An innovative mobile app for educating teens and young adults about reproductive health and wellness including sexually transmitted infections, pregnancy and contraception

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ABSTRACT

Objective: The authors studied the use of a new mobile app technology platform to offer easy access to accurate, evidence-based comprehensive reproductive health information with links to resources for teens and young adults to enhance wellness and reduce the risks of HIV, other STIs, pregnancy, and complications such as infertility and pelvic inflammatory disease.

Methods: The Healthy Teens Mobile App was designed, developed, tested, and implemented to deliver up-to-date sexual and reproductive health education based on science and written by experts. Initial testing was done for useability, readability and ease of navigation of the app.

Results: Beta testing among teens, young adults, parents, health educators, and nurse clinicians (n = 32) revealed the app was valuable, engaging, and could be revised to improve flow and functionality. 60% strongly agreed and 40% agreed the app was valuable, with important information and resources on sexual health and wellbeing. 55% strongly agreed and 45% agreed the images improved the experience of using the app and the text size was adequate for readability. Other comments were utilized to enhance the app, add more images, and decrease the amount of white space on certain sections of the app. The app was released in June 2024 in both the Apple & Google App Stores.

Conclusions: Utilizing a mobile app to delivery evidence-based sexual and reproductive health information for teens and young adults is practical and well accepted by teens, young adults, parents, health educators, and nurse clinicians. Plans are underway to disseminate the app widely. Future plans include translating the app into Spanish, French and other languages to promote global sexual and reproductive health and wellness and reduce the risks of HIV, other STIs, pregnancy, and complications such as infertility and pelvic inflammatory disease.

Key Words: Contraception, Pregnancy, Sexually transmitted infections, Teens, Young adults, Patient education, Smartphone, Application

1. INTRODUCTION

While there was a decline during the pandemic, the Centers for Disease Control and Prevention (CDC) recently released new data showing Sexually Transmitted Infections (STIs) are increasing with more than 2.5 million cases of chlamydia, gonorrhea, and syphilis reported in 2022.[1] Over the past decade, from 2011 to 2021, STIs have increased by 42 percent. The CDC data showed new gonorrhea cases

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dropped for the first time in 10 years, while chlamydia cases held steady during the same period, and total syphilis cases jumped with a 17% increase to 203,500, the highest number reported since 1950. A new CDC analysis reported people giving birth in 2024 were 3 times more likely to have syphilis than in 2016.[2] There is a 70% chance of passing congenital syphilis to the infant if untreated.[3] With 26 million new STIs reported annually, STIs are some of the most common infections. Of these new sexually transmitted infections, half are among young people 15-24 years of age. This makes education and screening of teens and young adults so important for preventing the spread of disease and as well as preventing other complications such as infertility and increased risk of HIV. According to the latest teen statistics:[4, 5]

- 64% of all teens had sex by the time they are seniors in high school
- 39.8% did not use a condom the last time they had sex
- 29.8% had sex during the previous 3 months

Increased numbers of sexual partners create a greater risk to contact a STI. However, a recent survey found that a large majority of people are unaware of how common STIs are and do not have adequate information to protect themselves.[6] The Healthy Teen Network reports "too many young people fail to receive the sexual health information, education, and access to care they need to live healthy lives."[7] The literature demonstrates reproductive health education for teens that is inclusive as well as culturally responsive aids in young people developing the emotional and social skills necessary to become kind and empathetic adults able to protect themselves from STIs and/or pregnancy.[8] However, organized, well-funded right-wing groups continue with attempts to dismantle our nation's public schools by limiting access to comprehensive sex education. Many states have passed bans on discussing sexual health information topics in K-12 environments further limiting access to accurate information for teens.[7] Too many young people do not have access to accurate sexual health information.

The U.S. teen birth rate is high compared to other western industrial nations, with racial, ethnic, and geographic disparities.[9–11] The birth rates for Hispanic teens (25.3) and non-Hispanic Black teens (25.8) were more than two times higher than the rate for non-Hispanic White teens (11.4), and the birth rate of American Indian/Alaska Native teens (29.2) was highest among all race/ethnicities.[9] Across and within states, geographic differences in teen birth rates exist; even in states with lower overall teen birth rates, some counties have high teen birth rates. In Illinois, all counties ranking in the 90th percentile of the CDC Social Vulnerability Index Report had teen births above the state average of 4.2%.[12] Social Determinants of Health (SDOH) such as low educa-

tion and low family income levels contribute to high teen birth rates.[13] Additionally, teens living in foster care are two times more likely to become pregnant than those not in foster care.[14] Teen pregnancy and childbirth contribute significantly to high school drop-out rates; approximately 50% of teen mothers obtain a high school diploma by age 22, while 90% of teens not giving birth obtain a high school diploma.[15] Children of teen mothers are more likely to drop out of high school, have lower academic achievement, have more health problems, be incarcerated during adolescence, give birth as a teenager, and be unemployed.[16] Accessible and free reproductive health information and education is key in reducing teen birth rates.

The proliferation of mobile app technologies offers an opportunity to provide accurate reproductive health information for teens and young adults that is affordable, reachable for disenfranchised and/or rural populations, and easy to access even in far-reaching geographic areas. Mobile apps may be utilized for educating the public by providing relevant health promotion and disease management information. The use of mobile health technology is cost effective and enhances accessibility. Mobile apps increase access to health information, patient involvement in care, and reduce costs leading to enhanced health outcomes.[17] In 2022 the number of health and wellness apps available was estimated to be 350,000 worldwide.[18] By enhancing patient engagement, mobile health apps lead to improved health outcomes revolutionizing healthcare delivery.[19]

Social media contains an abundance of inaccurate information and myths on many healthcare topics which is dangerous for teens as noted in the American Medical Association (AMA) Pediatric Journal.[20] The AMA study noted schools should offer education on media literacy, so students learn to distinguish fact from fiction since teens increasingly rely on online, non-expert sources for advice. Recognizing the impact of and increasing use of mobile app technology, the authors designed a safe, secure, private, human-centered, age appropriate, confidential, and effective app for teens and young adults for disseminating accurate, evidence-based sexual health information. The authors designed, developed, and implemented the Healthy Teens App. The goal of the app is to provide access to up-to-date and accurate sexual health information based on science and written by experts to enhance health and wellness and decrease the health risks of HIV, other STIs, and pregnancy. The app aims to improve teens and young adults' ability to better understand their own reproductive health with links to resources, support, and published evidence-based guidelines.

2. Methods

2.1 App design and development

The app was designed to offer comprehensive, free, easily accessible sources of information about sexual health and wellbeing with links to resources and support. The target users of the app were teens, young adults, parents, and health educators. A collaboration was formed between the content creators (nurse educators at the University of Illinois Chicago College of Nursing), the Administrative Information Technology Services (AITS), and the intellectual property experts in the UIC Office of Technology Management to develop the app over a 1 and 1/2 year timeframe.

The content for the app prototype was created based on current evidence-based literature and guidelines. The reading level for the app was designed for a general audience at a 6th grade level and all content was written in English. The AITS developers utilized html coding and CSS3 for formatting to produce several versions for use on a wide range of Apple and Android devices including iPads, phones, and tablets. Internal testing and quality control were carried out continuously throughout the process of app development and numerous versions of the app prototype were produced and revised. The app was designed with links to reputable resources for more information from websites such as the CDC. The links were provided in each section in a tab button to avoid lengthy lists of links on each screen. The tab could be clicked to open and close allowing the users to return to the app's content.

The icon shows the app's purpose of providing accurate reproductive health information for male and female sexual health. To establish visual appeal and convey the purpose of the app as a confidential source of evidenced-based information and resources, the design was developed in collaboration with the authors and a graphic designer. The colors of the icon are University of Illinois Chicago logo colors mixed with the Gen Z colors of neon green, bright sunny yellow, millennial pink, all-inclusive lavender, and vivid magenta. To cater to the Gen Z's aesthetic, gradients were used (see Figure 1).

The Healthy Teens App content organization was carefully considered to utilize a "wireframing process" to provide a graphic guide of the app layout and the flow of information from screen to screen. The wireframes were organized for users to navigate easily through the app. A "home" screen was added with "next" and "back" arrows to allow flow through the content screens. App users could visit any screen based on their individual area of interest for information and were not required to visit in any particular order.

Figure 1. Healthy teens app icon

The content was organized into sections and chapters within each section. On the app Home Page the sections were developed and designed with graphics to display the topics in each section. The first section is titled "My Body" and includes chapters reviewing the male and female anatomy, and reproductive health terms. The next section is named "Let's Talk About It" and offers strategies for effective communication skills. The third section gives readers a summary of the "Common STIs" with interactive tabs. The fourth section offers information on "Birth Control and Pregnancy". The next section gives users interactive activities with "Myths & Truths" and a "Quiz" providing users to learn the facts from fiction and then assess their own knowledge of what was learned (see Figure 2).
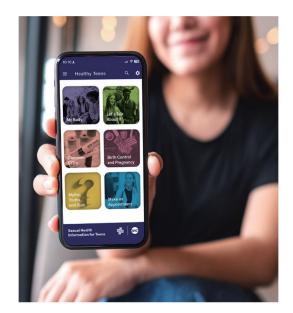

Figure 2. Healthy teens app home screen

For people living in the Peoria Regional Area, the last section is available for inquiring how to make a confidential appointment. This section links users to the ENRICH Project website where the locations, dates, and times will be posted for patients seeking care on the Mobile Health & Wellness Services Bus. The Mobile Health and Wellness Services will be discussed and disseminated in a separate publication (see Figure 3).

Figure 3. Mobile health & wellness services bus

2.2 App testing

While in-house testing was conducted constantly throughout the app development process, external beta testing of the Healthy Teens App was also done to identify issues, obtain feedback, and make revisions. The beta testers included teens, young adults, parents, health educators, and practicing nurse clinicians caring for patients with STIs, pregnancy and providing contraceptive services. Qualitative observational study sessions were held among a convenience sample of small groups of teens, young adults, and parents to examine usability and functionality of the app. Eligible participants included English speaking people ranging from 12 to 64 years of age. Eligible participants provided verbal consent prior to recruitment and those under the age of 18 also had consent of a parent/guardian to participate. No one was excluded from participation based on race, ethnicity or gender.

The app prototype was approved by Apple for a controlled online limited time beta test in a program known as, "Test Flight." The authors, with the assistance of AITS and the Technology Office, uploaded the app Test Flight prototype onto 6 iPads for the beta testing sessions. The testers were supplied with iPads to use the app without instructions for 15 minutes during which the authors observed for usability, readability, and ease of navigation. After the observation, the participants were given 10-20 minutes more time to use the app during which the authors interviewed them in small focus groups about the usability, readability, and ease of navigation. The Technology Office assisted with developing the interview questions on readability, usability, and ease of navigation (see Figure 4).

Visual/Observation Assessment:
- ☐ Ease of navigation (from screen to screen)
- ☐ Readability (font, text size)
- ☐ Usability of visual controls and icons

Interview Questions:
Navigation:
- ☐ Were the navigation arrows clear and easy to understand?
- ☐ Did you understand how to scroll and change views?
- ☐ Did you know how to change out of "book view?"

Readability:
- ☐ Was the font easy to read?
- ☐ Did you know how to change font size?
- ☐ Did the pictures provide visual cues?

Usability:
- ☐ Was it obvious if the text was interactive vs. view only?
- ☐ Was the menu intuitive?
- ☐ Do you need a tutorial on how to use the app?

Figure 4. Beta testing assessment

Selected teens, young adults, health educators, parents, and practicing nurse clinicians were also invited by the authors to beta test the app on their own devices. AITS was provided with the email addresses of each selected beta tester. Test Flight was utilized to invite these beta testers using their email address and sharing an invite to a link. Once they accepted the invitation, they were directed to the app prototype. They were instructed to access the app, examine

the subject matter, and complete an online feedback survey created by the authors. The survey asked questions about the content, value, practicality, links to the evidence-based resources, usefulness, and formatting.

3. RESULTS

32 total participants completed the beta testing of the app. The testers found the content "important and useful." The testers "liked the images" and requested more images. To assist with navigation, the testers requested bolder formatting of the arrows for the "back" and "next" buttons. The design of the app was revised to include a Contents Table, Search Chapters function, and a Provide Feedback button. The Provide Feedback button links users to a Qualtrics Survey created by the authors to assess role of the user, age, gender identity, ease of navigation, functions they would like added, features most and least useful/important, anything missing, other comments, issues or suggestions as well as provide ongoing quality improvement.

The results of the initial beta testing revealed 60% strongly agreed and 40% agreed the app was valuable, with important information and resources on sexual health and wellbeing for teens and young adults. 55% strongly agreed and 45% agreed the images improved the experience of using the app and the text size was adequate for readability. Negative feedback included comments such as, "too much white space," "arrow keys are not easily found to expand and collapse," and "need more images." The feedback was utilized to enhance the app, add more images, and decrease the amount of white space on certain sections of the app.

The beta testing of the usability, navigation, and functionality led to numerous revisions after which prototype number 27 was launched in June 2024. In the first 2 weeks after the release of the app, it has been downloaded/viewed over 60 times. The authors expect this number to grow and are in the process of developing and implementing a plan to facilitate the wide distribution of the free Healthy Teens App. The Healthy Teens App is freely available in the Apple Store at: `https://apps.apple.com/us/app/healthy-teens/id6453942069` and in the Google Play Store at: `https://play.google.com/store/apps/details?id=edu.uic.nursing.healthy_teens`.

4. DISCUSSION

The authors designed and developed the Healthy Teens App to provide accurate, evidence-based sexual health and wellness education, including myths/truths, a quiz, and links to important resources and support. Initial beta testing provided valuable feedback leading to considerable improvements in the organization and presentation of the app.

Currently there is a dearth of misinformation available on social media for teens and young adults related to sexual health. This misinformation can lead to harm.[18] Teens and young adults' utilization of social media is common and prevalent. The Healthy Teens App was written by experts to offer easily accessible, accurate, up-to-date reproductive health information based on science to promote health and wellness and reduce the risks of HIV, other STI's, and pregnancy. The app aims to improve teens and young adults' ability to better understand their own sexual health with links to resources, support, and published guidelines that are accessible in a safe, secure, and confidential manner. The app fills a gap, specifically the need for a comprehensive centralized source of information about reproductive health which is evidence-based and draws on published guidelines.

Six months after the initial app release, the authors plan to update the app and expand the user engagement. Strategies will include push notifications, regularly updated content, and more dynamic features with enhancements to the quiz interface with varying difficulty levels, immediate feedback for each answer, and a quiz score.

Working closely with the College of Nursing Global Health Leadership Office, future plans will include translating the Healthy Teens App into Spanish, French, and other additional languages, which may lead to global dissemination. This will increase awareness and provide additional populations with the knowledge and skills to better understand and promote sexual health and wellness. The authors will be developing a plan to measure impact across different populations and cultural contexts. Continuous ongoing testing and revisions will occur and be valuable as the effectiveness of the app is studied in other populations.

5. CONCLUSION

The authors utilized mobile app technology to create a "comprehensive reproductive health and wellness information platform" to reach the largest audience of teens and young adults possible to increase awareness, and to provide education with links to resources and support. Reproductive health and wellness can be improved by enhancing access to free, accurate, evidence-based information and resources. The app provides a confidential space to empower and educate teens and young adults to better understand their reproductive health. Education about STIs, pregnancy, and contraception is essential in creating a society better prepared to promote reproductive health and wellness and reduce the risks of HIV, other STIs, pregnancy, and complications such as infertility, and pelvic inflammatory disease.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

INFORMED CONSENT

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The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

DATA SHARING STATEMENT

No additional data are available.

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