



Published in final edited form as:

Health Promot Pract. 2026 September ; 27(5): 869–874. doi:10.1177/15248399241305394.

Digitizing a Travel Health Resource: Lessons Learned From Implementing a User Experience Framework to Improve a Travel Health Website

Suraj Arshanapally, MPH¹

¹Centers for Disease Control and Prevention, Atlanta, GA, USA

Abstract

User experience (UX) is a key element in the design of effective public health websites. The Centers for Disease Control and Prevention (CDC) Yellow Book, a key travel health resource published by the U.S. CDC, adapted its print publication into a free companion website in the late 1990s to increase the resource's online reach and allow for more frequent updates of content. This process did not adopt a digital-first approach, leading to UX gaps such as barriers to finding relevant content, poor visual appeal, and inaccessibility on mobile devices. On May 10, 2023, the CDC Travelers' Health Branch implemented a UX update for the CDC Yellow Book 2024 website to improve the website's overall structure, content, and functionalities. This meant that the previous CDC Yellow Book 2020 website was replaced with the updated CDC Yellow Book 2024 website. Website metrics from Adobe Analytics were collected to show the outcomes of these updates. The CDC Yellow Book 2024 website received 5,726,545 page views for the year following the UX update, which was a 46% increase in web traffic compared to the CDC Yellow Book 2020 website the year prior to the update. In addition, there were 2,375,995 users who returned to the CDC Yellow Book 2024 website seven or more days after their first visit. This case study provides an overview of how the UX framework was used for the CDC Yellow Book 2024 website, which includes describing the lessons learned to inform future digitization efforts for health promotion tools.

Keywords

user experience; health communications; health promotion; information technology; public health practice; public health websites; travel health

INTRODUCTION

Travel health is a critical aspect of public health that focuses on the prevention and management of health risks associated with international travel. As international travel increases, the need for effective travel health communication becomes crucial. Health care professionals who specialize in travel health play an essential role in providing evidence-

Address correspondence to Suraj Arshanapally, Health Communication Specialist, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road NE, Mail Stop H16-4, Atlanta, GA 30329, USA; otv1@cdc.gov.

based recommendations and guidance to mitigate health risks and promote safe travel practices among their patients (Yazdian Anari et al., 2015).

The *CDC Yellow Book: Health Information for International Travel*, commonly referred to as the CDC Yellow Book, is a key travel health resource published by the U.S. CDC. The CDC Yellow Book compiles the U.S. government's most up-to-date health-related travel recommendations, including pre-travel vaccination guidance and destination-specific advice on managing health risks (CDC, 2024). For decades, the CDC Yellow Book has served as an authoritative resource for health care professionals. In the late 1990s, the CDC adapted the print content into a free companion website to increase the resource's online reach and allow for more frequent updates of content.

User experience (UX) is a key element in the design of effective public health websites (Hasson et al., 2024; Imlawi, 2017). Successful UX ensures that public health websites are designed using a human-centered approach, solving the problems of the users as well as providing an intuitive interface to access the information needed. In a study conducted by Alqahtani and Orji (2020) on the UX reviews of mental health applications (apps), they found that users placed a high emphasis on the user experience of the app. The study found that poor usability of the app was the most common reason for abandoning the app, emphasizing the importance of UX in health promotion practice. In the context of travel health, a well-designed CDC Yellow Book website has the ability to make critical travel-related health information and recommendations easily accessible to health care professionals.

PURPOSE

Since the print content was digitized in the late 1990s, the CDC Yellow Book website has evolved. However, the digitization processes for each edition did not adopt a digital-first approach, an approach that optimizes content for the digital landscape, leading to several UX gaps such as barriers to finding relevant content, poor visual appeal, and inaccessibility on mobile devices. Noting the outdated user interface, the CDC Travelers' Health Branch implemented a UX update to the CDC Yellow Book 2024 website to address these challenges.

The objective of this case study was to provide an overview of how the UX framework was used for the CDC Yellow Book 2024 website, which includes describing the lessons learned to inform future digitization efforts for health promotion tools.

METHODS

Health communication specialists within the CDC collaborated with web developers using an iterative design process to improve the website. Wireframes and mockups of various elements from the existing website were developed, incorporating internal feedback from health care professionals who specialize in travel health and health communication specialists. Once consensus was reached on the design, web developers created functional prototypes, which were subsequently reviewed by the same experts and specialists for further input. Once the prototypes were approved, the CDC implemented the UX update on

May 10, 2023. This meant that the CDC Yellow Book 2020 website was replaced with the updated CDC Yellow Book 2024 website.

To evaluate the outcomes of these updates, website metrics were collected using Adobe Analytics, a web analytics software, for one year after the update, from May 10, 2023, to May 9, 2024. These metrics were then compared with the data from the year prior to the UX update, covering the period of May 10, 2022, to May 9, 2023. This project did not involve human data or participants; therefore, an Institutional Review Board (IRB) assessment was not necessary per the policy of the CDC.

The UX Honeycomb is a framework used for evaluating and improving the UX for digital platforms and products. Developed by Peter Morville (Semantic Studios, 2004), the framework ensures that UX updates consider and identify opportunities to improve seven essential features: *usability*, *usefulness*, *credibility*, *findability*, *desirability*, *accessibility*, and *value*. Using features from this framework, the CDC Travelers' Health Branch implemented the following tactics:

Health care professionals were consulted to obtain the most up-to-date recommendations for over 180 travel health topics to be included as chapters in the publication, an effort to improve *usefulness* and *value*. To establish *credibility*, over 300 authors considered experts in their fields were asked to write new chapters for health care professionals on how to counsel patients based on their possible exposure risks during their travel.

The home page (Figure 1) was redesigned to communicate the brand identity and enhance visual appeal, a tactic to improve *desirability*. On the home page, the updated design featured the top visited chapters, a map directory, new chapters, and popular travel itineraries. The print publication cover of a kayaker in a Romanian cave was used on the home page to make a strong first impression. In addition, a more visually appealing table of contents was developed, which included banners with high-quality images.

Search engine optimization (SEO) techniques, which are tactics to optimize web content for higher rankings in search engines, were applied. An approach to improve *findability*, SEO tactics ensured that webpages used strategic travel health keywords that health care professionals would search for online and that the webpages were up-to-date. These tactics help search engines recognize the value of the content to the audience (Loktionova, 2024). To facilitate easy navigation and *usability*, chapters were structured in scannable formats, featuring quick-access menus at the top of each webpage. Breadcrumbs, a navigational aid used in website design to help users understand the hierarchy of the website structure and their current location, were used. Internal linking between chapter webpages was included to enable users to seamlessly access relevant topics without having to scan the entire website.

A library of data tables, figures, and maps was organized. This approach aimed to address the chronological categorization of the previous version, where resources were listed by their placement in the print version and by their formats (e.g., tables, boxes, maps, figures) rather than by subject matter.

To support *accessibility*, efforts were made to improve responsive design, which ensures that a website's content displays appropriately regardless of varying screen sizes such as desktops or mobile devices. For instance, on the CDC Yellow Book 2020 website, the maps appeared appropriately for desktop devices but spilled off the screen for mobile devices. Therefore, the CDC Yellow Book 2024 used a responsive design to ensure maps were also accessible on mobile devices (Figure 2).

OUTCOMES

The CDC Yellow Book 2024 website received 5,726,545 page views for the year following the UX update, which was a 46% increase in web traffic compared to the CDC Yellow Book 2020 website the year prior to the update. Additionally, there were 2,375,995 users who returned to the CDC Yellow Book 2024 website seven or more days after their first visit. In comparison, the CDC Yellow Book 2020 website had 1,687,653 users return to the website after seven or more days.

Search Engine Referrals

The CDC Yellow Book 2024 website amassed 4,087,953 page views from search engines, which accounted for 71% of the total web traffic to the site. In comparison, the 2020 edition garnered 2,635,503 page views from search engines, accounting for only 67% of the total web traffic to the site the year prior.

Page Views

The CDC Yellow Book 2024 home page received 204,315 page views, a 13% increase in web traffic compared to the 2020 edition's home page during the year before the update. The Table of Contents received 146,952 page views, a 52% increase compared to the year prior to the UX update.

Website Engagement

For the CDC Yellow Book 2024, the number of page view sessions lasting over one minute was 1,359,791, which accounted for 49% of the total page view sessions. In comparison, there were 943,172 page view sessions for the 2020 edition lasting over one minute, which was only 46% of the total.

Of all the page views, more than half of the content on a specific CDC Yellow Book 2024 webpage was scrolled through 1,591,200 times, which was 38% of the total. In comparison, more than half of the content in the 2020 edition's website was scrolled through 1,295,923 times, which was 41% of the total. Even though people spent more time on the 2024 edition's webpages, they scrolled through more of the content within the 2020 edition.

Mobile Devices

The CDC Yellow Book 2024 website experienced 2,315,081 page views originating from mobile devices, which accounted for 40% of the total page views. In comparison, the CDC Yellow Book 2020 website received 1,370,106 page views from mobile devices, which accounted for only 35% of the total page views.

LESSONS LEARNED

The following lessons from implementing a UX framework for a public health website aim to support future digitization efforts in health promotion practice.

Adopt Digital-First Strategies From the Conception

Historically, the CDC Yellow Book has been primarily a print publication; however, a key lesson learned is the importance of adopting a digital-first strategy from the outset. Data tables from the print edition did not display properly on mobile devices due to numerous columns, a challenge observed for both editions. Implementing a digital-first approach, which includes considering how a print data table would display on varying digital devices, allows the content to retain its usability and integrity when the content is transferred to digital platforms, reducing the need for extensive rework and modifications during the transition phase.

Prioritize the Primary Audience

While the CDC Yellow Book 2024 website targets health care professionals, it is also accessed by international travelers. Acknowledging that multiple audiences use this website, it is vital to remain loyal to the primary audience. Attempting to cater to all potential users can dilute the effectiveness of the website in achieving its primary goals.

Obtaining feedback from health care professionals allowed for the content to focus on the primary users' needs. The rise in search engine referrals to the CDC Yellow Book 2024 website demonstrated the success of implementing intentional UX efforts to improve SEO. This lesson served as a reminder that any additional appeal to secondary audiences, such as international travelers, is an added benefit, not a primary focus.

Conduct Web Usability Tests

When developing a public health website, it is crucial to understand how the primary audience interacts directly with the website to ensure that UX improvements are genuinely effective. For instance, people scrolled through more of the content within the 2020 edition, even though they spent more time on the 2024 edition's webpages. Web usability tests, a UX research method that involves observing how real users interact with the website to understand user behaviors and preferences, would have provided insight into what users are looking for on these webpages. These user-testing methodologies have been shown to improve the effectiveness of digital public health tools (Denton et al., 2016; Jake-Schoffman et al., 2017).

LIMITATIONS

These web metrics have several limitations that must be acknowledged. First, the observed web traffic could not be directly linked to the UX updates since a formal study specifically designed to assess the impact of these efforts was not conducted. Second, behavioral factors such as the post-COVID surge in travel may have led more users to the CDC Yellow Book 2024 website. Third, broader technology trends, such as the increasing popularity of

mobile device usage for online information access, may have influenced user engagement and session duration.

CONCLUSION

The UX tactics used on the CDC Yellow Book 2024 website offer valuable insights for future digitization efforts of public health tools. The lessons learned from the implementation of this UX framework underscore the importance of human-centric design and digital-first approaches, particularly in public health products employing both print and digital formats. Public health professionals can use these efforts as a roadmap for building public health websites and digitizing public health tools.

Author's Note:

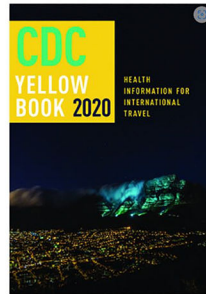
The author acknowledges the following people for their contributions and support in making the UX project possible: Jessica Allen Tchoukalov, Kristina Angelo, Lauren Blackmun Elsberry, Justine Chung, Ellie Glynn, Eric Halsey, Tanya Hamburger, Fariha Hossain, Jane Keir, Debra Lowery, Jeffrey Nemhauser, Alyssa Ostroff, Susan Schuffenhauer, and Tiarra Starr. The findings and conclusions in this report are those of the author and do not necessarily represent the official position of the U.S. CDC.

REFERENCES

- Alqahtani F, & Orji R (2020). Insights from user reviews to improve mental health apps. *Health Informatics Journal*, 26(3), 2042–2066. 10.1177/1460458219896492 [PubMed: 31920160]
- Centers for Disease Control and Prevention. (2024). CDC yellow book 2024: Health information for international travel. <https://wwwnc.cdc.gov/travel/page/yellowbook-home>
- Denton AH, Moody DA, & Bennett JC (2016). Usability testing as a method to refine a health sciences library website. *Medical Reference Services Quarterly*, 35(1), 1–5. 10.1080/02763869.2016.1117280 [PubMed: 26794192]
- Hasson RE, Xie M, Tadikamalla D, & Beemer LR (2024). Using a human-centered design process to evaluate and optimize user experience of a website (InPACT at home) to promote youth physical activity: Case study. *Journal of Medical Internet Research Human Factors*, 11, Article e52496. 10.2196/52496
- Imlawi J (2017). Health website success: User engagement in health-related websites. *International Journal of Interactive Mobile Technologies*, 11(6), Article 6959. 10.3991/ijim.v11i6.6959
- Jake-Schoffman DE, Silfee VJ, Waring ME, Boudreaux ED, Sadasivam RS, Mullen SP, Carey JL, Hayes RB, Ding EY, Bennett GG, & Pagoto SL (2017). Methods for evaluating the content, usability, and efficacy of commercial mobile health apps. *Journal of Medical Internet Research Mhealth and Uhealth*, 5(12), Article e8758. 10.2196/mhealth.8758
- Loktionova M (2024). The art of content optimization: The complete 2024 guide. Semrush. <https://www.semrush.com/blog/content-optimization-guide/>
- Semantic Studios. (2004). User experience design. https://semanticstudios.com/user_experience_design/
- Yazdian Anari P, Vaghefi M, Sepehri M, Sheibani-Tehrani D, & Habibi M (2015). Travel medicine: A systematic review. *International Journal of Travel Medicine and Global Health*, 3(3), 107–109. 10.20286/ijtmgh-0303109

CDC Yellow Book 2020 Home Page

CDC Yellow Book


[Table of Contents](#)
[Online Updates to the Yellow Book](#)

Purchase a Copy

Online at Or call 1-800-451-7556. Ask for ISBN# 978-0-19-092893-3 for paperback and 978-0-19-006597-3 for hardback.

You can also order a copy from major online booksellers, such as Amazon and Barnes & Noble.

About the Yellow Book

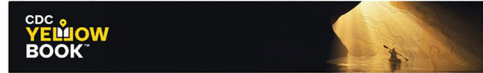
CDC Yellow Book 2020: Health Information for International Travel is published every two years as a resource for health professionals providing care to international travelers. The fully revised and updated CDC Yellow Book 2020 compiles the US government's most current travel health guidelines, including pretravel vaccine recommendations, destination-specific health advice, and easy-to-reference maps, tables, and charts.

The CDC Yellow Book 2020 includes important travel medicine updates:

- Recommendations for providing travel health care remotely via telemedicine
- Discussion of legal issues facing clinicians providing travel health care
- Cutting-edge rapid diagnostic tests for infectious diseases
- Introduction of new FDA-approved antimalarial drugs
- Road traffic safety advice for travelers
- Recommendations for treating infectious diseases in the face of increasing antimicrobial resistance

CDC Yellow Book 2024 Home Page

CDC Yellow Book



CDC Yellow Book: Health Information for International Travel is a resource for healthcare professionals providing care to international travelers. It compiles the US government's most current travel health guidelines, including pretravel vaccine recommendations, destination-specific health advice, and easy-to-reference maps, tables, and charts.

[About](#) [Table of Contents](#) [Resources](#)

Order a print copy of CDC Yellow Book 2024 from [Oxford University Press](#) and other major online booksellers such as Amazon and Barnes & Noble.

Featured Chapters


[Yellow Fever Vaccine & Malaria Prevention Information](#)

[Malaria](#)

[Yellow Fever](#)
[View All](#)
[Highly Allergic Travelers](#)
[Traveling with Pets & Service Animals](#)
[Medical Tourism](#)
[High Elevation Travel & Altitude Illness](#)
[LGBTQ+ Travelers](#)
[Traveling Safely with Children & Infants](#)

CDC Yellow Book Maps



CDC Yellow Book 2024 offers destination-specific maps, including maps on dengue, malaria, and yellow fever.

[View All](#)

Popular Itineraries


[Egypt](#)

[Mexico](#)

[Thailand](#)
[View All](#)

[Submit Feedback](#)
If you have any questions or feedback, please submit an inquiry to [CDC-IDDT](#).

[Get Travelers' Health Updates](#)
Connect with us on [Facebook](#) and [Twitter](#).

[Stay Connected on Figure 1](#)
If you have a [Figure 1](#) account, follow us at ["CDCtravel"](#) once you log in.

FIGURE 1.

Comparison (Before UX Update and CDC Yellow Book 2024) Between CDC Yellow Book 2020 (After UX Update) Home Pages

