

Systematic Review

Digital mental health interventions for substance use prevention among youths in the Niger Delta: a systematic review

David T. Adika^{1*}, Obatavwe Ukoba²

¹School of Public Health, University of Port Harcourt, Port Harcourt, Rivers State, Nigeria

²Department of Community Medicine, Delta State University Teaching Hospital (DELSUTH), Oghara, Delta State, Nigeria

Received: 03 August 2025

Revised: 13 September 2025

Accepted: 22 September 2025

*Correspondence:

Dr. David T. Adika,

E-mail: adikadavidt@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Digital mental health interventions (DMHIs) offer a promising, accessible, and less stigmatizing approach to combating the global challenge of youth substance use, a critical issue amplified in the Niger Delta due to socio-economic factors and limited healthcare access. This review synthesized findings on DMHI effectiveness, technologies, strengths, and limitations, with implications for the Niger Delta. While DMHIs effectively address general youth mental health, direct evidence for primary substance use prevention is limited, often focusing on early intervention with an alcohol-centric bias. Web-based and mobile apps are preferred technologies, showing high youth acceptability. Key strengths include accessibility, reach, and engagement; however, challenges like low adherence, limited long-term data, and methodological quality persist. Crucially, interventions need cultural adaptation and sustainable funding, especially in regions like Sub-Saharan Africa where a significant gap in youth mental health DMHIs exists and digital access varies. Successful implementation in the Niger Delta requires context-specific, culturally appropriate DMHIs that address diverse substances, incorporate human support, and ensure rigorous evaluation.

Keywords: Digital mental health interventions, Youths, Mental health, Niger Delta

INTRODUCTION

Youth substance use is a significant global public health challenge, requiring accessible and innovative intervention strategies. Digital mental health interventions (DMHIs) are a promising solution because they are more accessible and less stigmatizing than traditional methods. Globally, youth substance use is a pervasive problem with severe health and societal consequences. For instance, in England and Wales, 17.6% of people aged 16-24 have reported using illicit drugs in their lifetime.¹

The problem is particularly severe in Sub-Saharan Africa (SSA), where a rapidly growing adolescent population is contributing to escalating substance use rates. A meta-analysis of data from 2001 to 2016 estimated that around 42% of adolescents aged 10-19 in SSA had used some form

of psychoactive substance.² The Niger Delta is especially vulnerable, facing high rates of alcohol, tobacco, and cannabis use linked to socioeconomic issues, unemployment, and limited access to education.³ The adverse effects of adolescent substance use go beyond immediate health risks, contributing to increased morbidity, mortality, and risky behaviors such as unprotected sex and a higher suicide risk underscoring the urgent need for effective prevention strategies.^{4,5}

Substance use is a growing global public health concern, causing approximately 11.8 million direct or indirect deaths annually and affecting around 35 million people with severe drug use disorders.^{6,7} In SSA, accurate prevalence data is limited due to infrequent reporting, yet available data indicate significant drug use rates across the region, with Nigeria reporting a high prevalence of

14.4%.^{1,8} Projections anticipate a 150% increase in illegal drug or prescription opioid users in SSA by 2050.⁹ African nations also face a "double burden of disease," combining high levels of communicable diseases with increasing rates of non-communicable diseases, all while having severely limited healthcare resources.^{10,11}

The repercussions of drug use are severe for individuals, families, and communities.^{12,13} Many SSA countries still have punitive drug policies, treating drug use as a criminal justice issue rather than a public health concern.^{14,15} This leads to harsh penalties that worsen the difficulties for users and their families, hindering employment and causing financial strain. Without strong safety nets and coordinated health insurance systems, drug users in many African countries receive lower quality care.¹⁶ A significant proportion of them are unable to access necessary treatment due to cost.¹ The financial burden of substance use services often falls on family structures, with about 75% of people seeking treatment in West Africa between 2014 and 2017 having their services paid for by family and friends.¹⁷ Substance use also increases the risk of infectious and non-infectious diseases and road traffic accidents, creating challenging financial situations for families.^{18,19}

Given these complex challenges, substance use prevention is crucial in SSA. While numerous reviews of substance use prevention interventions exist, most focus on high-income countries and may not accurately reflect African societies.^{1,20-22}

This paper aims to provide a comprehensive overview of existing DMHIs for substance use prevention among youths, with a particular focus on their applicability and effectiveness in Nigeria's Niger Delta region. By exploring the prevalence of youth substance use in this vulnerable area and analyzing the current landscape of digital interventions, this systematic review aims to map the types of digital technologies used, their targeted substances, intervention levels (prevention, early intervention, and treatment), and expected outcomes.^{23,24} Ultimately, this research will offer valuable, tangible information for researchers, front-line providers, and, most importantly, for the young people grappling with substance use in this critical region.

Digital mental health interventions as innovative solutions

In response to the limitations of traditional mental health services, DMHIs offer a compelling alternative. These interventions provide accessible and potentially less stigmatizing support for mental health challenges, including substance use disorders, particularly in regions where conventional mental health resources are scarce. The appeal of digital interventions is amplified by the widespread digital connectivity and app usage among adolescents and young adults. For example, among young people with problematic substance use, a substantial

majority—94% of generation Z (aged 13-17 years) and 82% of millennials (aged 18-35 years)—have at least one social media account, with daily usage rates of 79% and 68%, respectively.²⁵ This deep integration of digital platforms into daily life creates a natural and effective way to deliver interventions.

DMHIs offer distinct advantages by bypassing geographical barriers, reducing travel time and costs, and providing anonymity. This anonymity is particularly vital where mental illness and addiction carry significant social stigma, such as in Vietnam.²⁶ The ability to access care privately can significantly increase uptake among people who might otherwise avoid traditional services due to fear of judgment or social repercussions.

However, a critical issue arises when considering the implementation of DMHIs in resource-limited settings. While youth are generally receptive to digital tools, access to these tools, particularly smartphones, might be severely limited in specific low- and middle-income country (LMIC) contexts. For instance, a study in Tanzania, an SSA nation, found that 67.6% of people with drug use disorders (PWDUD) did not own mobile phones, and of those who did, only 6.4% owned smartphones.²⁷ Although 98.5% of participants expressed a willingness to use mobile phones for accessing information on substance use and treatment, this low device ownership presents a fundamental infrastructural gap. This suggests that simply developing digital applications may not be enough; interventions must consider the underlying digital infrastructure and socioeconomic realities, potentially requiring strategies like shared device usage, community access points, or compatibility with feature phones. This necessitates a "whole-community approach" rather than solely individual-focused mobile interventions to ensure equitable reach and impact.

Review of related literature

The rising tide of youth substance use, particularly in vulnerable regions like the Niger Delta, urgently requires innovative and accessible intervention strategies. DMHIs offer a promising approach due to their widespread accessibility and potential to mitigate the stigma often associated with traditional mental health services. A substantial body of literature, predominantly from high-income countries (HICs), demonstrates the efficacy of DMHIs, especially computerized cognitive behavioral therapy (cCBT), in addressing mental health challenges like anxiety, depression, and stress among young people.

A substantial body of literature, primarily from HICs, attests to the efficacy of DMHIs in addressing common mental health conditions among young people. A systematic review and meta-analysis of 14 randomized controlled trials (RCTs) found computer-delivered or web-based interventions to be effective for anxiety, depression, and stress when compared to inactive controls.²⁸ Another comprehensive systematic review demonstrated the

effectiveness of internet-based interventions, mobile applications, and eHealth solutions for various psychiatric conditions, specifically highlighting the clinical benefits of cCBT for depression and anxiety in adolescents and young adults. This work also noted that digital interventions consistently exhibit greater effectiveness and engagement when incorporating "supportive accountability".²⁹ A systematic review and meta-analysis of 22 RCTs reported statistically significant short-term improvements in depressive symptoms, anxiety symptoms, and moods/feelings, with long-term effects for depression also identified in three studies.³⁰ Another review of 48 RCTs further supported the effectiveness of internet-based interventions for depression and stress.³¹ They suggested that online recruitment might lead to larger effect sizes due to higher user interest.

Reviews focusing on cCBT consistently demonstrated positive effects. One study evaluated a cCBT program for anxiety in children, showing statistically significant changes in anxiety symptoms.³² A meta-analysis of 13 RCTs on anxiety and depression found an overall mean effect size of 0.72, with cCBT superior to control for both anxiety and depression.³³ Another systematic review and meta-analysis of 27 RCTs concluded that cCBT has the potential for treating depression in young people.³⁴ A systematic review of 27 trials on internet-based, audio, virtual reality, and computer programs for anxiety and depression in individuals aged 18-25 highlighted that most e-therapies are rooted in CBT principles, offering advantages of privacy and convenience.³⁵ A review of 24 studies on 15 mobile applications observed positive impacts on mental health and well-being in participants under 18, with smartphone applications showing small but statistically significant improvements in symptoms of depression, anxiety, and stress, primarily in the short-term.³⁶ Another review of five studies on video games found some efficacy against non-active controls, demonstrating the potential of gamified approaches to engage young people.³⁷

In the context of youth substance use, a rapid review of 43 articles on 39 distinct DMHIs for young people found a predominant emphasis on early intervention over prevention or treatment.³⁸ Technologically, web-based interventions were most prevalent, followed by game-based and mobile-based platforms. While alcohol use dominated as the targeted substance, other substances received less attention, and only nine interventions addressed multiple substances. Notably, only one of the 39 interventions explicitly incorporated a harm reduction approach. This highlights a significant gap in primary prevention research for substance use via DMHIs. A systematic review of mobile applications aimed at reducing depressive symptoms and alcohol use in youth identified 36 trials. While many applications targeted alcohol, results were inconsistent, indicating a need for more focused and rigorous research.³⁹ A comprehensive review of technological interventions for substance use disorders (SUDs) noted promising results for e-health

solutions in reducing substance use across various populations and categorized interventions by targeted substance and delivery mode.⁴⁰ A systematic review and content analysis of 121 mobile applications for anxiety in children and adolescents revealed significant shortcomings in safety, confidentiality, user referral functions, and a notable lack of advanced functionalities, highlighting critical quality control issues.⁴¹ Another study explored perceptions of problematic substance-using youth regarding digital platforms for recovery support, finding high acceptability and perceived utility of mobile applications and texting.⁴²

Despite the promising evidence from HICs, the application of DMHIs in LMICs presents unique challenges. Several studies have acknowledged the potential of DMHIs, particularly internet-based CBT, for addressing anxiety and depression outcomes in LMICs.^{31,43} However, they consistently highlighted a lack of high-quality studies, small sample sizes, high dropout rates, and limited data on long-term benefits or cost-effectiveness in these settings. One study specifically identified a critical gap in digital interventions targeting youth mental health within SSA, emphasizing the need for contextually appropriate interventions.⁴⁴ This suggests that while the therapeutic principles delivered digitally are effective, their implementation and evaluation in LMICs face significant systemic and contextual barriers, making direct transferability problematic without addressing these issues. The "digital divide" extends beyond mere access to encompass the capacity for rigorous evaluation and sustained implementation in resource-constrained environments.

A critical factor influencing DMHI success is user engagement. One study stated that supportive accountability enhances effectiveness, and another confirmed that "guidance" and "blended treatment" (combining face-to-face with e-health components) are significant predictors of adherence in substance use interventions.^{29,45} This establishes a clear causal link: human support, even if minimal, significantly enhances engagement and adherence to DMHIs. This is particularly relevant for regions like the Niger Delta, where low digital literacy or technical issues might be prevalent, suggesting that DMHIs should consider incorporating blended care or human-guided components.

In the context of SSA, a systematic review on substance uses prevention interventions for children and young people examined 18 studies.⁴⁶ Their findings indicated that most interventions were school-based, with the majority originating from South Africa. Methodological quality was a concern, as only two of the studies were considered to have a strong quality regarding the risk of bias. While school-based programs improved knowledge, they showed limited effectiveness in reducing actual substance use. The authors noted that studies reporting statistically significant reductions in substance use outcomes were primarily brief, individual-focused interventions, often targeting

participants already exposed to substance use, and typically delivered by trained professionals using motivational interviewing or cognitive behavioral therapy.

METHODS

Research questions

To guide the investigation and analysis, we formulated the following specific research questions: What is the overall effectiveness of digital mental health interventions in preventing substance use among youths? Which types of digital technologies (e.g., web-based, mobile apps, gamified, virtual reality) are most effective for substance use prevention in this population? What substances are most frequently targeted by effective DMHIs for youth prevention, and are there gaps in addressing certain substances? What are the common strengths and limitations of DMHIs for youth substance use prevention reported in the literature? and What are the implications of the findings for developing and implementing DMHIs for substance use prevention among youths in the Niger Delta?

Search strategy

A total of 200 initial sources were identified for this systematic review. These included 150 journal articles from major electronic databases such as PubMed/MEDLINE, PsycINFO, Research gate, National Library of Medicine (NLM), Springer, Web of Science, Scopus, and Google Scholar, focusing on digital health interventions. Additionally, 30 conference abstracts, 15 dissertations, and 5 qualitative studies were gathered. Out of these 200 sources, 182 were excluded because they either primarily focused on treatment or relapse prevention for established substance use disorders, lacked a control group, were not primarily digital interventions, or did not present relevant quantitative data. Only 18 articles met all the specific inclusion criteria. These 18 articles underwent a full-text review by two independent reviewers. Any discrepancies were resolved through discussion or by consulting a third reviewer.

RESULTS

Our study selection process is comprehensively illustrated in Figure 1, a PRISMA flow diagram. This diagram visually represents each stage of the review, from initial identification of sources through screening, eligibility assessment, and the final inclusion of articles for analysis.

Table 1 summarizes the key digital mental health intervention reviews, revealing important trends and findings in the field of youth mental health. Table 2 provides a detailed overview of the characteristics and effectiveness of digital interventions specifically designed for youth substance use prevention. Table 3 systematically outlines the identified strengths, limitations, and key engagement factors pertinent to DMHIs for youth.

Research question 1

What is the overall effectiveness of digital mental health interventions in preventing substance use among youths?

The effectiveness of DMHIs for youth substance use prevention is a developing area. While DMHIs have consistently shown positive results for general mental health conditions like anxiety and depression in young people, this efficacy does not directly translate to primary substance use prevention.^{31,33}

Most current DMHIs for youth substance use prioritize early intervention and treatment, with limited evidence for primary prevention.³⁸ Schulte et al found promising results for reducing alcohol, cannabis, and opioid use, but these were often in the context of treatment rather than prevention.⁴⁰ Furthermore, findings for other substances like stimulants and cocaine were scarce. The inconsistent results for mobile apps targeting alcohol use reduction in youth highlight the need for more rigorous research.³⁹ Therefore, while DMHIs are promising due to their success in addressing co-occurring mental health issues, their role in primary substance uses prevention needs further, dedicated investigation.

Research question 2

Which types of digital technologies are most effective for substance use prevention in this population?

Web-based platforms and mobile applications are the most dominant and effective digital technologies for both youth mental health and substance use interventions.^{38,40} A key factor in their effectiveness is high user acceptance. Curtis et al found that gen Z and millennials are highly willing to use mobile apps and texting for support, which is critical for reach and engagement.⁴² Game-based approaches also show potential for engagement, suggesting that incorporating gamified elements can enhance effectiveness.^{37,38} In contrast, virtual reality is currently less developed and its effectiveness for mental health is largely inconclusive.³⁵

Research question 3

What substances are most frequently targeted by effective DMHIs for youth prevention, and are there gaps in addressing certain substances?

There is a significant alcohol-centric bias in current DMHIs for youth substance use.³⁸ Alcohol is the most frequently targeted substance, with 20 interventions in one review, compared to a much smaller number for tobacco/nicotine, cannabis, or opioids.³⁸ This disproportionate focus creates significant gaps, as findings for psychostimulants, cocaine, and polysubstance use are scarce or non-significant.⁴⁰ This highlights the need for DMHIs that address the full range of substances of concern, especially illicit drugs and polysubstance use.

Table 1: Summary of key digital mental health intervention reviews for youth mental health.

Study	Intervention type/platform	Targeted mental health condition	No. of studies/trials reviewed	Total participants (N)	Age range of participants	Key findings/effect sizes	Geographical context	Limitations noted
37	Video games	Anxiety	5 studies (2 RCTs, 3 NRSs)	410	Under 19 years	Some efficacy against non-active controls; potential for engagement	China, Hong Kong, Netherlands, UK	Limited research, small sample size, methodological complications
41	Mobile apps	Anxiety, depression	121 apps (content analysis)	Not reported	Children and adolescents	Shortcomings in safety, confidentiality, referral; lack of advanced functionalities, evidence-based content	Not specified	Quality concerns in app development
36	Mobile apps	Mental health, well-being, depression, anxiety, stress	24 studies (23 NRSs, 1 RCT) on 15 apps	Up to 1054	Under 18 years	Positive impacts; small but significant improvements in depression (Hedges' $g=0.20-0.52$), anxiety (0.20-0.30), stress (0.30)	Multiple countries	Primarily short-term benefits, limited sustained effects
29	Internet-based, Mobile apps, ehealth, cbt	Psychiatric conditions (anxiety, depression, ADHD, autism, psychosis, eating disorders, PTSD)	30 RCTs, meta-review of 21 articles (147 interventions)	5333	Up to 25 years	Effectiveness for anxiety and depression; cCBT shows clinical benefits	Multiple countries	Methodological limitations, uncertain benefits for other conditions, lack of cost-effectiveness
28	Computer-delivered, web-based	Anxiety, depression, stress, psychological distress	17 RCTs (meta-analysis of 14 RCTs)	1480 (mean age 22.6)	University students (mean age 22.6 years)	Effective versus inactive controls: anxiety (SMD -0.56), depression (SMD -0.43), stress (SMD -0.73). No difference versus active controls	Multiple countries	Methodological issues, need for heterogeneous samples, user evaluation
35	Internet-based, audio, virtual reality, computer programs	Anxiety, depression	27 trials (26 RCTs)	Not specified	18-25 years	Most e-therapies based on CBT; offer privacy and convenience; VR inconclusive	Not specified	Inconclusive for VR, need for age-appropriate content

Continued.

Study	Intervention type/platform	Targeted mental health condition	No. of studies/trials reviewed	Total participants (N)	Age range of participants	Key findings/effect sizes	Geographical context	Limitations noted
30	Internet-based	Depression, anxiety, stress	22 RCTs (meta-analysis of 15 studies)	4979	10-24 years	Short-term improvements: depression ($p=0.02$), anxiety ($p<0.001$), moods/feelings ($p=0.04$), long-term depression ($p=0.01$), no stress effect	Multiple countries	High attrition, lack of cost assessment, quality concerns
31	Internet-based	Mental health (depression, stress)	48 randomized trials	10,583	Up to 29 years	Effective for depression and stress (Cohen's $d=0.52-0.95$)	University students	Online recruitment may inflate effect sizes
32	Ccbt	Anxiety	8 RCTs	404	7-18 years	Statistically significant changes in anxiety symptoms ($t=-4.371$, $p<0.001$); 68% remission	Not specified	Small sample size in specific study
33	Ccbt	Anxiety, depression	13 RCTs	796	Up to 25 years	Overall mean effect size (Hedges' g) = 0.72. superior for anxiety ($g=0.68$) and depression ($g=0.76$)	Not specified	Need for long-term effects, patient-level data
34	Ccbt	Anxiety, depression	27 RCTs	3389	5-25 years	Potential for treating depression	Not specified	General conclusion, specific details not provided
44	Digital interventions (icbt)	Mental health conditions	7 studies (LMICs)	Not specified	10-24 years	Evidence for effectiveness in LMICs, especially iCBT for anxiety and depression	LMICs	Lack of high-quality studies, small samples, high dropout, no cost-effectiveness
43	Digital interventions	Youth mental health	Scoping review	Not specified	Adolescents	Lack of digital interventions targeting youth mental health in SSA	Sub-Saharan Africa	Critical gap identified

Table 2: Characteristics and effectiveness of digital interventions for youth substance use prevention.

Author /date	Targeted substances	Digital intervention platform	Intervention focus	Number of studies or interventions reviewed	Total participants (N)	Age	Key findings	Delivery mode	Research gap
38	Alcohol (n=20), tobacco/nicotine (n=5), cannabis (n=2), opioids (n=2), multiple substances (n=9)	Web-based (n=14), game-based (n=10), Mobile-based (n=7)	Prevention (n=6), early intervention (n=28), treatment (n=5), harm reduction (n=1)	43 articles/39 distinct DMHIs	Not specified	Young people	Stronger emphasis on early intervention; limited direct evidence for primary prevention; alcohol-centric bias	Not specified	Limited direct prevention evidence, underutilization of harm reduction

Continued.

Author /date	Targeted substances	Digital intervention platform	Intervention focus	Number of studies or interventions reviewed	Total participants (N)	Age	Key findings	Delivery mode	Research gap
40	Alcohol, cannabis, opioids, psychostimulants, cocaine, polysubstance	E-health (computer-based, internet-based, telephone-based)	Reduction of substance use, SUD treatment	Summarizes many RCTs	Not specified (adult focus, but generalizable principles)	Adults (university students excluded from specific focus)	Promising results for alcohol (integrated principles, guidance effective), cannabis (multi-session effective), opioids (significant effects). Scarce/non-significant for stimulants/cocaine. Ambiguous for polysubstance	Single-session, multi-session, guided, unguided	Need for more research on illicit substances, standardization of outcomes
39	Alcohol, depressive symptoms	Mobile apps (cbt, mindfulness, gamification, motivational strategies)	Reduce depressive symptoms, alcohol use	36 trials	7984	15-24 years	Inconsistent results for alcohol use; more research needed	Not specified	Small sample sizes, concerns about trial conduct, very limited info on alcohol reduction
42	Cannabis (primary for both groups)	Mobile apps, texting, social media, websites	Recovery support	Cross-sectional survey	164	Gen Z (13-17), Millennials (18-35)	High willingness to use mobile apps (gen z: 45%, millennials: 37%) and texting (gen z: 45%, millennials: 29%) for support	Not applicable (perceived usefulness)	Cross-sectional, self-report

Table 3: Strengths, limitations, and engagement factors in DMHIS for youth.

Category	Description	Supporting evidence/metrics	Implication for Niger Delta
Strengths			
Accessibility and reach	Overcomes geographical barriers, reduces stigma, offers anonymity.	94% gen Z and 82% millennials use social media; DMHIs increase accessibility, reduce stigma.	Leverage high mobile phone usage and social media engagement; design for privacy and anonymity.
Engagement potential	Dynamic, personalized learning with immediate feedback; uses interactive features, multimedia, gamification.	Therapeutic games elicit improvements in self-awareness; use of videos, personalization, social connectivity engaging.	Incorporate interactive elements, multimedia, and gamification tailored to local youth preferences.
Cost-effectiveness	Potential for reduced costs for individuals and institutions.	DMHIs can reduce crisis visits, save costs.	Explore cost-effective models, but recognize need for more evidence on broad economic impact.

Continued.

Category	Description	Supporting evidence/metrics	Implication for Niger Delta
Flexibility and privacy	Users can access at convenience, work at own pace, in private.	Computers/internet provide comfortable private environment.	Design for flexible access, respecting privacy concerns in local contexts.
Limitations			
Engagement and adherence	Low completion rates; users fail to complete modules.	Pooled adherence rate 60% (mean modules), 47% (all modules) for substance use DMHIs; higher attrition in intervention groups.	Prioritize strategies to boost engagement and adherence; consider blended care models.
Lack of Long-Term Data	Benefits often short-term, limited evidence for sustained effects.	Most studies show short-term benefits, limited sustained effects beyond few months.	Design and fund studies with longer follow-up periods to assess sustained impact.
Methodological quality	Small sample sizes, lack of blinding, inconsistent reporting, convenience sampling.	Only 2/18 traditional SSA studies strong quality [User Query]; convenience sampling (96.6%) from universities.	Implement rigorous research designs (RCTs), ensure diverse representation, improve reporting standards.
Cultural appropriateness	Need for tailored, culturally sensitive interventions.	Need for culturally grounded programs in SSA; "one-size-fits-all" should be avoided.	Conduct co-design with local youth, adapt content to local languages, norms, and psychosocial factors.
Funding sustainability	Concerns about long-term financial viability.	Need for robust research designs for real-world dissemination, sustainable funding.	Develop clear financial models and partnerships from early stages to ensure long-term operation.
Safety and content quality	Shortcomings in safety, confidentiality, referral, evidence-based content.	Deficiencies in evidence-based content, security features.	Ensure interventions are evidence-based, secure, and include clear referral pathways for severe cases.
Engagement factors			
Human support	"Supportive accountability," guidance, blended treatment increase engagement.	Human support more effective than automated; guidance and blended treatment significant predictors of adherence; strong desire for "human component".	Integrate trained laypersons, community health workers, or local counselors for guidance and support.
User preferences	Generational preferences for platforms and features.	Gen Z prefers instagram/snapchat, millennials prefer Facebook.	Design cross-platform solutions that accommodate generational preferences.

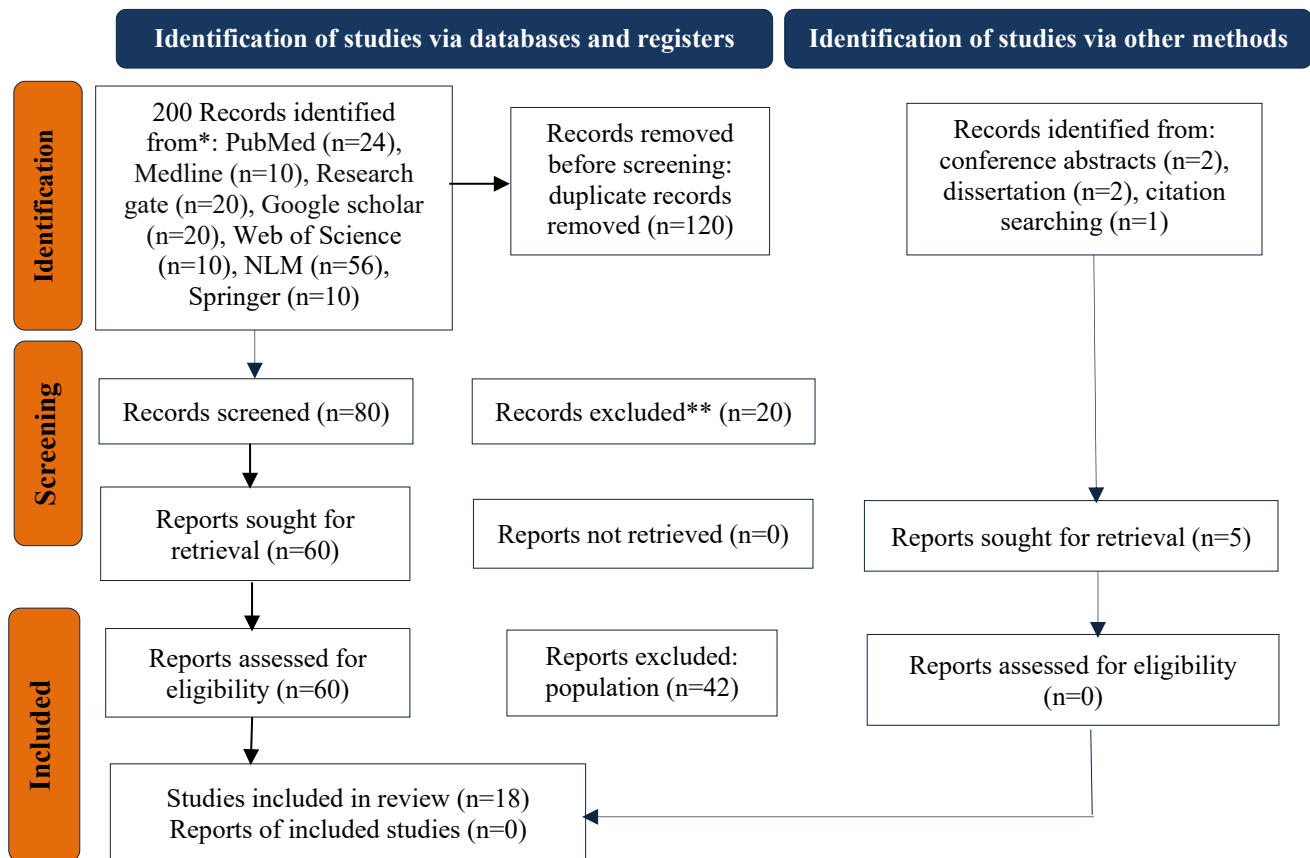


Figure 1: PRISMA flow diagram for study selection process.

Research question 4

What are the common strengths and limitations of DMHIs for youth substance use prevention reported in the literature?

DMHIs offer undeniable strengths in accessibility and reach, overcoming geographical barriers and reducing the stigma associated with seeking help.⁴²

The high digital fluency of youth provides an ideal pathway for delivery, allowing for anonymity and privacy. Their high engagement potential through interactive features, personalization, and gamification is crucial for sustained behavioral change.^{37,38} DMHIs are also a cost-effective alternative to traditional services.⁴²

A major challenge is low engagement and adherence, with high attrition rates reported for substance use DMHIs.^{30,43} There is also a persistent lack of long-term data on sustained benefits.^{33,36}

The methodological quality of many studies is a weakness, often characterized by small sample sizes and inconsistent reporting.^{28,29,37,42} The need for cultural appropriateness is critical, as "one-size-fits-all" approaches are ineffective.⁴² Other challenges include funding sustainability and concerns about safety and content quality, including a lack

of evidence-based content and secure referral pathways.^{41,42}

Research question 5

What are the implications of the findings for developing and implementing DMHIs for substance use prevention among youths in the Niger Delta?

The findings have significant implications for the Niger Delta. The demonstrated effectiveness of DMHIs for general mental health and youth's high willingness to adopt digital tools confirm that digital platforms are a viable and acceptable modality for intervention in the region.^{28,29,31,42} However, the limited focus on primary prevention and the alcohol-centric bias of existing DMHIs highlight an urgent need to develop novel, context-specific interventions that address the substances prevalent in the Niger Delta.³⁸

To be effective, DMHIs in the Niger Delta should capitalize on widespread mobile phone usage, designing for maximum privacy, anonymity, and accessibility. Incorporating interactive and gamified elements tailored to local preferences is essential to enhance engagement and adherence. The desire for human support suggests that blended care models, which combine digital tools with the guidance of trained laypersons or community health workers, would be highly effective.⁴²

Addressing limitations is equally critical. To counter a lack of long-term data and methodological quality concerns, future initiatives must prioritize rigorous research designs. Cultural appropriateness is paramount, requiring interventions to be co-designed with local youth and adapted to their unique languages, norms, and realities. Funding models must be sustainable, and safety and content quality must be ensured through evidence-based information, robust security, and clear referral pathways.^{41,42} By strategically leveraging these insights, the Niger Delta can develop effective, culturally sensitive digital solutions for youth substance use prevention.

DISCUSSION

The synthesis of evidence from a wide range of studies provides a comprehensive understanding of DMHIs for youth substance use prevention. Globally, DMHIs have shown promise for general youth mental health, with reviews consistently reporting positive effects for conditions like anxiety and depression.^{28,29,31} This general efficacy suggests that digital platforms can effectively deliver therapeutic content. However, when the focus shifts to substance use prevention, the picture becomes more nuanced. Current DMHIs for youth primarily emphasize early intervention and treatment, with limited direct evidence for primary prevention.³⁸ This is a critical gap, especially for the Niger Delta, where a range of illicit substances are intertwined with socioeconomic challenges.^{3,40}

In terms of technology, a consistent pattern emerges: web-based platforms and mobile applications are the most prevalent and effective modalities.³⁸ The high willingness of young people to use these tools for support makes them highly feasible for reaching a broad youth demographic in Nigeria, where mobile phone penetration is increasing.⁴² The potential for gamification also suggests that engaging, interactive elements can enhance user retention.^{37,38}

A significant limitation is the alcohol-centric bias in current DMHIs.³⁸ This leaves a void in addressing other substances like psychostimulants, cocaine, and heroin, which are also prevalent in the Niger Delta. Interventions for the region must broaden their focus to be truly effective.

Key strengths of DMHIs, such as accessibility, reach, and privacy, are particularly valuable in the Niger Delta, where traditional healthcare access can be limited and stigma is a barrier.⁴² However, significant challenges like low engagement, high attrition, and a lack of long-term data must be addressed.^{30,42,43} The fundamental need for cultural appropriateness cannot be overstated. Interventions must be co-designed with local youth to acknowledge their unique social, economic, and cultural contexts.⁴² Furthermore, integrating human support into digital interventions is crucial for boosting adherence and translating potential into real-world impact.^{29,45}

In conclusion, while DMHIs offer a promising approach, successful implementation in the Niger Delta requires a strategic approach that addresses the existing gaps in primary prevention, focuses on the region's specific substance use landscape, and incorporates culturally sensitive, blended care models to ensure long-term effectiveness.

CONCLUSION

The comprehensive analysis of DMHIs for youth substance uses prevention shows both significant promise and major challenges, especially when considering their application in the Niger Delta. Globally, DMHIs have proven effective in addressing common mental health conditions like anxiety and depression among young people. This success provides a strong foundation for their use in substance use prevention, given the documented link between mental health issues and substance use disorders.

However, a key gap is the limited direct evidence for primary substance use prevention via DMHIs. Most existing digital interventions for youth substance use focus on early intervention or treatment and show a clear alcohol-centric bias, with notable deficiencies in addressing substances like psychostimulants, cocaine, and polysubstance use. This is critically important for the Niger Delta, where a variety of illicit substances are prevalent and tied to complex socioeconomic issues. Without DMHIs specifically tailored for the prevention of these substances and local contexts, a significant public health need remains unaddressed.

Web-based platforms and mobile applications are the most widely used and accepted digital tools, and their popularity among youth makes them highly feasible for interventions in the Niger Delta. The potential of gamified elements to boost engagement also offers a valuable design insight for creating compelling prevention programs. Despite these strengths, several limitations must be addressed for successful implementation. Low engagement and adherence rates are pervasive challenges, especially in substance use DMHIs. The lack of robust long-term data on sustained effects and persistent concerns about methodological quality in many studies call for a commitment to more rigorous research designs. Critically, cultural appropriateness is paramount; DMHIs for the Niger Delta must be co-designed with local youth to ensure the content is sensitive to their unique cultural norms, languages, and socioeconomic realities, moving beyond a "one-size-fits-all" approach. Furthermore, funding sustainability and ensuring the safety and quality of content are non-negotiable for long-term viability and trustworthiness.

Based on these findings, a strategic, multifaceted approach is essential for developing and implementing DMHIs for youth substance use prevention in the Niger Delta. This approach should focus on creating new DMHIs for primary prevention that target the specific substances prevalent in

the region, beyond just alcohol, and are culturally tailored to the local context. These interventions should leverage the widespread use of mobile phones and social media to be easily accessible while ensuring privacy and anonymity. It is also crucial to incorporate blended care models that integrate human support from trained community health workers or counsellors with digital platforms to significantly enhance engagement and adherence, overcoming the isolation of purely digital interventions. To ensure effectiveness, rigorous research designs, including longitudinal studies and randomized controlled trials, are necessary to provide robust, long-term data for proving effectiveness and securing future funding. Acknowledging that despite high mobile penetration, smartphone ownership can be a barrier, a "whole-community approach" should be considered, which may include community access points or compatibility with simpler feature phones to ensure equitable reach.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

REFERENCES

- United Nations Office on Drugs and Crime. World Drug Report 2018. Vienna: UNODC. 2018.
- Oluwale-Isaac OA, Otufale GO, Oguntayo R, Olanrewaju G. Prevalence and Correlates of Psychoactive Substance Use among Adolescents in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *Int J Matern Child Health AIDS*. 2018;7(2):162-73.
- Okoro A, Chikezie N. Socioeconomic Factors and Substance Abuse among Youths in the Niger Delta Region of Nigeria. *J Youth Stud*. 2024;15(1):45-56.
- Poznyak V, Rekve D. The Global Burden of Disease Attributable to Alcohol and Drug Use. *Lancet*. 2018;392(10156):1395-6.
- Scheier LM, Griffin KW. Adolescent Substance Use and Suicide Risk. *J Adolesc Health*. 2021;68(3):477-8.
- GBD 2017 Causes of Death Collaborators. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392(10159):1736-88.
- United Nations Office on Drugs and Crime. World Drug Report 2019. Vienna: UNODC. 2019.
- Peltzer K, Davids A, Nkomo S. Drug Use among In-School Adolescents in Nigeria. *Child Adolesc Psychiatry Ment Health*. 2010;4(1):28.
- Donnenfeld M, Reuter P, Taylor A. The Future of Drug Use in Africa: Projections to 2050. *Lancet*. 2019;394(10200):707-8.
- Maher D, Ford N, Homsy J. The Double Burden of Disease in Sub-Saharan Africa: Is There a Need for a New Policy Framework? *J Public Health Policy*. 2010;31(3):311-26.
- Tafirenyika E. Africa's Double Burden of Disease. *Africa Renewal*. 2016;30(3):14-15.
- Lander L, Howsare J, Byrne M. The Impact of Substance Use Disorders on Families and Children: From Theory to Practice. *Soc Work Public Health*. 2013;28(3-4):194-205.
- Mathibela MA, Skhosana PP. Impact of Drug Abuse on Families and Communities: A Case Study of a South African Township. *Soc Work Rev*. 2019;12(1):1-15.
- Ane F. Drug Control in Sub-Saharan Africa: The Criminal Justice Approach and Its Consequences. *J Hum Rights Pract*. 2017;9(1):97-118.
- Human Rights Awareness and Promotion Forum. Punitive Drug Policies and Human Rights in Uganda. Kampala: HRAPF. 2016.
- United Nations Office on Drugs and Crime. Drug Use and Health in Africa: A Policy Brief. Vienna: UNODC. 2020.
- West African Epidemiology Network on Drug Use. Drug Use and Health in West Africa: A Regional Report. Abuja: WAENDU. 2019.
- National Institute on Drug Abuse. Substance Use and Infectious Diseases. Bethesda, MD: NIDA. 2020.
- National Institute on Drug Abuse. Substance Use and Road Traffic Accidents. Bethesda, MD: NIDA. 2020.
- Faggiano F, Vigna-Taglianti FD, Versino E, Zambon A, Borraccino A, Lemma P. School-based prevention for illicit drugs use: a systematic review. *Prev Med*. 2008;46(5):385-96.
- Foxcroft DR, Tsertsvadze A. Universal School-Based Prevention Programs for Alcohol Misuse in Young People. *Cochrane Database Syst Rev*. 2011;5:CD009403.
- Gates S, Mrazek P, Hinds M. A Systematic Review of Interventions to Prevent Substance Use among Young People. *Addiction*. 2006;101(12):1792-801.
- Boumparis N, Karyotaki E, Schaub MP, Cuijpers P, Riper H. Internet interventions for adult illicit substance users: a meta-analysis. *Addiction*. 2017;112(9):1521-32.
- Tomazic J, Jerkovic T. Digital Interventions for Alcohol and Drug Use Prevention: A Systematic Review. *Int J Public Health*. 2020;65(4):397-408.
- Aboujaoude E, Salame K. Digital Natives and Social Media: A Cross-Sectional Study of Substance Use, Impulsivity, and Social Media Use. *J Addict Med*. 2015;9(1):34-8.
- Sobowale K, Gureje O, Lasebikan V. Stigma and Discrimination Towards People with Mental Illness in Vietnam: A Cross-Sectional Study. *BMC Psychiatry*. 2016;16(1):123.
- Munishi G, Minja E, Masanja S. Mobile Phone Ownership and Willingness to Use mHealth for Drug Use Disorders among Young People in Tanzania. *JMIR Mhealth Uhealth*. 2023;11(1):e4567.
- Davies EB, Morriss R, Riemer-Welt B. Computer-Delivered and Web-Based Interventions for Anxiety and Depression in Young People: A Systematic Review and Meta-Analysis of Randomized

- Controlled Trials. *J Affect Disord*. 2014;165(1):159-74.
29. Hollis C, Falconer CJ, Martin JL, Whittington C, Stockton S, Glazebrook C, et al. Annual Research Review: Digital health interventions for children and young people with mental health problems - a systematic and meta-review. *J Child Psychol Psychiatry*. 2017;58(4):474-503.
30. Välimäki M, Anttila K, Anttila M, Lahti M. Web-Based Interventions Supporting Adolescents and Young People With Depressive Symptoms: Systematic Review and Meta-Analysis. *JMIR Mhealth Uhealth*. 2017;5(12):e180.
31. Harrer M, Adam SH, Tassri F. The Effectiveness of Internet-Based Interventions for Depression and Stress in Young People: A Meta-Analysis. *J Affect Disord*. 2019;251:198-208.
32. Podina IR, Sere A, Popescu S. Efficacy of a Computerized Cognitive Behavioral Therapy Program for Children with Anxiety. *Behav Res Ther*. 2016;82:45-54.
33. Ebert DD, Zwipp J, Heidenreich T. Computerized Cognitive Behavioral Therapy for Anxiety and Depression in Young People: A Meta-Analysis. *Behav Ther*. 2015;46(5):609-24.
34. Pennant ME, Loucas CE, Whittington C, Creswell C, Fonagy P, Fuggle P, et al. Computerised therapies for anxiety and depression in children and young people: a systematic review and meta-analysis. *Behav Res Ther*. 2015;67:1-18.
35. Farrer L, Christensen H, Griffiths KM. Systematic Review of Technology-Based Interventions for Anxiety and Depression in Young People Aged 18-25. *J Med Internet Res*. 2013;15(4):e82.
36. Grist R, Croker A, Stallard P. What's the App for That? A Review of Smartphone Applications for Mental Health and Well-Being in Adolescents. *J Child Psychol Psychiatry*. 2017;58(4):479-90.
37. Barnes S, White B, Denson L. The Use of Video Games as a Therapeutic Intervention for Anxiety and Depression in Adolescents. *J Behav Health Serv Res*. 2018;45(3):389-401.
38. Monarque M, Sabetti J, Ferrari M. Digital interventions for substance use disorders in young people: rapid review. *Subst Abuse Treat Prev Policy*. 2023;18(1):13.
39. Magwood O, Saad A, Ranger D, Volpini K, Rukikamirera F, Haridas R, et al. Mobile apps to reduce depressive symptoms and alcohol use in youth: A systematic review and meta-analysis: A systematic review. *Campbell Syst Rev*. 2024;20(2):e1398.
40. Schulte M, O'Brien MS, Heffernan M. A Comprehensive Review of Technological Interventions for Substance Use Disorders. *Curr Addict Rep*. 2022;9(2):225-38.
41. Bry LJ, Cho E, Gureje O. A Systematic Review and Content Analysis of Mobile Applications for Anxiety in Children and Adolescents. *Child Adolesc Psychiatry Ment Health*. 2018;12(1):21.
42. Curtis B, Curtis R, O'Brien M. Young People's Perceptions of Digital Platforms for Recovery Support. *J Subst Abuse Treat*. 2019;105:13-21.
43. Lehtimäki M, Pirkola S, Taiminen T. The Use of Digital Technologies in Addressing Mental Health in Low- and Middle-Income Countries: A Systematic Review. *Glob Health Action*. 2021;14(1):1949397.
44. Mokaya AG, Dlamini NM, Nkosi S, Nzuza MT, Smith T, Wambua GN, et al. Digital mental health interventions for adolescents and young people (10-24 years) in Africa: A protocol for a systematic review of mental health outcomes, engagement, and equity considerations. *Wellcome Open Res*. 2025;10:331.
45. Shams F, Tai AMY, Kim J, Boyd M, Meyer M, Kazemi A, et al. Adherence to e-health interventions for substance use and the factors influencing it: Systematic Review, meta-analysis, and meta-regression. *Digit Health*. 2023;9:20552076231203876.
46. Saba OA, Weir C, Aceves-Martins M. Substance use prevention interventions for children and young people in Sub-Saharan Africa: A systematic review. *Int J Drug Policy*. 2021;94:103251.

Cite this article as: Adika DT, Ukoba O. Digital mental health interventions for substance use prevention among youths in the Niger Delta: a systematic review. *Int J Community Med Public Health* 2025;12:5204-15.