App Review:
Developing Apps for Population Health Research

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Outline

1. Introduction
2. Review
3. Results
4. Advice
5. Questions

Introduction

Population Health Approach

"Aims to improve the underlying and interrelated conditions in the environment that enable all Canadians to be health and reduce inequities in the underlying conditions that put some Canadians at a disadvantage for attaining and maintaining optimal health.

Federal, Provincial and Territorial Advisory Committee on Population Health, 1997

Introduction

eHealth

" The cost-effective and secure use of information communication technologies (ICT) in support of health and health-related fields, including health-care services, health surveillance, health literature and health education, knowledge and research. "

World Health Assembly, 2005

Introduction

78% of the population owns a smartphone

57% of the population owns a tablet

325,000 health apps

2 million apps available on the Apple App Store

3.8 million apps available on the Google Play Store

Paré et al., 2017; Research2Guidance, 2017; Statistica, 2018

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Purpose and Objectives

1. Understand how researchers have developed apps for population health research

2. Provide recommendations for researchers who are planning to develop population health research apps.

Methods
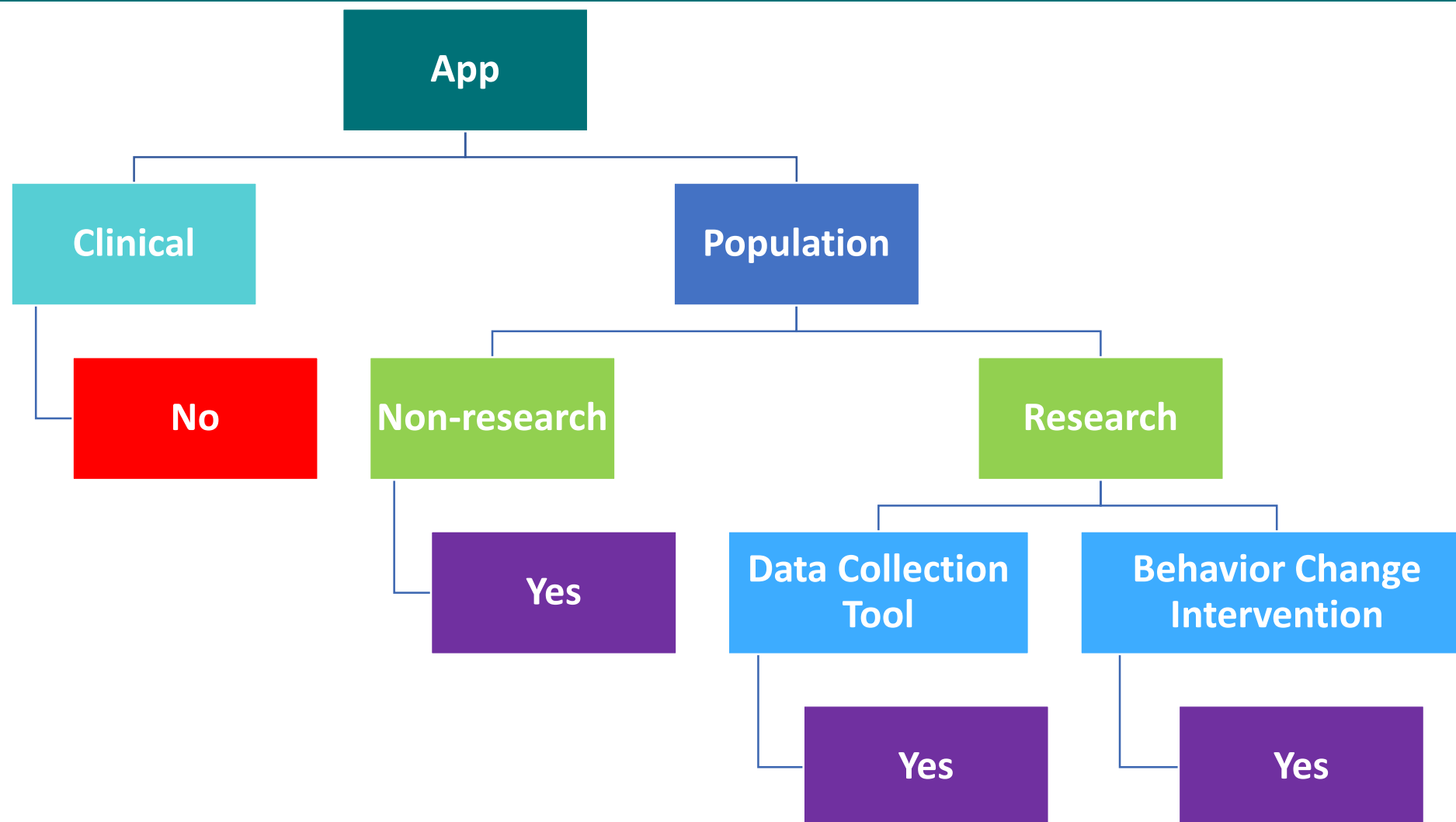
Methods

- Population Health App search
- Request interviews with researchers
- Snowball sampling
- Semi-structure interviews
- Summarized interviews according to questions
- Interviews analyzed and integrated with literature

Methods

- Interviewed 8 researchers and 1 external developer
- Participants developed ~20 apps in total
- Apps developed for
  - Research purposes
  - Dual purpose (research and non – research)
  - Non – research purposes

Benefits of using apps for health research

- Convenient for participants
- Minimal intrusion
- Reduced time commitment
- Reduced data collection cost
- Any geographic location
- Real world situations

→ High flexibility and more opportunities for participation

Munos et a., 2016; Raento, Oulasvirta, & Eagle, 2009;

Benefits of using apps for health research

" Our app has enabled a lot of very interesting research and it is commercially viable. I think that's pretty worthwhile. "

Risks of using apps for health research

- Not all Canadians have smartphones or tablets
- Smartphone users may not be representative of the Canadian population
- Informed consent process
- Protection of data and participant privacy

Jardine, Fisher & Carrick, 2015; Ernsting et al., 2017; Maronick, 2014

Developing App Content

- Data Collection Tool
- Content of Apps
  - Importance of using academic sources
- Students
  - Lower cost
  - May not be on same timeline
- Collaboration
  - Researchers and faculty members
  - Experts in the field
  - Third-party partners

Developing App Content

> "A lot of it came from the team and from research evidence that was out there. We had all hands on deck to develop because we needed quite a lot of content."

App Development – Android vs. iOS

1. Android only
2. iOS only
3. Both Android and iOS
4. Platforms compatible with Android and iOS
   1. Flutter
   2. React Native
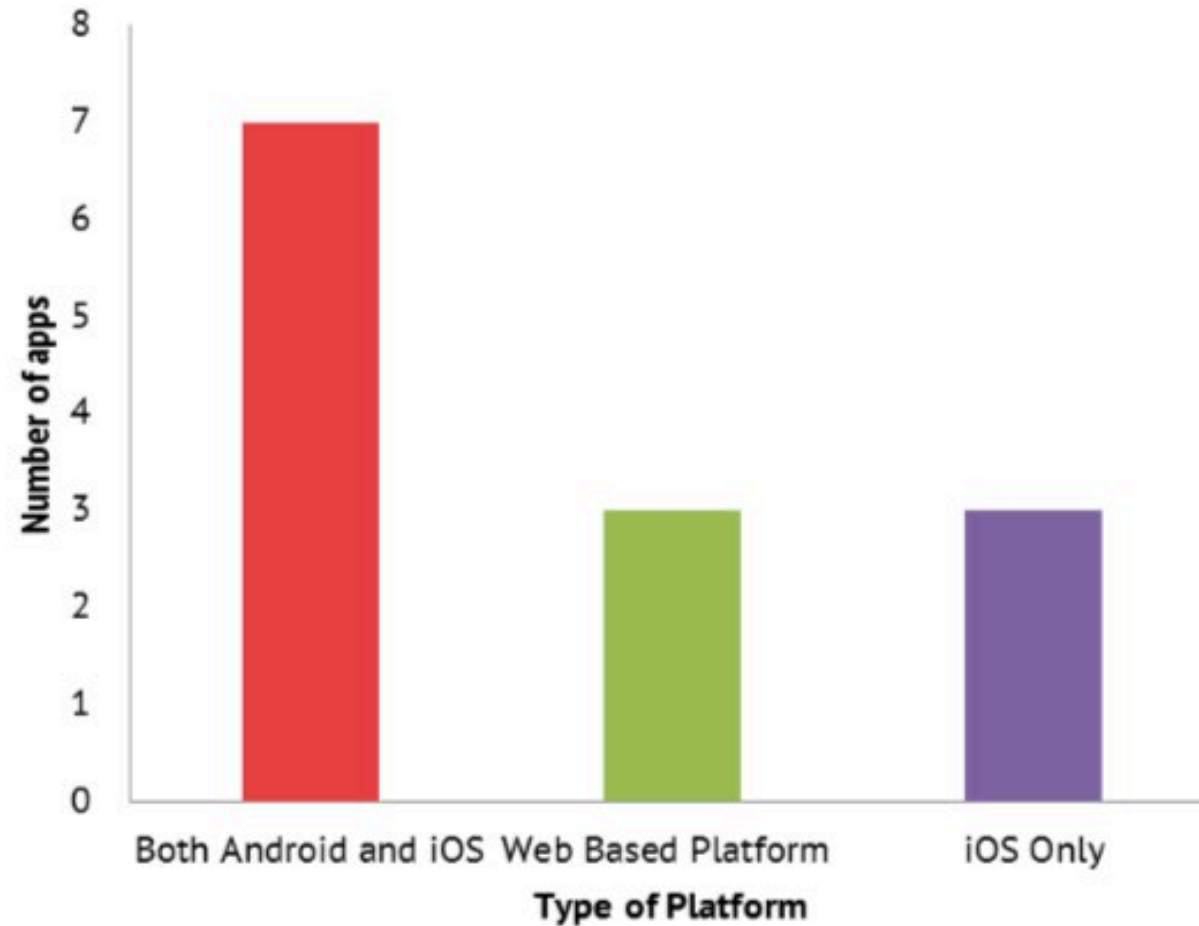   3. Native Script

Android vs. iOS

Figure 1. Number of apps developed on Android, iOS, or Web-Based Platforms

Android vs. iOS

- Majority of researchers wanted to develop for both platforms

- Some developed for one platform first before developing for the second platform
  - Cost savings
  - Technical issues
  - App complexity

Android vs. iOS

Features	One platform (Android or iOS)	Two platforms (Android and iOS)	Web-based Platform (Compatible with Android and iOS)
User base	Only users of one platform	All users	All users
Cost	Least expensive	Most expensive	Cost effective – less expensive than developing both apps separately
Design	Most appealing – designed specifically for the platform	Most appealing – designed specifically for the platform	Less appealing – not designed specifically for either platform
Updating	Update one platform	Update both platforms separately	Update one platform

Hiring an External Firm vs. Students

1. External Firm
2. Students
3. Combination of external firm and students
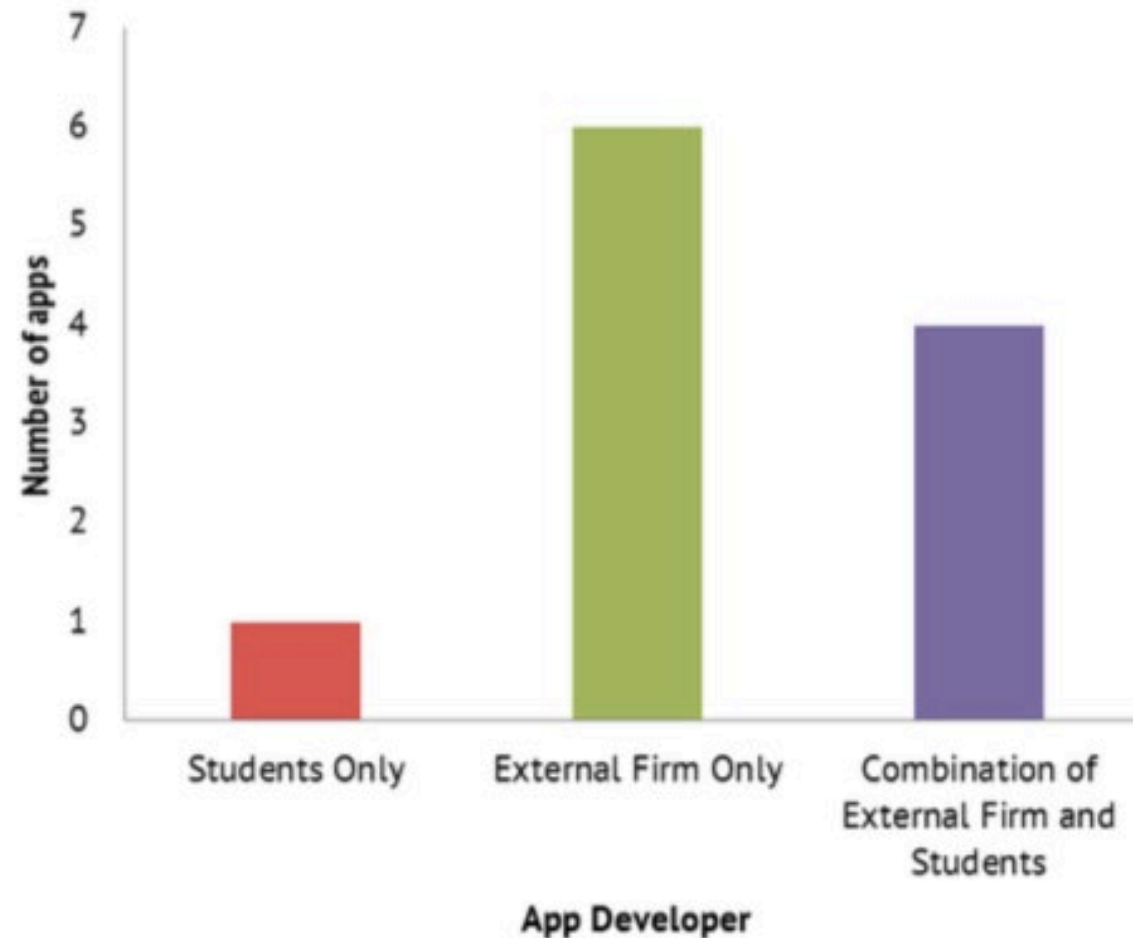
Hiring an External Firm vs. Students

Figure 2. Hiring students versus external consultants for app development

Hiring an External Firm vs. Students

External Developer	Students
More expensive	Less expensive
Support local economy	Easier to get funding
Signed contract between developer and research team	Competing interests (Ex: Moving on to graduate)
Professional product	Less professional product
Faster development period	Slower development period
Understanding about project management and real life integration	

Development Cost

Lowest development cost: $15,000

Highest development cost: $125,000

Average development cost: $56,000

Development Cost

- Development costs depend on various factors
  - App complexity
  - Number of iterations needed before the app is finalized
  - Longer development period = higher cost
  - Incorporating accessibility features
  - External developer vs. student
- Significant costs associated with updating and maintain the app

Time Frame

- Complexity of the app is the biggest factor in determining the period of time
- After development is completed, app still requires regular maintenance and updates

Defining App Success

- Majority of participants felt their app was successful
  - Number of downloads →→→ App designed for public use
  - Awards
  - App collected accurate and usable data →→→ Data Collection Tool
  - Ability to change behavior over a period of time →→→ Behavior Change Intervention
- Apps gained popularity
- App became a company

Defining App Success

> "The ultimate goal for my app and for the work I'm doing associated with data analysis is to change the way social scientists do research. That's a pretty big goal, but we will get there."

Challenges

- Background of the researcher
  - Researchers without a computer science background
    - Scope of the project – underestimating complexity of app development

- Communication between researcher's vision and development team

Challenges

- Cost to develop an app is high
- Difficulty attaining funding from traditional sources
- Technology and software problems
- Updating app
- Reducing device battery consumption

Challenges

"Dealing with technology development that you're not familiar with... It's like making decisions without having the right background to make those decisions."

Advice

1. Determining feasibility
2. Understand target audience

Advice

> " Make your app expandable, adaptable. So you can start with a simple concept first, but it's like a Tinker toy where you can add on different things. "

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Ethical Considerations

3. Informed consent process

4. Anonymization

5. Data storage

6. Sustainability

Sustainability

7.   Sustainability plan

8.   Budget for ongoing app updates and maintenance
   - Incorporate maintenance costs into initial grant application
   - Becoming a non-governmental organization (NGO)
   - Licensing the app
   - Sponsorships from third-party organizations
   - Other academic institutions
   - Company
   - In-app advertising or downloading cost

Sustainability

" Before we launched the project we did research on the feasibility and sustainability of how we would keep the app going after the research was over. "

Advice

1. Determine the feasibility of the app

2. Outline and understand the scope of the project. Create budget and time frame.

3. Determine whether how you will develop the app yourself, using students or hiring an outside firm.

Advice

4. Try to align the research team and the development team in the beginning. This can help to minimize communication challenges.

5. Develop a marketing and promotion plan for your app.

6. Think about sustainability of the app from the very beginning. Design a sustainability plan during development of the app.

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Advice

7. Consider not developing an app for health research.

Why?

a. The process is extensive and requires a lot of money, organization time, and human resources.

b. It is harder to make worthwhile from the research perspective now than it was in the past.

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Read the full report

http://www.beaplab.com/home/reports/

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