

# TB – ACTIVE SEARCH

TECHNOLOGY FOR TUBERCULOSIS CONTROL  
MOBILE APPLICATION FOR ANDROID DEVICE



**NÁDIA DE FÁTIMA RIBEIRO FERREIRA**

**LUCRÉCIA HELENA LOUREIRO**



VOLTA REDONDA  
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**OSWALDO ARANHA FOUNDATION  
VOLTA REDONDA UNIVERSITY CENTER  
PRO-DEAN FOR RESEARCH AND POST-GRADUATION  
PROFESSIONAL MASTER PROGRAM IN TEACHING OF  
ENVIRONMENTAL HEALTH SCIENCES**

# **“TB – Active Search”**

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FOR TUBERCULOSIS CONTROL**



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# 1 INTRODUCTION



The application (app) was developed with the purpose of facilitating the process of collecting and archiving information collected by a Community Health Agent (CHA) in his work of mapping the risk of tuberculosis (TB) in urban areas. In addition, the app also has an informative character, providing information related to the disease, forms of actions by the CHA in a risk situation, among others.

It was developed using the Flutter framework, a set of libraries and tools for mobile development created by Google and launched in December 2018. An important point to note is that, although the Flutter framework allows the development of apps for both Android and iOS devices, all development was carried out taking into account the deployment for the Android system. This choice was made considering mainly the large number of Android devices on the market, in the most diverse price ranges, as well as the number of people who already have Android devices, allowing the application to be used by as many people as possible.

The app, which is called TB - Active Search, was developed specifically to be accessed on a mobile device with Android technology and can be accessed at:

<https://drive.google.com/file/d/1qYojYTZ5XCMK6X0aoYRg1xzlil3Rj0P5/view?usp=sharing>

# 2 OPERATION OF THE APPLICATION TB – ACTIVE SEARCH



The app was divided into 19 screens and the CHA will be able to access them according to the characteristics or demands of each family or user. The device can be used both to register a new family and user, if the user does not have a registration in the system, or to register all related demands if the family is in a situation of vulnerability to develop or transmit tuberculosis (TB).

It is worth mentioning that with the app it will be possible to generate charts of the percentage of families or users who are under alert due to the risk of contracting the disease, by exporting the data to Comma - Separated Values (CSV), a program used in softwares such as Excel, which facilitates the compilation of collected data and saves them in the "folder". For this application, data will be saved in the folder called "ACS Data".

# 3 DESCRIPTION OF THE SCREENS



## 3.1 HEALTH AGENT INFORMATION SCREEN

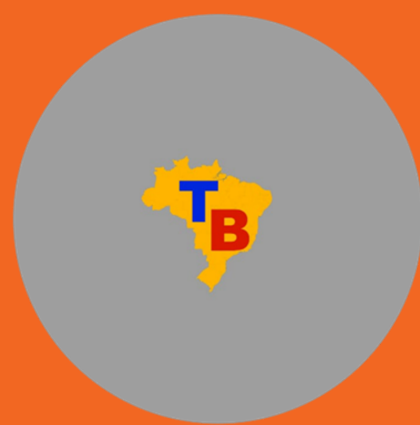
On the first access of the CHA in the app, the system opens a screen where they are requested to fill in the following data: agente name, neighborhood, unit and micro-area of coverage. These data are necessary to identify the person responsible for collecting and inserting the data into the system, as shown in Figure 1 .

Figure 1 - Access screen

A screenshot of a mobile application screen. At the top, the status bar shows the time 21:57 and signal strength. Below the status bar is a dark blue header with the text 'Community Health Agent ...'. The main content area is white and contains four text input fields stacked vertically: 'Agent Name', 'Neighborhood', 'Unit', and 'Microarea of coverage'. Below these fields is a grey button labeled 'Save CHA Information'. At the bottom of the screen, there are two small flag icons: the Brazilian flag on the left and the United States flag on the right. The bottom of the screen shows the standard Android navigation bar with back, home, and recent apps buttons.

Source: Screenshot taken by the author, 2020.

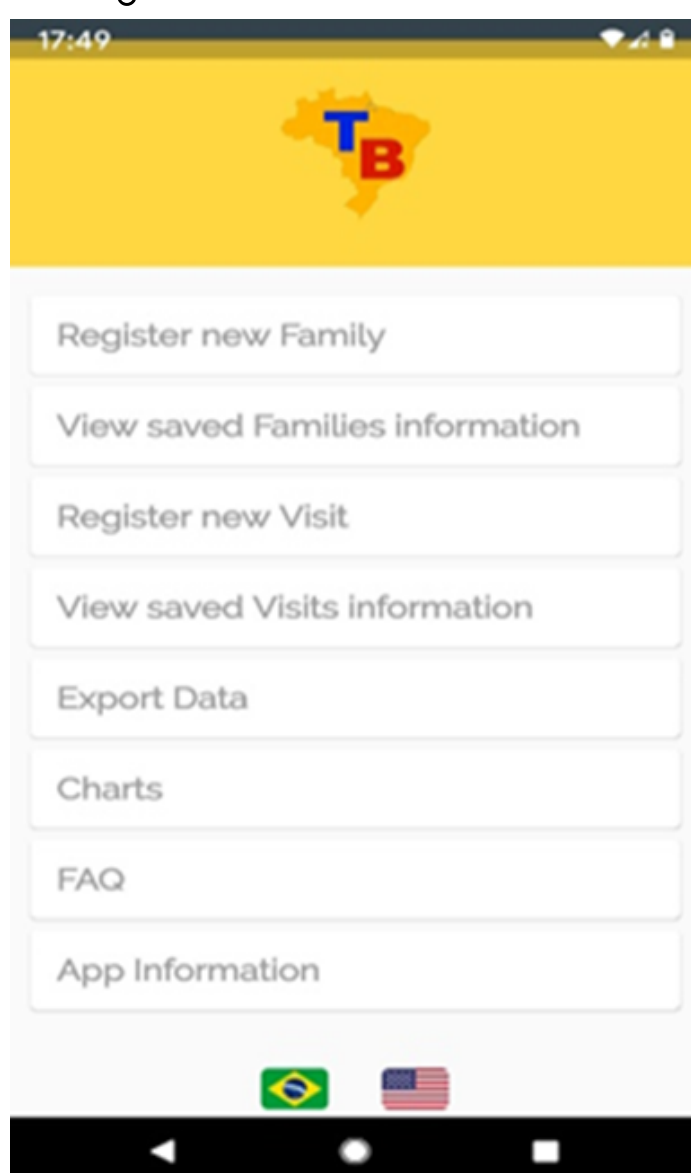
# 3 DESCRIPTION OF THE SCREENS



## 3.2 HOME MENU SCREEN

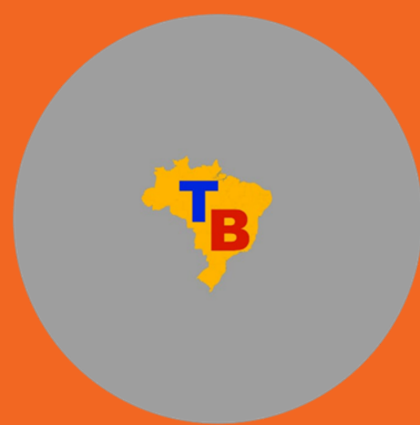
After entering the identification data, the system user is taken to the Home Menu screen (Figure 2). From this screen, the agent can register new families, manage users from the Family Health Strategy (FHS) registered families, register information for a new visit, manage information from previous visits, export the data collected to a data spreadsheet, among other features.

Figure 2 - Home Menu screen



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.3 FAMILY REGISTRATION SCREEN

To register a new family in the app (Figure 3), the agent must click on the “Register new family” button. When clicking, they are directed to another screen, where they must enter the family name.

Figure 3 - Family registration screen



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.4 FAMILY INFORMATION SCREEN

After the family is registered, the app directs the agent to the family information screen. On this screen, they can edit the family's surname (in case of an error in writing, for example) and can delete all data related to the family, if necessary. Also on this screen, agents can see which users are members of a family, as well as manage these users' data (Figure 4).

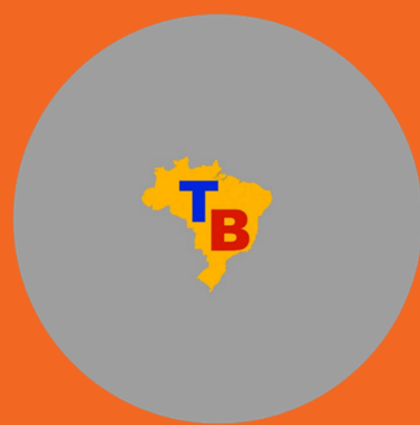
Figure 4 - Family information screen



Source: Screenshot taken by the author, 2020.



# 3 DESCRIPTION OF THE SCREENS



## 3.5 USER REGISTRATION SCREEN

In Figure 5, where it reads “Add new member”, the agent is directed to the user registration screen (Figure 5). On this screen, they can enter the user’s information (full name, date of birth, address, Unified Health System [SUS] card number and mother’s full name).

Figure 5 - User registration screen

The screenshot shows a mobile application interface for user registration. At the top, there is a dark blue header with a back arrow and the text "User Registration". Below the header is a yellow banner featuring a blue icon of a person with a plus sign. The main content area contains five text input fields stacked vertically: "Full Name", "Date of Birth" (with a "0/10" character limit indicator), "Address", "SUS Card Number" (with a "0/18" character limit indicator), and "Mother's Full Name". At the bottom of the form is a "Save User" button. The screen is framed by a black Android navigation bar at the bottom.

Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.6 USER INFORMATION SCREEN

To view registered users' information (Figure 6), the agent can click on the user's name in the "List of Family Members" on the family management screen. When clicking on the list element with the desired username, the agent is again directed to a screen with such user's information.

In this screen, the agent can edit the user's registration information (to correct of incorrectly entered registration data, or update their address, for example), or to delete their registration (action that deletes the registration information and all visits made to that user).

Figure 6 - User information screen



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS

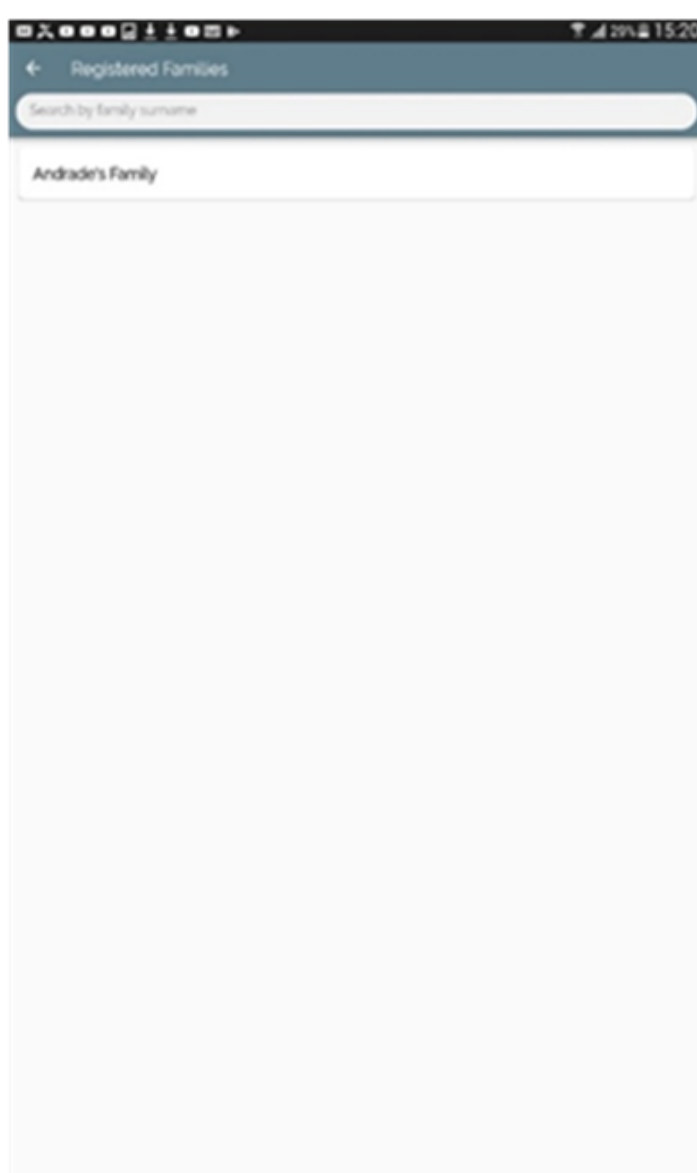


## 3.7 REGISTERED FAMILIES SCREEN

To view the families' registration (Figure 7), the agent must return to the family management screen by clicking on the "View saved families information" button. On the main menu screen, the agent is taken to a screen that lists all the families registered in the app.

This screen has a search bar at the top, which allows filtering the list by the surname of the desired family. And when clicking on one of the elements in the list, the agent is taken back to the family management screen.

Figure 7 - Registered families screen



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.8 VISIT USER SCREEN

With family and user both registered, the agent is able to enter the information collected during the visit. To do so, they must click on the “Register new visit” button (Figure 8). Afterwards, a list with all users registered in the app will appear. This list can also be filtered by user name; for this, the agent must select the user being visited.

Figure 8 - Visit User screen



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.9 VISIT REGISTRATION SCREEN

To start filling in the information of the visit made, the CHA visualizes in the app two checklists that must be filled with information collected during the visit and that can be used to determine the risk of TB in the area; the first one collects specific information related to the individual's health; the second one collects information about the environment, as shown in Figure 9.

Figure 9 - Visit registration screen

The screenshot shows the 'Visit Registration' screen. At the top, there is a header with a back arrow and the text 'Visit Registration'. Below the header is a decorative graphic with three columns of checkmarks. The main content area is divided into three sections: 'Visit Information', 'User Checklist', and 'Environment Checklist'. The 'Visit Information' section contains three fields: 'User Name' (filled with 'Usuário do Teste 2'), 'SUS Card Number' (filled with '463 6528 4358 9'), and 'Date of Visit' (filled with '08/05/2020'). The 'User Checklist' section contains seven items, each with a dropdown menu: 'Coughs for more than 20 days?', 'Has fever in the afternoon?', 'Has night sweats?', 'Exhibits loss of appetite?', 'Feels tired daily?', 'Exhibits weight loss?', and 'Knows anyone with Tuberculosis?'. The 'Environment Checklist' section contains four items, each with a dropdown menu: 'Airy house?', 'Room cleanliness', 'Number of household residents', and 'Number of household rooms'. At the bottom of the checklists is a 'Save Visit' button.

Source: Screenshot taken by the author, 2020.

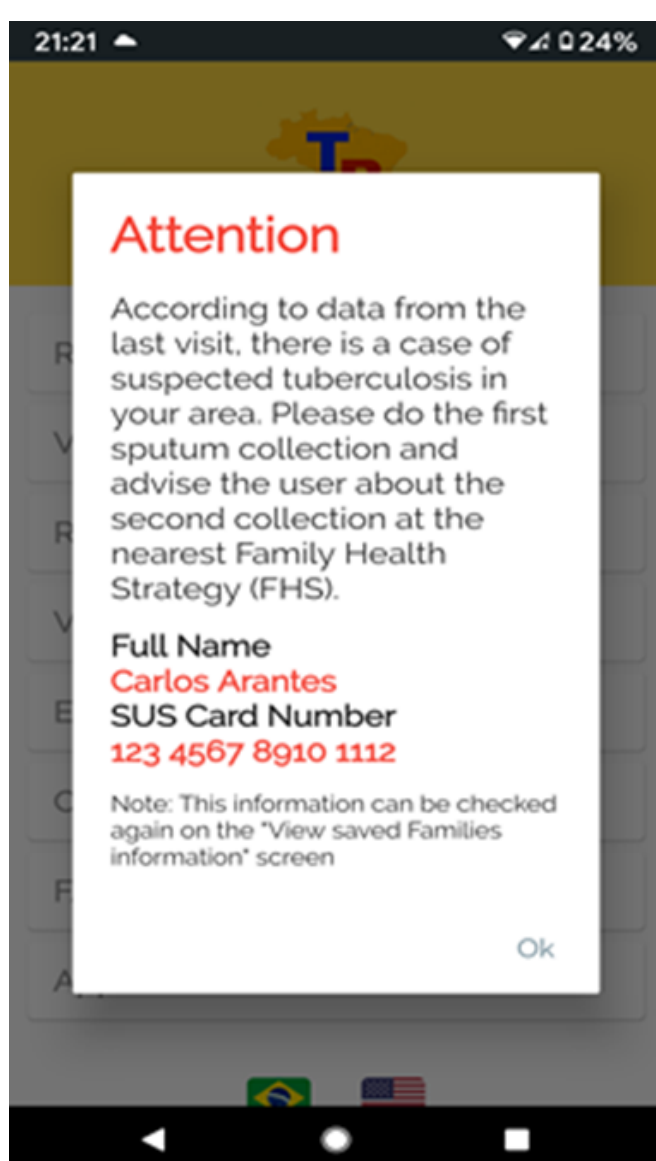
# 3 DESCRIPTION OF THE SCREENS



## 3.10 ALERT POP-UP WINDOW SCREEN

When the agent finishes registering the information of a new visit, the app checks the information collected for evidence that indicates TB risk. If the answers point to imminent TB risk, the app opens a pop-up style window and the agent is informed about the risk alert (Figure 10).

Figure 10 - Alert pop-up window screen



Source: Screenshot taken by the author, 2020.

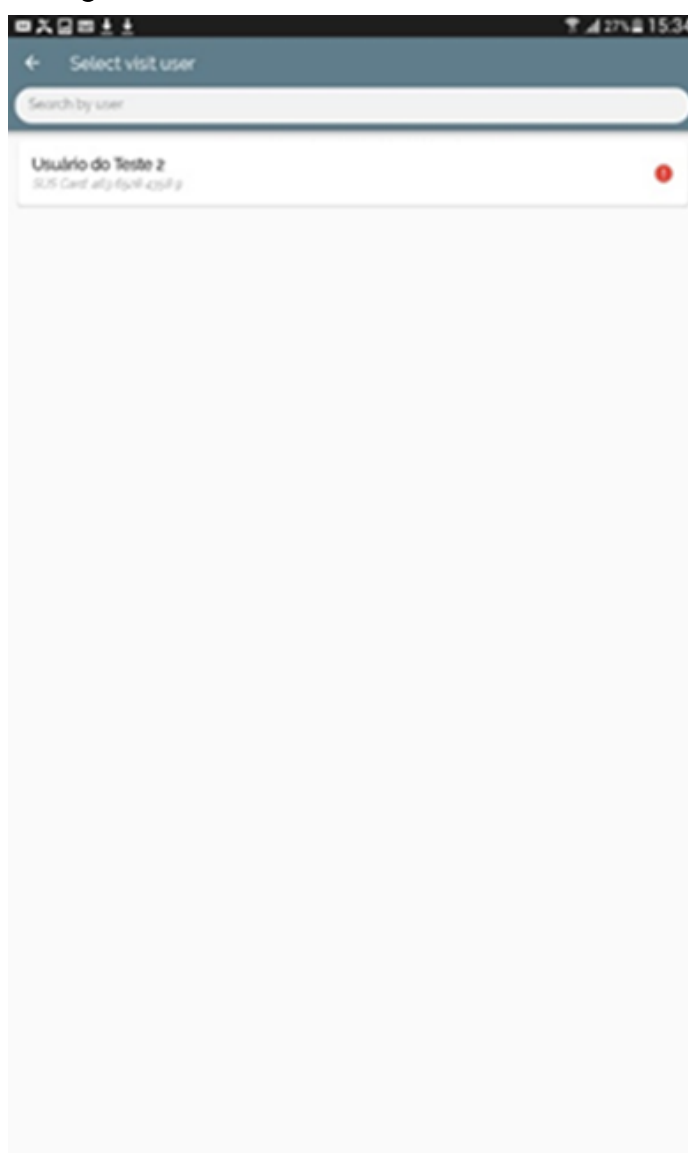
# 3 DESCRIPTION OF THE SCREENS



## 3.11 VISIT USER SELECTION SCREEN

In Figure 11, the app shows an exclamation point (!) highlighted in red, which will change its status only when a new visit is made and changes are made based on the checklist. This icon (!) indicates possible risks of TB contamination in the Family, and appears in a special box at the top of the screen.

Figure 11 - Select visit user screen



Source: Screenshot taken by the author, 2020.

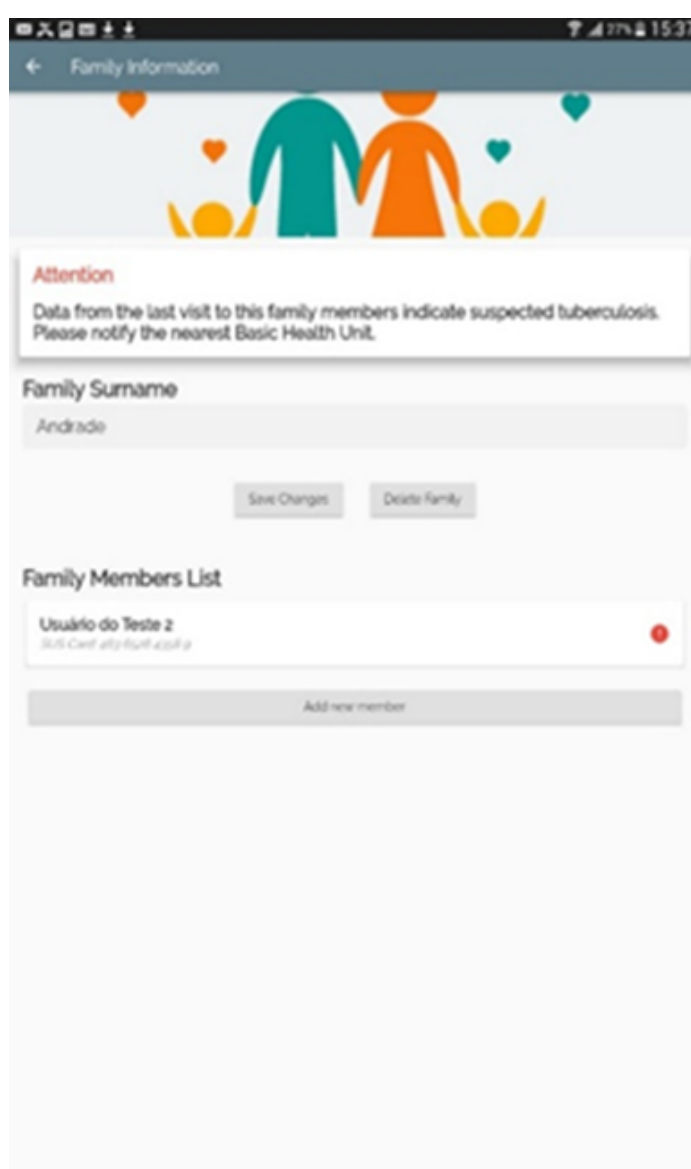
# 3 DESCRIPTION OF THE SCREENS



## 3.12 FAMILY INFORMATION SCREEN

In Figure 12, Family information, the agent will also be able to access data from previous visits, simply by clicking on the “View saved visits information” button. When accessing this screen, the CHA can view the list of visits made up to that time. To help agents find visits more easily, they can filter the list of visits by the user’s name using the search bar at the top of the screen. This tool facilitates the risk analysis of the visited family.

Figure 12 – Family Information screen



Source: Screenshot taken by the author, 2020.



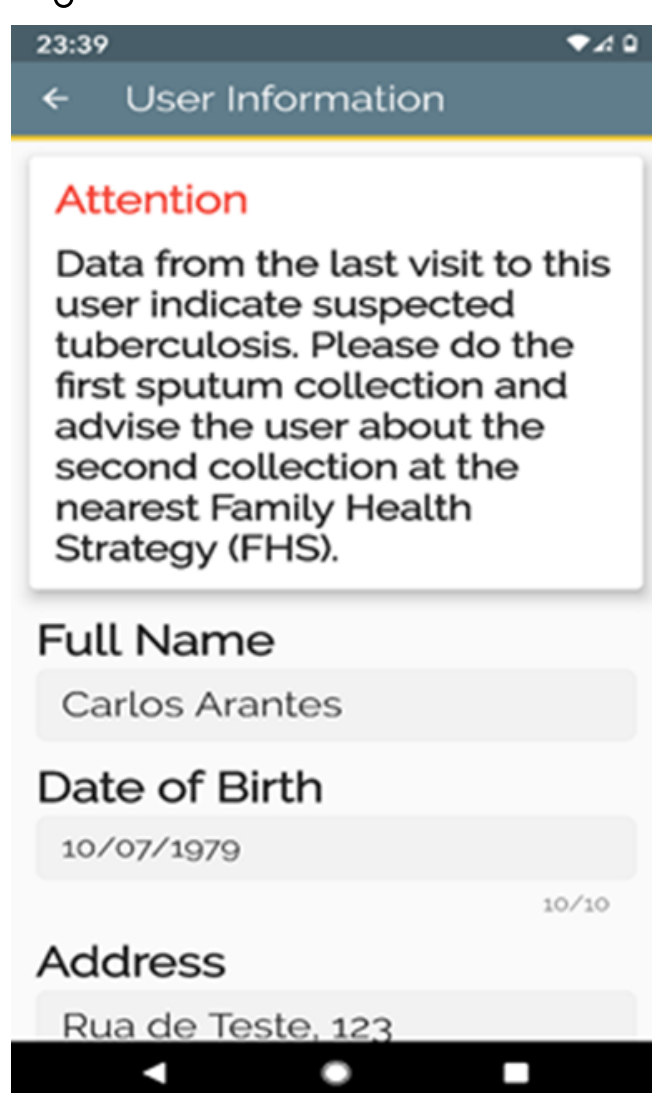
# 3 DESCRIPTION OF THE SCREENS



## 3.13 USER INFORMATION SCREEN

In Figure 13, User information, the agent will be able to view all the information described during a visit and also delete or modify it if necessary, as in the case of filling errors, just clicking on the button “Save Changes” or “Delete Visit”.

Figure 13 - User Information screen



Source: Screenshot taken by the author, 2020.

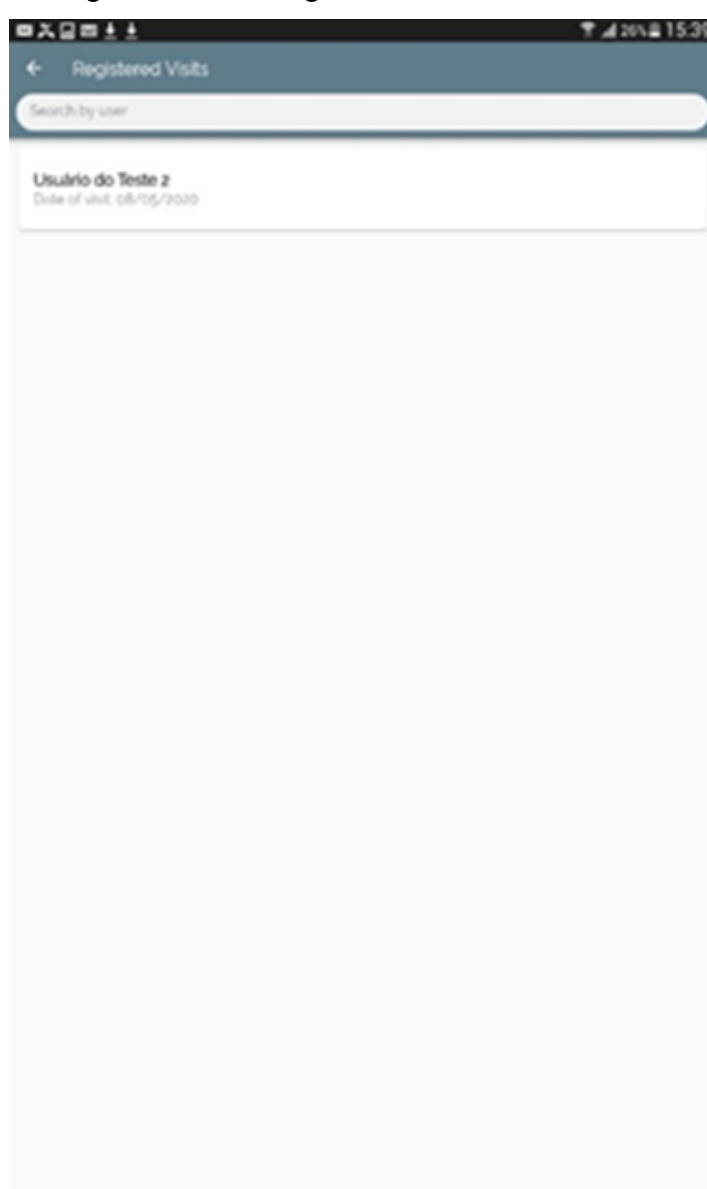
# 3 DESCRIPTION OF THE SCREENS



## 3.14 REGISTERED VISITS SCREEN

Similar to the registered families' data, the agent will also be able to access data from previous visits, by clicking on the button "View saved visits information" as shown in Figure 14. In this new possibility of access, the CHA is directed to the list of visits made screen, where they will be able to view the list of visits by registered user and date of the last visit. To allow agents to find visits more easily, they can filter the list by the user's name using the search bar at the top of the screen.

Figure 14 - Registered visits screen



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.15 VISIT INFORMATION SCREEN

In the visit information screen, the agent can access the list of families already registered, where it is possible to view the information filled in, modify it (in the case of a possible filling error) or delete it, simply by clicking on the button “Save Changes” after changing the necessary data, or simply on “Delete Visit” in situations where a user no longer lives in that home.

Figure 15 - Visit Information screen

Visit Registration

Visit Information

User Name: Usuário de Teste 1  
SUS Card Number: 523 4567 8910 1112  
Date of Visit: 08/05/2020

**User Checklist**

- Coughs for more than 20 days?
- Has fever in the afternoon?
- Has night sweats?
- Exhibits loss of appetite?
- Feels tired daily?
- Exhibits weight loss?
- Knows anyone with Tuberculosis?

**Environment Checklist**

- Airy house?
- Room cleanliness
- Number of household residents
- Number of household rooms

Save Visit

Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS

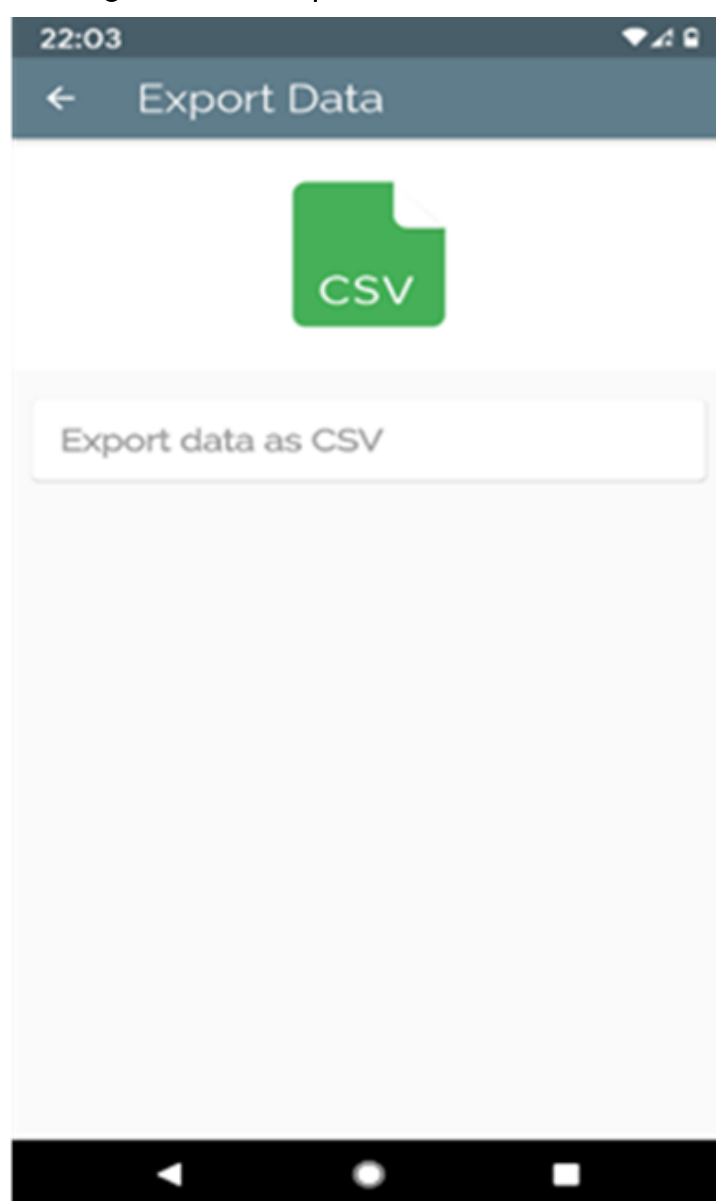


## 3.16 EXPORT DATA AS CSV SCREEN

It is worthy of note that the application allows exporting the filled-in data from the mobile device to the computer; to do so, one may simply click on “Export data” in the main menu; when accessing this tool, the agent is taken to a screen where the possibilities for exporting the data collected during the visit are shown. By accessing the “Export data as CSV” button (Figure 16), the application compiles all the information collected up to that moment (families, users and registered visits) and saves this information in a file on internal storage, in the “ACS data” folder present at the device root.

The CSV file allows the visualization and operation of the data collected in spreadsheet editing programs (such as Microsoft Excel and Google Spreadsheets).

Figure 16 - Export data as CSV



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.17 CHARTS SCREEN

The app also has the possibility of generating charts from the collected and saved data by using the “Charts” button located in the main menu; on this screen, the CHA is directed to another screen where charts that summarize the information collected during visits are displayed as shown in Figure 17.

Figura 17 - Gráficos



Source: Screenshot taken by the author, 2020.

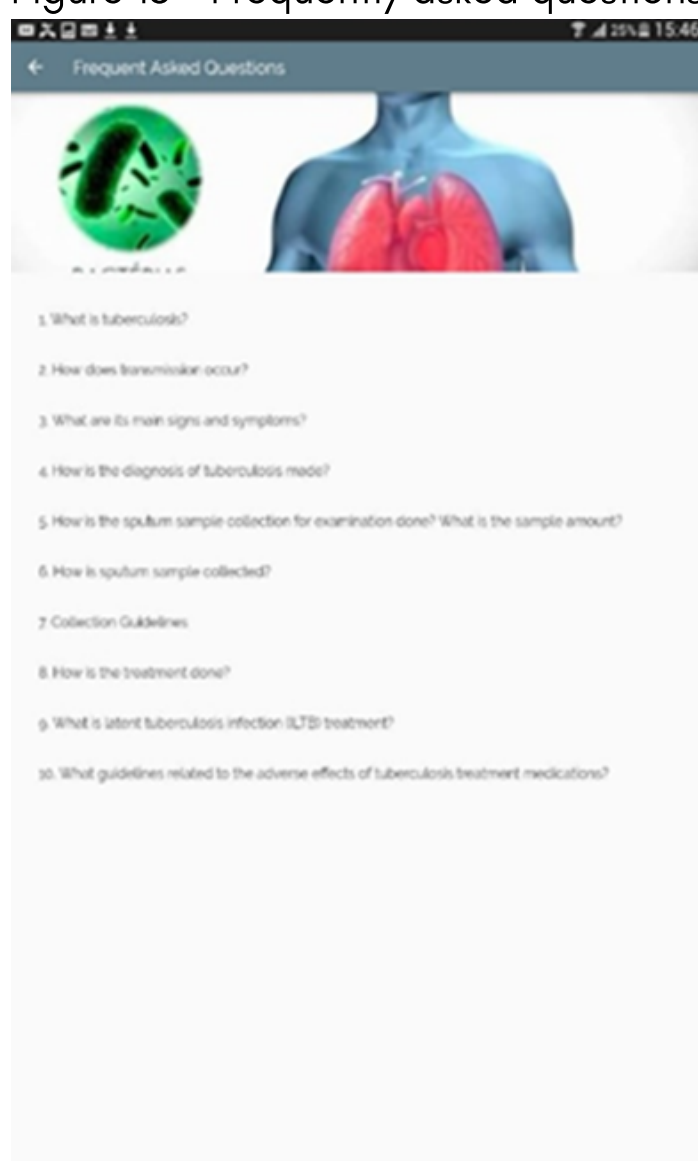
# 3 DESCRIPTION OF THE SCREENS



## 3.18 FREQUENTLY ASKED QUESTIONS SCREEN

On this screen, if the health agent has any difficulties or doubts during the visit, they will find a list of 10 questions and answers about the disease as shown in Figure 18.

Figure 18 - Frequently asked questions



Source: Screenshot taken by the author, 2020.

# 3 DESCRIPTION OF THE SCREENS



## 3.19 APP INFORMATION SCREEN

On the last screen of the application, as shown in Figure 19, basic information about the device was made available, including its authorship, developer and purpose of the app.

Figure 19 - App information



Source: Screenshot taken by the author, 2020.

# FINAL CONSIDERATIONS



The Community Health Agent (CHA) is a professional who is part of the Family Health Strategy (FHS), and among their technical skills, they develop several actions for the control and monitoring of tuberculosis (TB) within their action territory.

In this context, the CHA has a fundamental role within the health team, as by making home visits (HV) they are able to identify priority demands, transmission, contamination and illness risks, as well as provide the health team with the visits information, so that the team knows and is able to plan action strategies to block the transmission of diseases in their area of coverage.

In all sectors there has been an accelerated scientific and technological development, including in the health area. Each day new equipment and technologies appear in order to facilitate more resolute processes, diagnoses and treatments. We live in a globalized and computerized world and media resources are increasingly used in all production sectors, however it is clear that the use of easy access and handling devices is little explored in basic health care.

Undoubtedly, it is possible to introduce the use of mobile devices for the CHA, as nowadays the acquisition of these devices becomes increasingly accessible to everyone; thus, with the appropriate training to use the application and know all the disease-related demands, it is expected that the working conditions of this category will improve, achieving greater reliability of information during the HV, which will directly impact health actions.

It is also hoped that the incorporation of new technologies may help to improve the prevention, diagnosis and treatment of diseases, with a positive impact on the quality of life and on the reduction in mortality caused by TB.