# CommCare: a mobile platform for connecting community health workers in the US and abroad

**Y. Xian Ho**, PhD & **Meryn Robinson**, MPH


January 9, 2018

# A little bit about Dimagi...

## MISSION:

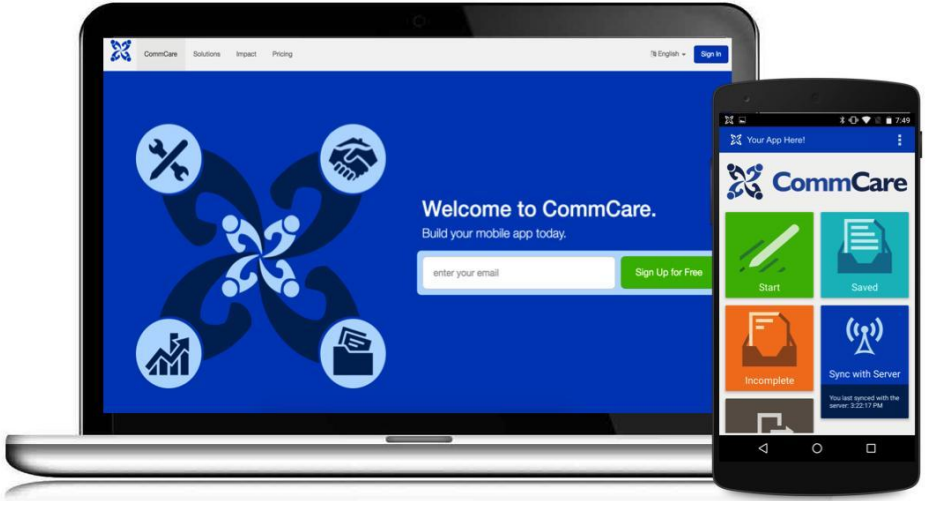
**Deliver open and innovative technology to underserved communities around the world**

- B Corp software company created in 2002
- Experience implementing 100s of projects in 60+ countries
- Team of 120+ engineers, scientists, agriculture and public health experts, and project implementation staff
- Offices in the United States (HQ), Senegal, India, Guatemala & South Africa

# Our platform

CommCare

An open-source mobile platform used around the world for longitudinal tracking and monitoring

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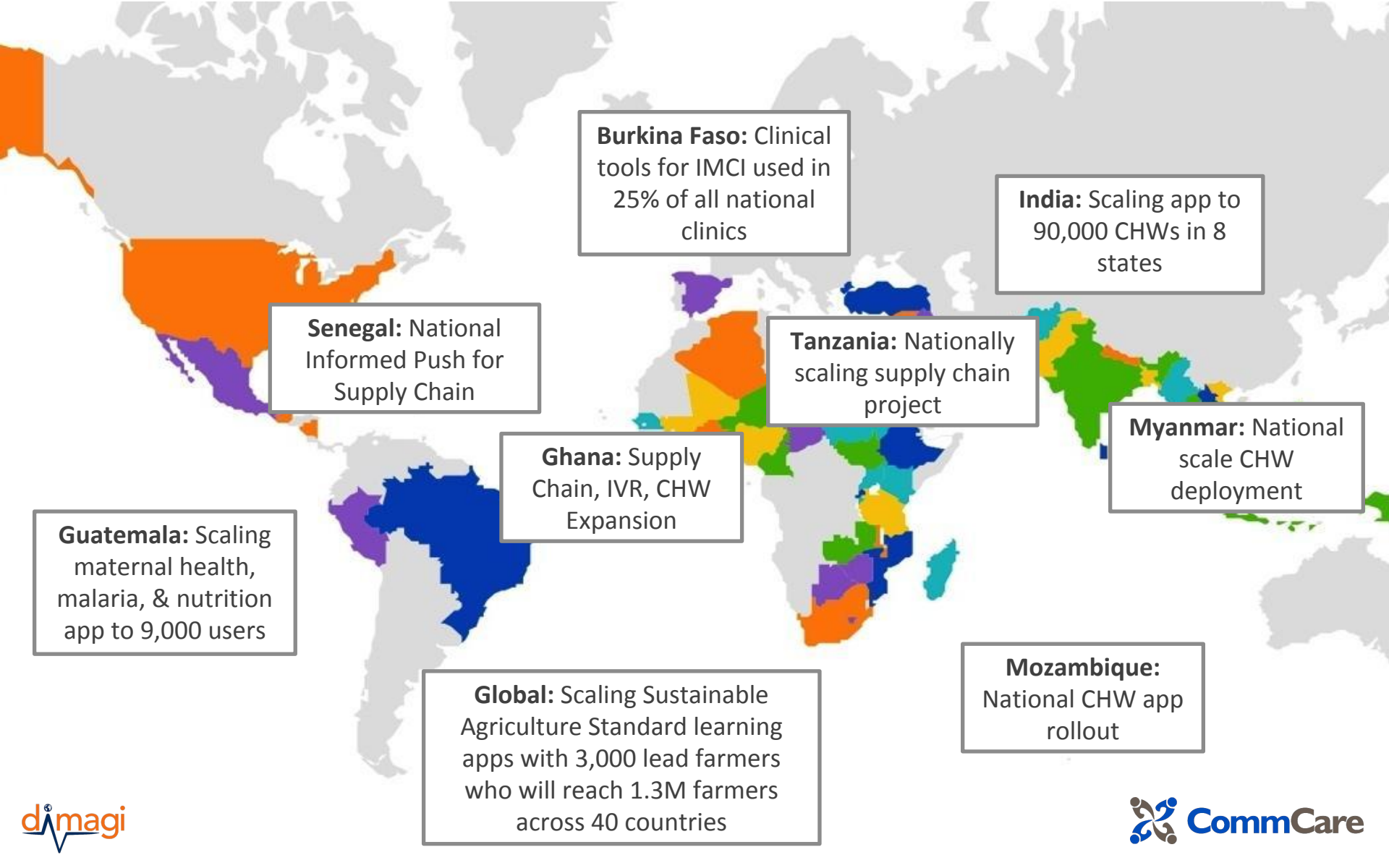


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CommCare


CRS
CATHOLIC RELIEF SERVICES
HARVARD
T.H. CHAN
SCHOOL OF PUBLIC HEALTH
GHANA HEALTH SERVICE
Boston Children's Hospital
BOSTON MEDICAL CENTER
Save the Children.
fhi360
THE SCIENCE OF IMPROVING LIVES
RTI INTERNATIONAL
PATH
NOVARTIS
care
psi
USAID
FROM THE AMERICAN PEOPLE
MEDECINS SANS FRONTIERES
IntraHealth
Because Health Workers Save Lives
D-TREE INTERNATIONAL
MILLENNIUM VILLAGES
Jhpiego
World Vision
Building a better world for children
Pathfinder INTERNATIONAL
BILL & MELINDA GATES foundation
JSI
John Snow, Inc.
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CommCare

# Overview

## PlusCare

- US-based project
- Collaboration with Boston Children's Hospital
- NIH SBIR Phase I

## Harvard School of Public Health (HSPH) Evaluation on:

- *The FIGO Project for 'Institutionalising Post-Partum IUD Services and Increasing Access to Information and Education on Contraception'*

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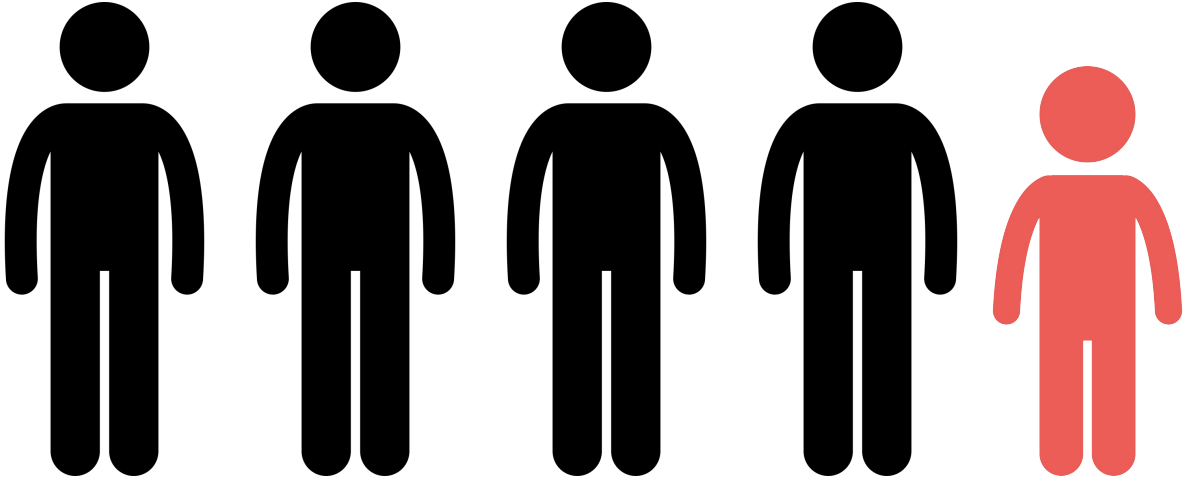
- *The FIGO Project for 'Institutionalising Post-Partum IUD Services and Increasing Access to Information and Education on Contraception'*

# Objective

To demonstrate **acceptability and feasibility** of a mobile application to support HIV case management in youth.

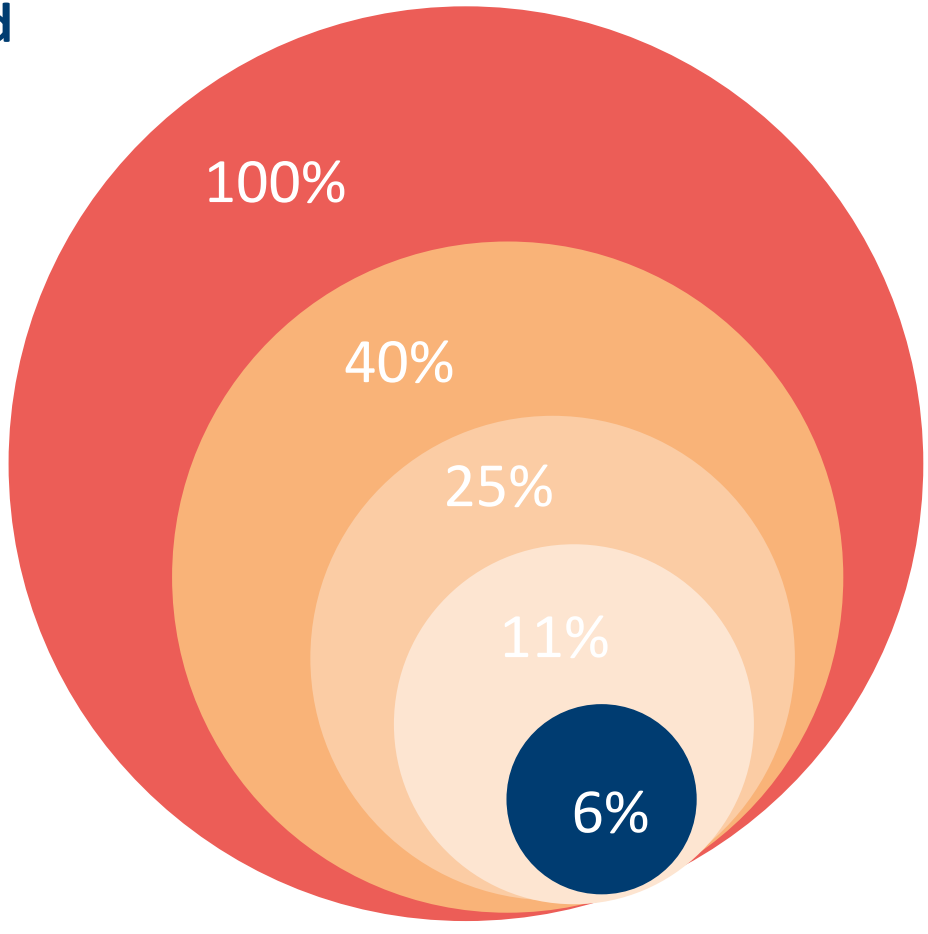
# Background



Adolescents and young adults account for more than **1 in 5** new HIV diagnoses.

CDC (2015)

# Background



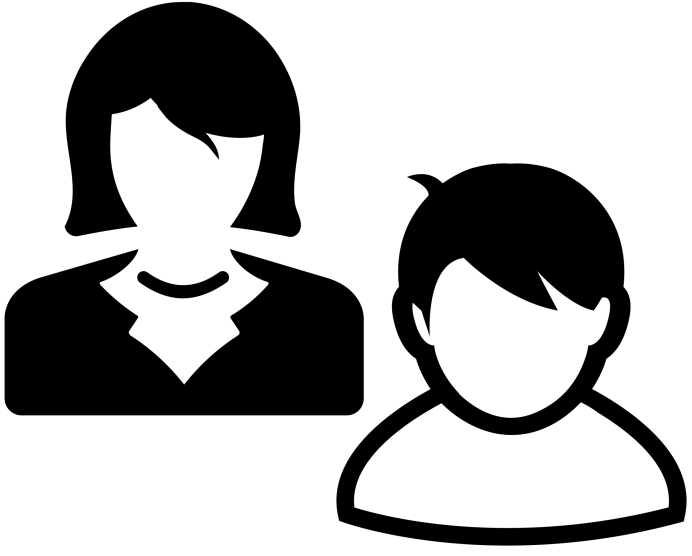

**Youth living with HIV**

- Infected (78,949)
- Diagnosed (31,979)
- Linked (19,824)
- Retained (8,723)
- Suppressed (4,449)

Only **6%** of HIV-infected youth are virally suppressed.

Zanoni & Mayer (2014)

# Background



Case Management

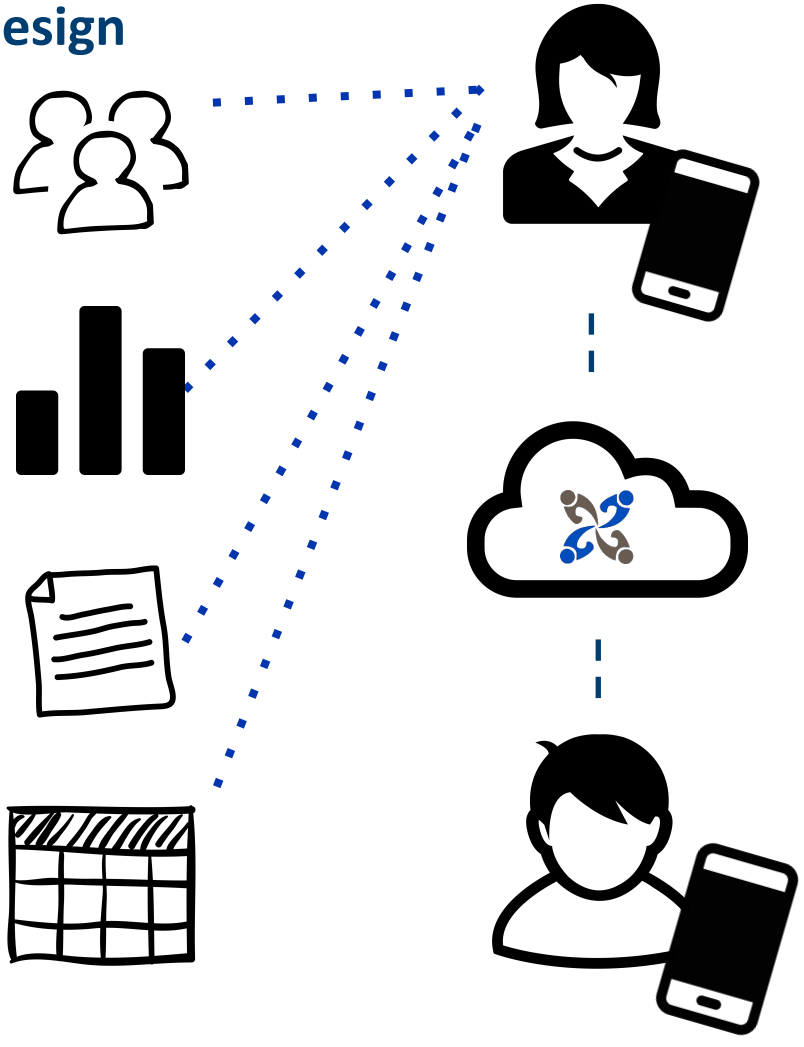
**Unmet needs**

**Use of medications**

Katz et al. (2001)

# PlusCare Design

# PlusCare Design



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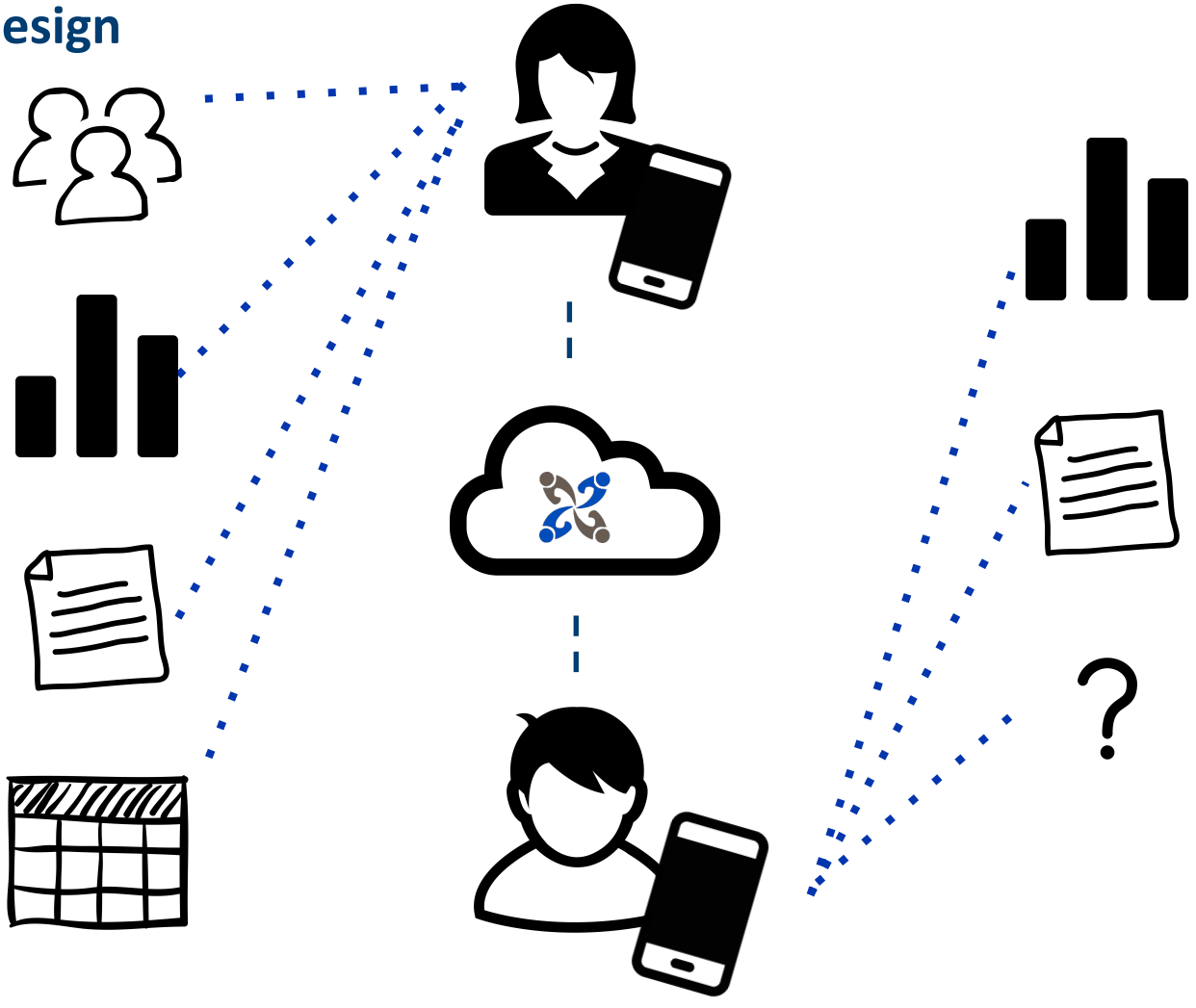
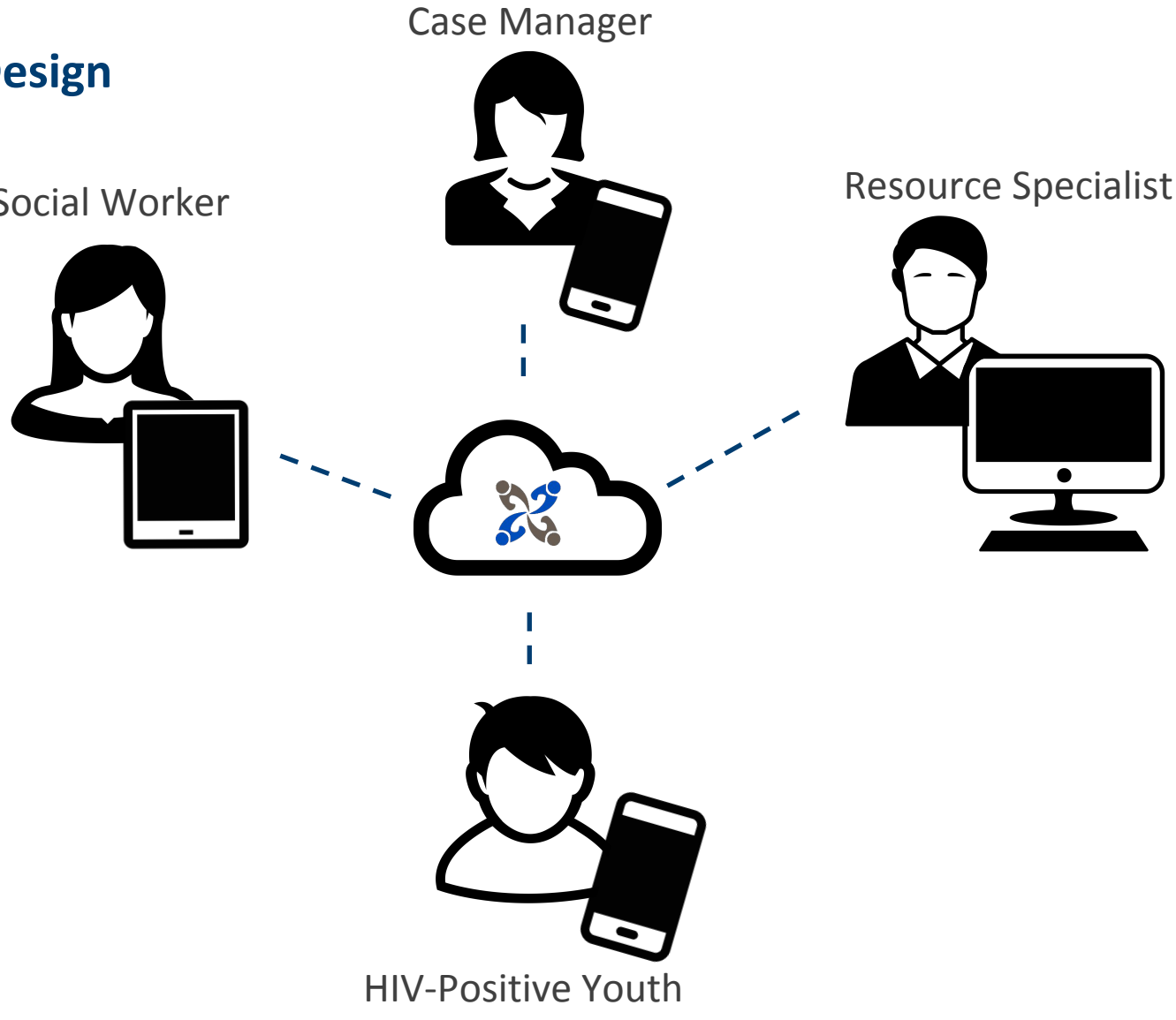
# PlusCare Design



# PlusCare Design



## Specific Aims

1. Perform formative assessment with target end users (Substudy 1)
2. Build a prototype
3. Conduct usability testing with prototype (Substudy 2)

# Study Settings

## HAPPENS

(Boston HIV Adolescent Provider and Peer Education Network for Services)

## CHAP

(Children's Hospital AIDS Program)

# Substudy 1

## Perform formative assessment with target end users

**Participants**:

- CMs (health professionals who perform case management duties)
- HIV-positive youth 13-25 yos


**Methods**:

- Brief survey
- Semi-structured qualitative interview

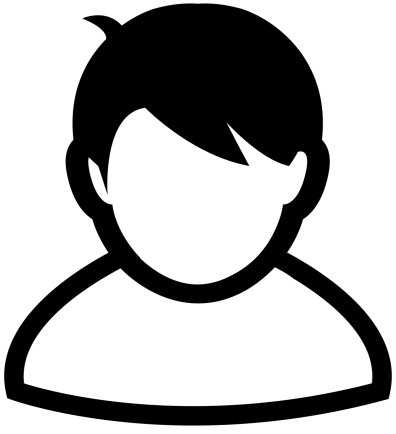
  CMs: *What are your biggest struggles with managing your HIV patients?*

  Youth: *What are your biggest struggles with getting care for your HIV?*
- Walkthrough using wireframe prototype

# Substudy 1: Methods
## Wireframing

# Substudy 1: Methods
## Wireframing

# Substudy 1: Results
## Participant Demographics



HIV-Positive Youth Participants (N=10)

**21 years old** (± 3.3), **not Hispanic** (90%), **Black** (70%), **female** (70%) with **some college education** (40%)…uses an **iPhone** (90%) anywhere from **0 to 13+ hours a day**…does not use apps for health or HIV management (100%)

# Substudy 1: Results
## Participant Demographics

CM Participants
(N=5)

**Between 18-44 years old** (60%), **Hispanic** (60%), **Mixed or other race** (60%), **female** (80%) with a **college degree** (80%)…uses an **iPhone** (80%) anywhere from **4 to 6 hours a day** (60%)

# Substudy 1: Results
Qualitative Themes

## Struggles with logistics of care

"For some of them, because they live so far, **it's a matter of getting them in or getting them**…like if they need health insurance…or **a lot of times it's just a matter of having their signature."**

CM

## Struggles with adherence

"**Just remembering everything to do.** Like I have to remember to take my medicine…Just remembering to take my medicine at night. Sometimes I forget to do that."

Youth, 14 yos

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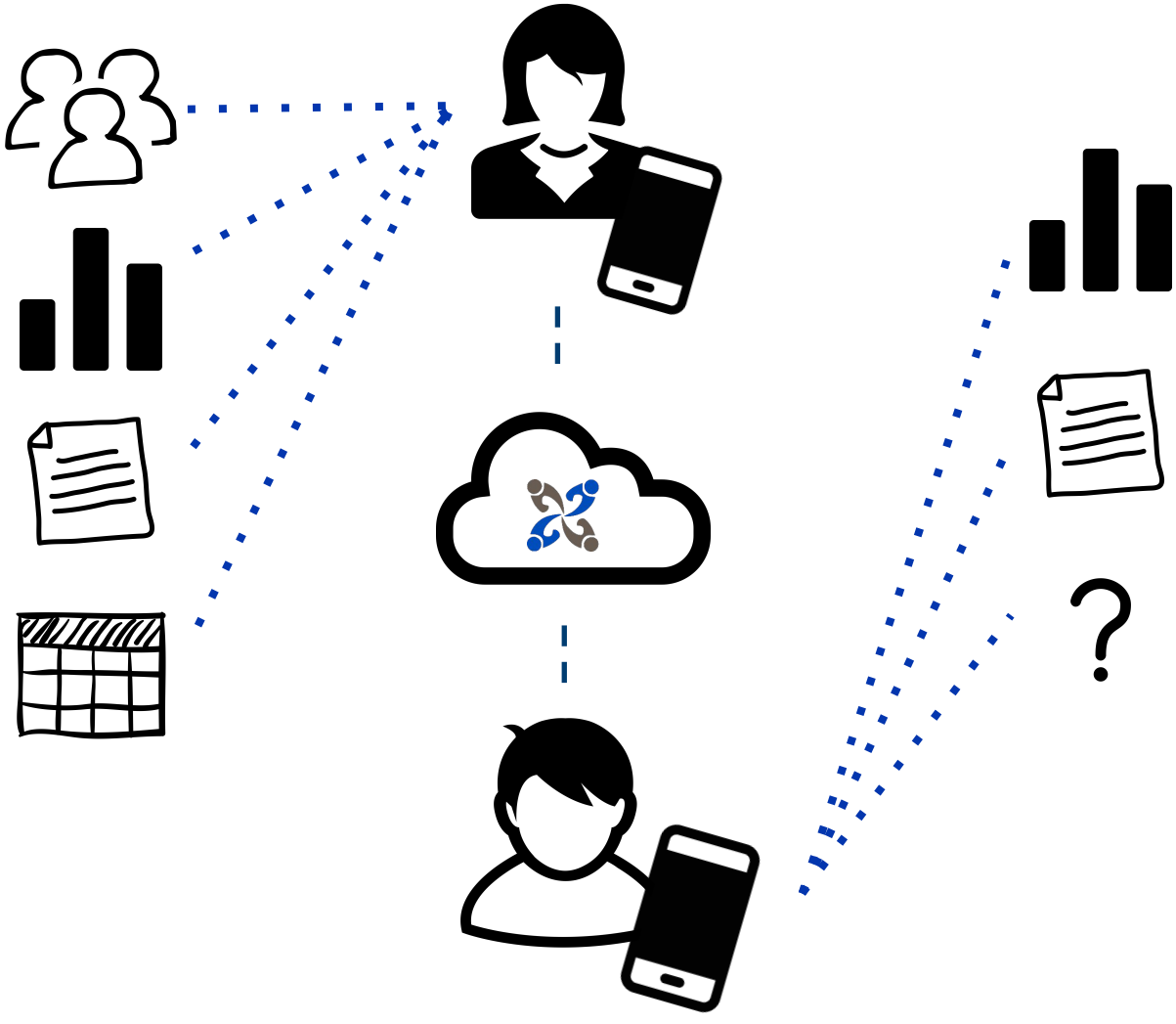
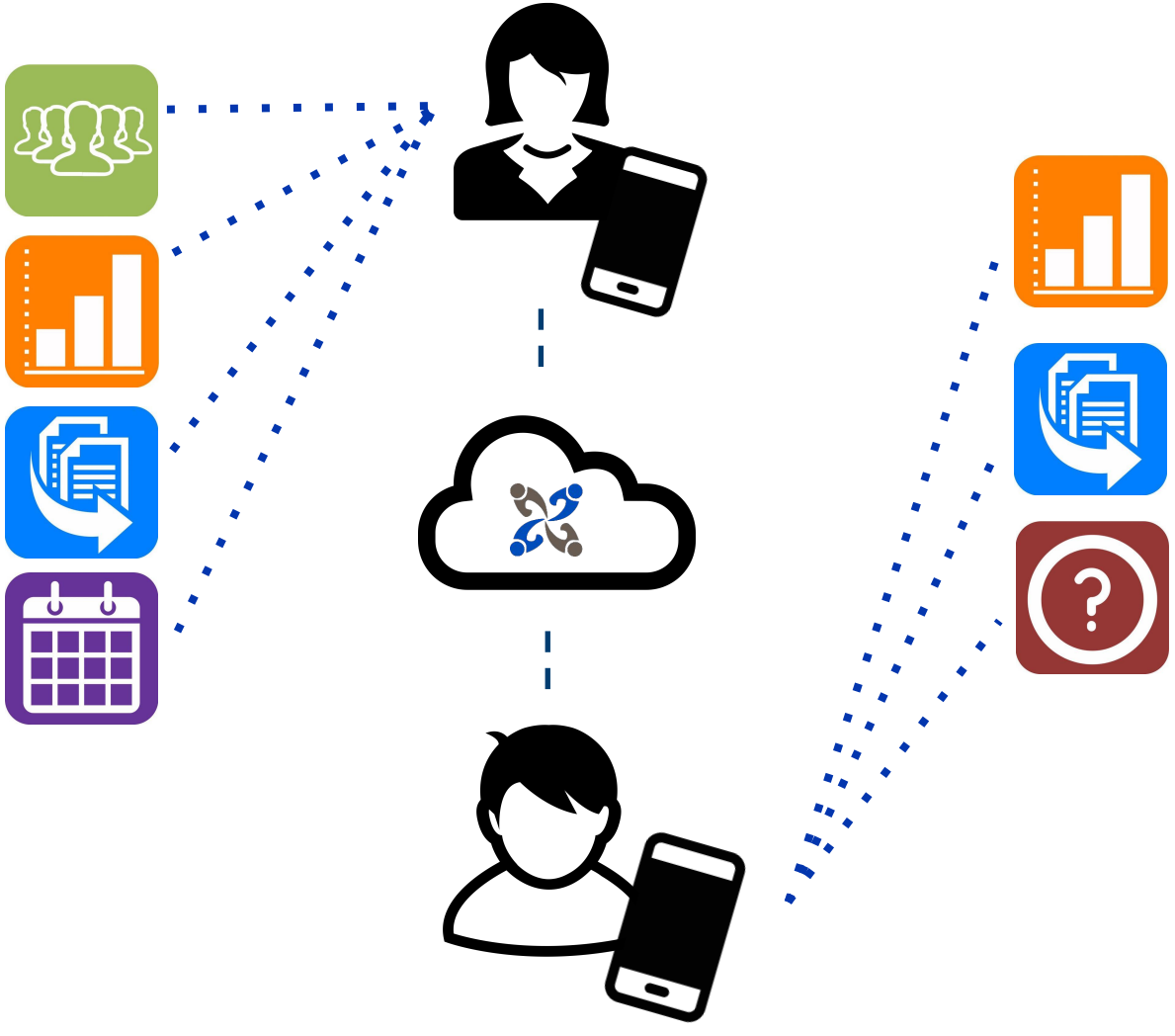
# Substudy 1: Results

## Recommendations



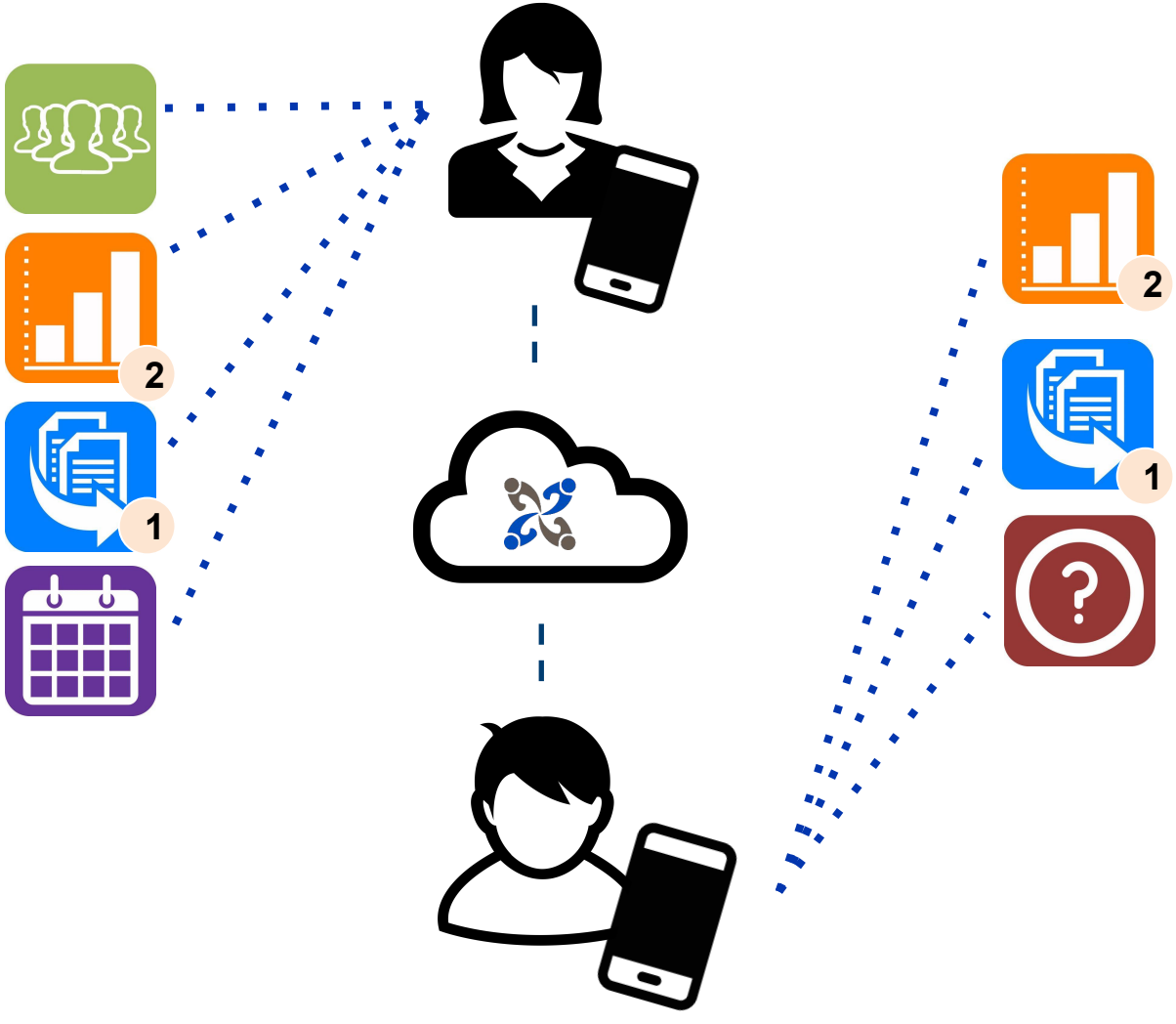
# Substudy 1: Results

## Recommendations



# Substudy 1: Results

## Recommendations



# Substudy 1: Results

## Recommendations

# Substudy 2

## Conduct usability testing with prototype

**Participants**:

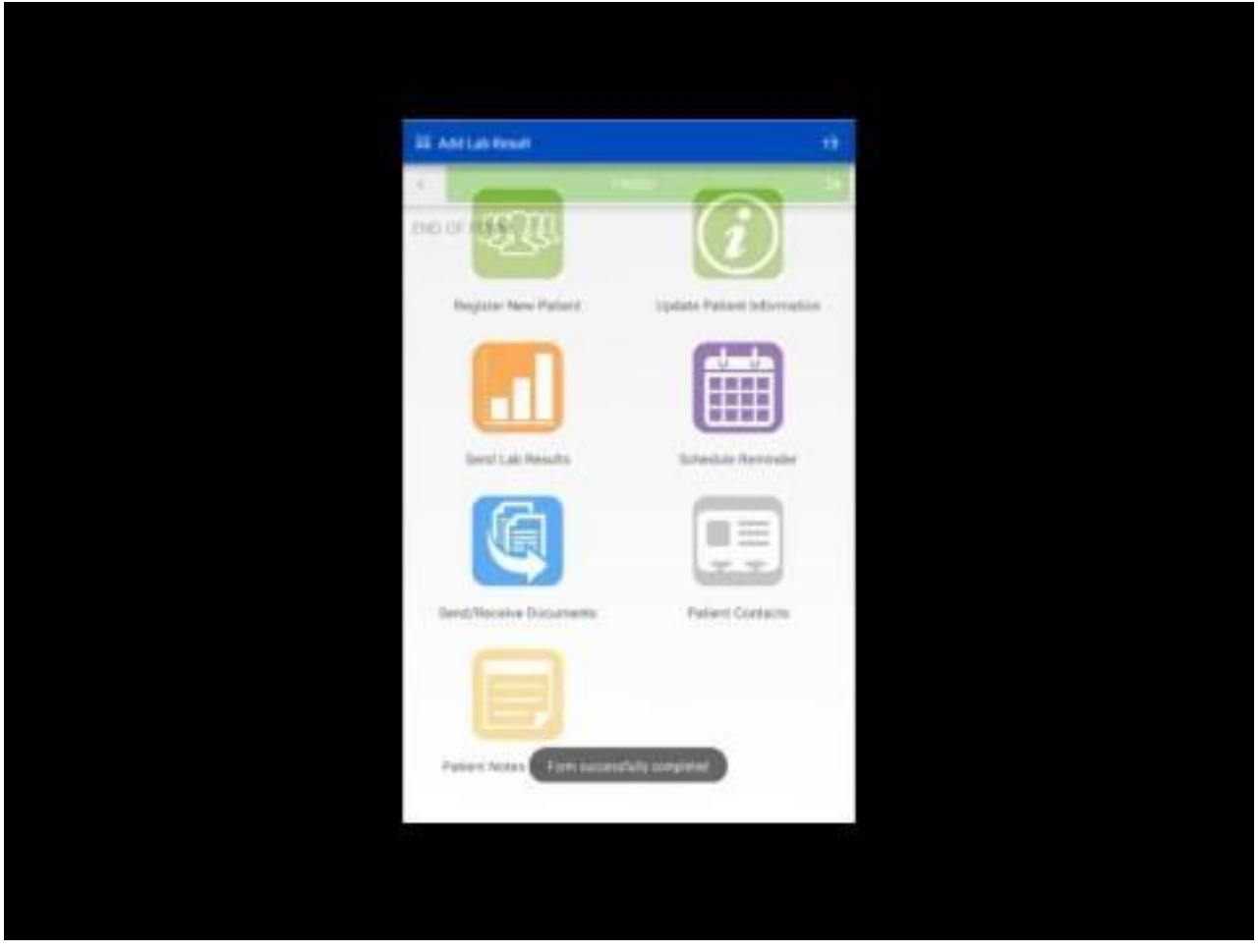
- CMs (health professionals who perform HIV case management)
- HIV-positive youth 13-25 yos


**Methods**:

- Brief survey
- Task-based usability testing session
  - Task time
  - Errors
  - System Usability Scale (SUS)
- Semi-structured qualitative interview

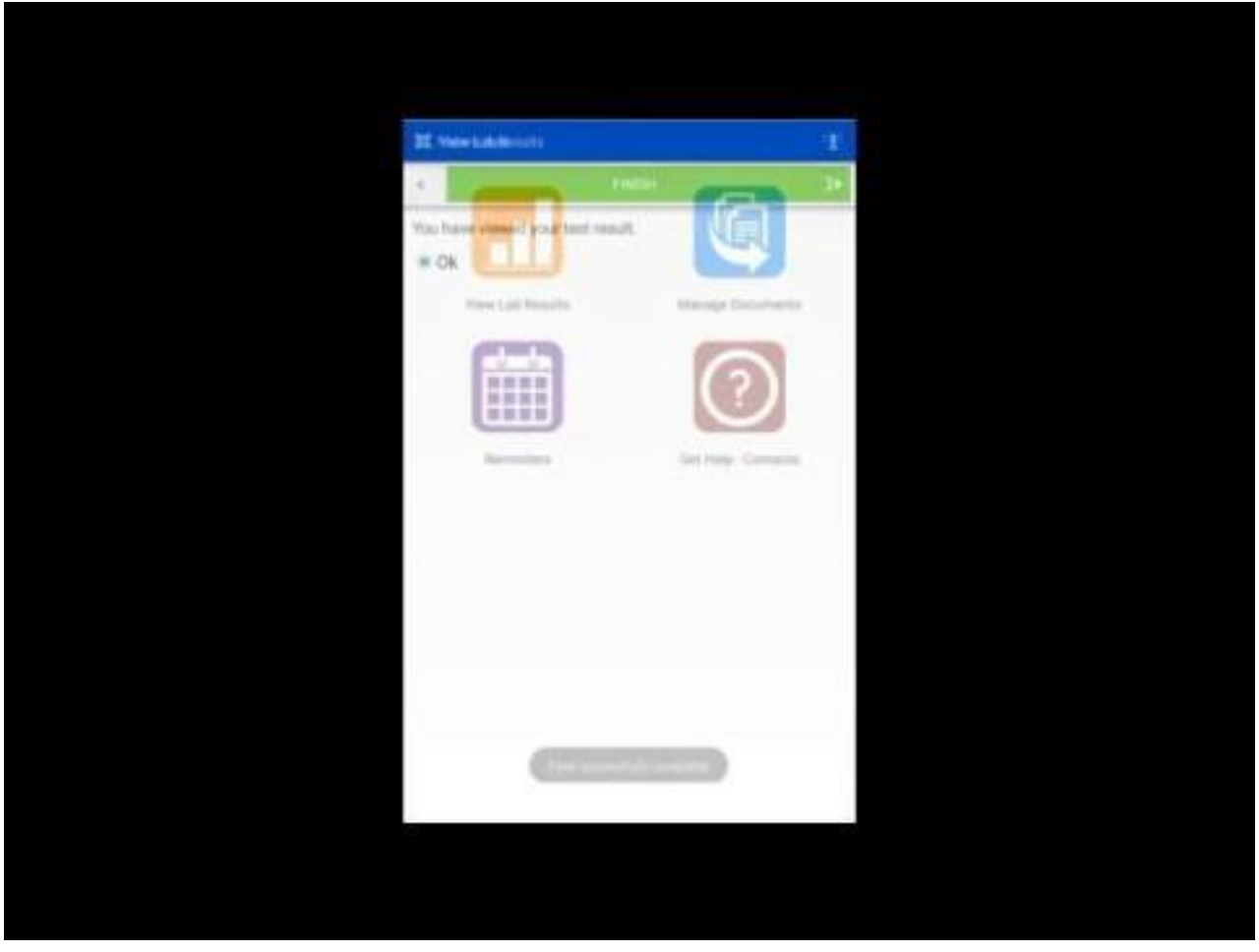
# Substudy 2: Methods

## CM App Demo with task example

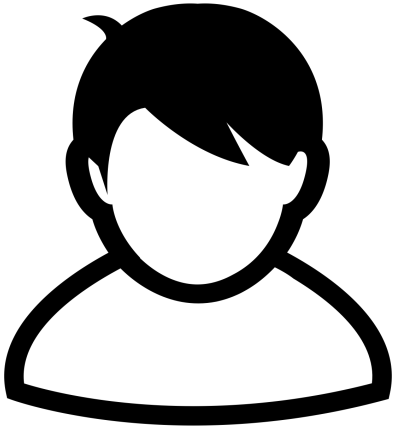


# Substudy 2: Methods

## Youth App Demo with task example



# Substudy 2: Results
## Participant Demographics



HIV-Positive Youth Participants (N=8)

**21 years old** (± 4.2), **not Hispanic** (75%), **Black** (75%), **female** (75%) with **some college education** (50%)…uses an **iPhone** (100%) from **4 to 13+ hours a day**…likely does not use apps for health or HIV management (75%)

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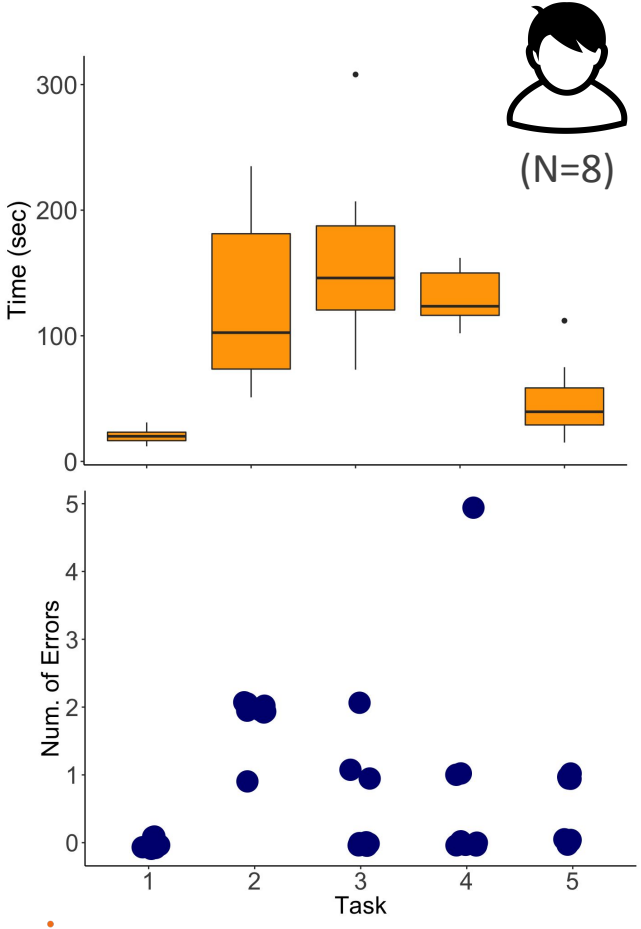
# Substudy 2: Results
## Participant Demographics

CM Participants
(N=5)

**Between 25-44 years old** (60%), **Hispanic** (60%), **White or Other/Mixed race** (80%), **female** (60%) with at least a **college or Associates degree** (100%)…uses an **iPhone** (40%) **or Android** (40%) from **0 to 12 hours a day**

# Substudy 2: Results

## Efficiency and Effectiveness

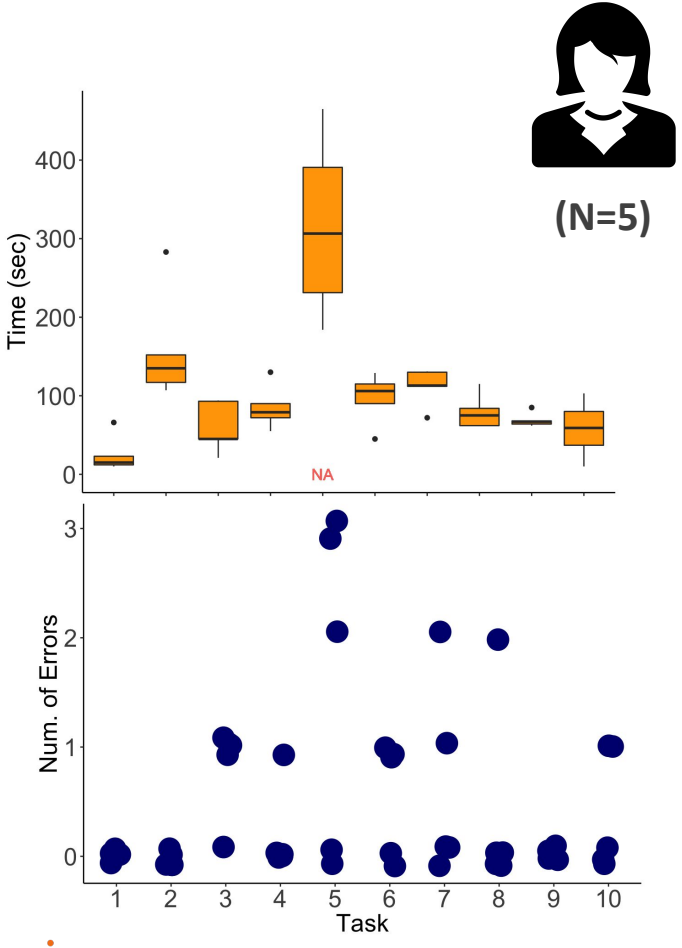



## USABILITY TASK LIST

1. **Log in** to the app with the username and password provided.
2. **View new lab result** and details. Then view each of the 2 other lab results and details.
3. **Review the shared document/form** and sign.
4. **Upload a copy of a photo ID**
5. **Find the contact** (provider, nurse, case manager) you would most likely reach out to about your lab result and call him/her.

# Substudy 2: Results

## Efficiency and Effectiveness




## USABILITY TASK LIST

1. **Sign in** with the username and password provided.
2. **Register the new patient** with the given information.
3. **Change Jordan Doe's insurance**.
4. **Enter the new lab result** (from the paper lab result provided) with the following note to explain the result and submit: Your result was normal.
5. **Send Jordan Doe an electronic copy of the paper form** provided to collect his signature.
6. **Request ID** from Jordan Doe.
7. **Send an appointment reminder** to Jordan Doe.
8. **Enter the given contact** for your patient.
9. **Enter the following note** in Jordan's record on the app: Jordan is out of town for the month of March.
10. **Confirm if/when Jordan checked his lab result** by viewing the last lab result you sent.

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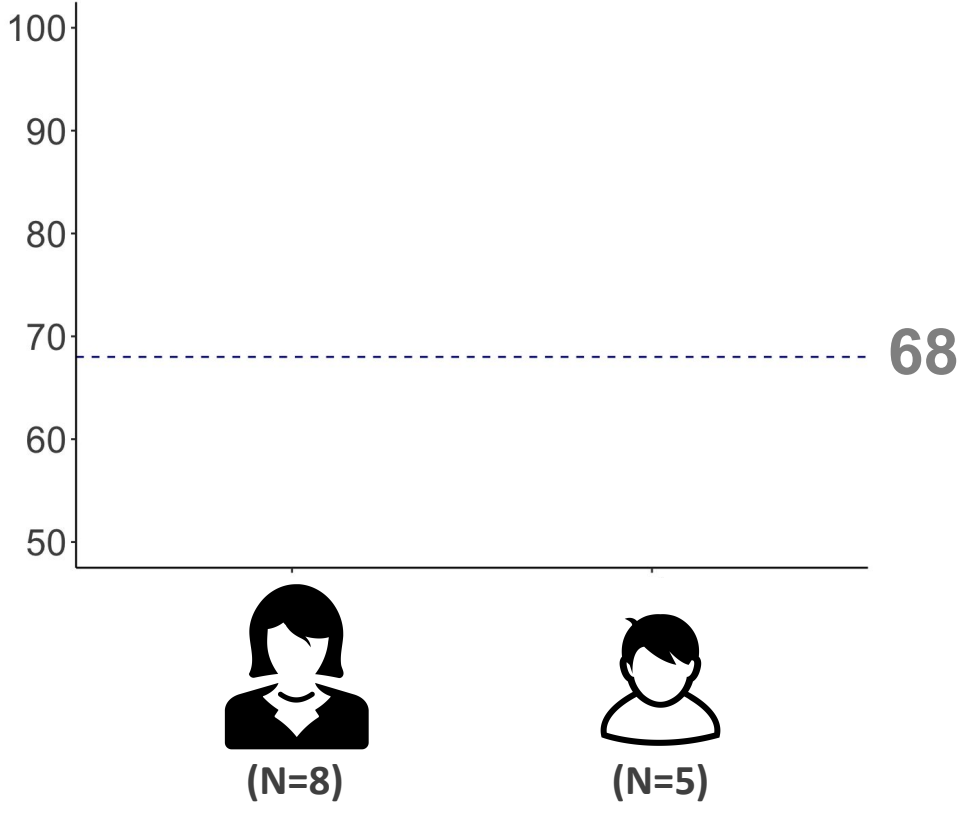
# Substudy 2: Results
## Usability

### System Usability Scale (SUS)

| | Strongly disagree | | | | Strongly agree |
|---|---|---|---|---|---|
| 1. I think that I would like to use this system frequently | 1 | 2 | 3 | 4 | 5 |
| 2. I found the system unnecessarily complex | 1 | 2 | 3 | 4 | 5 |
| 3. I thought the system was easy to use | 1 | 2 | 3 | 4 | 5 |
| 4. I think that I would need the support of a technical person to be able to use this system | 1 | 2 | 3 | 4 | 5 |
| 5. I found the various functions in this system were well integrated | 1 | 2 | 3 | 4 | 5 |
| 6. I thought there was too much inconsistency in this system | 1 | 2 | 3 | 4 | 5 |
| 7. I would imagine that most people would learn to use this system very quickly | 1 | 2 | 3 | 4 | 5 |
| 8. I found the system very cumbersome to use | 1 | 2 | 3 | 4 | 5 |
| 9. I felt very confident using the system | 1 | 2 | 3 | 4 | 5 |
| 10. I needed to learn a lot of things before I could get going with this system | 1 | 2 | 3 | 4 | 5 |

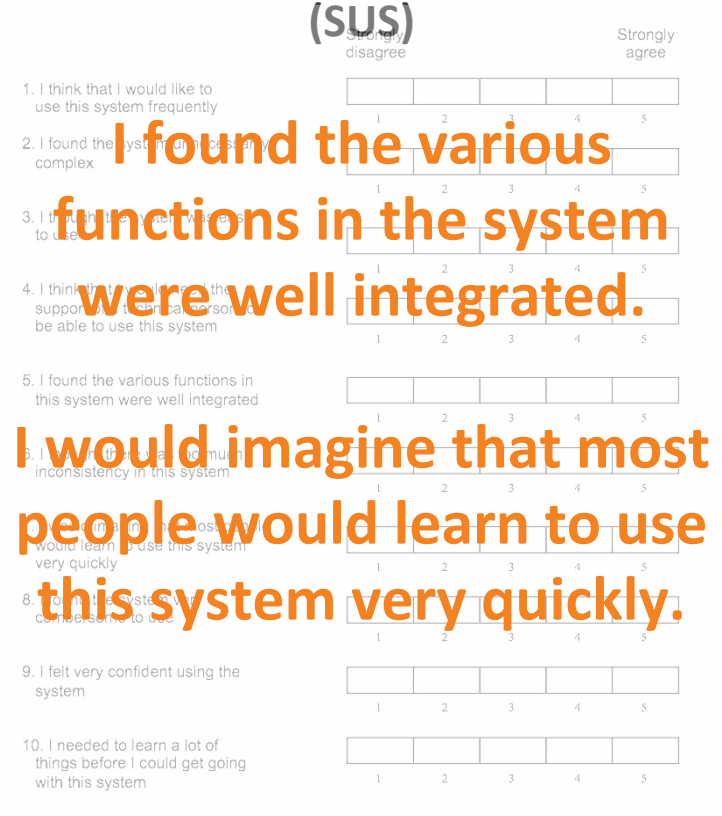
### SUS Score (out of 100)




Brooke (1996)

# Substudy 2: Results
## Usability

### System Usability Scale (SUS)




I found the various functions in the system were well integrated.

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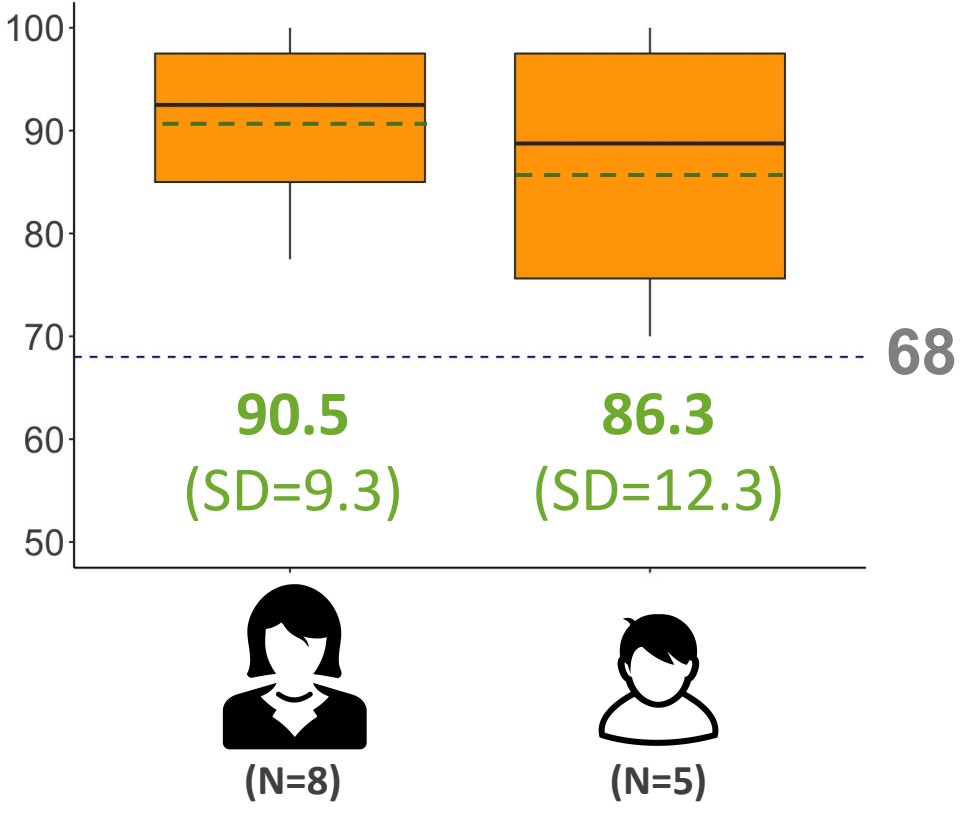
### SUS Score (out of 100)




Brooke (1996)

# Substudy 2: Results
## Qualitative Themes

## Overall, participants described PlusCare as...

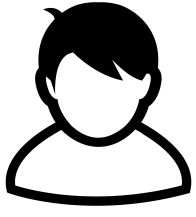
"entertaining"

CM

"pretty solid"

Youth, 20 yos

"just very straightforward"

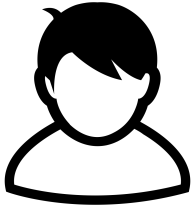


Youth, 16 yos

"useful"

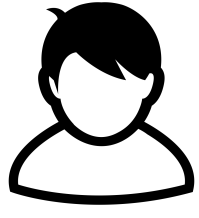
CM

"very easy to use"



Youth, 25 yos

"convenient"



Youth, 20 yos

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# Substudy 2: Results
## Qualitative Themes

## Would be helpful to build more support for youth transitions and individualized care

"…I'm still getting to know his **unique struggles and strengths**, but I feel with him it's not something we would be working on because he's been managing his medical needs for a number of years, but with a patient I have who is newly diagnosed, that's definitely something I have in my mind. Helping him feel like **he's in the steering—in the driver's seat**."

CM

"It was awful cuz I **didn't even know how to renew my health insurance** and stuff like that and I **had to go to the doctor's** and all that stuff and I didn't even know what that stuff was."

Youth, 20 yos

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# Substudy 2: Results
## Qualitative Themes

## Input and access by other care team members would be beneficial

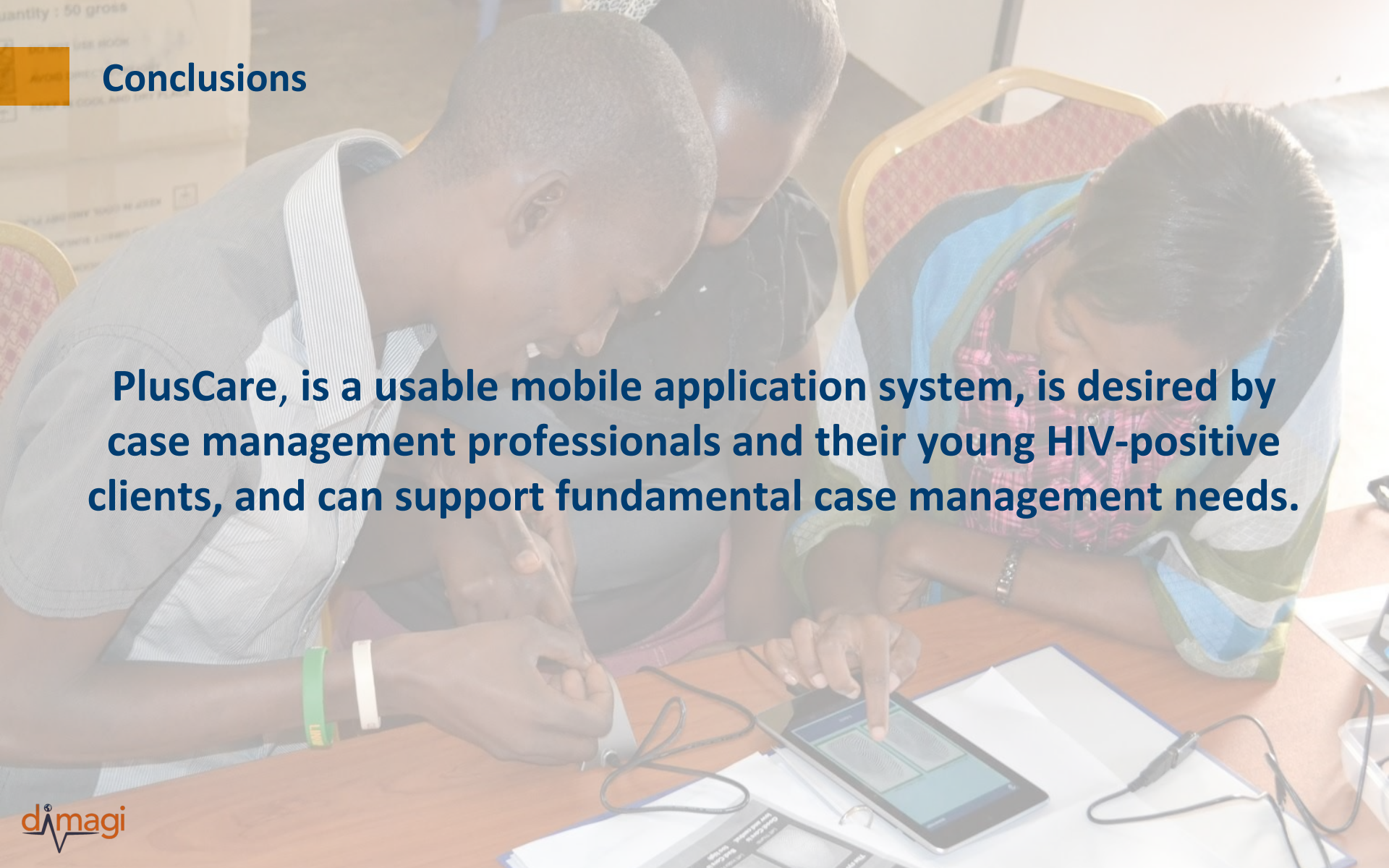
"Usually **my aunt would do that for me**...if she had any questions she would reach out to the case manager."


Youth, 25 yos

"You need their endorsement, their support around something like this… the **doctors are the bosses here and the NPs have a lot of sort of power**…"


CM

# Conclusions



**PlusCare, is a usable mobile application system, is desired by case management professionals and their young HIV-positive clients, and can support fundamental case management needs.**

# Next Steps

- Improve **generalizability** of the mobile system over other case management settings
- Determine **effectiveness** of PlusCare on HIV case management and health outcomes

# Thanks to...

**Jonathan Jackson**, MEng
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**Jessica Haberer**, MD, MS

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## Harvard School of Public Health (HSPH) Evaluation on:

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# HSPH PPIUD Project

## PPIUD Project

- Multi-country evaluation (Sri Lanka, Nepal, Tanzania)
- Collaboration with International Federation of Gynecology and Obstetrics (FIGO; https://www.figo.org/ppiud-project)
- Impact evaluation of FIGO intervention seeking to institutionalize PPIUD services as routine part of antenatal counselling and delivery room services [1]

[1] https://projects.iq.harvard.edu/ppiud

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# HSPH PPIUD Project - Background

- During the year following the birth of a child, 40% of women are estimated to have an unmet need for contraception [2]
  - For example, in Sri Lanka the proportion of women leaving facilities without receiving a contraceptive method of their choice is around 97% [6]
- Copper IUDs provide safe, effective, convenient, and long-term contraceptive protection [3]
- Considering places where women may not return for postnatal follow-up appointments due to distance, time, cost, or health-system access, PPIUDs offer a good alternative [4]
- The uptake of PPIUDs is still low despite these benefits [4]
  - Of 43 countries with recent DHS surveys, in only 3 were 20% or more of postpartum users of contraception relying on PPIUDs [5]

[2] Rossier C, Bradley SEK, Ross J, Winfrey W. Reassessing Unmet Need for Family Planning in the Postpartum Period. Stud Fam Plann. 2015;46(4):355–67.
[3] Kapp N, Curtis KM. Intrauterine device insertion during the postpartum period: a systematic review. Contraception. 2009;80:327–36.
[4] Canning et al. MBC Pregnancy and Childbirth (2016) 16:362, DOI 10.1186/s12884=016-1160-0
[5] Winfrey W, Kshitiz R. Use of Family Planning in Postpartum Period. 2014, 36.
[6] https://www.figo.org/ppiud-project

# HSPH PPIUD Project - The intervention

- The intervention: institutionalizing the practice of offering immediate post-partum IUD services
- FIGO has designed and has implemented the intervention program at the selected hospitals, which includes:
  - Training providers on PPIUD provision and insertion
  - Training community-based intermediaries (midwives, skilled birth attendants, community health workers) linked with each intervention hospital hospital
  - PPIUD service delivery
    - Women presenting at the study hospitals will receive information on postpartum contraception and availability of PPIUD services and can elect to receive a PPIUD

# HSPH PPIUD Project - Study design

- The potential benefit of the intervention to all women resulted in the decision to use a cluster-randomized step-wedge design
- 6 hospitals in each country were selected and were randomized into two groups of three
- Facilities were matched for # of deliveries per year

| Time (months) | 1-3 | 4-9 | 10-12 (Tanzania)<br>10-18 (Nepal and Sri Lanka) |
|---|---|---|---|
| Group 1 (Hospitals 1-3) | O | X | X |
| Group 2 (Hospitals 4-6) | O | O | X |

where X = PPIUD intervention and O = control (standard of care provided)

# HSPH PPIUD Project - participant (women) inclusion criteria

- *Expected enrolment rate: 300 women per month per hospital*
- Sri Lanka *(~32,400)*
  - Delivered in one of the 6 study hospitals during the 18-month enrolment period
  - Normally reside within Sri Lanka
- Nepal *(~32,400)*
  - Delivered in one of the 6 study hospitals during the 18-month enrolment period
  - Normally reside within Nepal
- Tanzania *(~21,600)*
  - 18 years or older
  - Delivered in one of the 6 study hospitals during the 12-month enrolment period
  - Normally reside within Tanzania

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# HSPH PPIUD Project - Research instruments (mobile application)

Quantitative interviewer-administered survey conducted with women up to four points in time:

1. Baseline form (in hospital)
2. 4-8 week follow-up form after delivery among women who accepted a PPIUD
3. 9-month follow-up form
4. 18-month follow-up form

Quantitative interviewer-administered surveys conducted with providers at three points in time:

1. Baseline, prior to implementation of FIGO intervention
2. 6 months after implementation begins
3. 12 months after implementation ends

# HSPH PPIUD Project - Outcome measures

1. Uptake of PPIUD
2. Receipt of PPIUD counselling before or after delivery
3. PPIUD expulsion rate and complication rate 4-8 weeks postpartum
4. Modern contraceptive use at 9 months postpartum
5. Modern contraceptive use at 18 months postpartum
6. Pregnancy rate 18 months postpartum
7. Sustainability: Percentage of trained providers who are still providing PPIUD services 12 months after the end of the implementation
8. Sustainability: Percentage of trained providers providing PPIUD services in new facilities 12 months after the end of implementation
9. Sustainability: Percentage of providers providing PPIUD services in intervention facilities 12 months after the end of implementation

# HSPH PPIUD Project - Tanzania implementation

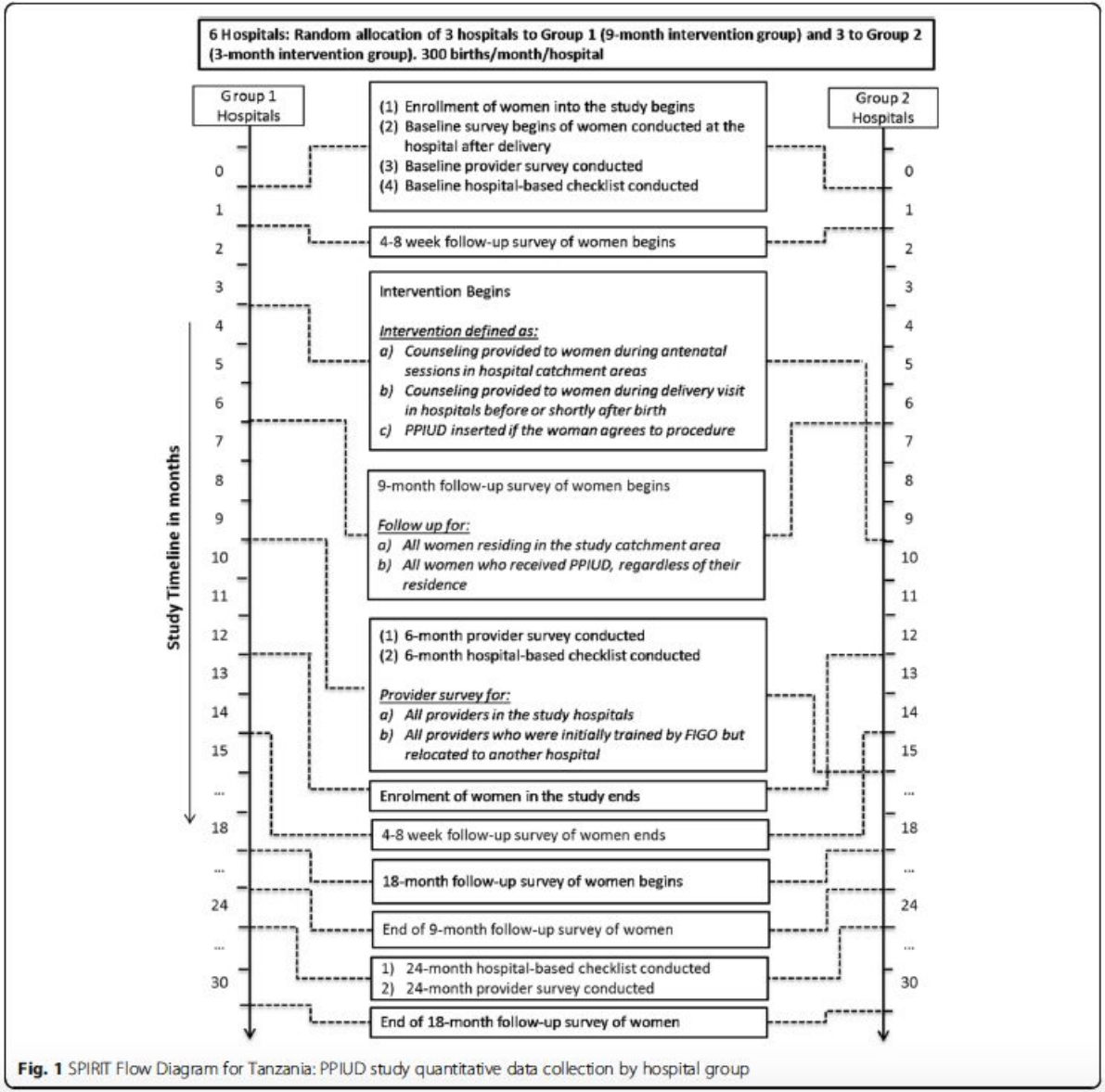



**Fig. 1** SPIRIT Flow Diagram for Tanzania: PPIUD study quantitative data collection by hospital group

# HSPH PPIUD Project - Sri Lanka and Nepal implementations

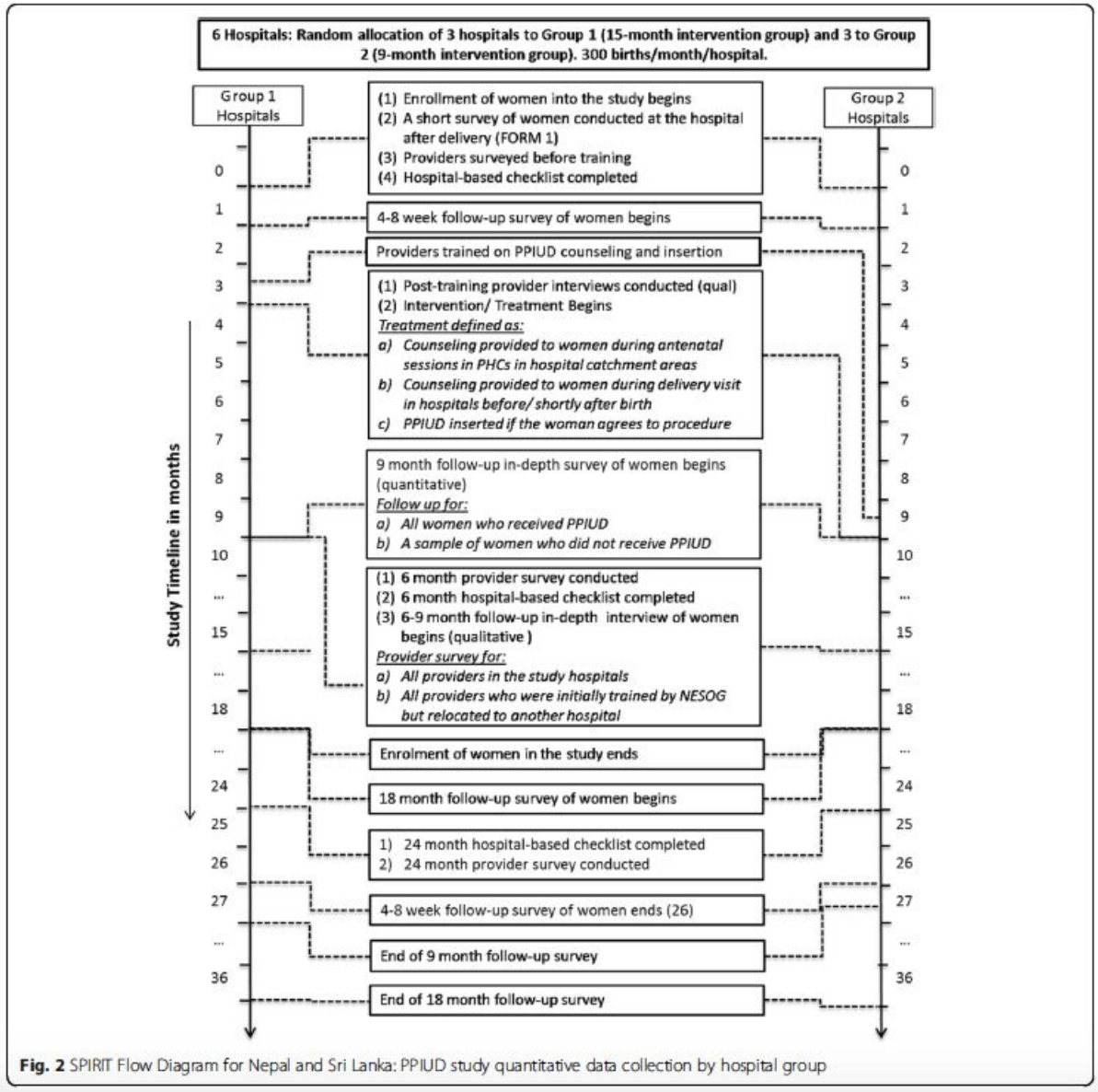



**Fig. 2** SPIRIT Flow Diagram for Nepal and Sri Lanka: PPIUD study quantitative data collection by hospital group

# HSPH PPIUD Project - The app

## Form 1- Baseline

*To be administered at the time of a woman's delivery*

- → Part A: When patient is admitted
- → Part B: Family Planning Counselling
- → Part C: PPIUD Insertion

## Form 2- 6 wk Follow-Up

*To be administered 4-6 weeks postpartum*

- → Part A: Demographics
- → Part B: Follow-up details- Continuation of Method
- → Part C: Follow-up details- Discontinuation of Method

## Form 3- 6mo/18mo Follow-Up

*To be administered at the 6 and 18th month mark*

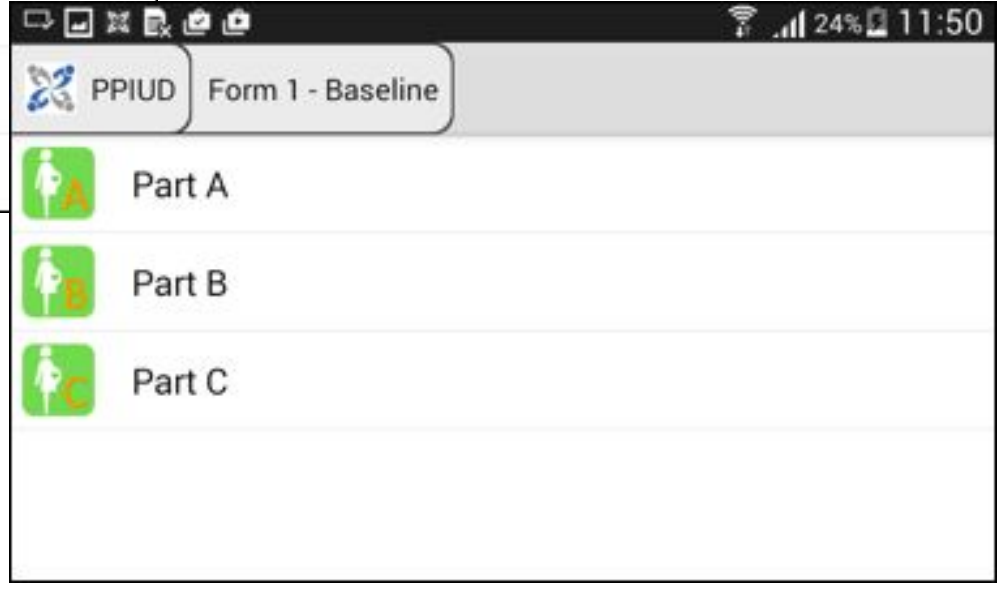
- → 6 and 18 month Follow-Up- Women

## Facility Forms

*To be administered with providers before the intervention training component starts*

- → Provider survey

# HSPH PPIUD Project - The app

# Location and content of counselling and acceptance of PPIUD in Sri Lanka

- "Location and content of counselling and acceptance of postpartum IUD in Sri Lanka" *[Karra et al. Reproductive Health (2017) 14:42, DOI 10.1186/s12978-017-0304-7]*
- Based on data from 13,731 women in four hospitals in Sri Lanka collected from January 2015 - May 2015
- Prior to the app use and evaluation; provided for context

# Results

- Quality counselling was more likely to be provided in hospital wards and hospital clinics
- Hospital-based counselling was linked to higher PPIUD uptake
- Women were more likely to be given information about risks and alternatives to PPIUD in hospitals
- Women who were counseled at hospitals reported higher level of satisfaction with their counseling

**Table 3** Determinants of PPIUD insertion

| VARIABLES | PPIUD insertion | PPIUD insertion | PPIUD insertion |
|---|---|---|---|
| PPIUD Positive Quality Indicators | | | |
| Could mention at least one risk? | | 0.133*** | 0.0473*** |
| | | (0.0526) | (0.0203) |
| Client informed about alternatives? | | 0.215*** | 0.674 |
| | | (0.0893) | (0.300) |
| Client given opportunity to ask questions? | | 1.321* | 1.220 |
| | | (0.189) | (0.180) |
| Given PPIUD information leaflet? | | 8.367*** | 5.633*** |
| | | (1.064) | (0.768) |
| PPIUD Negative Quality Indicators | | | |
| Could not mention at least one benefit? | | 1.58e-07*** | 7.92e-08*** |
| | | (3.52e-08) | (2.36e-08) |
| Dissatisfaction with PPIUD counselling? | | 0.0242*** | 0.0485*** |
| | | (0.0245) | (0.0487) |
| Counselling Location | | | |
| Home | 0.160*** | | 0.184*** |
| | (0.0271) | | (0.0278) |
| Field Clinic | 0.173*** | | 0.152*** |
| | (0.0231) | | (0.0179) |
| Hospital Clinic | 1.931*** | | 0.975 |
| | (0.200) | | (0.0942) |
| Hospital Ward | 4.372*** | | 2.139*** |
| | (0.441) | | (0.219) |
| Observations | 12971 | 12316 | 12295 |

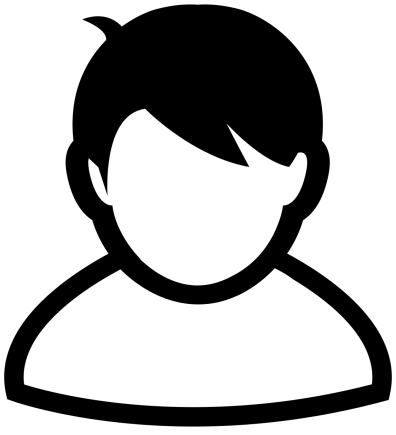
# Thank you!

*For more information on Dimagi, please visit www.dimagi.com*
*For more information on CommCare, please visit www.commcarehq.org*

*Questions?*
*Email me: yho@dimagi.com* or *mrobinson@dimagi.com*

# Appendix: Tables

# Substudy 1: Results
## Participant Demographics



HIV-Positive Youth

| CHARACTERISTICS (N=10) | | |
|---|---|---|
| **Age, years** | | 21 ± 3.3 |
| **Ethnicity** | Hispanic | 1 (10%) |
| | Not Hispanic | 9 (90%) |
| **Race** | Black | 7 (70%) |
| | White | 1 (10%) |
| | Other | 2 (20%) |
| **Sex** | Female | 7 (70%) |
| | Male | 3 (30%) |
| **Education, highest level** | Some high school | 3 (30%) |
| | High School | 2 (20%) |
| | Some college | 4 (40%) |
| | College degree | 1 (10%) |
| | Masters | 0 (0%) |
| **Smartphone ownership** | Android | 1 (10%) |
| | iPhone | 9 (90%) |
| **Hours on phone** | 0-3 | 2 (20%) |
| | 4-6 | 2 (20%) |
| | 7-9 | 2 (20%) |
| | 10-12 | 2 (20%) |
| | 13+ | 2 (20%) |
| **Health/HIV apps** | Yes | 0 (0%) |
| | No | 10 (100%) |

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# Substudy 1: Results
## Participant Demographics

Case Manager

| CHARACTERISTICS (N=5) | | |
|---|---|---|
| **Age, years** | | 18-44 (3, 60%); 45+ (2, 40%) |
| **Ethnicity** | Hispanic | 3 (60%) |
| | Not Hispanic | 2 (40%) |
| **Race** | Black | 1 (20%) |
| | White | 1 (20%) |
| | Other | 3 (60%) |
| **Sex** | Female | 4 (80%) |
| | Male | 1 (20%) |
| **Education, highest level** | Some high school | 0 (0%) |
| | High School | 0 (0%) |
| | Some college | 0 (0%) |
| | College degree | 4 (80%) |
| | Masters | 1 (20%) |
| **Smartphone ownership** | Android | 1 (20%) |
| | iPhone | 4 (80%) |
| **Hours on phone** | 0-3 | 0 (0%) |
| | 4-6 | 3 (60%) |
| | 7-9 | 0 (0%) |
| | 10-12 | 1 (20%) |
| | 13+ | 1 (20%) |
| **Health/HIV apps** | Yes | -- |
| | No | -- |

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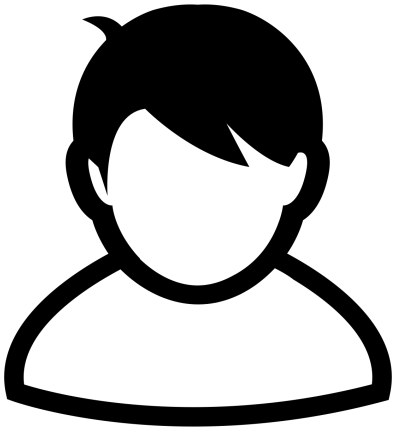
# Substudy 2: Results
## Participant Demographics



HIV-Positive Youth

| CHARACTERISTICS (N=8) | | |
|---|---|---|
| **Age, years** | | 21 ± 4.2 |
| **Ethnicity** | Hispanic | 2 (25%) |
| | Not Hispanic | 6 (75%) |
| **Race** | Black | 6 (75%) |
| | White | 0 (0%) |
| | Other | 2 (25%) |
| **Sex** | Female | 6 (75%) |
| | Male | 2 (25%) |
| **Education, highest level** | Some high school | 2 (25%) |
| | High School | 1 (13%) |
| | Some college | 4 (50%) |
| | College degree | 1 (13%) |
| | Masters degree | 0 (0%) |
| | Associates degree | 0 (0%) |
| **Smartphone ownership** | Android | 0 (0%) |
| | iPhone | 8 (100%) |
| **Hours on phone** | 0-3 | 0 (0%) |
| | 4-6 | 3 (38%) |
| | 7-9 | 1 (13%) |
| | 10-12 | 3 (38%) |
| | 13+ | 1 (13%) |
| **Health/HIV apps** | Yes | 2 (25%) |
| | No | 6 (75%) |

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# Substudy 2: Results
## Participant Demographics

Case Manager

| CHARACTERISTICS (N=5) | | |
|---|---|---|
| **Age, years** | | 25-44 (3, 60%); 45+ (2, 40%) |
| **Ethnicity** | Hispanic | 3 (60%) |
| | Not Hispanic | 2 (40%) |
| **Race** | Black | 1 (20%) |
| | White | 2 (40%) |
| | Other | 2 (40%) |
| **Sex** | Female | 3 (60%) |
| | Male | 2 (40%) |
| **Education, highest level** | Some high school | 0 (0%) |
| | High School | 0 (0%) |
| | Some college | 0 (0%) |
| | College degree | 2 (40%) |
| | Masters degree | 1 (20%) |
| | Associates degree | 2 (40%) |
| **Smartphone ownership** | Android | 2 (40%) |
| | iPhone | 2 (40%) |
| **Hours on phone** | 0-3 | 2 (40%) |
| | 4-6 | 1 (20%) |
| | 7-9 | 1 (20%) |
| | 10-12 | 1 (20%) |
| | 13+ | 0 (0%) |
| **Health/HIV apps** | Yes | -- |
| | No | -- |

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# Appendix: CommCare Features

CommCare

## Some product features

- Hosted on a cloud server and available through website
- Open source: made freely available and can be redistributed/modified
- App builder designed for non-programmers
- Complex workflows: longitudinal tracking, branching logic, SMS
- Fully functional offline
- Data privacy, HIPAA compliance and user permissions
- Variety of free and affordable SaaS subscriptions
- Free mHealth app “store”, featuring apps by other partners
- Adapted for low-literate users with multimedia content
- Software interoperability with APIs
- Compatible for Android,Nokia and web-enabled phones
- Client data management; online and workforce monitoring reports

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