Ethical and Human-Centred Innovation in Public Health Visual Communication: A Practice-Based Study of Eight Years of HIV Prevention Education in Chengdu

Yingxin Zhang *

Sichuan Normal University, Chengdu, China

* Corresponding Author Email: 1016924611@qq.com

Abstract. Digital platforms, mobile services and networked media have widened the reach of public health education. Yet reach alone says little about whether a message is intelligible, equitable or humane. This distinction matters in HIV prevention, where medical complexity is entangled with privacy, stigma and unequal access to services. Drawing on debates in educational technology, this article asks how ethical principles can inform innovation in public health visual communication. It examines an eight-year archive of HIV prevention work developed in Chengdu, China. From a larger body of project materials, twenty cases were purposively selected to cover five areas: digital health services, public health mascot and identity design, educational materials, online communication, and event and professional communication. The comparison considered audience, information structure, visual language, medium, service pathway and ethical risk. Four strategies recur across the cases. Information translation turns specialised medical content into visual structures that are easier to follow without removing necessary complexity. Emotional connection offers an alternative to fear-based or stigmatising messages by using respectful and locally recognisable forms. Behavioural guidance links information to risk assessment, testing, consultation and feedback, while systematic communication supports continuity across different media. Together, these strategies suggest a four-layer model: information understanding, emotional acceptance, behavioural transformation and sustained communication. Five ethical concerns cut across the model—privacy; equity and inclusion; dignity and stigma reduction; audience agency; and human judgement and accountability. The cases suggest that public health visual design is more than a decorative treatment of medical content. It forms part of the educational and service environment through which people encounter a sensitive health issue, interpret its relevance and decide whether to act. The evidence, however, comes from one city and from practice records rather than a controlled outcome study. The model should therefore be read as a framework derived from practice and open to further testing, not as proof that any single design caused a change in behaviour.

Keywords: Public health communication; visual communication design; HIV prevention; health literacy; human-centred design; communication ethics; digital health.

1. Introduction

Digital technology now forms part of the ordinary infrastructure of public health education. Mobile applications, social media accounts, online risk-assessment tools, infographics and digital service interfaces sit alongside posters, booklets, exhibitions and community activities. Used well, these forms can widen access to health information and provide more flexible routes to services. The World Health Organization (WHO) treats digital health as a means of strengthening health systems, but stresses that it must be integrated with organizational, financial and human resources [1]. In China, the Healthy China 2030 initiative likewise places prevention, health promotion, equity and public participation within a long-term national framework [2].

Greater technical capacity does not automatically make communication ethical or effective. Information may be available on a platform and still be difficult to understand. A risk-assessment interface may simplify access while heightening concerns about privacy. Public visibility can also work in two directions: an HIV campaign may draw attention to prevention yet reproduce fear, blame or stereotypes. Even visual consistency has limits if it assumes that audiences share the same needs. Technology and visual form are therefore not neutral delivery mechanisms. As Selwyn [3] argues,

educational technology should be examined not only for what it enables but also for the values and relationships it normalizes. The same scrutiny is needed in public health education, where communication shapes knowledge, emotion, trust and health-related action.

HIV prevention is a particularly demanding context for this inquiry. Medical knowledge is closely entangled with sexuality, identity, personal risk and social judgement. HIV-related stigma can discourage information seeking, testing, treatment and participation in care [4]. Messages intended to warn or reach priority groups may also have unintended effects when they rely on threatening imagery, individual blame or stereotypical representations [5]. The task is therefore not simply to make information visible. Communication must help people understand relevant knowledge without increasing shame, recognise risk without labelling groups, and approach services without unnecessary exposure.

Visual communication design is central to this process because it shapes how medical content is selected, ordered, represented and connected to action. Pictures and visual structures can improve attention, comprehension and recall, especially when they are closely linked to clear verbal explanation [6]. Yet images are not automatically inclusive. They can oversimplify uncertainty, reproduce stereotypes or imply that one visual language is appropriate for all audiences. Design decisions therefore have ethical as well as aesthetic consequences.

This article considers these issues through a practice-based study of HIV prevention visual communication in Chengdu. The archive grew through sustained work across public health communication, digital services, educational materials, identity design and event systems. The selected cases include the “Rong Ai Jian” digital testing service, the “Xiong Ai” public health mascot, youth- oriented materials, online knowledge platforms, university campaigns and tools for professional communication.

The study addresses two questions:

1. How can concerns about privacy, equity and inclusion, dignity and stigma reduction, audience agency, and human judgement and accountability be translated into public health visual communication practice?

2. What design strategies can be derived from the Chengdu HIV prevention cases to connect information understanding, emotional acceptance, health-related action and sustained communication?

The article argues for moving beyond tool-centred and output-centred accounts of innovation. A new platform is not necessarily useful because it is technically novel, nor is a campaign effective simply because it is visually attractive. A more meaningful test is whether people can understand the material, encounter it without avoidable stigma, retain genuine choice and find an appropriate route to professional support.

2. Conceptual Framework

2.1. From Technology Integration to Ethical Public Health Education

The ethical question raised by educational technology is not whether digital tools are simply good or bad, but how they serve educational purposes and human development. Public health education faces the same issue. Technical capacity should not be allowed to define the communication goal. A platform may be able to collect detailed information, yet collecting all of it may be neither necessary nor proportionate. Automated recommendations can be useful, but they should not displace professional explanation. Likewise, the reach of social media is not evidence that a message has been understood or acted upon.

This distinction redirects attention from the tool to the relationship created around the tool. Digital health communication creates relationships among institutions, health professionals, designers, platforms and members of the public. These relationships involve differences in knowledge and power. Institutions decide what information is prioritized, designers determine how it is represented, platforms influence what is visible, and users may have limited opportunity to question how their data

or attention are being used. Ethical technology integration therefore requires transparency, proportionality and accountability.

Although none of the cases analyzed here relies on advanced artificial intelligence, the WHO guidance on AI for health is still useful as a broader ethical reference. It places autonomy, safety, transparency, inclusiveness, accountability and sustainability at the centre of health technology governance [7]. Seen from this perspective, human-centred design is not only a usability method. It is also a commitment not to treat people as passive recipients, behavioural targets or convenient sources of data.

2.2. Health Literacy and Information Translation

Health literacy is not limited to reading a leaflet or locating a website. It includes the ability to access, understand, appraise and use health information and services. In digital settings, eHealth literacy also involves finding, evaluating and applying information from electronic sources [8].

Communication design therefore helps shape the conditions under which health literacy can actually be exercised.

Complex medical language, unclear hierarchy and visually crowded interfaces raise the cognitive cost of participation. When people must decode specialist terminology, compare multiple pathways and manage anxiety at the same time, even accurate information may become practically inaccessible. Information translation responds to this problem by reorganising rather than merely illustrating content. It identifies essential knowledge, establishes sequence, clarifies relationships and connects explanations to action.

Visual communication can support this process through diagrams, icons, illustrated scenarios, modular layouts and step-by-step pathways. Houts et al. [6] found that pictures can improve attention, comprehension and recall when they are meaningfully connected to text. The qualifications are important. Decorative images do not necessarily improve understanding, and an image that is culturally unfamiliar or emotionally threatening may reduce engagement. Ethical information translation therefore requires both medical accuracy and audience-centred interpretation.

2.3. Equity, Accessibility and Audience Diversity

Equality of distribution does not ensure equity of access. The same digital content may be technically available to everyone while remaining difficult to use for people with limited health literacy, limited digital experience, unstable internet access, disabilities or different cultural expectations. Public health communication must therefore consider not only whether information is present, but also who can interpret it, who feels addressed by it and who can follow the pathway it proposes.

This concern parallels debates about algorithmic and platform-based fairness in education. Digital systems often make particular behaviours visible while overlooking the conditions that produce them. Low online activity, for example, may be interpreted as low interest even when it results from access barriers or concerns about privacy. In a health context, failure to complete a digital assessment may reflect confusing navigation, fear of disclosure or uncertainty about what will happen next. Treating non- completion as an individual deficit can obscure a design problem.

Audience segmentation is ethically defensible when it creates additional routes to accurate information rather than fixing people into narrow categories. Youth materials may use characters, stories and campus settings, whereas professional materials need terminological precision and a more formal structure. Community communication often benefits from direct service information and familiar situations. The form can change without lowering the standard of knowledge, dignity or opportunity offered to any group.

2.4. Agency, Motivation and Behavioural Support

Public health education ultimately seeks more than exposure to information. It aims to help people make informed decisions and undertake appropriate actions. Bandura's [9] concept of self-efficacy suggests that people are more likely to act when they believe they can perform the required behaviour.

Ryan and Deci's [10] self-determination theory similarly emphasises autonomy, competence and relatedness as conditions that support internalized motivation.

These ideas help separate behavioural guidance from behavioural manipulation. An ethical interface clarifies the next step, explains why information is requested, provides feedback and leaves room for meaningful choice. Manipulative design, by contrast, may rely on fear, urgency or hidden defaults to push a predetermined action. In HIV prevention, testing and consultation can already involve anxiety and stigma. Users should therefore understand the purpose and limits of a risk assessment and know where to obtain professional support, rather than being left with an automated label.

Agency also means recognising the user as an interpreter of their own situation. Public health communication should not frame people only as targets of intervention. Feedback channels, voluntary service routes and opportunities to seek clarification allow users to participate in communication relationships. Design can support this participation by making options visible and reducing avoidable procedural barriers.

2.5. Dignity, Stigma and Human Judgement

HIV communication can unintentionally reinforce the stigma it is intended to reduce. Peinado et al. [5] show that particular comparison frames, visual exemplars and narratives of individual responsibility may contribute to blame, stereotyping, distrust or social distancing. Images deserve particular care because the associations they create can be registered more quickly than the qualifications provided in explanatory text.

Emotional tone is therefore not a superficial choice. Red-and-black warning palettes, isolated bodies, danger imagery or exaggerated medical symbols may attract attention, but they can also frame the subject as contaminated, shameful or socially distant. A supportive visual language need not minimise medical risk. Its purpose is to communicate that risk without symbolically punishing the people associated with it.

Human judgement is essential to this balance. Designers contribute expertise in hierarchy, narrative, interaction and visual meaning; public health professionals contribute medical knowledge and service responsibility; community participants contribute lived experience and contextual interpretation. No single actor should be treated as sufficient. Professional review is necessary because visual simplification can distort medical content, while medical accuracy alone does not guarantee that communication is understandable or respectful. Ethical practice depends on dialogue among these forms of knowledge.

3. Research Context and Method

3.1. Research Context

This study is part of the Sichuan Normal University Graduate Innovation Capacity Development Project, “Public Health Science Communication through Innovative Visual Design: An Analysis of Eight Years of HIV/AIDS Prevention Communication Practice in Chengdu” (Project No. SJ2025012). The broader project examines how visual communication has participated in local HIV prevention education across digital services, public campaigns, campus communication and professional exchange.

The archive covers work initiated in 2017 and developed across an eight-year period (2017–2024). It contains more than 100 visual outputs and service-related design materials. These materials were created for different audiences and settings rather than as components of a single controlled

intervention. The archive offers longitudinal evidence of practice, but not a uniform experimental dataset.

3.2. Case Selection

For this analysis, a case was defined as a bounded design project or service touchpoint documented in the archive. Some cases consist of a single output, while others are linked to components of a wider communication system. Twenty cases were purposively selected to reflect variation in medium, audience, communication objective and design function. They were organised into five clusters:

Table 1. Case clusters, representative cases and primary analytical focus.

Case cluster	Representative cases	Primary analytical focus
Digital health service design	"Rong Ai Jian" overall visual system; appointment function; HIV risk assessment; application for an HIV self-test kit and result feedback	Privacy, trust, information hierarchy, interaction pathway and behavioural support
Public health mascot and identity design	"Xiong Ai" character; character specifications; expressions and scenarios; campus applications	Emotional safety, local recognition, consistency and stigma reduction
Educational information design	HIV prevention picture book; creative educational materials; youth materials; university posters; community materials	Health literacy, visual translation, audience adaptation and accessibility
Online communication design	Online knowledge platform; "Chengdu Ai Qing Chun" WeChat Official Account; infographics and long-form visual posts	Modular information, digital readability, continuity and channel adaptation
Event and professional communication	"Rong Ni Shuo Ai" university health-education presenter competition; annual visual-system upgrades; international HIV prevention seminar; professional communication toolkit	System identity, multi-channel coordination, professional credibility and sustained communication

Aesthetic quality was not used to rank or select cases. Their value for the study lay in the different parts of the communication process they made visible: encountering and understanding information, developing an emotional relationship to the subject, moving towards a health-related action, and maintaining communication over time.

3.3. Analytical Procedure

The analysis proceeded in three passes. First, each case was described across seven dimensions: communication objective, target audience, medium and setting, information structure, visual language, service or action pathway, and ethical considerations. The second pass compared cases within and across the five clusters. A final pass grouped recurring design functions into broader themes while noting differences that did not fit the emerging pattern.

The framework in Section 2 functioned as a set of sensitizing concepts rather than a scoring rubric. Five concerns guided attention to ethical tensions: privacy; equity and inclusion; dignity and stigma reduction; audience agency; and human judgement and accountability. The analysis remained open to themes arising from the archive itself. Four recurrent strategies were identified—information translation, emotional connection, behavioural guidance and systematic communication—and related to four layers of practice: information understanding, emotional acceptance, behavioural transformation and sustained communication.

3.4. Scope and Research Ethics

The analysis is limited to communication design. It does not examine identifiable health records or disclose information about individual users. Discussion of the "Rong Ai Jian" service concerns only the interface, information structure and service pathways documented in the archive. The archive by itself cannot establish changes in testing rates, health outcomes or levels of stigma.

The author's participation in the design practice provided contextual knowledge that is not always visible in the final artefacts. It also increased the risk of reading intended effects into the work. To address this tension, the analysis separates observable design features and documented service pathways from claims about audience response. Where outcome data are not available, effects are framed as possibilities rather than demonstrated results.

4. Findings: A Four-Layer Model of Ethical Visual Communication

4.1. Information Understanding: Translating Knowledge Without Distortion

Across educational materials, online platforms and digital service interfaces, a recurring problem was the distance between professional medical knowledge and what a non-specialist reader could reasonably take in. The archive did not suffer from a shortage of information. The difficulty lay in its density, terminology and organisation.

The picture books, long-form visual posts, posters and community materials reorganized content into three broad levels. The first level presented essential knowledge that needed to be recognised quickly, such as basic definitions, prevention principles and available testing routes. The second level provided explanation, including relationships among risk factors, testing processes and common misunderstandings. The third level connected knowledge to an action, such as seeking consultation, making an appointment or using a self-test service appropriately.

This approach positioned visual design as a form of editorial and educational judgement, not a surface treatment applied at the end. Decisions had to be made about which concepts belonged together, what sequence matched likely audience questions and where simplification might become misleading. Icons and illustrations were most useful when they explained a process or relationship. Step-based images supported testing procedures, grouped symbols helped distinguish prevention recommendations, and scenarios situated abstract knowledge within campus, household and community life.

Differences among audience groups were most visible in the route each design offered into the same medical knowledge. Youth materials used narrative, character and campus settings. Community materials placed direct service information and familiar situations first, while professional tools retained specialised terminology and a formal structure. The underlying medical standard remained the same even when the mode of access changed.

Three practical requirements follow from these cases. Simplified information still needs medical review; hierarchy should reduce cognitive burden without hiding uncertainty; and visual symbols need to be read in their cultural and situational context. Distribution at scale is useful, but it does not by itself make information equitable.

4.2. Emotional Acceptance: Designing for Dignity and Reduced Stigma

The second layer concerns willingness to engage. A person may understand the words on a poster and still avoid the subject because its visual tone communicates danger, shame or social distance. In HIV prevention, this emotional barrier is part of the communication problem itself. It may affect whether information is read, shared or related to a personal decision.

The “Xiong Ai” character system illustrates a move from disease-centred imagery towards relationship-centred communication. Its panda reference is locally recognisable, and its friendly personality was intended to create a stable, approachable figure. The significance of the character is not simply that it is “cute.” It changes the tone of the institutional voice: instead of confronting audiences with warning symbols, the system offers a guide that can appear in campus materials, educational scenarios and service information.

The character specifications, expressions and scenario extensions also show why emotional communication depends on a system rather than one mascot image. Repeated use of a consistent posture, colour language and narrative role may support recognition across contexts. It also allows later messages to return to the subject without rebuilding the visual language of crisis each time.

Story-based picture books and youth materials served a related purpose. Health information was placed in situations involving study, friendship, relationships and help seeking, so that HIV prevention appeared as part of ordinary health responsibility rather than as a marker of a stigmatised identity. This direction is consistent with the people-centred and inequality-sensitive approach of the UNAIDS Global AIDS Strategy [11].

A friendly tone also carries risks. Character appeal can trivialise the subject if medical seriousness and practical information disappear behind it. In the Chengdu materials, the stronger examples pair emotional accessibility with structured knowledge and an explicit service route. The goal is not to portray the issue as harmless, but to make accurate engagement psychologically possible.

4.3. Behavioural Transformation: Supporting Agency Through Service Pathways

The third layer moves from exposure to health-related action. Posters and leaflets often end once information has been delivered. The “Rong Ai Jian” cases extend the design task into appointment booking, risk assessment, applications for HIV self-test kits, result feedback and consultation pathways.

This transition changes the responsibility of design. In a static poster, hierarchy determines what is read first. In a service interface, hierarchy also determines what a user can do next, what information must be entered, what uncertainty is explained and where a user may abandon the process. Interface design therefore participates directly in the conditions of action.

The appointment pathway shows how complicated a service can be divided into manageable steps. Clear grouping, progressive disclosure and visible feedback may strengthen a user's sense of competence. Risk assessment raises a different problem. A brief assessment may help someone recognise that testing is appropriate, but it should never be presented as a diagnosis or final judgement. The limits of the tool must be visible, and professional support should be available when interpretation is needed.

Applications for self-test kits and the result-feedback pathway involve both agency and vulnerability. A digital route may feel more private and convenient, yet it can also create uncertainty about data use or leave someone isolated after receiving sensitive information. Privacy therefore needs a visible form: data minimisation, understandable explanations, discreet presentation and clear support options. A legal statement hidden at the end of the process is not enough.

Seen through motivation theory, a clear pathway can make a difficult action feel more concrete and manageable. Ethically, however, that clarity must not become coercion. Options and consequences should be explained, and visual cues should support informed choice rather than manufacturing urgency.

The cases therefore redefine visual communication as service support. The designer's role expands from presenting a message to mapping the user's journey from question to information, from information to decision, and from decision to professional or community support. This is the point at which public health visual design becomes part of a wider service ecology.

4.4. Sustained Communication: Building Systems Without Losing Human Accountability

The fourth layer concerns continuity. Public health education rarely succeeds as a single campaign. Knowledge changes, audiences meet information through several channels, and trust develops through repeated contact. Across the archive, isolated outputs gradually gave way to reusable systems: identity standards, icon libraries, layout principles, character rules, digital modules and event formats.

The annual “Rong Ni Shuo Ai” university health-education presenter competition offers one example. Repeated updates allowed the activity to remain recognisable while responding to new themes and media.

The international seminar and professional toolkit required a more formal tone, yet they shared the wider aim of coherent and credible communication. A system made it possible to coordinate online posts, print, venue graphics and teaching materials without rebuilding the visual language from the beginning each year.

Systematization improves efficiency, but efficiency is not the only value. Consistency can reduce interpretation costs and strengthen institutional trust. It can also preserve quality when materials are adapted by different teams. However, a design system can become rigid if its templates are treated as substitutes for contextual judgement. A youth-friendly character may be inappropriate for a professional clinical explanation; a formal conference visual language may create distance in a community setting. Ethical system design therefore requires rules for adaptation as well as rules for consistency.

Human review remains important at three points. Public health professionals must verify medical content and service advice. Designers must assess whether the visual form communicates the intended meaning without producing avoidable stigma or confusion. Audience feedback should identify where the communication does not match actual experience. These forms of judgement cannot be fully replaced by engagement metrics such as views, clicks or completion rates. Metrics can identify patterns, but they cannot on their own explain whether a user felt respected, understood a risk correctly or trusted the service.

Sustained communication is therefore better understood as a feedback system than as a fixed campaign. Five stages recur in the archive: needs analysis, information organisation, visual strategy, implementation, and feedback and revision. The final stage returns the work to earlier decisions instead of merely recording performance. Technology is useful within this cycle, but it does not replace professional judgement.

5. Discussion

5.1. From Visual Beautification to Ethical Communication Infrastructure

The four-layer model places visual communication throughout the public health education process. Translation is central when people first encounter complex information. Questions of dignity, distance and trust become more prominent as they decide whether to engage. When a message leads towards testing or consultation, design begins to shape a service pathway. Over time, the same work must also coordinate media, institutions and professional responsibility.

This expanded role challenges the assumption that visual design enters only after health content has been finalized. If designers are involved only at the stage of appearance, opportunities to reorganise information, identify user barriers and protect emotional safety may already have been lost. Ethical visual design requires earlier participation in problem definition and service planning.

Communication quality cannot be reduced to visual preference. An attractive design may still be medically unclear; a clear message may be stigmatising; a supportive message may fail to connect people with an appropriate and accessible service. A pathway can even be easy to use while collecting more information than it needs. Ethical quality lies in how accuracy, accessibility, dignity, agency and accountability are held together.

5.2. Connecting Five Ethical Concerns to Four Design Strategies

The analysis uses five connected concerns rather than a checklist of separate obligations: privacy; equity and inclusion; dignity and stigma reduction; audience agency; and human judgement and accountability. Each becomes visible through more than one design strategy.

Information translation addresses equity and inclusion by reducing avoidable barriers to specialist knowledge. It also depends on human judgement, since simplification has to remain medically accurate.

Emotional connection brings dignity and stigma reduction into decisions about tone, imagery and narrative. Its purpose is not to make a serious subject cheerful, but to reduce the psychological distance created by shame and negative identity labels.

Behavioural guidance is most closely linked to audience agencies. It turns abstract advice into visible options and manageable steps, while raising privacy questions whenever a pathway collects sensitive personal information.

Systematic communication concerns continuity and accountability. Standards, professional review and feedback make ethical commitments less dependent on the judgement of one designer or the short life of a single campaign.

These relationships explain why an ethics section added at the end of a project is insufficient. Ethical responsibility is distributed across information architecture, colour and image choices, interface sequences, data explanations, service links and governance processes.

5.3. Local Practice and International Relevance

The Chengdu cases are deliberately local. “Xiong Ai” draws on the city's association with pandas, and the archive reflects Chinese public health institutions, university communication and social media. This specificity is not a weakness to be designed away. Human-centred communication needs local symbols, service structures and expectations if it is to be meaningful.

The underlying design problems nevertheless travel across contexts. Public health organisations must translate specialist knowledge, avoid reinforcing stigma, connect information to services and manage digital systems responsibly. The 2021 UNAIDS strategy and the WHO digital health strategy both link technological progress with equity, participation and health-system capacity [11, 1].

The transferable contribution is therefore a way of questioning design decisions rather than a visual style to copy. In another setting, a team might begin by asking whether the intended audience can understand the material and whether any part of the message creates avoidable shame or blame. It should then consider whether users retain meaningful choice, can identify a supported next step and understand how their data will be handled. Finally, professionals need a route to review and revise the system. These questions can be adapted to other public health topics and regional contexts.

6. Practical Implications

The analysis points to a five-stage workflow for public health visual communication.

1. Needs analysis: define the health problem, communication objective, audience groups, service environment and potential ethical risks.

2. Information organisation: work with subject specialists to identify essential knowledge, uncertainty, misconceptions and action points; then build an audience-centred hierarchy.

3. Visual strategy: select an appropriate tone, symbol system, narrative form and channel mix while reviewing accessibility, cultural meaning and stigma risk.

4. Implementation: producing coordinated materials across digital services, social media, print, events and professional communication without forcing every channel into the same format.

5. Feedback and revision: collect evidence about comprehension, emotional response, usability and service participation; interpret metrics with qualitative feedback and professional judgement.

For institutions, this workflow shifts attention away from procurement and technical functionality alone. Time and responsibility are also needed for content review, accessibility, privacy explanations and user feedback. Designers, health professionals and intended audiences should therefore be involved early enough to influence the problem definition, not only the appearance of the final material. For educators and community communicators, the workflow offers a practical test of whether a message supports informed participation rather than passive exposure.

7. Limitations and Future Research

Four limitations should be kept in view. First, the cases come from one city and one area of public health practice, so local institutions, media platforms and cultural symbols limit direct generalisation. Second, the archive brings together projects produced over time and under different conditions. Third, the analysis is qualitative and practice-based; it does not include controlled measures of comprehension, stigma reduction, service uptake or long-term behaviour change. Finally, the author's

role in the design practice may still shape interpretation despite the reflexive measures described in Section 3.4.

Future research could test the four-layer model through mixed methods. Comprehension studies might compare alternative information structures, while interviews and focus groups could examine emotional acceptance, trust and perceived stigma. Usability studies would be useful for locating points of confusion or abandonment in digital service pathways. With suitable privacy safeguards, aggregated service data could also show whether interface changes are associated with completion of testing or consultation pathways. Comparison across cities and public health topics would help establish how far the four strategies extend beyond HIV prevention.

Co-design deserves particular attention. Young people, community members, health workers and people living with or otherwise affected by HIV may notice visual meanings and service barriers that professional teams overlook. Their participation should begin before the main message and visual direction have been fixed. Preference testing at the end of a project is not a substitute for involvement in problem definition, framing and evaluation.

8. Conclusion

Technology-enhanced public health education can widen access, make services more flexible and support communication over time. The same technologies also create responsibilities. Information may be widely distributed yet poorly understood; personalization may overlook inequality; and an efficient pathway may still restrict meaningful choice.

The Chengdu HIV prevention cases respond to these tensions through four connected strategies: information translation, emotional connection, behavioural guidance and systematic communication. Their relationship is captured in a four-layer pathway moving from information understanding to emotional acceptance, behavioural transformation and sustained communication.

Public health visual design should therefore be treated as part of educational and service infrastructure, not as decoration added after medical content is complete. It influences how people encounter knowledge, judge its personal relevance, develop trust and move towards action. Ethical innovation depends less on adopting the newest tool than on holding technology and visual systems accountable to privacy, equity and inclusion, dignity and stigma reduction, audience agency, and human judgement and professional accountability.

Acknowledgements

This study was supported by the Sichuan Normal University Graduate Innovation Capacity Development Project (Project No. SJ2025012).

References

[1] World Health Organization. (2021a). Global strategy on digital health 2020–2025. World Health Organization. https://www.who.int/publications/i/item/9789240020924

[2] Central Committee of the Communist Party of China and State Council. (2016). Outline of the Healthy China 2030 Plan. National Health Commission of the People's Republic of China. https://en.nhc.gov.cn/2016-11/07/c_74820.htm

[3] Selwyn, N. (2016). Is technology good for education? Polity Press.

[4] Stangl, A. L., Lloyd, J. K., Brady, L. M., Holland, C. E., & Baral, S. (2013). A systematic review of interventions to reduce HIV-related stigma and discrimination from 2002 to 2013: How far have we come? Journal of the International AIDS Society, 16(3 Suppl 2), 18734. https://doi.org/10.7448/IAS.16.3.18734

[5] Peinado, S., Treiman, K., Uhrig, J. D., Taylor, J. C., & Stryker, J. E. (2020). Effectively communicating about HIV and other health disparities: Findings from a literature review and future directions. Frontiers in Communication, 5, 539174. https://doi.org/10.3389/fcomm.2020.539174

[6] Houts, P. S., Doak, C. C., Doak, L. G., & Loscalzo, M. J. (2006). The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. Patient Education and Counseling, 61(2), 173–190. https://doi.org/10.1016/j.pec.2005.05.004

[7] World Health Organization. (2021b). Ethics and governance of artificial intelligence for health: WHO guidance. World Health Organization. https://www.who.int/publications/i/item/9789240029200

[8] Norman, C. D., & Skinner, H. A. (2006). eHealth literacy: Essential skills for consumer health in a networked world. Journal of Medical Internet Research, 8(2), e9. https://doi.org/10.2196/jmir.8.2.e9

[9] Bandura, A. (1997). Self-efficacy: The exercise of control. W. H. Freeman.

[10] Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

[11] UNAIDS. (2021). Global AIDS strategy 2021–2026: End inequalities. End AIDS. Joint United Nations Programme on HIV/AIDS. https://www.unaids.org/en/Global-AIDS-Strategy-2021-2026