# **Review Article**

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# Applications for data collection: AppDatCol

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#### **ABSTRACT**

Health surveillance or routine health surveys are the main sources of health-related information in developing countries. The need to support the paper process and the recent advanced popularity of mobile devices fortified the development and use of electronic data collection methods in community health and clinical research works. Data collection apps are mobile applications that make it possible to collect data from a smartphone, tablet, or iPad. The main objective of this article is to explore different type of applications easily available for using as a tool for data collection purpose. This article will brief about software's that are easily available to be customized and can be used for data collection. Mobile data collection apps are becoming integral to secure, reliable, and scalable research. The efficiency and dependability of these mobile survey apps, even in offline settings, open doors to new research possibilities. It begins with the freedom and adaptability of designing research-specific forms that work even in the most challenging environments. Sharing experiences of the barriers and distinct benefits of this technology will help future users to be better informed and allow for the swifter adoption of these and similar technologies. Although any digital form may suffice for the purpose of data gathering, not every data collection system may be used for sensitive, clinical or research data. We believe that Teamscope and CSPro stands out in the mobile data collection landscape and is the best choice for research purposes. No other application combines data encryption, passcode lock, crossdevice compatibility with iOS and android, support for both cross sectional and longitudinal studies, like these applications does.

Keywords: Applications for data collection, Health surveillance, iOS and android

# INTRODUCTION

Health surveillance or routine health surveys are the main sources of health-related information in developing countries. Large-scale national and sub-national surveys are needed to map the distribution of a health condition, establish baseline prevalence and incidence data for planning, and monitoring the health status of the population. <sup>2</sup>

Conducting any survey requires extensive use of paperpen and manual processes to manage the data. Paper data collection processes are labor intensive, time-consuming, susceptible to errors, incur high printing and running costs, and are cumbersome and uncomfortable for field data collection.  $^{1-3}$ 

The need to support the paper process and the recent advanced popularity of mobile devices fortified the development and use of electronic data collection methods in community health and clinical research works.<sup>2</sup> Data collection apps are mobile applications that make it possible to collect data from a smartphone, tablet, or iPad. One of the main advantages of data collections apps is the possibility of gathering data offline or while on-the-go. Offline forms allow researchers that are working in places with unreliable internet to store a backup of their data on their mobile device and upload it

once an internet connection is available. Electronics devices such as personal digital assistants, mobile phones and tablet computers are noticeably tested for their potential role in replacing the standard paper-based tools. <sup>4-6</sup> The anticipation is that electronic data capturing tools may overcome substantial limitations of the paper-based system through saving time, improving the data quality, and minimizing overall cost. <sup>1,3,7</sup>

Due the fast evolution of information technology and the heterogenicity of infrastructures in different countries, evaluations of such systems require periodic and setting context evidence to support the growing claims on their efficiency, effectiveness, and impacts.<sup>8</sup>

Data collection software was first introduced in the early 1980s to address the many shortcomings of paper-based forms, such as increased errors through transcription and late detection of inaccuracies.<sup>10</sup>

The main objective of the study was to explore different type of applications easily available for using as a tool for data collection purpose.

This article briefed about software's that are easily available to be customized and can be used for data collection. Their suitability for offline surveys and their further services that set them apart will also be explored (Table 1).

Table 1: Summary table for Software's Used for Data Collection.

S. no.	Para- meters	CSPro	Team- scope	ODK	KoBo Toolbox	RED- cap	Mag- pi	Jot forms mob- ile	Sur- vey CTO	CommCare
1.	Manage ment of the app	Easy to make, customize and edit	Easy to make, custom- ize and edit	Initiatio n step requires technic- al knowl- edge	Web version can be used to create the form, requires technical knowle- dge	Requires technica l expertis e to install software and customize the form	Easy to install the form	Requires soft-ware specific know-ledge to create forms	Easy to make, cust- omize and edit	Needs training and technical knowledge to initiate
2.	Mobile data capture	Both offline and online in both android and iOS	Both offline and online in both android and iOS	Both offline and online in android only	Both offline and online in android only	Both offline and online in android only	Both offline and online in both android and iOS	Both offline and online in both andro id and iOS	Both offline and online in android only	Both offline and online in android only
3.	Data extractio n	Data files can be export-ed into spreadsheet s and statistical packages as well.	Data can be export- ed as a CSV/ex cel file	Data can be export- ed as a CSV/ex cel file	Can be extracted easily	Data can be extract- ed through its applicati on	extracte d as Google sheet, or	PDF copi- es can be expo- rted	Thro- ugh deskt- op applic ation data can be extra- cted	Need to identify source to extract the data
4.	Charges to use the applicatio n	Free	Paid	Paid	Free	Free	Free but pro versi- on is paid	Free but pro versi- on is paid	Paid	Paid

# CENSUS AND SURVEY PROCESSING SYSTEM $(CSPr_0)^{11}$

CSPro is a public domain software package used by individuals and organizations for entering, editing, tabulating, and disseminating census and survey data. CSPro is designed to be as user-friendly as possible, yet powerful enough to handle the most complex applications. It can be used by a wide range of people, from non-technical staff assistants to senior demographers and programmers.

CSPro supports data collection on android devices (phones and tablets). The CSEntry android app works in collaboration with the desktop version of CSPro. CSPro supports smart data transfer from android or windows devices to a server CSWeb.

CSPro users can create data entry forms (screens) for data capture. The application designer has full control over form layout. CSPro supports rosters, consistency checks and skip patterns of unlimited complexity, user-defined messages and menus, multiple lookup files, and produces operator statistics. Once a case has been completely entered, the operator can modify any part of the existing data and can add or remove information, as well (subject to application constraints).

CSPro permits the user to generate detailed reports on all errors found; the user may also create subfiles from the original data and may use multiple look-up files during the validation and/or report generation process. The export data tool can now output Stata exports in unicode format. To open these exports, you need Stata version 14 or later. The excel to CSPro tool is much improved, allowing you to create dictionaries from excel data and to convert data from multiple worksheets. This application is freely downloadable, and their supporting staffs are available to extend their support at all the time.

# TEAMSCOPE<sup>12</sup>

Teamscope is a data collection application for clinical and field research. This can be used to create mobile forms, collect data offline and visualize it with a few clicks. Teamscope offers a unique approach at on-the-go and secure data gathering. The application mobile form builder to build own forms, without any prior programming knowledge. Moving from another Electronic data capture (EDC) to Teamscope is quick and easy. Teamscope sets data security as its highest priority. Data is stored encrypted on mobile devices and users, apart from requiring a username and password to login, user must create a four-digit passcode to unlock the app. All sessions on its mobile app time out after 30 sec of inactivity or once the app has been closed, to access the app a user must reenter their Teamscope passcode.

Irrespective of study setting, Teamscope allow to work wherever you need. This mobile application is offline-

friendly which means data can be stored without the need for internet and synchronized once you gain a connection. It is easy to track data creation, edits, and reason for changes. Data can be exported at any moment as a CSV/excel file for all modification and analysis.

There is a subscription fees for using Teamscope. But Teamscope provides discounts for students as well as NGOs.

## OPEN DATA KIT (ODK)13

The goal of ODK is to offer open-source and standards-based tools which are easy to try, easy to use, modify and scale. For a trial, ODK offers a demo version and after the demo, it provides a free 14-days trial account to try ODK at your own pace after which there is a subscription fees for the same. ODK allows android based multiple types of data - from text to pictures to location- to be entered and collected in line with the researchers need. They allow teams to use ready-to-use mobile, desktop, or server devices or customize them to suit their needs both online and offline.

To make these tools widely accessible and functional, ODK is supported in multiple languages. ODK further has an immense and highly active community. ODK forum is a space where ideas on mobile data collection can be shared and discussed. The primary limitation of ODK is the need for programming or coding experience for it to be set up.

# KOBOTOOLBOX14

This is a free, open-source, simple, robust, and powerful tool for mobile data gathering developed by the Harvard humanitarian initiative. Data entry may be done via the web browser or on KoBo toolbox's android application called KoBoCollect. KoBoCollect supports offline data entry with on both android phones and tablets.

Data could be collected online/offline, on phone, tablets or any browser using KoBoCollect on android devices. Synchronize data via SSL ensures data cannot be read by a third party. Strong safeguards are in place against data loss Even on very long interviews. Also, data is immediately available right after it is collected. KoBoToolbox is funded entirely through generous grants and donations from partners. It gives unlimited use for humanitarian organizations whereas KoBoToolbox also provides researchers, aid workers, and others, 10,000 submissions per months with 5 GB data storage with unlimited projects.

# REDCAP<sup>15</sup>

REDCap is a secure Electronic data capture (EDC) solution (web, smartphone, tablet, and iPad) for building electronic case report forms and managing databases. REDCap was created in 2004 at Vanderbilt University.

The objective of this project thus was to empower the researchers by allowing them to single-handedly manage their databases, without the need for any programming or technical knowledge.

REDCap users can collect their data in a mobile app on an iPhone, iPad, or Android phone or tablet. The REDCap Mobile App adds a new dimension to REDCap's versatility by providing users with a tool for offline data collection, particularly in environments with poor Internet connectivity. The app cannot be used on its own but is a companion app that must be used alongside REDCap itself (you must first be a REDCap user at a REDCap partner institution before you can utilize the mobile app). Non-profit organizations can join the REDcap consortium and receive a free license of the software, which allows them to install and manage REDcap on their own IT infrastructure.

#### MAGPI<sup>16</sup>

Magpi is a mobile data recording app that allows users to create mobile forms both online and offline within minutes. Its use extends through health, agriculture, environment, and industry sectors, where rapid and lowcost conduction of mobile surveys enables scalable and straightforward research. With four easy steps from setting up an account, to creating a form, and downloading the app, user can start collecting data. This simplicity and efficiency means user is ready to start collecting data on any smartphone, tablet, or iPad within minutes. Real-time dashboards and data visualizations are provided. Data instantly and continuously can be integrated into your enterprise database, Salesforce account, Google Sheet, or Microsoft excel. Raw data on a click of a button can be manually/automatically ex. Offline data entry, SMS notification, Interactive voice response (IVR) data collection, Zapier integration are all unique features of the same. Free basic accounts, paid pro and enterprise plans are available for users.

## JOTFORMS MOBILE<sup>17</sup>

Jotforms app allows users to collect various types of data, such as voice recordings, barcodes, geolocations, and electronic signatures and then build, view, access, sort, fill out, share, and organize all this data in a single place. The utility of using a mobile data recording app, in this case, enables it to function offline and utilize iOS and Android push notifications to alert the user of new respondents or changes in data. The PDF copies of submitted information can even be downloaded or shared.

One of Jotforms distinct features is Kiosk mode, this mode turns tablet or iPad into a fixed survey station. While on this mode, respondents only have access to a single form, blocking them from other submissions or forms. This feature increases data security and makes it

easy to collect data in public spaces, such as hospital waiting rooms, conferences, or social events.

Mobile forms can be created and assigned to individual researchers who will then collect data even in areas with limited or no connection to the internet. Once respondents have filled in the forms, you can view the data, and act quickly on the information you have received. Free basic accounts, paid pro and enterprise plans are available for users.

#### SURVEY CTO<sup>18</sup>

Survey CTO is a reliable, secure, and scalable mobile data collection app for researchers and professionals. This app expanded on ODK software to increase its scale, utility, and power.

The application allows users to design a variety of complex survey forms with either an intuitive spreadsheet format or a drag-and-drop form. Data can further be preloaded and streamed between datasets. The data can also be collected offline with the Survey CTO android app or using an online web interface. The data is kept secure through multiple layers of encryption.

The researcher or professional is further able to monitor all incoming data using review and corrections workflow, automated quality checks, and data classification systems. Visualization of the data is almost instant through a built-in tool, and further analysis of the data is done using external analytical tools.

Survey CTO has further built up a large community that aims to offer advice and information on various projects.

# COMMCARE<sup>19</sup>

CommCare is a world-class data collection platform developed by Dimagi which is a for-profit social enterprise based in USA and widely adopted by international organizations such as partners in health, International rescue committee (IRC) and USAID. The platform supports both cross-sectional and longitudinal data and is geared towards humanitarian and medical data gathering. CommCare stands out for its comprehensive onboarding support with the possibility for on-site training.

The platform consists of an intuitive drag-and-drop web interface for designing own mobile forms and an Android application for robust and offline data recording. It offers in-person training packages to help the team, learn CommCare, and develop the skills they need to manage the application.

# **DISCUSSION**

Entering data on case report forms and subsequently digitizing them in electronic media is the traditional way

to maintain a record keeping system in field studies. Direct data entry using an electronic device avoids this two-step process. It is gaining in popularity and has replaced the paper-based data entry system in many studies.

Mobile data collection apps are becoming integral to secure, reliable, and scalable research. The efficiency and dependability of these mobile survey apps, even in offline settings, open doors to new research possibilities. It begins with the freedom and adaptability of designing research-specific forms that work even in the most challenging environments; it continues with secure and collaborative data entry and ends with faster data analysis and visualization. Sharing experiences of the barriers and distinct benefits of this technology will help future users to be better informed and allow for the swifter adoption of these and similar technologies.<sup>3</sup>

Despite the advances in web-based data entry systems, historically field researchers and clinical teams working on the go have still suffered from the burden of paper-based data gathering. This is due to a simple reason: web-based data recording tools become useless when there is no internet. Although smartphone adoption in the world has skyrocketed in the last five years, internet access has not increased at the same speed, and so much of the world today remains offline.

When looking into data gathering tools for research, it is essential to acknowledge that projects differ in their design and purpose. Thus, the mobile survey platform of choice should be flexible enough to be used for a range of different data, as well as in potentially disconnected areas. With an ever-increasing saturation of mobile survey solutions, we researched the best ones to date.

# CONCLUSION

Although any digital form may suffice for the purpose of data gathering, not every data collection system may be used for sensitive, clinical or research data. We believe that Teamscope and CSPro stands out in the mobile data collection landscape and is the best choice for research purposes. No other application combines data encryption, passcode lock, cross-device compatibility with iOS and android, support for both cross sectional and longitudinal studies, like these applications does. Moreover, the availability of a free plan (open research), enables this technology to any researcher in the world.

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