Scaling up mHealth interventions for youth: what will it take?

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Adherence 2018 • June 8-10 • Miami

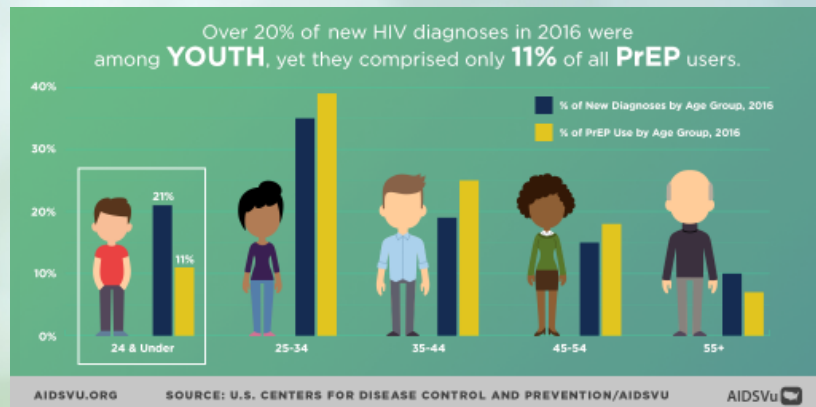# Disclosure statement

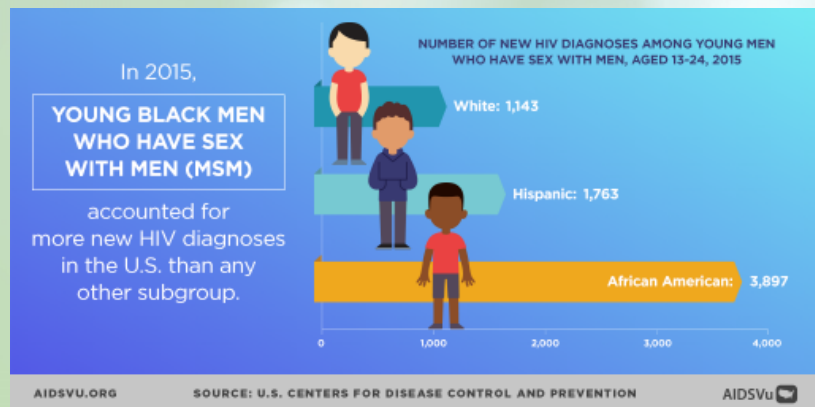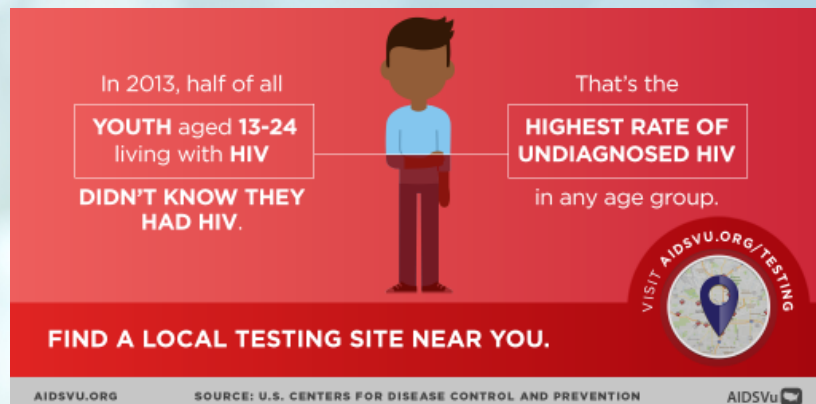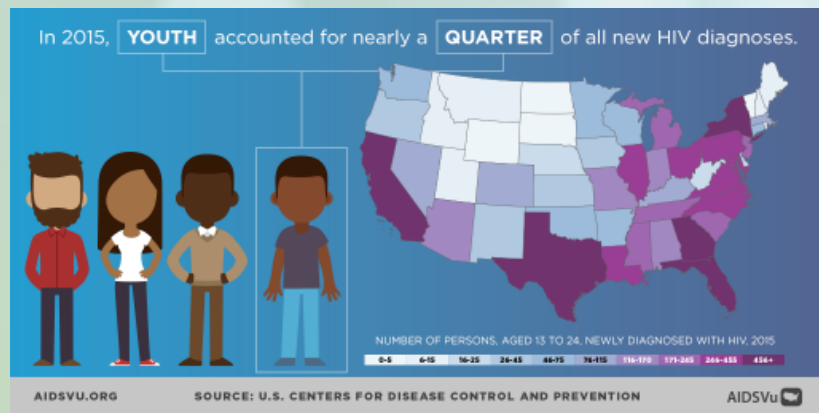- I have no relevant disclosures.

Learning Objectives

- Identify key strategies to promote successful implementation of mHealth interventions for youth.

- Discuss potential ways to increase the scale-up and dissemination of mHealth interventions for youth.

The issues are clear

In 2015, **YOUTH** accounted for nearly a **QUARTER** of all new HIV diagnoses.

NUMBER OF PERSONS, AGED 13 TO 24, NEWLY DIAGNOSED WITH HIV, 2015

0-5 6-15 16-25 26-45 46-75 76-115 116-170 171-265 266-455 456+

AIDSVU.ORG   SOURCE: U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION   AIDSVu

In 2013, half of all **YOUTH** aged **13-24** living with **HIV** **DIDN'T KNOW THEY HAD HIV.**

That's the **HIGHEST RATE OF UNDIAGNOSED HIV** in any age group.

VISIT AIDSVU.ORG/TESTING

FIND A LOCAL TESTING SITE NEAR YOU.

AIDSVU.ORG   SOURCE: U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION   AIDSVu

In 2015, **YOUNG BLACK MEN WHO HAVE SEX WITH MEN (MSM)** accounted for more new HIV diagnoses in the U.S. than any other subgroup.

NUMBER OF NEW HIV DIAGNOSES AMONG YOUNG MEN WHO HAVE SEX WITH MEN, AGED 13-24, 2015

White: 1,143
Hispanic: 1,763
African American: 3,897

0   1,000   2,000   3,000   4,000

AIDSVU.ORG   SOURCE: U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION   AIDSVu

Over 20% of new HIV diagnoses in 2016 were among **YOUTH**, yet they comprised only **11%** of all **PrEP** users.

% of New Diagnoses by Age Group, 2016
% of PrEP Use by Age Group, 2016

40% 30% 20% 10% 0%

24 & Under   25-34   35-44   45-54   55+
21% 11%

AIDSVU.ORG   SOURCE: U.S. CENTERS FOR DISEASE CONTROL AND PREVENTION/AIDSVU   AIDSVu

Self-assessment Question #1

- According to the most recent estimates- fully XX% of teens have access to a smartphone, and XX% say they are online 'almost constantly'
  - A. 85% smartphone/ 55% online constantly
  - B. 95% smartphone/ 45% online constantly
  - C. 80% smartphone/ 30% online constantly
  - D. 90% smartphone/ 90% online constantly

Youth and Technology

- Mobile phones are pervasive among youth
- Youth are avid consumers of social media
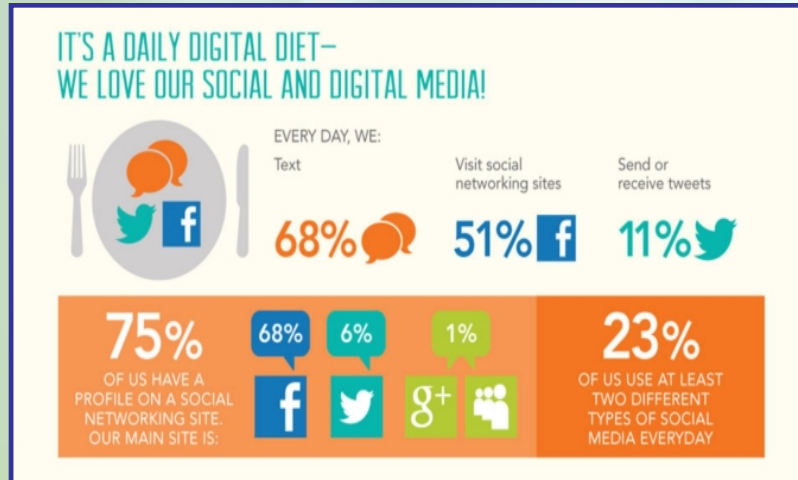
Social Media, Social Life. How teens view their digital lives

HIV, mHealth and Youth

- These technologies offer key functions that are particularly relevant to youth:
  - anonymity, social support, provision of real-time assessment and feedback, and highly engaging features
- While much progress has been made, gaps exist in the availability and evaluation of mHealth interventions along the Continuum of Prevention and Care
  - To date, most studies are formative or small trials

Taking mHealth forward

Scaling Up

- Deliberate efforts to increase the impact of innovations successfully tested in pilot or experimental projects so as to benefit more people and to foster policy and program development on a lasting basis.

Sustainability

- A process that enables individuals, communities and organizations to decrease their dependence on insecure resources and maintain the health gains of the intervention beyond the specific/initial project period.

For an mHealth product to be sustainable, it must be supported by stable and secure financial and technical resources, enduring partnerships and the project's capacity to continually adapt the product to meet the demands of users and the ever-evolving operational environment.

How can we improve the likelihood of successful implementation of mHealth interventions for youth?

Keys to successful implementation

- Ensure that mHealth technologies are developed in collaboration at all stages of development with diverse groups of intended end-user populations.
  - What do we already know about users?

Preferences for Comprehensive eHealth/mHealth Interventions among Youth

- Multiple formative studies have identified comparable preferences for intervention components across multiple settings (both in the US and globally)

- Features mentioned consistently include:

  ✓ Facilitating connections to providers and peers
  ✓ Inclusion of *discrete* reminders for HIV prevention/care related activities
  ✓ Provision comprehensive, holistic and accurate information
  ✓ Careful attention to privacy/confidentiality
  ✓ Games/rewards/incentives for usage

Anand et al., 2017; Holloway et al., 2017; Saberi et al., 2016; LeGrand et al., 2016; Rana et al., 2015; Goldenberg et al., 2014; Hightow-Weidman, et al., 2018

Keys to successful implementation

- Ensure that mHealth technologies are developed in collaboration at all stages of development with diverse groups of intended end -user populations.
    - What do we already know about users?
    - How do we learn more?

"Agile Development":
app development is an iterative process

- ✓ Test the functionality of the device/program early and often
- ✓ Understand how the end-user will (and wants to) interact with the device/program
- ✓ Understand what the end-user likes (and doesn't like)
- ✓ Ensure that you are addressing a problem of value to the end-user
- ✓ Ensure that your "solution" is attractive, engaging and meaningful to the end-user
- ✓ Gather feedback (and new ideas!) from end-users that may be incorporated into continued design elements
- ✓ Test how user-friendly and intuitive the device/program is for the end-user

Keys to successful implementation

- Engage collaborators from all relevant sectors (e.g. computer science, programming, design, medicine, marketing); work to develop common "language"/understanding across disciplines.

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- Build interventions on existing platforms or use open source options to allow for more rapid development and potential cost savings

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- Conduct fully-functional, internal and external pilot testing and evaluation of the mHealth intervention technology prior to larger-scale implementation.

How can we promote the uptake of mHealth research findings into healthcare in individual, clinical, organizational, and policy level contexts?
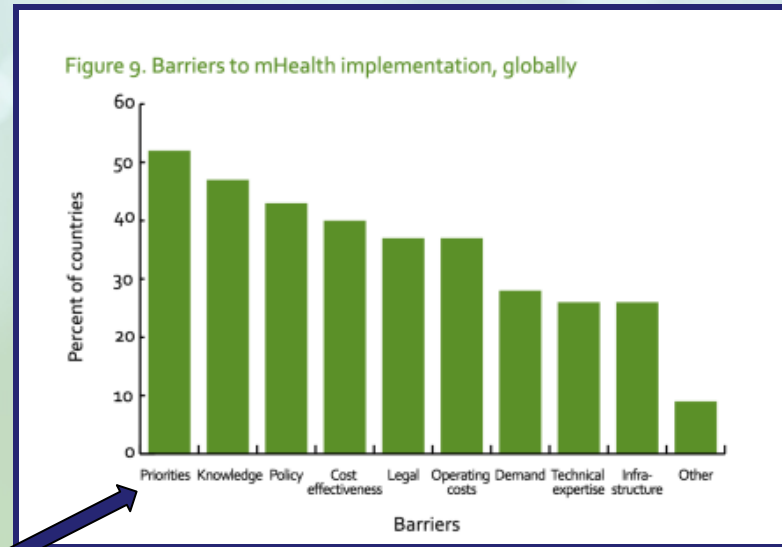
Self-assessment Question #2

- According to a 2011 WHO survey, what is the largest barrier to mHealth implementation globally?
  - A. Policy
  - B. Infrastructure
  - C. Priorities
  - D. Technical Expertise

Promoting Scale-up and Dissemination

- Align mHealth initiatives with local and national health priorities

Figure 9. Barriers to mHealth implementation, globally

WHO. New horizons for health through mobile technologies: second global survey on eHealth, 2011

Promoting Scale-up and Dissemination

- Align mHealth initiatives with local and national health priorities

- Incorporate "youth focused" engagement strategies within the intervention design

Fostering persistent engagement over time

The law of attrition

- In many mHealth intervention trials, a substantial proportion of users drop out (*dropout attrition*) before completion or stop using the app/website (*nonusage attrition*).

Key Considerations:

- ✓ Tailoring interventions to users
- ✓ Fostering social support
- ✓ Inclusion of game-based elements
- ✓ Provision of self-monitoring/feedback

Eysenbach. J Med Internet Res 2005;7(1):e11

Why Tailor?

- Tailoring increases the message or content relevance to an <u>individual</u> end-user.

- Tailored interventions have been found to produce higher rates of behavior change and <u>maintenance</u> than non-tailored programs in a variety of health domains.

- A review of internet-based behavioral interventions for chronic illness suggests that user engagement may be <u>sustained</u> by addressing health concerns that are relevant to the user and offering tailored advice and feedback.

Noar SM et al., Psychol Bull. 2007 Jul; 133(4):673-93.
Kreuter MW, et al. Taylor & Francis: New York. 2013:288.
Schubart et al. *Computers, Informatics, Nursing*. 2011;29(2):81-92.

Fostering social support

- Features that facilitate the receipt of social support, were found to positively influence engagement in a range of digital behavior change interventions.

- Technological advances show promise for generating support networks that bypass geographic boundaries.

Perski et al. Transl Behav Med. 2017 Jun; 7(2): 254–267. Brouwer et al. J Med Internet Res 2011;13(1):e2;

Inclusion of game-based elements

gamification:
The use of game mechanics & rewards for non-game applications in order to increase engagement and loyalty.

- Interventions can utilize gamification to deliver highly engaging content, enhancing the degree and depth of participant interaction and increasing behavior change opportunities.

5 COMMON MECHANICS

POINTS
Measure a user's achievements in relation to others
Can double as currency to exchange for rewards

BADGES
Reward achievements visually

LEVELS
Encourage users to progress and unlock new rewards

LEADERBOARDS
Organise players by rank

CHALLENGES
Encourage engagement by offering specific tasks to complete

Cugelman B. Jmir Serious Games 2013;1:e3.
King D, et al. Journal of the Royal Society of Medicine 2013;106:76-8.

Provision of self monitoring and feedback

- Can introduce a routine that can become a behavior with time due to repetition.

- Can be motivational especially if one is able to see positive results or a trend of improvement.

- Leads to self-evaluation and reflection, leading the individual to make efforts to achieve the set targets.

- Increases self efficacy and determination which can impact behavior change

Processes of Goal Realization

Self-observation
Self-efficacy
Self-reaction
Self-evaluation
Goal Attainment and Motivation

Promoting Scale-up and Dissemination

- Engage a variety of stakeholders (not just end-users and funders) from the beginning of the project to improve buy-in and lay the groundwork along the way for promoting uptake if/when the intervention proves effective.

  - Anticipate where money is going to come from, early on and later in the solution lifespan

  - Understand all partners' success metrics. All stakeholders must be presented with a compelling value proposition to ensure sustainability.

Promoting Scale-up and Dissemination

- Is the intervention effective?
    - Ensure that the design of your mHealth evaluation study is strong and robust; if a randomized controlled trial is not feasible, what other rigorous study design could be used?
    - Make sure you are capturing all the usage data you will need to demonstrate acceptability and use among your end-user target population.

Scale-up should be preceded by efficacy and effectiveness trials so that it is founded on an appropriate evidence base

Measuring Effectiveness

- It is important to ensure <u>comparative metrics</u> for these technology-based studies to advance the field in terms of what works and for whom it works.

- Data on where and how users access and move through an intervention may be automatically collected as users log on to the system and use its different components to assess online engagement.

- These metrics, referred to as **paradata**, can be used as 'auxiliary data that capture details about the process of the interaction with the online intervention'.

Couper MP, Alexander GL, Zhang N, et al. JMIR 2010; 12:e52.

Paradata is key

- Paradata are <u>under examined</u> and <u>underreported</u> in research in this area.
  - Common practice to report participant dropout rates or 1 measure of use (i.e. total time spent)
- Paradata can be used to help understand what components of the intervention led to behavior change and help understand who responds to a technology-based intervention and who does not.
- Paradata can help identify what intervention components should be *kept*, *removed* or *redesigned* between versions of their technology-based intervention or prior to scale-up and dissemination

Capturing Paradata

- Establish baseline paradata metrics and measurement tools
- Specific paradata needs dictated by intervention design and goals
- Research teams and developers work together to ensure necessary user actions will be recorded

| STANDARD PARADATA			
Variable name	**Description**	**Data type**	**Notes**
id	Participant ID	Numeric	Linked to username
arm	Study arm	Binary	0 = control; 1 = intervention
login_date	Login date	MM/DD/YY	
login_time	Login time	HH:MM:SS	
logout_time	Logout time	HH:MM:SS	
user_agent	Device and browser type	String	
total_dur	Total duration of session	HH:MM:SS	Calculate duration: logout/timeout time min
exit_page	Logout/timeout page	String	Name of exit page
INTERVENTION-SPECIFIC PARADATA			
[pageName]_dur	Duration per page	HH:MM:SS	Calculate duration: exit time minus entrance
[pageName]	Number of visits to a page	Numeric	Increment number if user visits page >1 time
[navigationButton]	Number of clicks to navigation button	Numeric	Increment number if user clicks button >1 tin
[infoBox]	Number of clicks to information box	Numeric	Increment number if user clicks box >1 time/
[accordionItem]	Number of clicks to expand accordion content	Numeric	Increment number if user expands accordion
[filterItem]	Number of clicks to select a search filter item	Numeric	Increment number if user selects filter item >
[searchButton]	Number of clicks to search button on filter page	Numeric	Increment number if user clicks button >1 tin

Promoting Scale-up and Dissemination

- Conduct **cost-effectiveness analyses** to make the financial case that the mHealth intervention will save [patients/clinics/hospitals/insurance companies/health departments] money.
  - Review on the economic evaluation of text-messaging and smartphone-based interventions aimed at improving medication adherence in adolescents with chronic health conditions (CHCs).
    - Of 156 articles meeting inclusion criteria- only 4 described interventions with possible future cost-savings.
    - None of the interventions included any formal economic evaluations.

Badawy et al. JMIR MHEALTH AND UHEALTH 2016;4(4):e121

Stop "reinventing the wheel"

- Consideration should be given to the creation of a content repository for researchers that could be updated and adapted for the unique needs, developmental stage, and cultural features of the population of interest (e.g. age, race/ethnicity, gender).

    - A review of 10 computer-based interventions focused on adherence, found significant overlap in content

Claborn KR, Translational behavioral medicine. 2015;5(3):294-306.
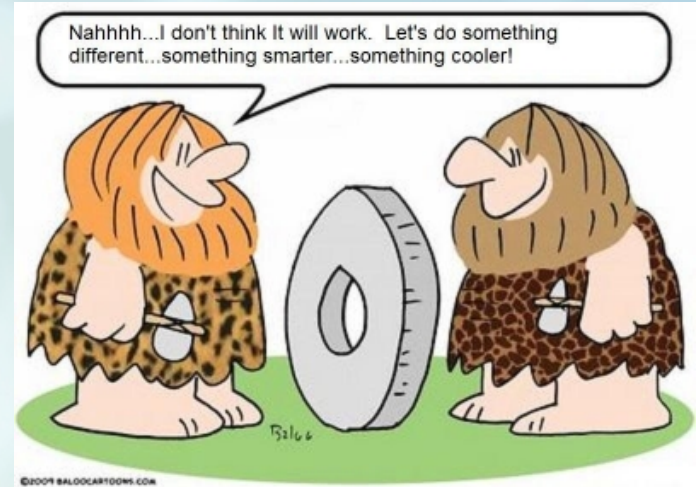
Ayogo's Empower™ Platform

empower

Informed by Fogg Behavioral model and Social Cognitive Theory.

Available as a mobile application (iOS and Android) and includes a robust web-based app analytics reporting system

Input from Target Population-focus groups, YABs, literature review

ⵏAnonymity and privacy important for YMSM eHealth.
ⵏ Game-based elements (e.g. levels, competition) influence intervention engagement.
ⵏSocial support and connection with others are important features for apps for YMSM.
ⵏYMSM desire information on both HIV-related issues and general health and wellness

Evidence based strategies to improve ART/PrEP adherence and support behavior change

ⵏ Medication reminders improve adherence, but may not be sufficient.
ⵏDynamic tailoring and feedback based on frequent assessments effectively promotes behavior change, including HIV prevention and ART adherence.
ⵏ Gamification increases iimpact.
ⵏNarrative communication through role modeling facilitates behavior change.
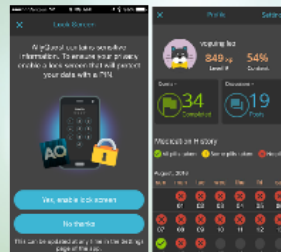ⵏ Connections to health care providers/ counselors and MI-based counseling support adherence.

CHARGE (Comprehensive health adherence using Gaming and social Engagement) app

P³ Prepared, Protected, Empowered PrEP adherence app in US YMSM, TW
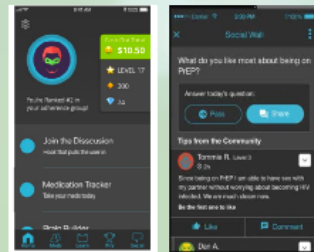
AllyQuest: An ART adherence app in US HIV+ YMSM

Thai PrEP adherence for Thai YMSM

South African TAF PWSRT app for YBWSM

Grant #5 U19 HD089881 02

Currently being developed and tested in 6 US cities. U19 the Adolescent Trials Network (mPIs: LeGrand/Hightow-Weidman)

Grant #5R21MH107266-02

Pilot study results indicated strong acceptability, feasibility, and impact on HIV knowledge and adherence self-efficacy among HIV+ YMSM (PI: Hightow-Weidman)

Apps currently developed or planned using CHARGE

An example: CHARGE (Comprehensive health adherence using Gaming and social Engagement) app

Opportunity awaits

- *usability, affordability, scalability, sustainability and large-scale accessibility*

Examining evidence to date, lessons learned, and gaps in knowledge will help to identify a path forward- a path toward sustainable mHealth interventions that are best suited to addressing the HIV prevention and care needs of youth today.