6 articles were excluded due to inability to access the full text. So, the total articles included in the systematic review were 22 articles.

Table 1 presents a summary of the primary research about empowering communities: harnessing technology for HIV literacy and triple zero goals affecting included in the systematic review. The summary in table 1 contains the author and year of research, title, journal name, research objectives, research methods and conclusions.

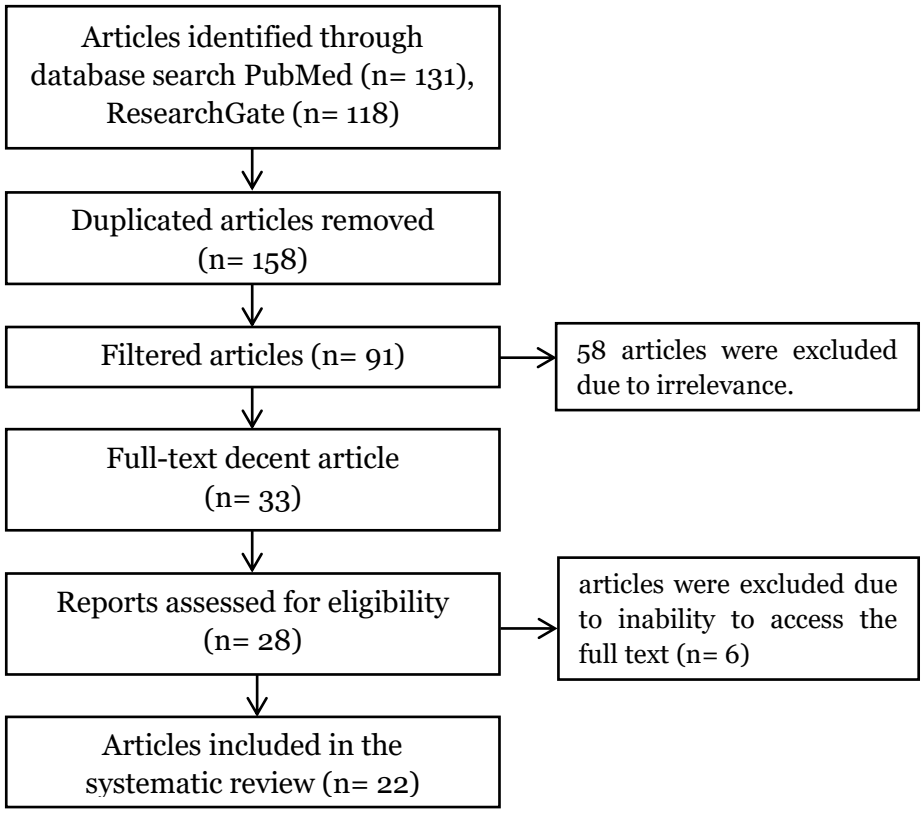

Figure 1. PRISMA Flow diagrams of empowering communities: harnessing technology for HIV literacy and triple zero goals affecting.

Table 1. Summary of articles empowering communities: harnessing technology for HIV literacy and triple zero goals.

Author (Year)	Tittle	Journal	Objective	Methods	Conclusion
Stafylis et al. (2022)	Relative Effectiveness of Social Media, Dating Apps, and Information Search Sites in Promotive HIV Self-testing: Observational Cohort Study	JMIR Formative Research	Evaluating the efficacy of social media, dating applications, and information retrieval websites in promoting HIV self-testing among homosexual males who have a heightened risk of contracting HIV.	This research conducted recruitment in two waves using the same platform. Participants completed surveys covering sexuality, injection drug use, alcohol, HIV, and stigma. They receive an e-code to order an independent HIV test kit. Follow-up assessed kit use and PrEP adherence 14–60 days post-recruitment.	Utilizing popular dating application can serve as an effective means to encourage HIV self-testing. Stigma, attitudes around HIV testing and treatment, or lack of faith in health institutions may not impact the demand for HIV testing kits advertised online.
Taggart et al. (2015)	Social Media and HIV: A systematic Review of Uses of Social Media in HIV Communication	J Med Internet Research	Presents a comprehensive systematic review of the literature published to date on HIV prevention and management.	This systematic review examines data up until February 2014. This article centers on the topic of HIV/AIDS communication, particularly in relation to social media. The study design is independent and the research was released prior to February 19, 2019. This demonstrates the utilization of technology and social media for HIV communication.	In conclusion, this review underscores the importance of integrating technology and social media in HIV communications. This report analyzes the relevant literature up to February 2014, with a particular focus on studies published before 19 February 2019, that used independent research designs. This approach has the potential to increase the effectiveness of HIV communication strategies.
Cao et al. (2017)	Social Media Engagement and HIV Testing Among Men Who Have Sex with Men in China: A Nationwide Cross-Sectional Survey	J Med Internet Research	Evaluating the relationship between social media use and HIV testing habits among Chinese homosexual men.	In July 2016, an internet survey involving homosexual men in 8 Chinese cities used Blued, the world's largest gay app. The survey collected data on sociodemographics, social media use, sexual behavior, and HIV testing history. They assessed their engagement with HIV testing content on social media through Confirmatory Factor Analysis (CFA).	This study involved 2,105 participants, with a significant percentage under 24 years of age. More than half of participants used various social media, such as WeChat, for HIV testing-related content, highlighting the important role of technology and social media in HIV communication.

Author (Year)	Tittle	Journal	Objective	Methods	Conclusion
Jones et al. (2019)	Attitudes toward HIV testing, awareness of HIV campaigns, and using social networking sites to deliver HIV testing messages in the age of social media: a qualitative study of young black men	Health Education Research	This research examined HIV attitudes and awareness among US Black teens. This study verifies the efficacy of HIV testing messaging and examines how marketing strategies use Instagram and other social media platforms.	A qualitative study with a total of 19 Black male students at a public university in Atlanta, GA, USA for 3 focus groups from September to October 2016. Data was collected by recording opinions in each focus group and transcribed by graduate student volunteers.	Universal HIV messages, free from subpopulation stereotypes, and tailored to motivating factors, can increase HIV testing among diverse populations. Social media platforms, such as Instagram, play an important role in reaching and educating young Black men on HIV risk behaviors.
Yun et al. (2019)	Development and Validation of a Personalized Social Media Platform–Based HIV Incidence Risk Assessment Tool for Men Who Have Sex With Men in China	JMIR Publications	Created a social media-based HIV risk prediction tool for Chinese MSM. This tool helps healthcare providers identify and reach this group for counseling and risk reduction.	A group of men who have sex with men (MSM) from Shenyang, China, were studied from 2009 to 2016 to create and confirm the accuracy of a prediction model. MSM meeting the criteria were randomized at random to either the training or validation data sets.	Disseminating HIV infection risk prediction tools using social media platforms is a straightforward task. These methods enhance awareness of individual susceptibility to HIV infection and categorize MSM populations into subgroups according to their risk of contracting HIV. This provides guidance on effectively assist-ing men who have sex with men (MSM) who are at high risk of acquiring HIV.
Hsiao et al. (2019)	Demographic differences in people living with HIV according to recruitment sources: comparison between health-care systems and social media networks.	AIDS Care	Evaluate the demographic disparities among individuals who have HIV based on their recruiting source, specifically examining disparities between healthcare institutions and social media networks.	This study employed a cross-sectional survey to examine individuals living with HIV who were recruited via social media networks and healthcare systems. The survey included an HIV stigma and discrimination questionnaire.	The study identified disparities between people living with HIV (PLHIV) who were recruited from social media networks and those from the health care system. These disparities encompassed factors such as age, sexual activity, education, and under-standing of legislation protecting the rights of individuals with HIV.
Cao et al. (2018)	Understanding HIV testing behaviors through	BMC Public Health	To understand HIV testing behavior via	This research involves analyzing the sentiment and behavior of Weibo	This study found that social media sentiment can provide insight into

Author (Year)	Tittle	Journal	Objective	Methods	Conclusion
	social media, a big data analysis of Weibo users' sentiment, and the use of healthcare services in China.		social media and sentiment analysis of Weibo users, as well as healthcare use in China.	users in China regarding HIV testing using big data techniques.	HIV testing beha-vior and health service utilization. Weibo data analysis can complement traditional data analysis in public health research.
Hightow-Weidman et al., (2020)	Association between sexually transmitted infections and engagement with technology-based outreach interventions among adolescents and young adults.	JAMA Pediatrics	Investigating the relationship between sexually transmitted infections (STIs) and engagement in technology-based outreach interventions among adolescents and young adults.	This study analyzes data from a technology-based STI outreach intervention among adolescents and young adults, with a focus on engagement and impact on STIs.	This research reveals an association between STIs and engagement with technology-based outreach interventions, highlighting the potential of technology in reaching and educating adolescents and young adults about STI prevention and testing.
Hightow-Weidman et al., (2015)	Youth, Technology, and HIV: Recent Advances and Future Directions	Curr HIV/AIDS Rep.	Examines the impact of technology, namely mobile technology and social media, on the effectiveness of HIV prevention and care interventions among adolescents and young adults, focusing on their ability to attract, involve, and maintain engagement.	This research focuses on recent observational and experimental studies (Jan 2014-May 2015) regarding technology, HIV, and adolescents. The conference highlights innovative approaches to technology interventions for youth in HIV prevention and care, discusses global and US trends in youth technology use and emerging research issues in the field.	The utilization of technology, encompassing mobile technology and social media, has significant promise in the realm of HIV prevention and care for adolescents and young adults. Innovative approaches to technology interventions can increase engagement, exposure, and evaluation of HIV prevention and care strategies.
Ratnaningtyas et al. (2020)	Effectiveness of a live-chat social media and leaflets for people living with HIV/AIDS (PLWHA) under antiretroviral therapy (ARVs)	Malahayati Nurs J	Evaluating the efficacy of social media and live-chat posters in supporting individuals with HIV/AIDS who are on antiretroviral treatment (ART).	This pre-experimental quantitative study has a one-group pretest and posttest. PLWHA receive 4-week live-chat social media and pamphlet therapy. Pretests and posttests examined ARV knowledge, attitudes, and adherence.	Live chat and leaflet social media interventions are effective in increasing knowledge, attitudes and adherence to taking ARVs in PLWHA undergoing antiretroviral therapy (ARtV).
Fay et al. (2016)	Online HIV awareness and technology affordance benefits for black female collegians —	JAMIA	Explored the technical capacities linked to and expected from an online platform called my-	Established 11 focused discussion groups comprising of 60 African American female students enrolled at two colleges in the United States. The	The perception of stigma related to HIV has a detrimental effect on the act of searching for and exchanging health-related infor-

Author (Year)	Tittle	Journal	Objective	Methods	Conclusion
	maybe not: the case of stigma		Health Impact Network, designed to raise awareness about HIV prevention among Black college students.	focus group talks were videotaped, transcribed, and subjected to content analysis.	mation in online social networks that involve Black college students. By comprehending unforeseen repercussions, researchers may aptly devise strategies for societies and subcultures that are both afflicted and impacted by health inequalities.
Viraj et al. (2018)	Empowering With PrEP (E-PrEP), a Peer-Led Social Media–Based Intervention to Facilitate HIV Preexposure Prophylaxis Adoption Among Young Black and Latinx Gay and Bisexual Men: Protocol for a Cluster Randomized Controlled Trial	JMIR Publications	Creating and testing a program run by peers, using social media, to encourage young, bisexual, gay, and men who have sex with men to use PrEP more frequently.	The campaign's objective is to provide individuals with knowledge about pre-exposure prophylaxis (PrEP), enhance their willingness to utilize PrEP, and facilitate their access to PrEP. Subsequently, a randomized controlled study of E-PrEP (E-Health) was conducted among individuals aged 18 to 29.	In comparison to individuals who were allocated to E-Health, those who were given E-PrEP are more likely to demonstrate increased PrEP usage as well as changes in characteristics that influence it, such as knowledge, attitudes, stigma, and access. An intervention that is web-based, known as E-PrEP, has the potential to spread effectively with few resources, therefore having a large influence on communities.
Davies et al. (2020)	CITY Health II - using entertainment education and social media to reduce HIV among emerging adults: A protocol paper for the Beat HIVe project	Elsevier Inc.	Create new approaches to reduce HIV rates in African American young adults and leverage new HIV preventive efforts to reduce HIV incidence in men aged 18-25 years living in urban communities with few resources.	Eight music artists and bands teamed up for an engaging educational video series titled "The Beat HIVe," crafted for mobile sharing. Data gathered on the study day and at 3- and 6-month follow-ups encompassed demographics, behaviors, interactions, and norms. Analyses seek to evaluate better HIV outcomes, norm effects on interventions, and socio-demographic links to outcomes.	The findings gained provide insights into methods for enhancing the knowledge of HIV among African American adults through educational initiatives, such as utilising entertainment or other measures to encourage the adoption of healthy sexual behaviours.
Onsomu et al. (2023)	Effect of Mass Media Exposure on HIV/AIDS Stigma Among Kenyan	East African Journal of Health and	Determine the mass media platform that exerts the most signifi-	The Kenya Demographic and Health Surveys 2008/09 cross-sectional approach is used in this study. Survey	Media in Kenya generally decreased negative perceptions and discrimination linked to HIV/

Author (Year)	Tittle	Journal	Objective	Methods	Conclusion
	Women and Men	Science	cant influence on HIV/ AIDS stigma against both women and men in Kenya, supported by empirical data.	findings from the Individual Recode dataset (women) and HIV Recode dataset (men) are merged. Only women and men aged 15–54 who had been surveyed about HIV/AIDS testing and social media use were included.	AIDS. Men who regularly read newspapers, magazines, or listen to the radio tend to create and spread less stigma than those who don't. The media must intensify efforts to eliminate HIV/AIDS stigma in both urban and rural areas.
Garofalo et al. (2022)	Evaluation of the iCARE Nigeria Pilot Intervention Using Social Media and Peer Navigation to Promote HIV Testing and Linkage to Care Among High-Risk Young Men: A Nonrandomized Controlled Trial.	JAMA Network Open	The present study presents preliminary data from iCARE Nigeria, a comprehensive intervention that utilizes social media and peer navigators to enhance HIV testing and raise awareness among high-risk adolescents and young men, including young men who have sex with men (MSM).	Four peer navigators utilized social media as a means to advocate for sexual health and direct individuals towards HIV counseling and expedited testing in clinics, communities, or residences.	According to the data, using iCARE Nigeria is linked to more HIV tests and better access to care for high-risk and hard-to-reach groups. This makes it very likely that the intervention will reach young MSM.
Manciuc et al. (2018)	Access to digital and social media among Romanian HIV/AIDS clinical providers	Global Health Action	The objective is to facilitate the utilization of social media by clinical service providers operating in Transylvania and Moldavia, two areas in Romania, in order to address the distance-related obstacles they encounter, which might possibly be resolved through social media interactions.	The participants has a daily use of Facebook and WhatsApp, with 62% and 45% of users indicating that they utilize these services correspondingly. There is a statistically significant correlation between service providers that use one media platform and their probability of using another social media platform ($p < 0.05$).	The information that has been gathered is helpful for the development of an online training platform for clinical care providers in Romania that will provide information regarding HIV/AIDS.

Author (Year)	Tittle	Journal	Objective	Methods	Conclusion
Nielsen et al. (2017)	Social Media Monitoring of Discrimination and HIV Testing in Brazil, 2014-2015	AIDS and Behavior	Promoting HIV testing and combating discrimination against marginalized populations impacted by the HIV pandemic or connected with HIV/AIDS is crucial.	The data was obtained via a poll conducted on the Tweet media platform between January 2014 and March 2015. The survey was filtered using four keyword categories: discrimination, HIV prevention, HIV testing, and HIV campaigning.	The monthly clinical HIV testing data from the city of Curitiba was compared with the number of tweets specifically related to the city. The analysis revealed a modest positive connection (r = 0.39).
Cahyaningsih et al. (2019)	The Influence of Health Education on the Knowledge, Attitude and Practices of Operators in Preventing HIV/AIDS in Argorejo Resocialization, Semarang	Journal of Health Science and Technology Vol 10, no 1	Knowing the Effect of Health Education on Operators' Knowledge and Attitudes in Preventing HIV/AIDS in Argorejo Resocialization.	This study falls under the category of explanatory research, employing a survey methodology with a cross-sectional survey design. The population for this study consisted of all operators in the Argorejo Semarang Resocialization region, amounting to a total of 157 individuals. A sample of 50 individuals was selected using the Accidental Sampling approach.	Because health education has an effect on changes in knowledge and attitudes, it is vital to expand and socialize the peer educator technique for preventative and promotional efforts in infectious disease prevention in particular groups.
Silaban et al. (2023)	Utilization of Pocket Books as a Health Promotion Media in Increasing Teenagers' Knowledge About HIV/ AIDS at SMKN 6 Padang City.	Human and Health Scientific Journal Vol 6 no 2	Knowing the use of pocket books as a health promotion medium in increasing teenagers' knowledge about HIV/-AIDS at SMK N 6 Padang.	Employing a quasi-experimental approach including a single group pretest and posttest. The population for this study consisted of all students enrolled in the hospitality program at SMK N 6 Padang, with a total of 120 students. A selection approach called total sampling was used, which involved selecting all 100 students as the sample. Data collection was carried out using a questionnaire. Data processing was carried out computerized and analyzed univariately and bivariately.	The average knowledge before and after being given the intervention using pocket book media was 8.94 and 14.25. The research results showed a significant increase in knowledge ($p<0.05$) and pocket book media was useful in increasing teenagers' knowledge about HIV/AIDS.
Lin Zhang et al. (2023)	The relationship between social media use and collective identity among the HIV/AIDS-	Vulnerable Children and Youth Studies	Analyzing the correlation between the utilization of social media and the shared sense of	Using a questionnaire with a total of 82 teenagers in Wen Lou village, after completing the questionnaire, they continued with sampling	The correlation analysis reveals a favorable relationship between the extent of social media usage and the provision of information

Author (Year)	Tittle	Journal	Objective	Methods	Conclusion
	affected adolescents: from the online social support perspective.		identity among young individuals impacted by HIV/AIDS.	through interviews.	support (r= 0.291, p < .05) as well as instrumental support (r= 0.269, p<0.05) by individuals affected by HIV/AIDS. Adolescent.
Argenyi et al. (2019)	Social Media Use and HIV Screening Uptake Among Deaf Adults in the United States: Cross-Sectional Survey Study	JMIR Public Health and Surveillance	Examined the probability of HIV screening utilization among deaf adults within the previous year and the correlation between social media usage and HIV screening utilization among deaf adult ASL users.	Between 2015 and 2018, 1,340 deaf US people participated in the National Trends in Health Information Survey in ASL. After adjusting for sociodemographic and infectious disease covariates sexual intercourse, modified Poisson with robust standard errors was used to assess the association between social media use and HIV screening outcomes (screened more than one year ago, screened within the past year, and never screened).	Screening is still far from the target of universal screening, with disparities between heterosexual adults, women, Caucasians, or elderly deaf people. HIV screening outreach may be ineffective due to inaccessibility of technology or language, leaving ASL users as an under-recognized minority group. Nevertheless, social media remains a potent instrument, particularly among deaf adolescents who face a heightened vulnerability to HIV infection.
Gupta et al. (2017)	Social Media Interventions to Promote HIV Testing, Linkage, Adherence, and Retention: Systematic Review and Meta-Analysis	JMIR Publications	Evaluating the efficacy of social media initiatives in promoting HIV testing, facilitating connection, ensuring adherence, and maintaining retention among critical populations.	This study used the PRISMA checklist and the Cochrane standards. The study was also added to PROSPERO, the International Prospective Register of Systematic Reviews. This is in addition to searching through many records and then examining the results. Meta-analyses were conducted by Review Manager, version 5.3. Pooled relative risk (RR) and 95% confidence intervals were calculated by random-effects models.	Social media initiatives have proven to be successful in encouraging HIV testing among men who have sex with men (MSM) in various contexts. It is important to take into account social media initiatives as a means to enhance HIV services in low and middle-income countries, as well as among other crucial demographics, beyond only HIV testing.

DISCUSSION

This literature review examines many facets of HIV education utilizing technology, community engagement, and the application of big data in HIV prevention initiatives. After conducting a thorough screening process, a total of 22 papers that satisfied the specified inclusion and exclusion criteria were chosen to be included in this review. In addition to online searches, manual searches were conducted on pertinent article references. The aim of this study is to offer a thorough comprehension of how technology can be utilized to tackle HIV and enhance community involvement in initiatives related to HIV prevention and care.

1. Technological Advances for HIV Literacy

In recent years, there has been a growing emphasis on using technology into HIV prevention initiatives. The study done by Stafylis et al. (2022) highlights the relative effectiveness of social media, dating apps, and information search sites in promoting the use of HIV self-testing. This study conducted a comparative analysis of various platforms aimed at promoting self-testing among gay men who have a higher susceptibility to HIV infection. Conclusively, the research discovered that widely used dating applications could serve as an effective means to encourage HIV self-testing, hence potentially diminishing social disapproval and enhancing the availability of testing kits.

Taggart et al. (2015) conducted a thorough examination of the use of social media in HIV communication. This study focuses on the integration of technology and social media in the context of HIV communication. This study highlights the significance of these platforms in enhancing HIV prevention and management efforts by examining studies published prior to February 2019. The research conducted by Cao et al. (2017) examined the correlation between the level of involvement in social media and the likelihood of undergoing HIV testing among Chinese males who participate in sexual activities with other men. Technology and social media significantly influence the communication about HIV among this demographic. This demonstrates the strategic utilization of technology to target particular high-risk populations and encourage HIV testing.

2. Community Participation and Involvement

Active involvement of the community is a crucial element in effectively preventing and treating HIV. The research conducted by Jones et al. (2019) examined the opinions of Black youth toward HIV testing and the utilization of social networking platforms to disseminate HIV testing information. This paper emphasizes the significance of creating HIV messages that are devoid of stereotypes and customized to the motivational elements of the intended audience. Furthermore, it underscores the significance of social media platforms, such as Instagram, in effectively reaching and enlightening Black adolescents regarding HIV prevention.

In China, Yun et al. (2019) created a customized social media platform that serves as a tool to evaluate the risk of HIV incidence among males who engage in sexual activities with other men. The purpose of this tool is to assist healthcare providers in identifying and focusing on people that are at a higher risk for counseling and treatments aimed at reducing their risk. This study demonstrates the utilization of technology to accurately identify and actively involve targeted populartions, so guaranteeing that treatments are effectively directed towards those individuals who are most in need. Furthermore, Hsiao et al. (2019) investigated demog-

raphic differences among people living with HIV based on recruitment source, comparing healthcare systems and social media networks. This study revealed differences in age, sexual activity, education, and awareness of HIV protection laws between individuals recruited through social media networks and the health care system. This underscores the importance of considering recruitment strategies when targeting different demographic groups and the potential bias introduced by the use of social media for research.

3. Use of Social Media in HIV Literacy and Community Engagement

Research by Cao et al. (2018) investigated understanding HIV testing behavior via social media using big data analysis of Weibo user sentiment and healthcare utilization in China. This research utilized social media sentiment analysis to gain insight into HIV testing behavior and health service utilization. This report highlights the complementarity of social media data analysis with traditional health research, and emphasizes the potential of big data in public health research.

Hightow-Weidman et al. (2020) explored the relationship between sexually transmitted infections (STIs) and engagement in technology-based outreach interventions among adolescents and young adults. This study shows an association between STIs and engagement in technology-based interventions, underscoring the potential of technology to reach and educate young people about STI prevention and testing.

Study highlights the significance of youth, technology, and HIV. This study examines the latest developments and potential future paths in utilising technology, such as mobile technology and social media, to effectively include and maintain the participation of young individuals in HIV prevention and care. This study discusses innovative approaches to technological interventions, highlighting their potential to improve HIV prevention and care strategies among young populations (Hightow-Weidman et al., 2015).

4. Promoting HIV Testing via Social Media

In their study, Ratnaningtyas et al. (2020) examined the efficacy of social media and live-chat posters in supporting individuals with HIV/AIDS who are on antiretroviral treatment. This study used a quantitative pre-experimental approach to deliver educational interventions to people living with HIV/AIDS (PLWHA) using both live chat sessions and informational booklets. The study's findings demonstrated the efficacy of this intervention in enhancing knowledge, attitudes, and adherence to antiretroviral medication among individuals living with HIV/AIDS (PLWHA).

Fay et al. (2016) explored the benefits of HIV awareness and affordability of online technology for Black female college students. Their research focused on myHealthImpactNetwork, an online platform designed to reach Black college students and raise awareness about HIV prevention. This research found that HIV-related stigma negatively impacts the dissemination and search for information on social media platforms among Black college students. However, by understanding the unanticipated consequences of stigma, researchers can effectively design cultures and subcultures to reduce health disparities and reach affected populations.

5. Innovative Interventions for HIV Prevention

Viraj et al. (2018) introduced the Empowering With PrEP (E-PrEP) intervention, a peer-led, social media-based approach to promote adoption of HIV pre-exposure prophylaxis (PrEP) among Black and Latino

gay and bisexual youth. This study talks about a programme that teaches people about PrEP, makes them more likely to use it, and makes it easier for people to get it. This study discovered that people who took E-PrEP were more likely to say they were going to use PrEP, actually did use it more, and had changes in things that might affect their use of PrEP. This innovative web-based biobehavioral intervention has the potential to rapidly increase PrEP adoption, even with limited resources, thereby having a significant impact on PrEP use at the population level.

Davies et al. (2020) provided a comprehensive account of the CITY Health II initiative, which employed entertainment education and social media as strategies to mitigate the prevalence of HIV among young individuals in their early stages of development. This initiative aims to increase HIV awareness and prevention efforts among African American youth, particularly those aged 18-25 years living in urban communities with limited resources. Through the creation of educational video content distributed via mobile devices, this project seeks to improve sexual health behaviors and reduce HIV transmission. It is hoped that the results of this project will provide input for strategies to increase awareness of HIV among young adults, thereby encouraging optimal sexual health practices.

6. Reducing HIV Stigma and Increasing Testing Coverage

Onsomu et al. (2023) did a study to investigate the impact of mass media exposure on the level of stigma towards HIV/AIDS among both women and men in Kenya. The present investigation examined data from the Kenya Demographic and Health Survey and identified a significant association between media exposure and decreased HIV/AIDS stigma in Kenya. However, the report also highlights that certain media, such as newspapers and radio, are more effective in reducing stigma than others. This underscores the importance of strategic media campaigns in combating HIV stigma and promoting HIV testing.

7. Correlation of Findings and Limitations

These studies collectively emphasize the beneficial influence of technology, namely social media, on endeavors connected to HIV. They disclosed that utilizing these platforms to advocate for HIV testing and disseminate educational messages can enhance awareness and involvement among populations at high risk. Furthermore, these discoveries underscore the need of customized and culturally aware material, as well as the necessity to adapt interventions to particular populations and areas, taking into account cultural and social subtleties in order to achieve optimal outcomes. This study additionally emphasizes the capacity of technology-based interventions to effectively include and instruct young individuals regarding HIV and STIs, rendering them influential instruments for forthcoming prevention endeavors. Moreover, technology can aid in the identification of groups at a higher risk of contracting HIV and offer customized interventions, hence enhancing the efficacy of HIV preventive measures.

The limitations of these research have yielded interesting insights, it is crucial to recognize their inherent limits. Firstly, it is important to note that the information presented in this document is not comprehensive, and there may exist further pertinent research that has not been addressed. Moreover, these studies exhibited variations in terms of their extent, methodology, and specific groups under investigation, thus constraining the applicability of their results. Utilizing data from diverse coun-

tries and populations introduces variability in the efficacy of technology-based interventions. Furthermore, it is important to note that the referenced study may not encompass the most recent advancements and trends in technology-based HIV therapies due to the quickly evolving nature of the area. Therefore, additional research is required to address this gap.

In conclusion, technology and social media have proven to be valuable tools in the fight against HIV. The studies discussed in this comprehensive review collectively demonstrate the effectiveness of the use of technology and social media in increasing HIV literacy, reducing stigma, and increasing community engagement. They highlight the importance of content that is culturally sensitive and tailored to specific populations, as well as the potential of technology to target high-risk groups and provide personalized interventions.

As technology continues to develop, it will undoubtedly play an important role in HIV prevention and management. Future research in this area should focus on exploiting the technology's full potential, addressing its limitations, and keeping up with current developments in digital health interventions. By doing this, we can take significant steps towards a world free from the burden of HIV/AIDS.

AUTHOR CONTRIBUTION

Ronald Pratama Adiwinoto: conceptualizing research ideas, designing studies, formulating research questions, searching for research articles, writing the manuscript.
Jennifer Wijaya: helping in searching for research articles and writing the manuscript, translating and proof-reading the manuscript.
Alicia Stevina Martono: helping in searching for research articles and writing the manuscript, translating and proof-reading the manuscript.
Fernita Naomi Putri: helping in searching for research articles and writing the manuscript, translating and proof-reading the manuscript.
Vincentia Prasasti: translating and proof-reading the manuscript.
Hanung Prasetya: discussing topics, designing studies, searching for research articles, writing the manuscript.

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CONFLICT OF INTEREST

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