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ICT Toolkit for Integrated Prevention, Testing and Linkage to Care Across HIV, Hepatitis, STIs and Tuberculosis in Europe

Christine KAKALOU^{a, 1}, Lella COSMARO^b, Vlasios K. DIMITRIADIS^a, Anne RAAHAUGE^c, Dorthe RABEN^c and Vassilis KOUTKIAS^a

^a Institute of Applied Biosciences, Centre for Research & Technology Hellas, Thermi, Thessaloniki, Greece

^b "Fondazione LILA Milano" - Italian League for Fighting AIDS, Italy ^c CHIP, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

Abstract. Online digital tools are considered an innovative method to promote HIV, hepatitis and STIs prevention, testing and treatment services, overcoming individual and social barriers, especially for younger people and other, possibly hard-to-reach, target population groups. In this paper, we introduce INTEGRATE RiskRadar, a web and mobile application developed in the scope of the EU-supported INTEGRATE Joint Action (JA), that aims to enhance the integration of combination prevention, testing and linkage to care for HIV, hepatitis, STIs and tuberculosis by providing integrated information and digital tools regarding all four diseases to population groups at increased risk, aiming to eliminate the individual and social barriers to effective adoption of prevention practices, testing and linkage to care, and thus reduce the incidence and burden of these diseases in the European Region.

Keywords. Human immunodeficiency viruses (HIV), hepatitis, sexually transmitted infections (STIs), tuberculosis (TB), integrated approach, prevention, combination prevention, testing, linkage to care, eHealth, mHealth.

1. Introduction

Despite the fact that the global HIV response has resulted in impressive achievements, HIV epidemics continue to have a profound impact on the health and lives of millions of people worldwide [1]. At present, the coverage of the HIV services is still inadequate, and the rate of their expansion has to be accelerated to meet the 2020 target as well as the 2030 sustainable development goals (SDGs). Equally important, one of the key challenges is the burden of HIV coinfections, namely sexually transmitted infections (STIs), viral hepatitis and tuberculosis (TB), and the impact they have on HIV prevention, treatment and the related increasing morbidity and mortality [1]. This calls for the implementation of several prevention strategies that, if combined, may have additive and synergistic effects on reducing new HIV transmission incidences. Combination prevention is the strategic and coordinated use of biomedical, behavioural and social/structural activities operating on various levels (individual, community, societal) to reinforce the sustained impact of HIV prevention. The World Health Organization

¹ Corresponding Author: Christine Kakalou, Institute of Applied Biosciences, Centre for Research and Technology, Thermi, Thessaloniki, Greece; E-mail: ckakalou@certh.gr.

(WHO) emphasises that the existing momentum of the HIV response should be bolstered by new evidence- and rights-based combination prevention tools that are tailored to the needs of specific people and communities, especially those of vulnerable population groups that are disproportionately affected by HIV [1].

In this context, digital tools are considered an innovative method to promote HIV, hepatitis and STIs prevention, testing and treatment and overcome individual and social barriers, especially for young people and hard-to-reach target population groups [2], given the rapid uptake and ubiquity of smartphones and Internet access in Europe. Although notable progress has been achieved recently in the fields of eHealth and mHealth, the main focus has been on the management of non-communicable diseases (NCDs), rather than infectious ones. While a growing pool of HIV/hepatitis/STIs-related apps and online tools exists [3], they mostly target medication adherence and specific groups [4]. Several gaps remain in the implementation agenda, e.g. the inclusion of more key populations and other points along the care continuum besides treatment [4] [5]. In this paper we introduce INTEGRATE RiskRadar, a web-based and mobile application developed in the scope of the INTEGRATE joint action (JA), that aims to enhance the effectiveness of combination prevention for HIV, hepatitis, STIs and TB. By providing integrated information and digital tools regarding all four diseases to the public regardless of gender, age, sexual orientation or insurance status, we aim to eliminate the individual and social barriers to effective adoption of prevention practices, testing and linkage to care, and to thus reduce the incidence and burden of these diseases in EU member states.



Figure 1. Overall RiskRadar development process and landing page for Web tool and mobile app.

2. Methodology

Our design and development approach focused on the assessment of available relevant digital tools to identify promising and innovative features and their consequent adaptation to address all four disease areas. The design of this new integrated ICT (information and communication technology) toolkit accommodates the distinctive needs of various vulnerable groups, i.e., *Young adults* and *men who have sex with men (MSM)* who adopt new partner-seeking and sexual behaviours [6], might engage in illicit drug use [7], report an enhanced need for privacy and anonymity, especially in some countries and demand an attractive and modern user interface (UI) [8]. For *persons who inject drugs (PWID)* risk reduction advice is needed, while *migrants* require a toolkit

with mobility and ubiquity to help them acquire an understanding of additional risk factors. Finally, *prisoners and homeless persons* would benefit from an easily accessible, fast and simple web interface available at clinics and NGO sites, focusing on risk reduction. The RiskRadar development methodology involved three phases (Figure 1).

2.1. Mapping Exercise

First, a mapping exercise was conducted, aiming to identify existing ICT resources addressing combination prevention strategies worldwide with additional focus on tools implemented on a national level in the European region. A "mapping matrix" was introduced to align the data collection process, where a specific structure was proposed, featuring fields describing the tool, the target audience, the disease(s) addressed and its availability. INTEGRATE partners were invited to contribute to this phase by submitting any relevant tool they were aware of. The outcomes of the review were harmonised, resulting in the complete mapping matrix of ICT tools, consisting of 115 candidates.

2.2. Evaluation of Existing Tools

To evaluate the collected tools, we determined the appropriate criteria by analysing the matrix and excluding any non-ICT tools such as online guides, manuals or training modules. These were flagged for further consideration during the JA's capacity building activities. The final list of tools for consideration was reduced to 53 and divided into two groups, according to their respective uses in the care continuum, i.e., **Group A-Prevention**, containing 29 tools related to prevention, harm reduction and PrEP (pre-exposure prophylaxis); and **Group B-Testing**, containing 24 tools related to testing, partner notification and linkage to care. A two-fold, more thorough review of these tools followed based on the following criteria: (a) perceived relevance and adaptability to the JA purposes, and (b) adaptability, reproducibility, and data relevance from a technical standpoint, since the vast majority of the tools addressed a single disease.

The review process identified seven tools that scored high in all criteria, then the results were discussed with respect to their strengths, weaknesses and shortcomings with the JA steering committee members. An initial proposal for the RiskRadar structure was formulated according to the toolkit's intended use, target audiences, and overall scope.

2.3. RiskRadar Components

The proposed toolkit features modular components that could be enabled according to the capacity and intended target audience. The following components were defined: (a) a **Factsheets** component offering basic information regarding the different diseases; (b) a **Risk Calculator** (RC) tool that allows users to assess if they have been exposed to the diseases based on underlying risk assessment algorithms, tailored to each key group's needs; (c) a **PrEP** component to inform the user of this novel prevention tool; (d) a **Test Finder** featuring filtering capabilities per disease, type of point-of-care, and country; (e) a **Reminders** component to help users stay on track with their respective testing schedule; (f) a **Partner Notification** (PN) tool based on the combination of existing services, and (g) a **TB** component offering information and highlighting the differences with the other three disease areas in terms of transmission, prevention, and care. RiskRadar will be piloted in Croatia, Italy and Lithuania; thus appropriate translations of its components have been prepared to accommodate language barriers.

Risk Calculator	Result:
Are you vaccinated for hepatitis B?	Condoms when used always and correctly are very effective at preventing HIV and reducing a risk of 511. Take the Condom Test to help you choose the right condom for you.Other sexual acts such as fisting and sharing sex toys without cleaning them alterwards can also expose you to hepatitis and S11s. It is recommended to get tested at least twice per year or more often if you have sex often and with different partners.
← Risk Calculator	🏸 You might have been exposed to HIV and hepatitis through shared injecting equipment; you should get tested. Remember that
	injecting or using drugs exposes your health to other risks and harms. If you would like to stop using drugs but cannot make it on your own, it is important that you seek help. You can also seek advice and learn about harm reduction strategies, in order to reduce as much as possible the risks associated to drug use.
Integrate	🛞 It is recommended that all gay and bisexual men get vaccinated for Hepatitis A & B; consider asking your medical doctor for a
Why are you using this risk calculator?	Hepatitis A & B vaccination (You will need a test before getting vaccinated).
I am HIV+ I My partner is HIV+ I Both me and my partner are HIV+ I had condomless sex with someone	Screening for hepatitis C is recommended if you come from Central Asia; Asia; Sub-Saharan Africa; Middle-East; Central and South America where the virus is highly prevalent.
I inject drugs film just curious	Tuberculosis is highly prevalent in Eastern Europe, Sub-Saharan Africa or Asia - so if you originate from these regions it is recommended to consult a medical doctor for TB screening.
CONTINUE	Got it! Retake quiz Take the condom test

Figure 2. (a) Question of the RC component in the web app (upper left part) and question from the RC component in the mobile app (lower left part); (b) the result of the RC (right part).

2.4. Design and Development Considerations

The main challenge concerned the RC component, since (to the authors' knowledge) a comprehensive tool for calculating the inextricable nature of the combined risks for all four disease areas tailored to the high-risk key populations consisting RiskRadar's end users is missing. A consolidation of all available guidelines by WHO and ECDC reinforced the algorithms derived by the previous analysis of the partial risk assessment tools for each disease. The RC decision tree resulted from an extensive iterative process of obtaining input from all partners, while its final release was approved for official translation in the piloting countries' languages. As regards the information components, contacts with central information sources were established, such as NAM for the Test Finder, "PrEP in Europe" for the PrEP component and ECDC for the factsheets.

Overall, the design approach relied on (a) *effective communication strategies* outlined by WHO and ECDC, and (b) *informed UI design* based on the literature findings of relevant websites and mobile apps [9]. Emphasis was placed on offering adequate information to the user to make informed decisions and possibly adjust risky behaviours while keeping users with low health/eHealth literacy engaged with the app.

3. Results

RiskRadar is available as a web application and as native Android and iOS mobile apps, integrating the various components presented in section 2.3. Overall, our development approach was based on the following pillars: (a) *easy to update content* and (b) *adaptable content to fit diverse target groups*, via a modular design for the RC answers which can be independently modified according to the target audience (**Figure 2**); (c) *easy to use, intuitive and interactive UI*; (d) *use of acceptable, non-judgmental, non-threatening and non-fear-inducing language and imagery*, through an iterative process of consulting with various public health institutions and relevant NGOs; (e) *patient empowerment* by providing direct PN services as well as a self-evaluation risk calculator tool, and (f) *ensure that the user feels safe and also that their trust, privacy, and confidentiality are clearly perceived while using the app*. The latter is achieved by establishing privacy and cookie policies that explicitly state the anonymisation and encryption mechanisms

employed, featuring them prominently in the application; namely the use of anonymous, unique random codes to access the PN component, the encryption and enhanced security during data transfer and the absence of any identifiable information in the RC component.

Each pilot country targeted different populations. Currently, the pilot sites are testing RiskRadar before its release to the public. The outcomes of the pilots will be used to evaluate RiskRadar's effectiveness and usability. A short questionnaire was added to support pilot exercise, given that it is difficult to evaluate the effectiveness of ICT tools' in the prevention of the four diseases. This is because measures such as the number of web accesses or downloads do not give a precise measure of the usefulness of ICT tools. Nonetheless, RiskRadar has the potential to be an appealing source of information for the prevention and testing of these diseases. Especially for people who encounter barriers to care, RiskRadar could facilitate entry to and retention in the healthcare system.

4. Conclusion

In this paper, we presented the overall approach regarding the design and development of an integrated toolkit accessible over the web or a dedicated mobile application, in line with the current public health authorities' guidelines. The development of RiskRadar exploits the expertise and various insights from INTEGRATE's inter-disciplinary consortium, thus enabling the synergy of biomedical and behavioural prevention and offers a new level of privacy, confidentiality and security as well as the opportunity to satisfy the diverse needs of various target groups at the same time (scalability).

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