SOFTWARE REQUIREMENTS SPECIFICATION

for

HotSpotter - Track & Trace

Version 1.0

Prepared by Adam Ryan (14395076)

UCD-COMP

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Contents

Revision History

Name	Date	Reason For Changes	Version
Adam Ryan	2020-02-04	Document Creation	v0.1
Adam Ryan	2020-02-10	Requirement Scoping Complete	v0.3
Adam Ryan	2020-02-10	Executive Summary Complete	v0.4
Adam Ryan	2020-02-11	Change Request Process Finalised	v0.6
Adam Ryan	2020-02-12	UI Elements Added	v0.7
Adam Ryan	2020-02-12	Draft Complete	v0.9
Team Lead	2020-02-12	Reviewed	v0.95
Product Sponsor	2020-02-14	SRS Approved	v1.0

1 Introduction

1.1 Purpose

The purpose of this document is to define the requirements for the creation of a COVID-19 Track and Trace mobile application for use in the Irish marketplace.

This document is for the use of the HSE's product sponsor, the UCD-COMP project development team, and the UCD-COMP business executive team.

1.2 Scope

The scope of this project will entail:

1. The production and release of the HSE's **HotSpotter** mobile application by UCD-COMP.

The HotSpotter application will be a mobile application available to the Irish marketplace on all modern mobile devices. It will:

- Allow users with a confirmed diagnosed of COVID-19 to anonymously self-report their diagnosis.
- Notify the users of the application who have been in close proximity of an anonymous positively diagnosed individual that they are a 'close-contact' and should get tested for COVID-19 by a medical professional.
- Display areas with a high incidence of COVID-19 on a map and notify users entering these areas with a reminder to wear a mask.
- Allow users to select Irish regions and view graphical information on the incidence of COVID-19 within a that region over the last seven days.
- Educate users on news of COVID-19.
- Be trusted by users by ensuring no user is identifiable by information captured in the app.

The key objective for the creation of this application is:

1. Aid in the reduction of the incidence of COVID-19 in Ireland by more efficiently identifying at-risk individuals and increasing mask compliance.

This objective and the app's effectiveness will be measured against the following key performance indicator's set by the HSE:

1. The app should be downloaded onto over six hundred thousand devices in Ireland by the end of calendar year 2021.
2. A minimum of 30% of those notified per month as being a close-contact subsequently get tested.
3. The monthly active user count should not fall below fifty-thousand users until at least 30% of the population have been vaccinated against COVID-19.

The key benefits for the application are:

- For Doctors and Nursing Staff
  - Identify quickly if a patient is at high-risk of COVID-19 exposure.
- For Public Health Officials:
  - Aid in the identification of cluster sources.
- For the Irish Population:
  - Create an increased likelihood in mask-compliance.
  - Reduce the risk of COVID-19 exposure by deterring non-essential journeys to high-risk areas.
  - Aid in the early detection of COVID-19 and reduce risk of disease severity through early monitoring.
  - Educate on the symptoms of COVID-19.
  - Aid in the long-term reduction of COVID-19 within the population.

Information pertaining to the HSE's system or how the HSE will generate a diagnostic key for a device user upon positive diagnosis is outside the scope of this document.

1.3 Definitions, Acronyms, and Abbreviations

The following terminology will be used for the remainder of the document:

UCD-COMP	The developing company.
population	All people resident in Ireland.
Irish	Any person resident in Ireland.
close-contact	An individual whose phone was within 10m of an individual diagnosed with COVID-19's phone in the last 14 days.
device	A mobile phone.

app The HotSpotter mobile application.

user Any individual who uses the app, internal or external.

app user An individual who has downloaded the application on any device.

active user An individual who has opened the app within the last thirty days.

HSE Health Service Executive

product sponsor The HSE

product owner The UCD-COMP Team Lead.

medical facility A HSE-registered general practitioners, hospital, or medical centre to be excluded from hotspotting as per HSE.

hotspot Following the CDC definition of a hotspot adjusted to the Irish market and app usage as provided by the HSE, a hotspot shall be a region where

- The region has a radius of 20m and does not intersect within 20m of a hospital, a HSE registered general practitioner's office, or a medical centre.
- $\geq$ 10 new close-contacts tested positive for COVID-19 within 7 days of receiving a close-contact alert.
- an increase in the most recent 7-day COVID-19 incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert, over the preceding 7-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.
- a decrease of $\leq$ 60% or an increase in the most recent 3-day COVID-19 incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert over the preceding 3-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.
- the ratio of 7-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert/30-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert exceeds 0.31. In addition, hotspots must have met at least one of the following criteria:
  - $\geq$ 60% change in the most recent 3-day COVID-19 incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.
  - $\geq$ 60% change in the most recent 7-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.

Positive close-contact A close-contact testing positive for COVID-19 within 7 days of a close-contact alert.

Push System	A push notification system to manage automated and manual push notifications, including deep-linking, lock-screen messaging, image displays, and in-inbox messaging.
RTL Tracking	Real-Time Location Tracking, the ability to identify the real-time location of a user's device.
deeplinking	Sending a notification to a use which links to non-landing pages within the app.
Hotspot Classifier	A system to classify locations as hotspots.
Hotspot Page	A page displaying information on hotspots nearby.
Update Page	A page displaying the latest informaiton on COVID19
Contact Trace Page	A page allowing the user to report whether they've been diagnosed with COVID-19 and to opt in to contact tracing.
Inbox Page	An in-app inbox to store alerts for users opted in and out of notifications with deep-linking capabilities to the relevant hot-spot.
Settings Page	A page to manage opt in, language, and accessibility settings.

1.4 References

The structure of this SRS was chosen based upon the IEEE 830-1998 SRS standard

The definition of a hotspot was chosen based upon the CDC Hotspot Definition modified for usage within an Irish app context following discussion with the HSE.

A comparison of COVID-19 Track and Trace apps was completed by the New Zeland Privacy Commissioner which has informed the product perspective.

App Store guidelines for iOS are available here which dictate content constraints.

Google Play guidelines for Android are available here which dictate content constraints

General Data Protection Regulation is available here here which informs data protection constraints and consent collection and storage.

A clickable wireframe is available at FluidUI at the link here

The Functional Requirement Document is "COMP30830-FunctionalRequirement_Doc.xlsx" also submitted with this SRS. This document is used as the source for the images within the file as LaTeX cannot load the full tables.

1.5 Overview

Section 2 details the general app functions and design constraints. Additional context is provided on some of the assumptions which were made to generate the requirements.

Section 3 provides information on the functional and non-functional requirements.

2 Overall Description

In this section, we provide an overall perspective on the HotSpotter app and detail the functions and interfaces of the application.

2.1 Product Perspective

The HotSpotter app is a new app which provides the product functionality detailed in 2.3. This application is one of many disease tracking apps which have been proposed in response to the COVID-19 pandemic. Although each are similar in the objective of aiding in the local region's reduction of incidence of COVID-19, the feature set and data privacy objectives for each app varies greatly. A review as of 5th May 2020 was complete by the New Zealand Privacy Commissioner which is contained in 4.0.1. Broadly speaking European offerings place a greater focus on data privacy concerns due to European GDPR legislation than other regions which HotSpotter shall conform with.

This system will interface with HSE's system (outside the scope) to retrieve a list of valid diagnostic keys which will be used to validate a user's self-reported diagnosis. This retrieval of diagnostic keys shall be an automated process facilitated via standard secured transfer methods (SFTP, ODBC, etc.). The application will retrieve locations of medical facilities from the HSE's system to retrieve a list of locations to be considered as medical facilities for hotspot exclusion. The application will retrieve data to be displayed on the Update page of the app.

In order to facilitate the product functionality, the product will include a variety of systems including a push system, a real-time location tracking system, a hotspot classification system, a graphical user interface, and a data visualisation system. Figure 2.1 details how the systems which the system will interact with and contain, however full implementation and design details are out of scope of this document and is up to the expertise of the development team.

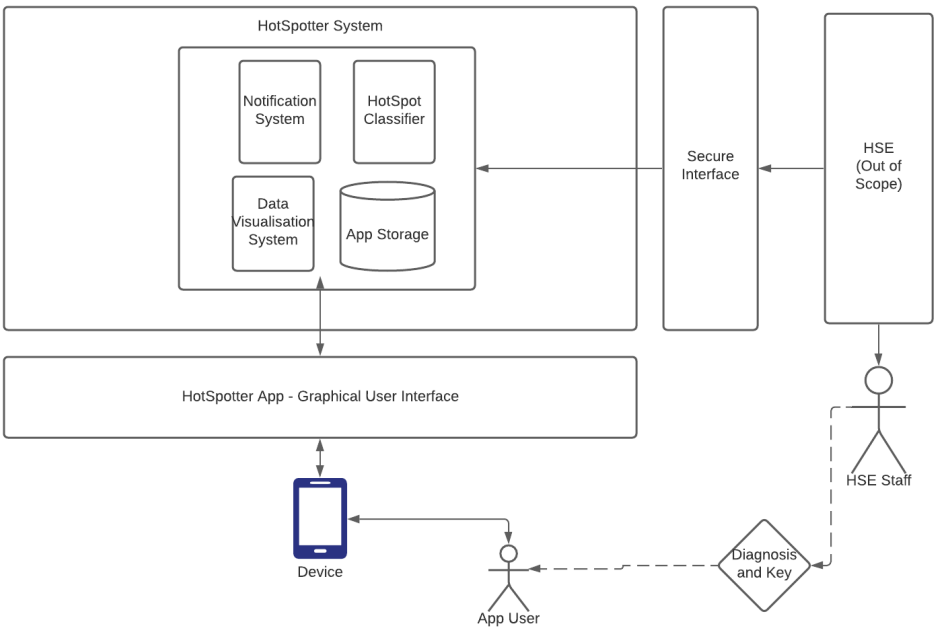

Figure 2.1: The Model

2.2 System Interfaces

The following section details the various interfaces for the HotSpotter app.

2.2.1 User Interface

This section details the interfaces between the user and the application.

- A user will access and interact with the mobile application through a graphical user interface.
- A user will navigate around the application using touch or, if enabled by the user at a device level, voice commands.
- A user should be presented with a default homepage.
- All pages should be able to navigate to the Hotspot Page, the Contact Tracing Page, the Update Page, the Inbox Page, and the Settings Page.
- All pages should be intuitively navigatable to the user through the use of visual cues such as arrows, checkboxes, font headings.
- All pages should be responsive to the user.
- All pages must be available in English and Irish.

- All pages should be structured in a logical and consistent manner.
- All pages should use consistent font, styling, visual cues, and colouring.
- Push notifications and in-inbox messaging should conform to the styling of the application.
- All pages should have colour-blind friendly colour scheme customisation available.
- All visualisations and graphics should be labelled clearly and appropriately with axes, headers, units, and any other information appropriate for the accurate consumption of the information conveyed.
- The copy of the app should be written with minimal complexity.
- All interactions with opt-ins must be preserved.

A wireframe of the application detailing the expected level of connectivity between pages here and in Appendix 4.0.2

2.2.2 Hardware Interfaces

As this is a mobile application, the app will need:

- A modern device and commonly used operating system to run.
- A device with appropriate technological capability to handle the implementation of contact tracing features and location services.

2.2.3 Software Interfaces

This section details software interfaces required for the running of the app. There are no explicit interfaces required, however some interface will be needed with the HSE's data for the retrieval of valid diagnostic keys and COVID19 updates.

2.2.4 Communications Interfaces

The app is required to be able to provide alerts to users.

- For users opted in, push notifications are to display lock screen alerts and inbox alerts.
- For users opted out, only in-app inbox alerts are to be provided to users.

2.2.5 Memory Constraints

There are no explicit memory constraints.

2.2.6 Operations

There are no explicit operational requirements.

2.2.7 Site Adaptation Requirements

The HSE will develop the following data flows from their system to HotSpotter's and make any necessary changes needed to accomodate these:

- Diagnostic Key Automated Data Transfer to enable the recording of verified diagnosed user reports in a format appropriate to allow for the population of HotSpotter's data tables and to exclude medical facilities from hotspot detection.
- COVID-19 Update Information Data Transfer to enable the display of the latest COVID-19 updates and statuses in a format to display to users in the app.

2.3 Product Functions

This section details the key functions of the product.

2.3.1 Identify and Visually Display Hotspots

The application should be able to identify hotspots as defined in 1.3 and display this graphically on a map with hotspots nearest the user appearing first and the most significant hotspots in terms of incidence prevalence should be highlighted.

The hotspot identification process flow is detailed in figure 2.2

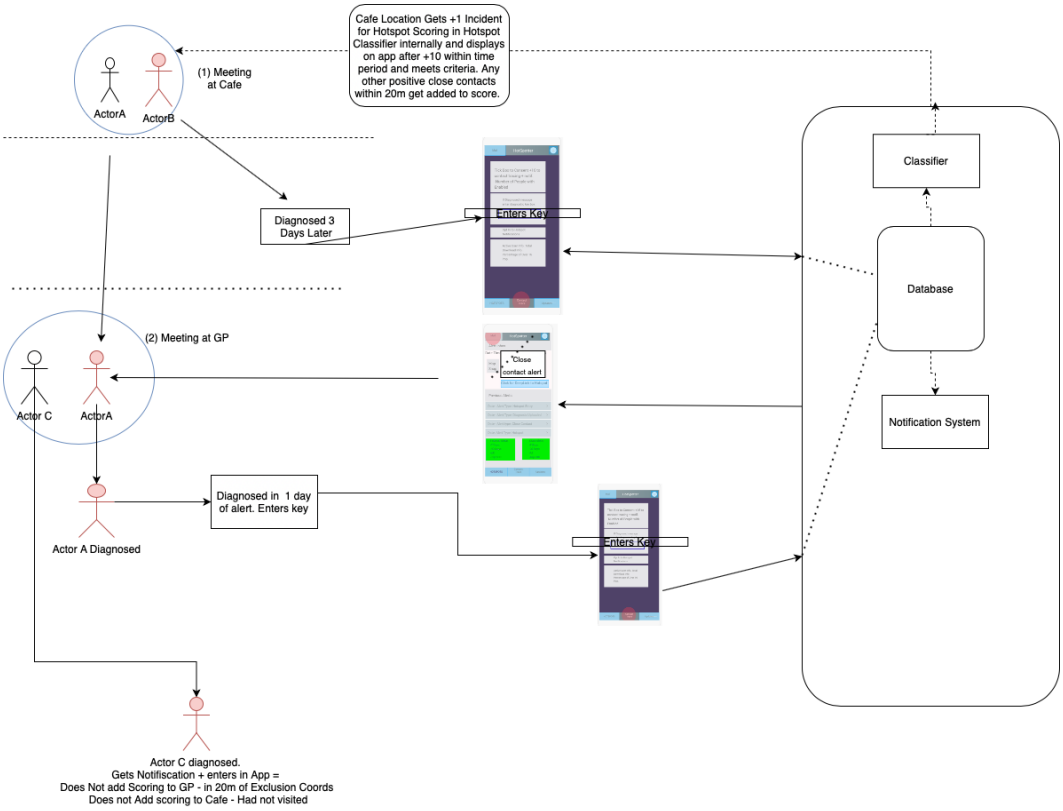

Figure 2.2: Hotspot Identification Flow

2.3.2 Display additional Hotspot Metrics

The application should be able to provide a graphical view of when the hotspot is most likely to produce close contacts, put the hotspot in context of other hotspots in the nation, and display the history of the hotspot over time.

2.3.3 Allow the searching of a Hotspot

The application should allow the user to search a location and identify hotspots nearby and view the same information as if the user was located their.

2.3.4 Contact Tracing

The application should allow the user to begin contact tracing and notifying them or others if they are close contacts.

2.3.5 Notification

The app should feature both push notifications and in-app inbox messaging. When a user enters a hotspot, they should be alerted to put on their mask. When a user is a

close contact, they should receive a notification to get tested for COVID-19. The user should be able to view their notification history.

2.3.6 Confirm Diagnosis

The app should allow users to self-report a diagnosis of COVID-19, and validated their report via a diagnostic key provided to them by their doctor and alert their close contacts to get tested.

2.3.7 COVID-19 Updates

The app should have a page displaying information provided by the HSE including stats about COVID, news on COVID, and the county split of COVID users.

2.3.8 Notification Retention

The application should retain history of notifications received and provide the user with information on how many updates of a hotspot warning or close contact warning they've received

2.3.9 Privacy Focused and Transparent

The application should be transparent in what data is held to the user, and should have all data anonymised to increase trust and compliance in the application.

2.3.10 Accessible

The application should be designed with accessibility in mind and adjustable to the needs of a wider user base.

2.4 User Characteristics

The intended user of the application is to be the population of Ireland. As such, users vary in educational level, experience, and technical expertise from low-expertise to high-expertise, with a range of accessibility requirements from language to assistive technological needs. The app should be designed with accessibility in mind to remove barriers of use. This has an impact on the user interface referred to in 2.2.1 and an impact on the requirements outlined in 3 Describe those general characteristics of the intended users of the product including educational level, experience, and technical expertise. Do not state specific requirements but rather provide the reasons why certain specific requirements are later specified in section 3.

For this application, there are no specific user roles outside of user.

Typical user journeys for app users include:

Scenario 1

1. User downloads app onto their device.
2. User consents to notifications and contact tracing features.
3. User plans to make journey and sees that it is a hotspot.
4. User views more information on the hotspot and notes that on today's day of the week COVID contacts are twice as high as other dates.
5. User makes essential journey in mask and is conscious of maintaining social distancing.
6. User makes detour on journey on way home and unbeknowingly enters a hotspot.
7. The application alerts the user of a hotspot.
8. User ensures mask is active.

Scenario 2

1. User has been using app and receives a close contact alert.
2. User clicks app notification and is taken to the region where the close contact took place.
3. User notices area is a hotspot and there were therefore many users with COVID at the time user visited.
4. User schedules a GP appointment and alerts them of the close contact warning and hotspot status.
5. GP immediately tests for COVID and user is diagnosed.
6. User reports their diagnosis by entering their diagnostic key into the app.
7. Close contacts of user are alerted.

Scenario 3

1. User is interested in identifying how their business is doing in maintaining social distancing requirements.
2. User checks their region in the HotSpotter.
3. User looks at more info on the region and observes region where there business is located has been a hotspot twice in the last thirty days.
4. User informs their staff members of this and ensures that all staff members are conscious of risk of COVID-19.

Scenario 4

1. User is considering visiting a local cafe to meet up with friends.
2. User has at-risk relatives within their household.
3. User checks the status of the area and notices that it has been a hotspot multiple times over the course of the last six months.
4. User decides the journey is non-essential and decides not to go on trip.

2.5 Constraints

The following constraints are present in the system design:

2.5.1 Regulatory Policies

The system should comply with GDPR and the Data Protection Act.

2.5.2 Hardware Limitations

The system should be able to run on modern mobile hardware and operating systems.

2.5.3 Interfaces

The system will need to interface with the HSE's system (outside the scope of this SRS) for the retrieval of data.

2.5.4 Audit Info

The system will need to capture and record user's consent options and changes.

2.5.5 Reliability

The system will need to run at all times and should be able to run efficiently without downtime or performance degradation even with a large user base. The information in the app should be kept up-to-date and trust-worthy.

2.5.6 Adjustable

The definition of a hotspot needs to be maintainable as the COVID-19 pandemic develops.

2.6 Assumptions and Dependencies

It is assumed within the SRS that all modern smartphones will be capable of running the application, and that the features outlined are feasible to modern smartphones. If a smartphone does not have the performance capacity capable of running some of the features, or OS releases impact some of the dependencies, it is understood that the user may not have the expected experience. Similarly, it's assumed that the contact tracing feature is platform agnostic in that it does not matter which operating system or device a user has, it is still capable of engaging in contact tracing with devices' with other specifications. If this is not the case, and there are OS specific dependencies, the application design will need to be adjusted to facilitate cross-platform contact tracing.

2.7 Apportioning of Requirements

Features have been split between Core, High, Medium, and Low priority as outlined by the client. Core features are features which are expected and anticipated to be available within the MVP release if full feature-inclusion for the release deadline cannot be met. The final undelivered features should be prioritised based on the ranking of High, Medium, and Low.

3 Specific Requirements

3.1 External Interfaces

This section details the external systems feeding into the HotSpotter application.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
ER-HS01	ER-HS	External Requirement - HSE	HSE Integration	HSE shall build the required dataflows and the system shall store the necessary information to maintain ingestion of this data betweeen the hours of 12am and 5am.	Core	-

Figure 3.1: External Requirements Table

3.2 User Interface Requirements

This section details the requirements for the user interface. These requirements are designed to compliment and add context to the FluidUI wireframe located here

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
UI-HP01	UI-PL	Page List	Contact Tracing Page	The system shall have a contact tracing page allowing the user to see how many people are using the app. Consent to tracing, consent to notifications, and submit a diagnosis.	Core	-
UI-HP02	UI-PL	Page List	HotSpot Page	The system shall have a hotspot page which allows the user to search for a Hotspot in a location, displays the hotspots within 20km of the user, shows the user a list of hotspots closest to them ordered by nearness, and displays statistcs on hotspots nationwide. (required functionality to be dictated by system functionality)	Core	-
UI-HP03	UI-PL	Page List	HotSpot - More Info Page	The system shall have a page displaying more information on a hotspot selected by a user. This page shall display graphic representations of the hotspot data as outlined in Functional Requirements.	Core	-
UI-HP04	UI-PL	Page List	Updates Page	The system shall have a page displaying the latest statistics and news of COVID-19 as supplied by the HSE. It should display overall stats about the hotspot, its ranking relative to the rest of the country, news on COVID-19, and a historic representation of the COVID-19 incidence per county	Core	-
UI-HP05	UI-PL	Page List	Notifications Page	The system shall have a page detailing the alerts received by a user. For new alerts, it should provide detailed information on the type of alert, a recommendation, a link to the event triggering the alert if a hotspot. For old alerts, it should display a historical list of alerts received. There should be information at the bottom of the page pertaining to how many alerts of each	Core	-
UI-HP06	UI-PL	Page List	Settings Page	The system shall have a settings page where the user can withdraw consent, change notification preferences, view all data held on them by UCD-COMP, request removal of all data, change accessibility settings, and change language settings. There should also be an external link to UCD-COMP's Terms and Conditions and Privacy Policy.	Core	-
UI-HP07	UI-PL	Page List	Settings - Tracking Consent	The system shall have a dedicated page in settings to opt out of Content Tracing and Location Services if desired.	Core	-
UI-HP08	UI-PL	Page List	Settings - Notification Preferences	The system shall have a dedicated page in settings to opt out of Content Tracing and Notification Services if desired.	Core	-
UI-HP09	UI-PL	Page List	Settings - View all Data	The system shall have a dedicated page for the user to retrieve and view all data held on them in table format by HotSpotter	Core	-
UI-HP10	UI-PL	Page List	Settings - Language Settings	The system shall have a dedicated page for the user to change the app's language.	Core	-
UI-HP11	UI-PL	Page List	Settings - Accessibility Settings	The system shall have a page to enable accessibility settings as outlined in accessibility functional requirements.	Core	-
UI-ST01	UI-ST	Style	Font Style	The system should have all font types have the same styling applied to maintain consistency across the application	Core	-
UI-ST02	UI-ST	Style	Colour Style	The system shall not ever use green or blue to represent a hotspot - this cannot be overridden by accessibility settings.	Core	-
UI-ST03	UI-ST	Style	Data Visualisations	All Data Visualisations should have a Heading, axes labels, axes pips, and the content of the graphic must be headed.	Core	-
UI-NV01	UI-NV	Navigation	Navigation	It shall be possible to navigate to the Hotspot Page, Updates Page, Contact Tracing Page, Settings Page, and Updates Page from all other pages in the application	Core	UI-HP01, UI-HP02, UI-HP04, UI-HP05, UI-HP06
UI-NV02	UI-NV	Navigation	Navigation	All navigation items shall have a label and icon to indicate it is interactable to aid in accessibility	Core	-
UI-AC01	UI-AC	Accessibility	Colouring	All colourable items should be customisable from within the app to aid in accessibility. Limitaitons across components to be decided at the style stage.	Core	UI-ST02
UI-CX01	UI-CX	Consistency	Consistency	The system shall have the same visual appearance on Android and iOS. Device specific appearances will not be utilised.	Core	-
UI-HP02-01	UI-HP02	Page Specific Design	Iconography	The system shall represent the user on the HotSpot map with a pin.	Core	UI-HP02
UI-HP02-02	UI-HP02	Page Specific Design	Iconography	The system shall represent hotspots with circles where the colour gradient (red) indicates the severity.	Core	UI-HP02

Figure 3.2: UX Requirements Table

3.3 System Features

The functional requirements of the application have been structured using a feature organisation structure, and features have been grouped according to similarity. The functional requirements of the application has been designed with the specificity and accuracy feasible at this stage, however design details of these functions are left to the

expertise of the UCD-COMP development team for implementation.

3.3.1 HotSpot Features

HotSpot Definition

As discussed in 1.3, following the CDC definition of a hotspot adjusted to the Irish market and app usage as outlined by the HSE, a hotspot shall be a region where

- The region has a radius of 20m and does not intersect within 20m of a hospital, a HSE registered general practitioner's office.
- $\geq$ 10 new close-contacts who visited the area tested positive for COVID-19 within 7 days of receiving a close-contact alert.
- an increase in the most recent 7-day COVID-19 incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert, over the preceding 7-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.
- a decrease of $\leq$ 60% or an increase in the most recent 3-day COVID-19 incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert over the preceding 3-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.
- the ratio of 7-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert/30-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert exceeds 0.31. In addition, hotspots must have met at least one of the following criteria:
  - $\geq$ 60% change in the most recent 3-day COVID-19 incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.
  - $\geq$ 60% change in the most recent 7-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert.

The implementation details of this definition is left up to the development and design team and the classification of areas into hotspots shall be a key requirement of the application.

The severity of the hotspot should by the 7-day incidence of close-contacts testing positive for COVID-19 within 7 days of a close-contact alert from contact with a user in that hotspot radius.

3.3.2 System Features

This section details the functional system requirements of the app.

HotSpot Features

This section details functional requirements concerning the hotspot features.

FunctionalRequirementID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
FR-HS01	FR-HS	HotSpot	HotSpot Calculation	The system shall calculate which areas are hotspots and calculate th	Core	-
FR-HS02	FR-HS	HotSpot	HotSpot Severity Ranking	The system shall rank hotspots based on the Incidence Rate and convert this into a colour gradient to indicate severity.	Core	FR-HS01
FR-HSQV01	FR-HSQV	HotSpot QuickView	HotSpot Map Display	The system shall display hotspots on an interactable map with their severity gradient.	Core	FR-HS
FR-HSQV02	FR-HSQV	HotSpot QuickView	HotSpot Listing	A list of the top 4 hotspots shall be displayed underneath the map display ordered by closeness to the user.	Core	FR-HS
FR-HSQV03	FR-HSQV	HotSpot QuickView	HotSpot Overall Country Stats	A summary of the number of hotspots present in the country should be displayed to the user.	Medium	FR-HS
FR-HSSV06	FR-HSSV	HotSpot SearchView	HotSpot Search	A user should be able to enter an address a the system will display areas within 20km of that location which are classified as hotspots and receive the same functionality as in the HotSpot QuickView	High	FR-HS
FR-HSDV07	FR-HSDV	HotSpot DetailedView	Hotspot Specific Country Ranking	Within the detail view of a hotspot the system will rank display a ranking of how high the incidence is relative to all other hotspots and give the incident percentage.	Low	FR-HS
FR-HSDV08	FR-HSDV	HotSpot DetailedView	Incidence By Day By Week Vis	The system should display a view of how close contact infection incidence varies by day by hour over the last seven days	Medium	FR-HS
FR-HSDV09	FR-HSDV	HotSpot DetailedView	Incidence Over Time	The system should highlight a six month view of this location's incidence rate and graphically display in which time periods it was classified as a hotspot	Medium	FR-HS

Figure 3.3: Functional Requirements Table - HotSpots

3.3.3 Contact Tracing And Notification Features

This section details functional requirements concerning the contact tracing and notification features.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
FR-CT01	FR-CT	Contact Tracing	Contact Info Capture	The system shall record the history of device contacts and locations of an individual.	Core	-
FR-CT02	FR-CT	Contact Tracing	HSE Diagnostic Key Retrieval	The system shall retrieve the list of valid diagnostic keys from the HSE system and an exclusion list for medical practices.	Core	
FR-CT03	FR-CT	Contact Tracing	COVID Diagnosis	The system shall be able to capture the self-reporting of a positive diagnosis of COVID-19 and validate the users key against the list.	Core	FR-CT02
FR-UP01	FR-UP	COVID Update Info	HSE COVID Update Retrieval	The system should retrieve [COVID News ID, COVID News Item, COVID News Image URL, COVID News URL], [Total Case Count], [Total Active Case Count], [County ID, County Name, Active Case Count, Total Case Count], [ID, Date, County Name, Total Active Case Count, Total Case Count], [Symptom ID, Symptom Name,Symptom Description,Symptom Image URL] in order to display the complete update information and have this page be configurable by the HSE.	Medium	-
FR-UP02	FR-UP	COVID Update Info Graphics	HSE COVID Update Graphics	The system should be able to graphcially display the latest information provided by the HSE in the Update Page	Medium	FR-UP01
FR-NT01	FR-NT	Notifications	Push Messaging - Close Contact	The system shall be able to send a push message to users when a close contact was diagnosed with COVID	Core	FR-CT03, FR-DC02
FR-NT02	FR-NT	Notifications	Push Messaging - HotSpot	The system shall be able to send a push message to users when they enter a hotspot.	Core	FR-HS, FR-DC03
FR-NT03	FR-NT	Notifications	Inbox Messaging - Close Contact	The system shall be able to send an in-app inbox messages to users when a close contact was diagnosed with COVID	Core	FR-CT
FR-NT04	FR-NT	Notifications	Inbox Messaging - HotSpot	The system shall be able to send an in-app inbox messages to users when they enter a hotspot.	Core	FR-HS
FR-NT05	FR-NT	Notifications	Notification - History	The system may retain the history of notifications for a user and display this information	High	FR-NT01, FR-NT02, FR-NT03, FR-NT04, FR-DS02
FR-NT06	FR-NT	Notifications	Notification - Summary Statistics	The system may provide a summary as to how many notifications by type they've received since using the app.	Low	FR-NT05
FR-NT07	FR-NT	Notifications	Notification - Deep Linking	The system should deeplink hotspot notifications to the specific hotspot which triggered the notification.	Medium	FR-NT04, FR-NT02

Figure 3.4: Functional Requirements Table - Contact Tracing and Notifications

3.3.4 Privacy and Accessibility Features

This section shall detail functional requirements surrounding privacy and accessibility features. These features are considered functional as there are functional requirements underlying the inclusion of these features necessitating that they are available within the app before launch.

FunctionalRequirementID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
FR-DC01	FR-DC	GDPR	Location Consent	The system shall request and store consent from devices to track their location and the user must be able to opt back out.	Core	FR-DS
FR-DC02	FR-DC	GDPR	Contact Tracing - Push Consent	The system shall request and store consent from devices to send push notifications for contact tracing and the user must be able to opt back out. Customers who opt out should still receive in-app inbox messaging.	Core	FR-DS
FR-DC03	FR-DC	GDPR	Hotspot - Push Consent	The system shall request and store consent from devices to send push notifications for hotspots and the user must be able to opt back out. Customers who opt out should still receive in-app inbox messaging.	Core	FR-DS
FR-DC04	FR-DC	GDPR	Right to be Forgotten	The system shall have the functionality to remove all data for a device from within the app.	Core	FR-DS
FR-DC05	FR-DC	GDPR	Right to Data Access	The system shall have the ability to view all data stored for an individual device and display it in a table format.	Core	FR-DS
FR-DS01	FR-DS	Data Storage	Hotspot	The system shall be able to store Hotspot information sufficient to enable all functionality	Core	-
FR-DS02	FR-DS	Data Storage	Notification	The system shall be able to store all notification information sufficient to enable all functionality	Core	-
FR-DS03	FR-DS	Data Storage	User Data	The system shall be able to store all user information pertaining to consent, contacts, and location sufficient to enable all functionality.	Core	-
FR-DS04	FR-DS	Data Storage	Consent Audit	The system shall store details on all changes to consents provided	Core	-
FR-AC01	FR-AC	Accessibility	Colour Blind Options	The system should have the ability to set custom colour schemes to aid colourblind accessibility.	Medium	-
FR-AC02	FR-AC	Accessibility	Language	The system shall have the ability to choose from English or Irish	Core	-
FR-AC03	FR-AC	Accessibility	Language	The system may have the ability to choose from French, Portuguese, Polish, Spanish, German, Arabic	Low	-
FR-AC04	FR-AC	Accessibility	Speech to Text	The system should have the functionality to enable the functionality of speech to text by appropriately tagging alt_keys, adding image descriptions, and all assistive technology best practices to aid adoption from visually impaired users.	High	-
FR-TC01	FR-TC	Terms and Conditions	Terms and Conditions Link	The system shall have a link to UCD-COMP's terms and conditions of use	Core	-
FR-TC02	FR-TC	Terms and Conditions	Privacy Policy Link	The system shall have a link to UCD-COMP's privacy policy	Core	-

Figure 3.5: Functional Requirements Table - GDPR, Data Storage, Accessibility

3.4 Performance Requirements

This section details some key performance requirements for the app.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
PR-PR01	PR-PR	Performance Requirements	User Count	The system shall be scalable up to 7 million users	Core	-
PR-PR02	PR-PR	Performance Requirements	User Count	The system shall be scalable up to 15 million users (twice the Irish population size) for future scalability purposes.	Low	-
PR-PR03	PR-PR	Performance Requirements	Hotspot Calculation	The system shall be able to manually complete a nationwide hotspot classification within a two hour window if required without application performance degradation.	Low	-
PR-PR04	PR-PR	Performance Requirements	Consent Processing	The system shall process all consent changes and GDPR requests in real-time and this must be available at all times.	Core	-
PR-MM01	PR-MM	Memory Requirements	Memory Minimum	The system shall be able to store data for up to seven million active users and their behaviour without application responsiveness declining by more than 10%.	High	-
PR-NT01	PR-NT	Performance Requirements	Notification	The system shall provide all alerts within ten minutes of the trigger behaviour (hotspot entry, positive close contact) being conducted.	Core	-
PR-AC01	PR-NT	Accuracy Requirement	Mapping	The system shall be accurate to within 10m for on the overall hotspot view.	Core	UI-HP02
PR-AC02	PR-NT	Accuracy Requirement	Contact Tracing	The system shall have an upper bound error limit of 1m for close contact identification.	Core	FR-CT

Figure 3.6: Performance Requirements Table

3.5 Logical Database Requirements

While data must be stored into a database for the functionality of the app, there is no explicit requirements on what the database structure or representation must look like so long as the other requirements are fulfilled.

3.6 Design Constraints Requirements

This section outlines some design constraints which must be followed by the application.

3.6.1 Standard Compliance

This section details some standards which the app must be compliant with.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
ST-GD01	ST-GD	Standards	GDPR Compliance	The system must process data in compliance with GDPR	Core	-
ST-GD02	ST-GD	Standards	Coding Standards	The system must be coded conforming to standardised coding practices	Core	-
ST-GD03	ST-GD	Standards	GDPR Compliance	The system must be compliant with disability legislation	Core	-

Figure 3.7: Standard Compliance Requirements Table

The requirement concerning conforming to standardised coding practices includes the need to pass release requirements for app distribution channels.

3.7 Software System Attributes

This section details some attributes of the software system not otherwise covered in previous requirement sections.

3.7.1 Reliability

This section covers some of the reliability requirements which are needed for the application.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
RL-UP01	RL-UP	Reliability	Uptime	The system shall be running 24/7.	Core	-
RL-UP02	RL-UP	Reliability	File transfers	No more than 2% of data ingestions from the HSE shall fail per 28 days.	Core	-
RL-UP03	RL-UP	Reliability	Rollback	The data stored in the system shall accurately reflect the actions of user and not drop data while being processed.	Core	-

Figure 3.8: Reliability Requirements Table

3.7.2 Security

This section details some of the security requirements for the HotSpotter application.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
SC-SC01	SC-SC	Security	Security	The system shall be protected against SQL Injection attacks	Core	-
SC-SC02	SC-SC	Security	Data Leakage	The system shall not expose data during its functionality	Core	-
SC-SC03	SC-SC	Security	Encryption	The system shall encrypt all data with standard medical data encryption algorithms.	Core	-

Figure 3.9: Security Requirements Table

3.7.3 Maintainability

This section covers some of the requirements surrounding maintainability of the HotSpotter Application.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
MT-MT01	MT-MT	Maintainability	Definition Updates	The system should allow an updating of the HotSpot definition to be complete within two days of a HSE request.	High	-

Figure 3.10: Maintain Requirements Table

3.7.4 Portability and Hardware

This section details requirements of the HotSpotter application for the purpose of porting the application to various other systems of software or hardware, and the associated hardware requirements.

Requirement ID	Functional Grouping ID	FunctionalRequirementGroup	FunctionalRequirementName	Functional Requirement Description	Priority	Dependency
PB-HW01	PB-HW	Portability	Hardware	The system shall not made in-built assumptions about the hardware beyond that the device is capable of running a modern mobile operating system with the necessary features required to enable the system requirements.	Core	-
PB-HW02	PB-HW	Portability	Hardware	The system should be portable between, at a minimum, Android and iOS.	Core	-
PB-HW03	PB-HW	Portability	Hardware	The system should be compatible with future OS releases and not rely upon functions which are currently known to be at risk of depreciation in future releases.	Low	-

Figure 3.11: Portability Requirements Table

3.8 Change Request Process

The change request process shall be defined as follows:

1. The product sponsor shall submit a file containing specific details of the change request to the UCD-COMP product owner.
2. The change request will be reviewed and discussed by UCD-COMP.
3. At the end of the current sprint, a Change Advisory Board meeting will be called involving the product sponsor, product owner, and any additional participants who may be required to work on the change.
4. An agreement will be made on the scope of the change and any additional cost implication of the change.
5. A Statement of Work will be prepared by UCD-COMP detailing the requirement changes, cost implications, and effort requirements
6. The Statement of Work will be signed off by the product owner and product sponsor and added into the SRS appendix.
7. The change will be implemented into the SRS document.
8. The revised SRS draft will be signed off by both the product owner and product sponsor.

3.9 Document Approvals

The document must be approved by the product owner and product sponsor before ebing confirmed as final.

Name	Role	Date
Gregory House	HSE Product Sponsor	2020-02-14
John Judge	UCD-COMP Product Owner	2020-02-14

4 Appendix

4.0.1 New Zealand Privacy Commissioner Track and Trace App Comparison - 5th May 2020

The complete comparison of COVID-19 apps released in various locations as completed by the Privacy Commissioner of New Zealand

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Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Australia	Covid SAFE	State	Voluntary	Registration info, Bluetooth close contact	Contact tracing	Public health officials with consent	It collects records of close contacts within the last 21 days. Aside from registration data, the information remains on the phone until a user who tests positive to COVID-19 consents to uploading the data.	It has attracted criticism because the federal government is a data repository, even though the government has stressed only state health officials will have access to it. Despite already being rolled out, the information cannot yet be used for contact tracing as final information sharing details haven't been finalised. Diabetes Australia has received reports the app was interfering with continuous glucose monitoring (Department of Health are investigating).
Austria	StoppCorona	State	Voluntary	Bluetooth close contacts	Contact tracing		Close contacts are anonymously informed when a contact tests positive and asked to self isolate.	Unclear what registration info is required – appears to be very little (i.e. you could download app and use it without the state knowing your identity) Potential issues of inaccuracy
Bahrain	BeAware Bahrain	Public	Voluntary	Location info	Contact tracing	Information and eGovernment Authority	Push notifications to individuals in the event they approach a location where an active case has been detected, or if they were in close proximity with an active case - Track the movement of quarantine cases for a duration of 14 days, and ensure they abide by quarantine regulations - Track active cases and provide contact tracing updates - Highlight COVID-19 developments - Publish latest recommendations issued by the Kingdom's health authorities	There is also a bracelet that the government as issued to assist with the location accuracy of the users.
Bulgaria	ViruSafe	State	Voluntary	Personal data such as personal ID, age, any chronical diseases, location	Contact tracing	Ministry of Health with individual consent	Personal data of individuals are used by the MoH and competent authorities to combat the spread of the infection for the purposes of analysing the dynamics of the infection: - Analysis of the number of individuals with symptoms and the moment of their manifestation; - location of individuals with symptoms, the history of their movement and their proximity to other people; - Informing individuals targeted at specific individuals and / or groups; - Other analyses and visualizations of the collected information.	MoH may disclose information to third party service providers

Figure 4.1: International App Comparison Page 1

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Canada (Alberta)	ABTraceTogether	Public	Voluntary	Bluetooth close contacts	To assist with contact tracing			The app has the same issue where the app doesn't work unless the phone is unlocked and the app is running in iOS. Based off Singapore's TraceTogether, but tweaked by Deloitte and IBM
China	Alipay & WeChat app	Private	Defacto Mandatory	Location and contact with other phones	Contact tracing and providing access to services including transport	Individual and government	Before people can do things like ride the subway or enter a crowded shopping mall, they have to prove they're at low risk of having Covid-19. They do that by scanning a government-mandated QR "health code" on their cellphone that's either green (likely Covid-19 free), yellow (at risk of Covid-19), or red (likely Covid-19 positive).	It's not known exactly how the code is calculated, but it's loosely based on information like a user's location and their medical and travel history, which is informed in part by a government questionnaire.
Colombia	CoronApp	Public	Voluntary	CoronApp collects public, semi-private, private and sensitive user data Location data	To help in diagnostic efforts, such as: Verification of the health status by the Plan Management Entities Benefits (EAPB), precise channeling of potential cases that need to be directed to centers assistance to start their care, identification of possible conglomerates of cases, in time and place, which facilitate prioritising the action of health authorities, identify potential chains of contagion, among others.	Health authorities	The mobile application allows daily reporting of symptoms and the state of health of the entire family, knowing official information on government measures, prevention recommendations, location of health services, as well as channels to guide and promptly attend the coronavirus.	
Colombia	CoronApp	Public	Voluntary	Health and location	To understand spread of virus across community and contact trace	Government	Individuals can register on the update and each day update how they are feeling so the government can track symptoms and likely cases. It logs individuals location when they login. Individuals can also use the app without registering just to get updates from the government.	Note – had to use google translate to get this info

Figure 4.2: International App Comparison Page 2

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Cyprus	CovTracker	Public-private	Voluntary	Location information (device only)	Contact tracing	Public health officials with consent	The app is a location log providing time-stamped records of a user's path within a specified period. The trail generator updates every five minutes and all data are stored only on the user's phone. Location is determined by GPS, Device Sensor data, IP address Wi-Fi access points, Bluetooth and cell towers. (The user may switch on and off the app's logging by selecting the Start/Stop Logging option in the app.)	Cyprus government was previously developing a Bluetooth based app which had privacy concerns – that app has been shelved.
Czech Republic	eRouska (eFacemask)	Public	Unsure	Bluetooth	Contact tracing	Ministry of Health	Notes phones you have had close contacts with and then if one tests positive notifies you of need to test and isolate.	Only available on google play store but soon also available for Apple.
Czech Republic	Mapy.cz	Private	Voluntary	Location data and if the user wants can submit health data as well	Contact tracing	Information collected is usually not shared unless user consents	User has to turn on location sharing for COVID-19 location in the app, the app will process user location history and may notify user in the future if the app evaluates that the user may have come in contact with a positive person.	The data is collected with an emphasis on protecting the user's privacy. The app only stores the application id for the location history, for feedback to user, without reference to user's Account List or any other information. The data is stored separately from others and will be deleted after the epidemic. No data is passed on to any other entity, any transfer of data would require your further express consent.
Ghana	GH Covid-19 Tracer App	Public	Voluntary	Health	Contact tracing	Ministry of Communication	Individuals download the app and can update how they feel and their phone number to assist govt with identifying cases. The COVID-19 Tracker App, through the common platform of mobile networks, is able to trace contacts of persons infected by the virus, show where they have been in recent time, through various telephone related data, and link such people to health professionals for urgent action to be taken.	Security was an initial concern but seems to have been resolved now.
Iceland	Rakning-C 19	State	Voluntary	Location data and mobile number and if necessary social security number	Contact tracing	Civil Protection Infection Tracking Team and then with user's consent.	While the app is running on the user's phone, it collects location data for the last 14 days and securely stores on the user's phone. The application starts collecting data when the user starts using it, so no data will be available on the user's trips before that time. The location data will only be stored on the user's phone. The user will not be contacted by the Infection Tracking Team without the user's consent. The infection tracking team will only ask the user to share location data if trips prove necessary. In such cases, the user will also be asked to provide social security number, to ensure that the data belongs to the right person.	Remove the app from the user's phone and no locations will be saved to the user's phone.

Figure 4.3: International App Comparison Page 3

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
India	Aarogya Setu	Public	Mandatory	Location/Bluetooth	Contact tracing/spread of virus	Indian Ministry of Home Affairs	The app requires continuous access to location information for social movement and uses Bluetooth technology to alert people when they come in contact with someone who has tested positive for COVID-19.	The Indian Government have refused to release the source code. The privacy policy of the app is silent on security and purpose and disclosure limitations are unclear.
India	Saiyam – Track and Trace	Private	Mandatory for individuals in quarantine	Real time tracking of individuals in quarantine and location data. GPS collection	Monitoring and tracking	City administration, and/or local police station	People who have returned from overseas travel are required to download the application for the City Administration to monitor their real time movements	
India	COVA Punjab	State	Mandatory	Personal, demographic, location, device and other similar information may be collected. Bluetooth and GPS	Monitoring and tracking	City administration, and/or local police station	By geotagging positive patients, the App helps district administration trace locations that the positive individual has visited during the last few days.	
India	Corona Watch	State	Voluntary	Name, Mobile Number, Address, Gender and GPS Location Device ID, allows the app to establish if a phone call is being made or received and the phone number the call is connected to	Monitoring and tracking Also helps identify nearest hospitals for corona virus including the sample collection centers and testing labs	City administration, and/or local police station		An app by Karnataka (state) government, shows the locations of coronavirus-affected patients and their movement history of 14 days. The app also has a map that shows spots visited by people who were later tested positive for coronavirus and area where citizens are under house quarantine.
Indonesia	Care Protect	State	Voluntary	Bluetooth	Contact tracing	Government agencies	The app uses data produced by the user's device with Bluetooth enabled to record the information needed. When there are other devices within the Bluetooth radius that are also registered in Care Protect, an anonymous ID exchange will occur which will be recorded by each device. The app will then identify people who have been in close proximity to people who tested positive for COVID-19 or Patients Under Supervision and People in Monitoring.	Data is stored securely in an encrypted format and will not be shared with others. Users data will only be accessed if they are at risk of contracting COVID-19 and need to be contacted immediately by a health worker.
Israel	HaMagen	Public	Unsure	Location	Contact tracing	Ministry of Health	The Ministry of Health keep the app updated with epidemiological data of known COVID-19 cases, and if you cross paths with a case the app alerts you and directs you to the webpage.	Note also in Israel, Shin Bet using mobile phone location tracking technology (tracked 500 positive COVID-19 cases) – Supreme Court ruled the program can continue if a parliamentary committee overseas it.

Figure 4.4: International App Comparison Page 4

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Israel	Track Virus	Private	Unclear – presume voluntary	GPS (Bluetooth reported but unverified) Location history (device only) If user is notified they have crossed paths with an identified patient with COVID-19, user can export location history.	Allows users to see if they have crossed paths with any confirmed COVID-19 cases.	Health authorities	The app crosschecks the users' path with the paths of confirmed COVID-19 cases (as per data collected by the Israeli Health Ministry), and notifies the user if they were present or near an "infected" location. If so, user will receive a notification requesting they get in touch with the health authorities as soon as possible.	No user identification, (e.g. via email or cellphone)
Italy	SM-COVID19	Private	Voluntary	Number of contacts, duration of time with contacts, and distance between contacts. GPS data is not shared unless enabled by the user. GPS data will ONLY be recorded when contacts are detected.	Assessing the risk of virus transmission.	Health authorities	Uses Bluetooth to monitor the number of contacts, duration of time with contacts, and distance between contacts.	There are reports a private company named Bending Spoons may also be creating a tracing app (initially named Immuni)
Kyrgyzstan	Stop Covid-19 KG	Public	Unclear – possibly mandatory for people in quarantine.	GPS	Prevent entry into the country and prevent further spread of COVID-19	Headquarters of Kyrgyz Republic and individual authorised persons	Monitoring and controlling the location of people infected with COVID-19 and those who have had contact with them.	Also - IT Chat Bot in Telegram function provides information to public on Covid-19.
North Macedonia	StopKorona!	Private	Unsure	Location/bluetooth	Contact tracing	Ministry of Health	This app itself acts as a personal log tool for tracing user's exposure by measuring the distance between mobile devices that have the application installed. The data deriving from StopKorona! is shared with the authorities only upon explicit consent given by the app users.	Using Bluetooth technology, this application exchanges encrypted, anonymized data with every other nearby app users, measuring their mutual distance. It uses received signal strength indication (RSSI) values to measure signal strengths between telephones. RSSI calibrated values are used to estimate approximate distance between users, whereas the duration of such connection is registered by the mobile app itself. This information is stored only on the user's device and includes records only from the past 14 days.

Figure 4.5: International App Comparison Page 5

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Norway	Smittestop	Public and Private	Voluntary	Bluetooth and GPS	Contact tracing	Public Health	App used to log close contact with another phone – logged on phone for 14days only sent to health if person tests positive. Other people notified by alert message.	All data in the app will be continuously deleted after 30 days, and the entire app will be deleted in December. The app can be deleted at any time by anyone who has downloaded it, and that will mean that all data is deleted.
Pakistan	Covid-19 Gov PK	Public	Voluntary*	GPS*	Provide awareness to citizens about Covid-19 prevention. One major feature "Radius Alert" will allow citizens to "identify" COVID-19 patients in a certain radius so citizens can maintain social distancing. Also provides Dashboard for current status of COVID-19, alarms for washing hands, Chatbot for awareness of COVID-19 and WHO videos for prevention of Coronavirus.	-	Monitors user location and alerts user if there is a Covid-19 patient within a radius of 32 yards.	Some concerns: the app's privacy policy comprises only two paragraphs and offers no details about how it adheres to "social, moral, ethical values, and privacy." Reports of using patient's phone data to obtain locations visited by confirmed Covid-19 cases and cellphone numbers of those in vicinity at the same time.
Philippines (Cebu)	WeTrace	Public/Private (developed privately then endorsed).	-	GPS Reports anonymised user data is kept for 30 days then auto deleted.	Tracing and monitoring persons living in the Province of Cebu who have severe acute respiratory infections, influenza-like illness or have been classified as persons under monitoring or those with COVID-19 symptoms.	Unclear	Traces user timeline, movements and contacts. User identified by app through unique QR Code or device ID number.	Other options under development for tracing in the Philippines also.

Figure 4.6: International App Comparison Page 6

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Poland	Home Quarantine	Public/private*	Mandatory for people required to quarantine (except the blind, visually impaired, or those who sign a declaration confirming they do not use telecommunications networks or have a smartphone)	GPS Biometrics (facial recognition) Data kept for six years	To facilitate compulsory quarantine at home. Allows users to confirm where they are, do a basic health assessment, directly report danger and supply most-needed items to people who cannot do this themselves.	Police, state governors, the Centre for Information Technology, National Centre for Healthcare Information Systems and the subcontractor. The Government	The app prompts users to take a real-time selfie, multiple times a day, at the address they have provided to the authorities. Users reportedly have 20 minutes to respond.	A failure to install the app results in a Police visit and a fine of 30,000 zloty ($11,200)
Poland	ProteGO Safe	Public	Voluntary	The application is anonymous and will not collect users' data or tracking their location. It will only remember other "encountered devices", not users. The app will use random identifiers for communication between devices, which will be changed every hour.	The app has two main functions to control the spread of the disease. Firstly, allow users to monitor their health by completing a Health Journal and taking a Risk Assessment Test. Secondly, use Bluetooth technology to collect information about what devices a user has encountered. According to the App store, this Bluetooth feature may not be available yet.	Sanitary Inspection (to contact people who should be quarantined more quickly).	The Risk Assessment Test is done through a survey. It puts users into groups based on risk and provides them with health advice. The Health Journal allows users to keep a regular record of how the user is feeling, whether they have any symptoms, etc. The app will use Bluetooth technology to log connections between smartphones on a device. This data is encrypted and stored on the phone for two weeks. To install the app, users must register their phone number. A user, if they become sick, changes their status in the application anonymously and then the app, sends data about what devices the user has encountered to a special server. This server informs users of all devices that had contact with the sick person within the previous two weeks about a possible risk and the need for quarantine, taking into account the length and frequency of meetings (in accordance with WHO guidelines). The user's status will change (from green to red) to mark contact with an infected person.	Polish media have made some controversial report about the app collecting personal data. The Ministry of Digitization has denied these allegations.
Saudi Arabia	Rest Assured (Tatamman) app	Public	Voluntary	Health	Monitoring of active cases and assisting those in quarantine	Ministry of Health	Those in self-isolation can assess their health condition, receive advice and speak to medical staff	

Figure 4.7: International App Comparison Page 7

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Saudi Arabia	Tawakkalna	Public	Mandatory	Location info	Contact tracing and monitoring movement of people when they leave their residences during their 4 hour a day allocated time	Ministry of Health and Saudi Artificial Intelligence and Data Authority	Facilitates the issuance of movement permits for essential workers and individuals leaving their homes for up to 4 hours a day to collect supplies. Also allows individuals to notify suspected cases both of themselves and others. Also provides close to realtime updates on number of cases and where these are located ie hotspot mapping.	
Singapore	TraceTogether	Public	Voluntary	User's mobile number (used by MoH to contact users if they are in close proximity to a COVID-19 case). Encounter/ Proximity data is stored on a user's phone for 21 days on a rolling basis. After that, it is deleted. This data is not shared with MoH unless they seek consent. Anonymised app analytics to improve app experience. No location data is collected.	To enable community-driven contact tracing by allowing participating devices to exchange proximity information whenever an app detects another device with the app installed.	Ministry of Health If a person unfortunately falls ill with COVID-19, the Ministry of Health (MOH) would work with them to map out their activity for past 14 days, for contact tracing. And if the person has the TraceTogether app installed,	The app exchanges Bluetooth proximity data with nearby phones running the same app. This data is anonymised and encrypted, and does not reveal the user's identity or the other person's identity. In order to measure distance, information about the phone models and signal strength recorded is also shared. If a person becomes ill with Covid-19, they can grant MOH access to their Bluetooth proximity data, to assist the MOH with contract tracing.	TraceTogether complements contact tracing and is not a substitute for professional judgment and human involvement in contact tracing.
Slovak Republic	Covid19 ZostanZdravy	Private	-	Email address for registration GPS Bluetooth information	Stop the spread of COVID-19 by supporting people in quarantine, notifying people when they are approaching a person who has tested positive for Covid-19 (50 metres), and retrospectively tracing people who have had contact with a person that has since tested	Health authorities	User give app permission to access Bluetooth, GPS and notifications. If device recognises another close Bluetooth device, and that contact exceeds a particular time duration, the application will record the GPS position and send an anonymous log of both devices to the server. If a person becomes sick with COVID-19, they provide health authorities with their unique ID number. This ID number is added to the system and all devices that were in contact or come into contact with the carrier receive a notification warning them about exposure to Covid-19. After receiving a notification, the user decides when they get tested. Users can order tests directly from the application and can have results received through unique code on app. If anonymous identifier is marked as positive, the app will	

Figure 4.8: International App Comparison Page 8

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
					positive for COVID-19.		automatically anonymously notify other users who have been in contact with the infected person. App also monitors movement of people in mandatory quarantine. If a person leaves their quarantine address for longer than a specified time, they will be notified by the app to return to quarantine. The application also shows a map with the latest information about infections in individual districts. If you are approaching a person with a positive test, the application will show you the date, time and estimated position with an accuracy of 50 meters.	
South Korea	Corona-100m	Private	Voluntary	Data from public government sources	Provides user with detailed information about COVID-19 patients, including where they visited, and how close they are to COVID-19 patients.	N/A	Collects data from public government sources and alerts users of any diagnosed Covid-19 patient within a 100-meter radius along with the patient's diagnosis date, nationality, age, gender, and prior locations.	Privacy concerns in cases where enough information is made public to infer the patient's identity (even though app supposed to be 'anonymous').
South Korea	Corona Map	Private	Voluntary	Data from public government sources	Plots the locations of people with COVID-19 so users can avoid these areas.	N/A	The app uses government data available online to map the locations where people known to have had COVID-19 have been.	Privacy concerns in cases where enough information is made public to infer the patient's identity (even though app supposed to be 'anonymous').
South Korea	Location Notification	-No info available	No info available	GPS*	No info available	No info available	No info available	
Spain	CoronaMadrid	Public with private assistance	Voluntary	GPS location, symptoms tracker, registration info	Symptom tracker to help with burden on telehealth; location information "to better organize the medical resources""	Private companies in development, state security forces and judicial bodies	Centralised	Doesn't appear to be a contact tracing app, more of a symptom tracker with the use of location as an additional intelligence source. Privacy policy could not be found.
Thailand	Mor Chana	Public / private	Voluntary	Bluetooth and GPS, rego info is just mobile number. Health info also	Contact tracing	Health authorities	Users answer health assessment questions and receive risk level results. These risk level results are then given for areas – it looks as though the risk levels for areas are published. Users asked to share Bluetooth/gps info only when contacted for contact tracing purposes, is stored locally otherwise.	Data from the app will be processed by the DDC iLAB analytic platform, which combines epidemiology analysis and AI to identify users who may be in proximity to infected people

Figure 4.9: International App Comparison Page 9

Office of the Privacy Commissioner: Overview of COVID-19 Contact Tracing Apps – 12 May 2020

Country	App Name	Public / Private	Voluntary / Mandatory	Info collected	Purposes	Disclosed to	How does it work?	Notes/issues
Turkey	Korona Onlem	Public with assistance of telecommunication providers	Those with the virus are required to download the app. Unclear for others.	Symptom tracker, GPS location for contact tracing	Contact tracing, app is also used to inform the public about numbers of cases, tests, recovered and fatalities.	Unclear	The application shows the risk level, the density of infected people and the density of people in isolation at the users' locations.	Has been downloaded more than 1 million times in one day (as at 19 April)
Ukraine	Act at Home	Public	Voluntary – individuals required to self isolate can use app or presumably checked by state officials	GPS	To confirm that individuals who are required to self-isolate are self-isolating in their place.	Unclear	Individuals who are required to be self isolating receive message at intervals and need to take photos of your face and provide it, with the geolocation of the photograph . The app also links to driver's licenses and vehicle registration information.	Sounds similar to Poland's solution. The app reportedly has 2 million users.
USA	Private Kit: SafePaths	Private (MIT)	Voluntary	GPS	To assist with contact tracing	Unclear – MIT website says "public health researchers"	The app collects users' location data, keeping a time stamped log every 5 minutes, for up to 28 days. The data stays on the phone and is encrypted – you can choose to send your location data to public health researchers if you test positive. A second roll out of the app also includes a notification feature where individuals who have crossed paths with those who have tested positive are notified.	The app is open source.

Figure 4.10: International App Comparison Page 10

4.0.2 App Wireframe

This section details the connectivity and wireframe of the application. Elements of this wireframe not outlined explicitly as requirements should not be interpretted as design decisions.

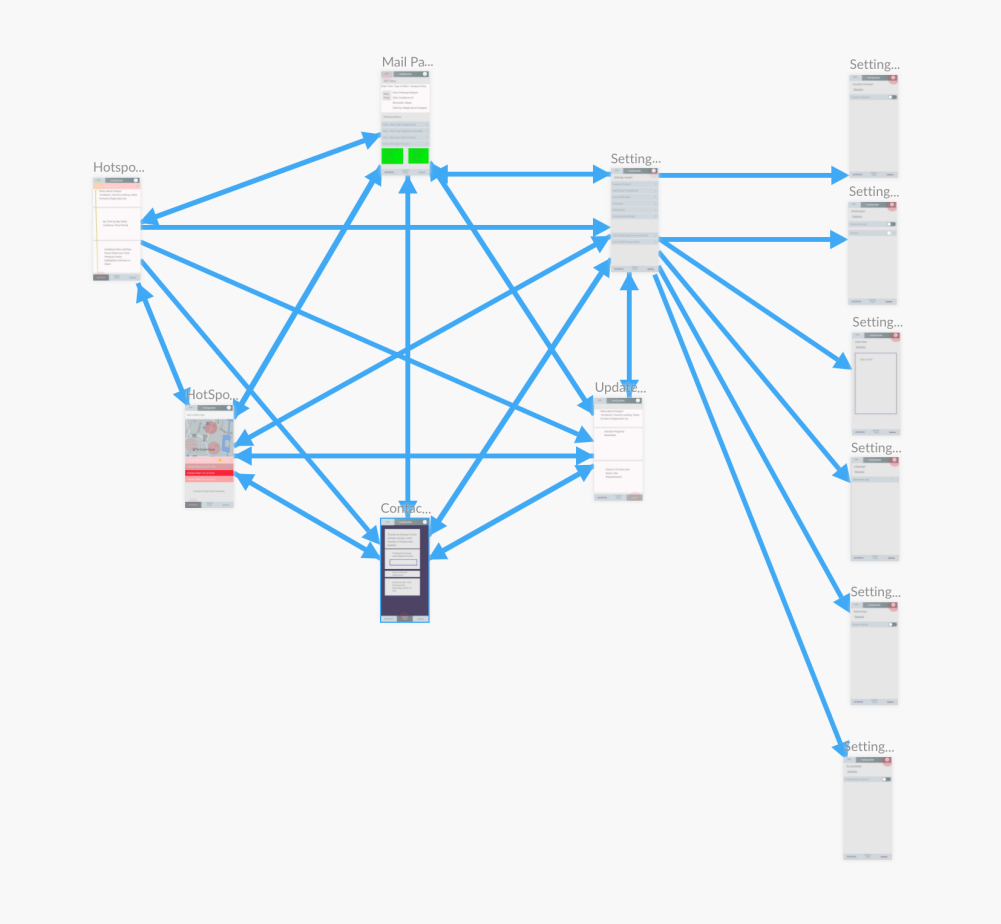

Figure 4.11: App User Interface Connectivity - For diagram Connections between the Settings pages and the other pages have been removed however should be present in the final design

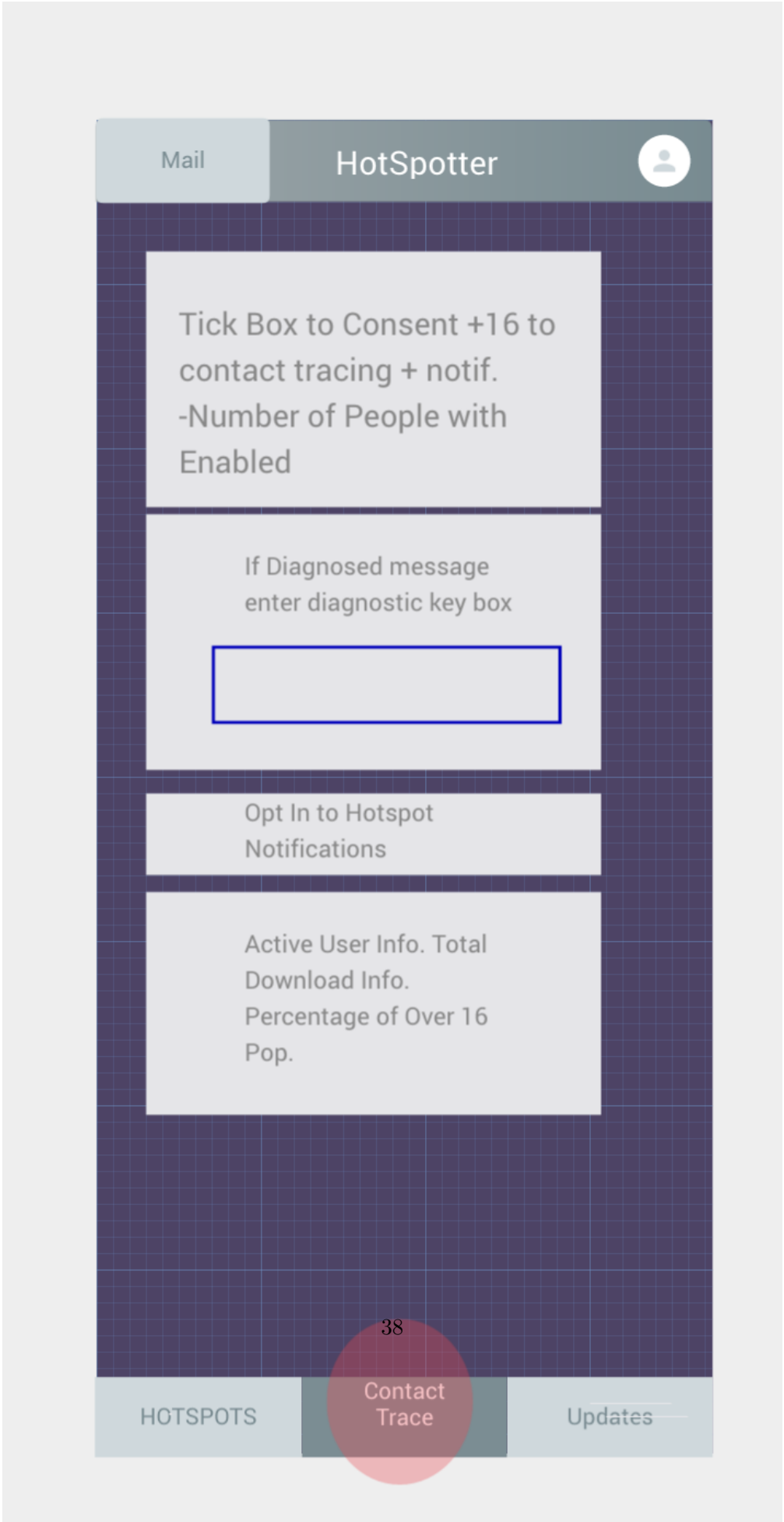

Figure 4.12: Main Page - Contact Tracing

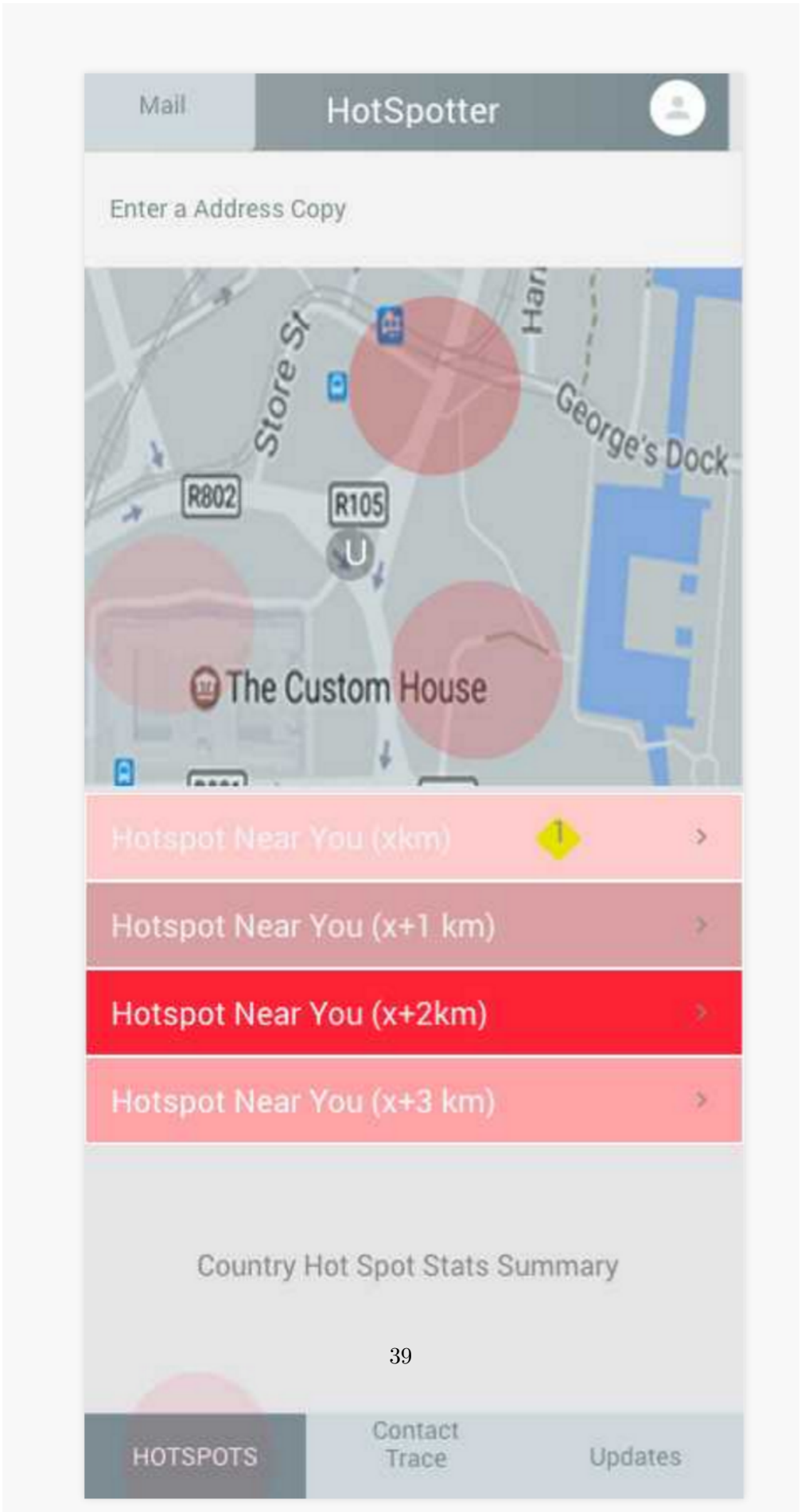

Figure 4.13: Main Page - HotSpots

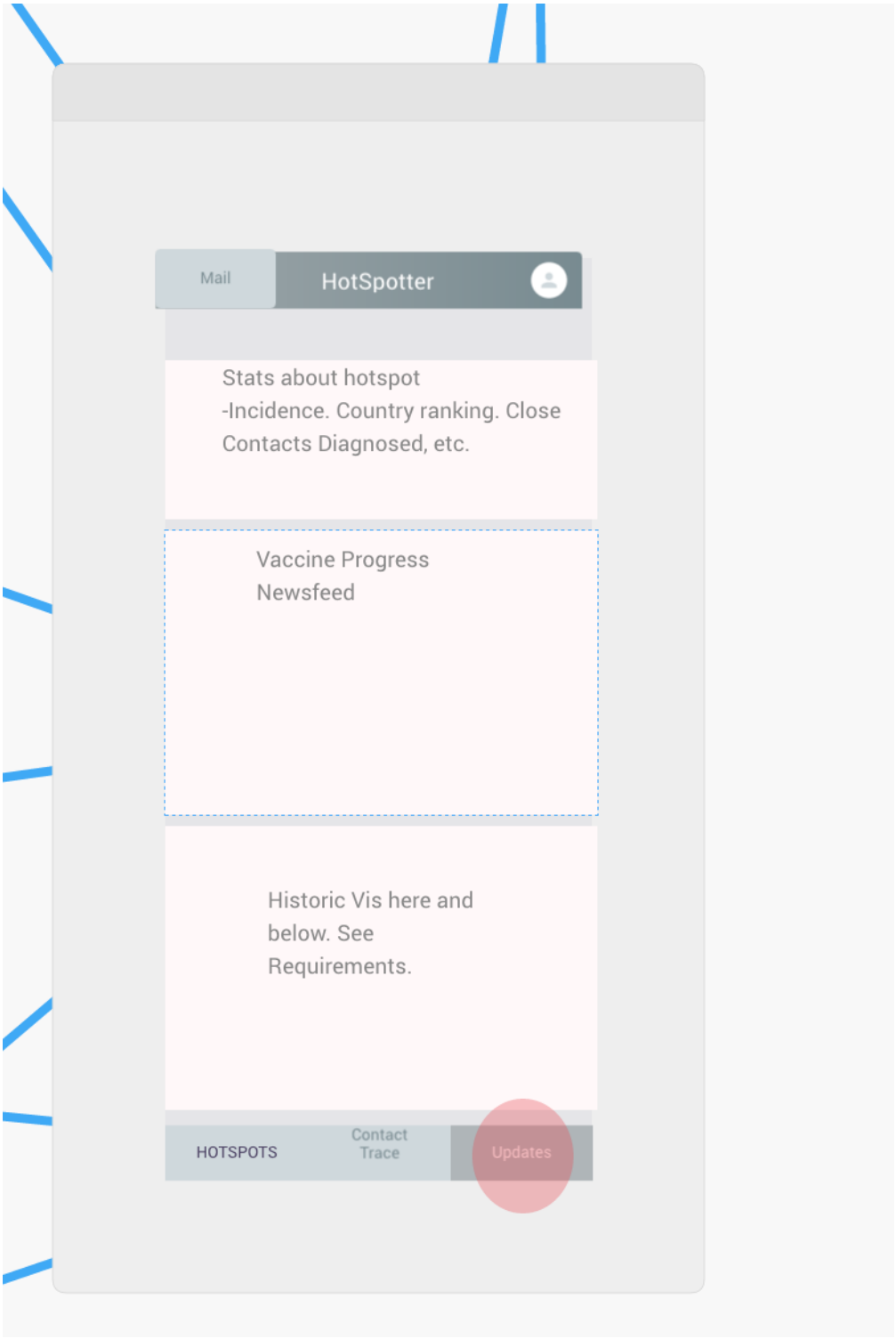

Figure 4.14: Settings - Consent

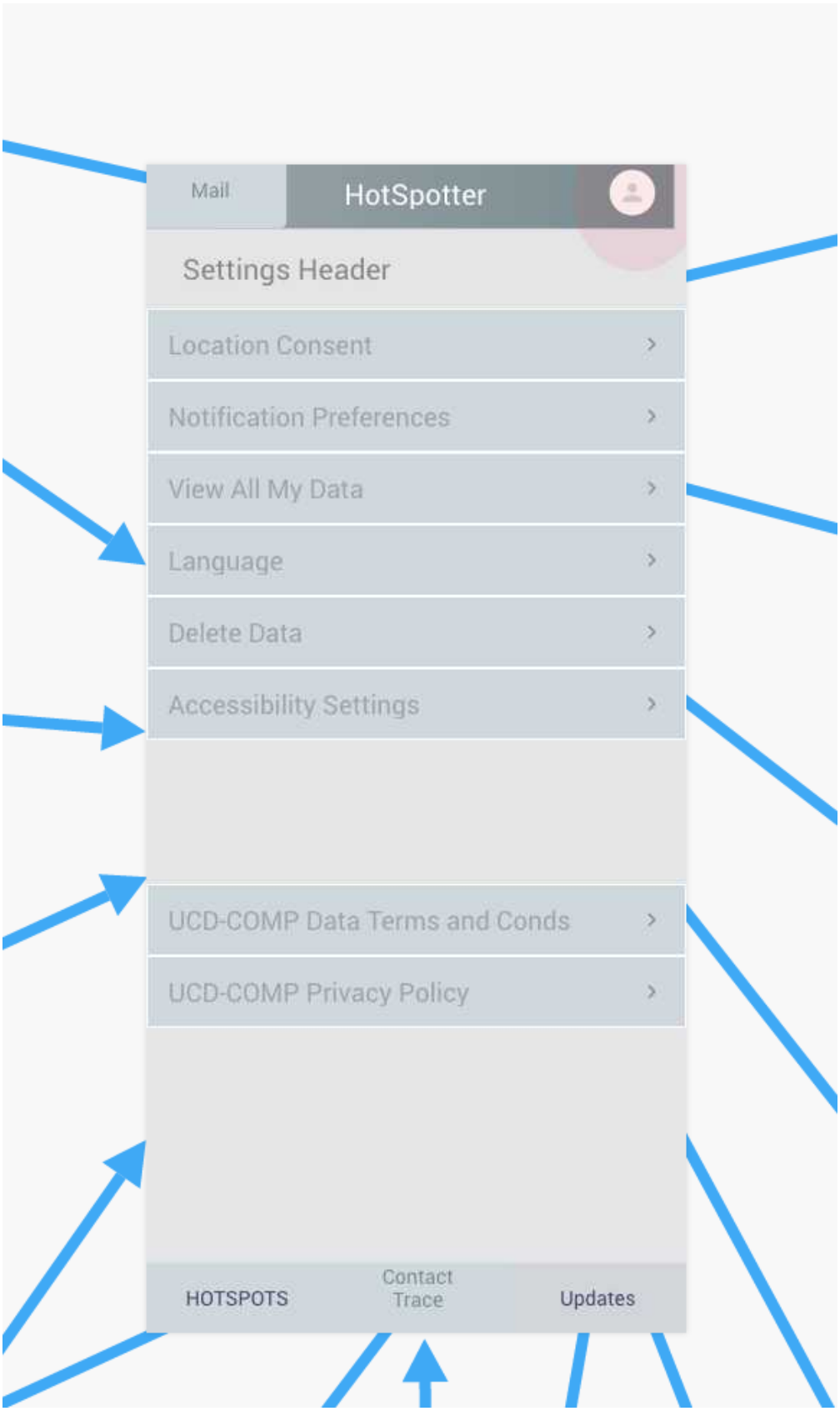

Figure 4.15: Main Page - Settings

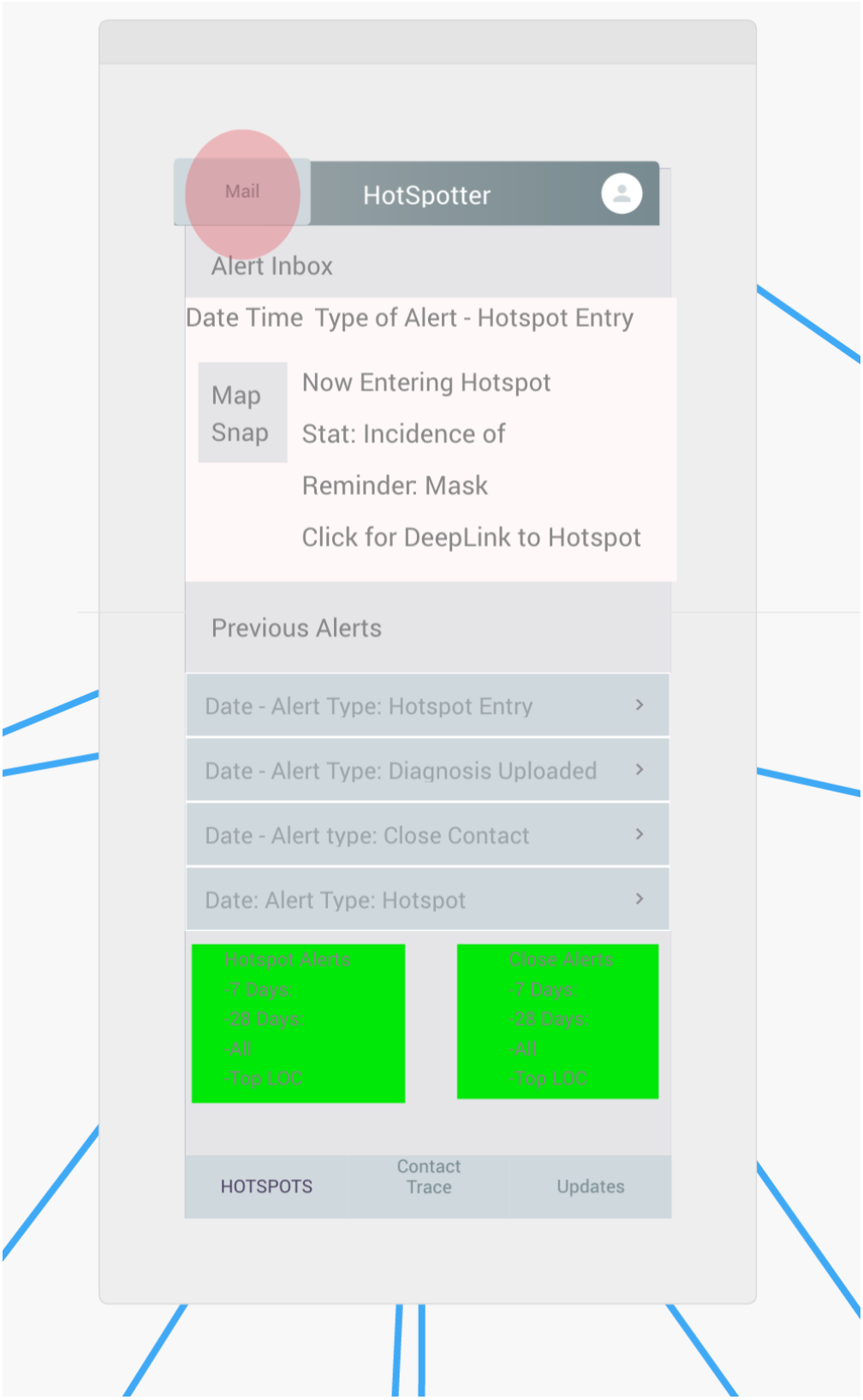

Figure 4.16: Main Page - Mail

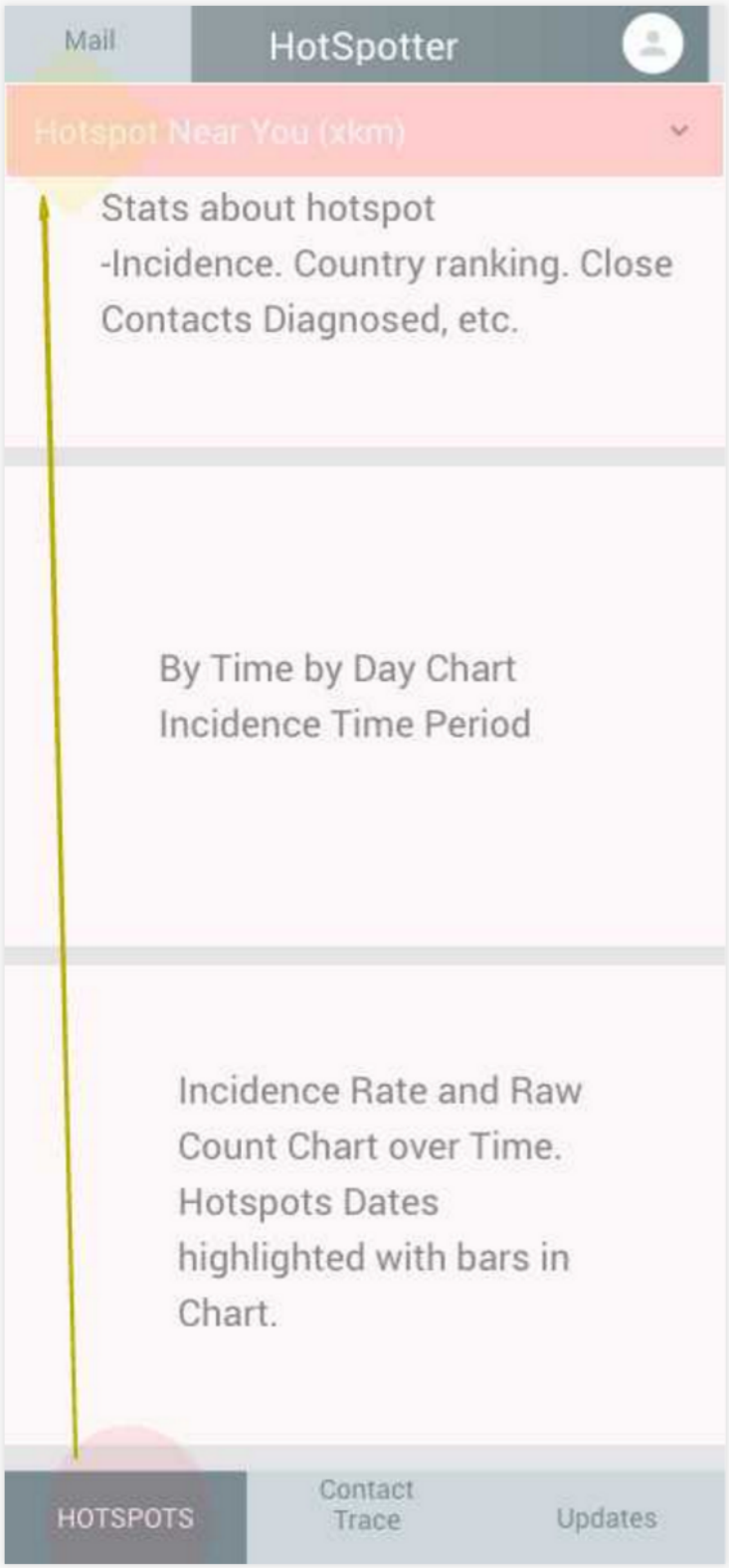

Figure 4.17: HotSpot - More Info or Address Search

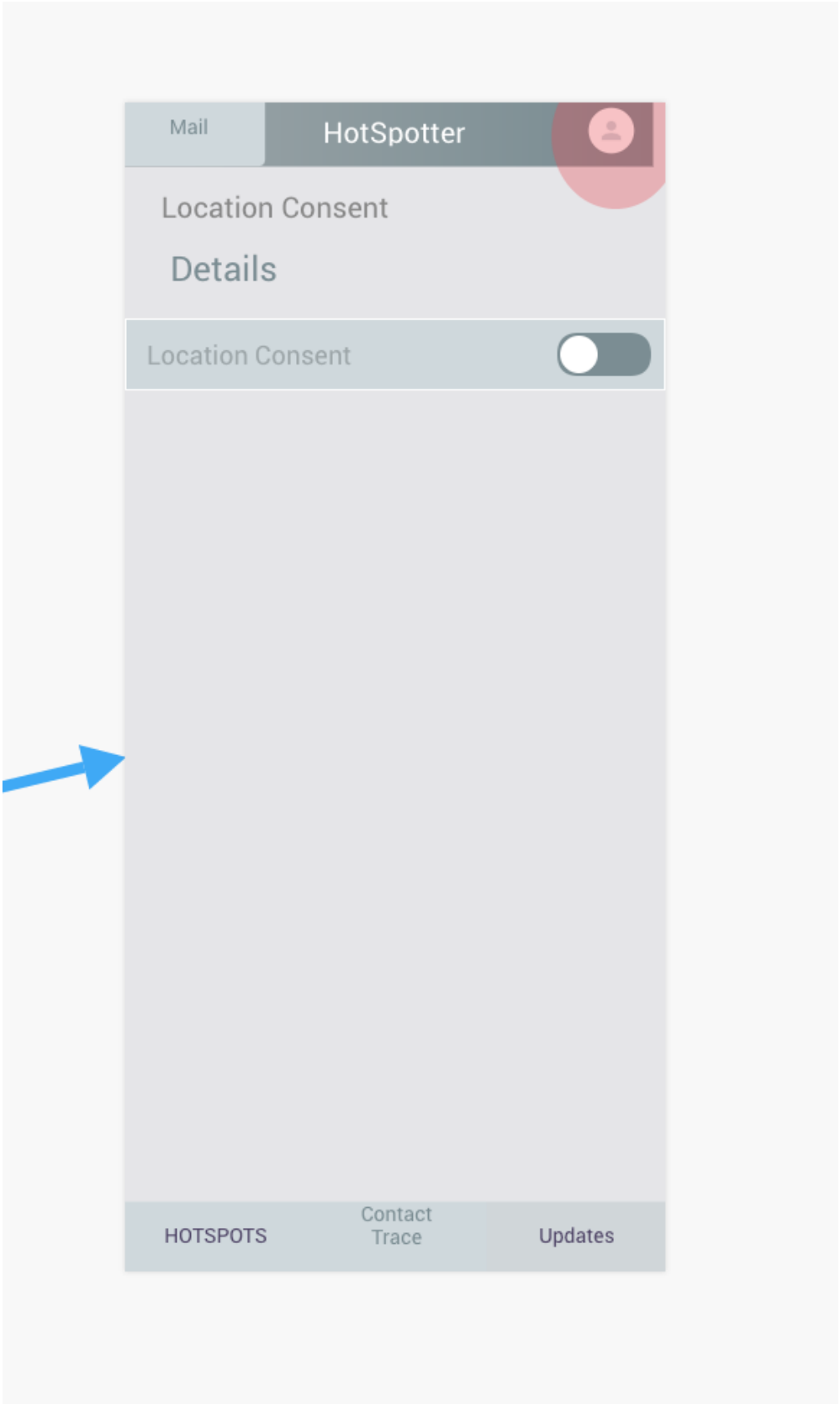

Figure 4.18: Settings - Location Tracking Consent

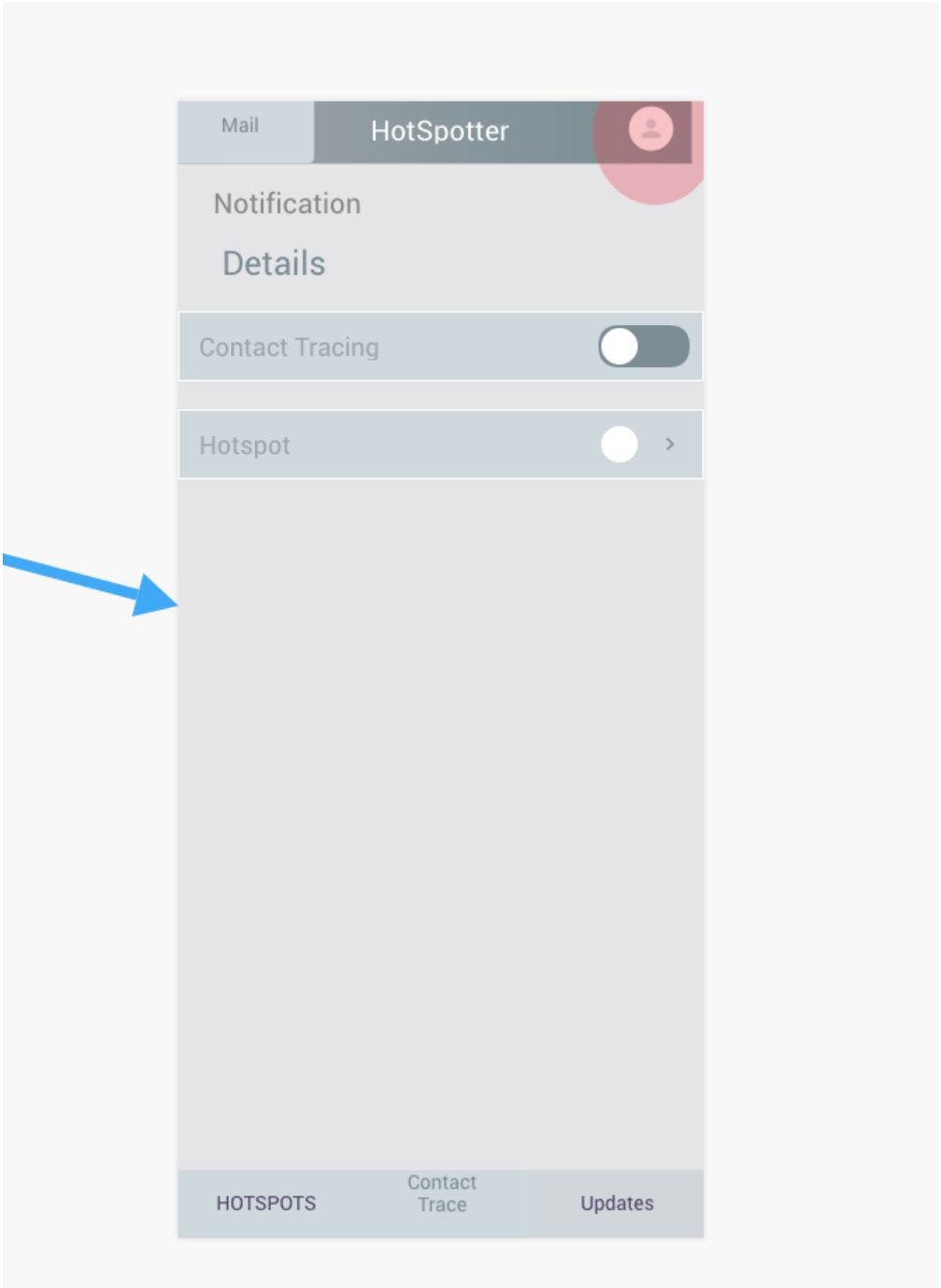

Figure 4.19: Settings - Notification Consent

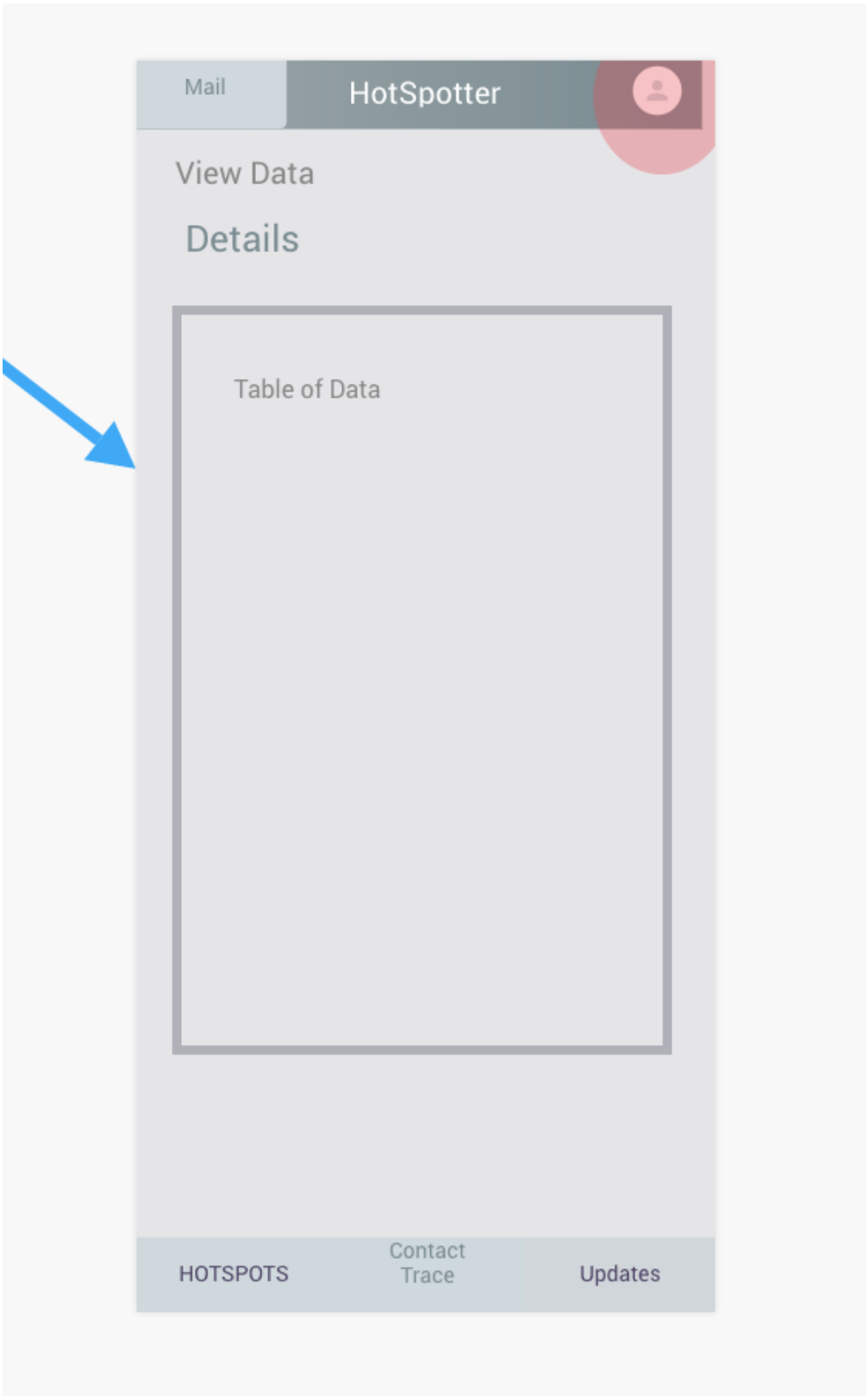

Figure 4.20: Settings - GDPR - Right to Retrieval

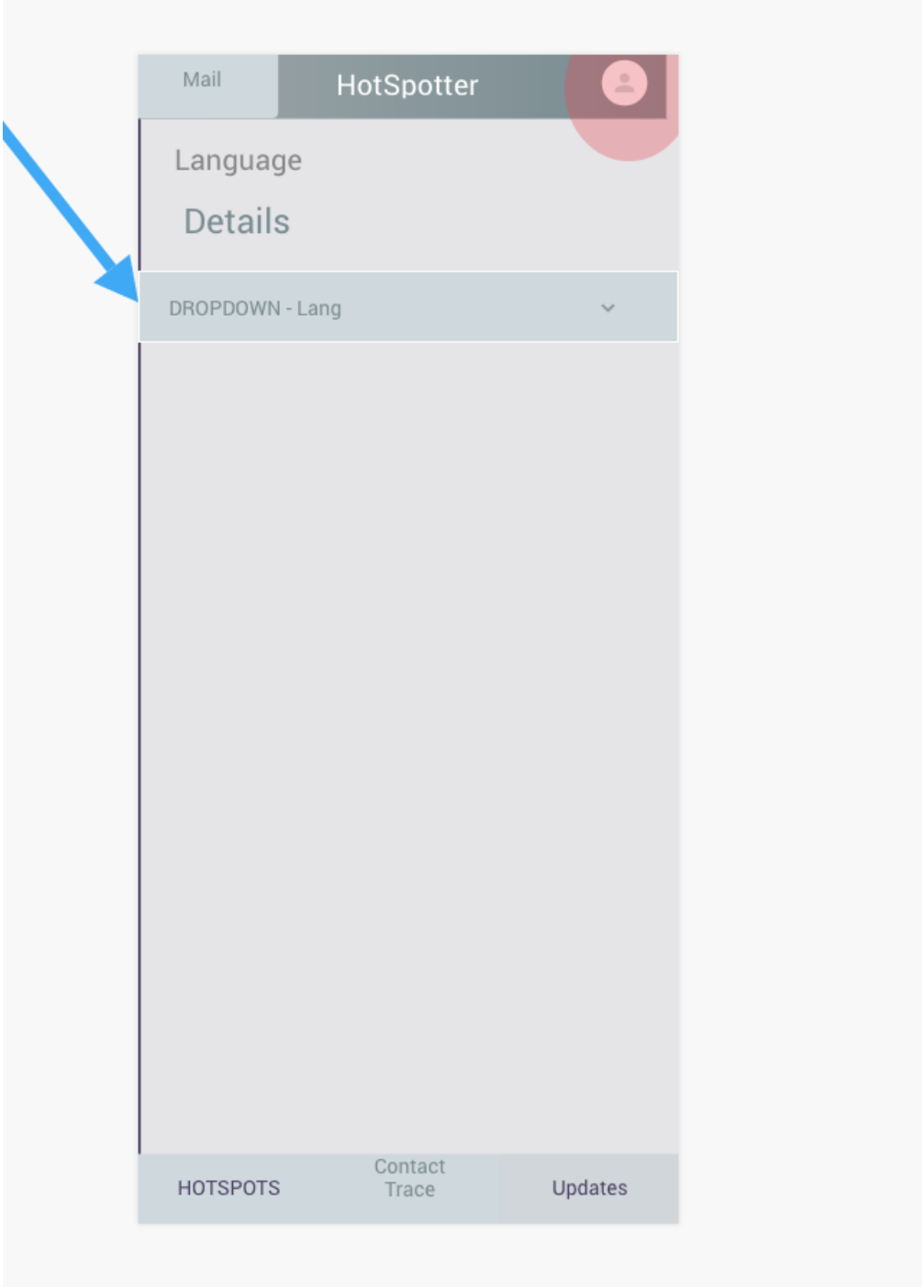

Figure 4.21: Settings - Language Options

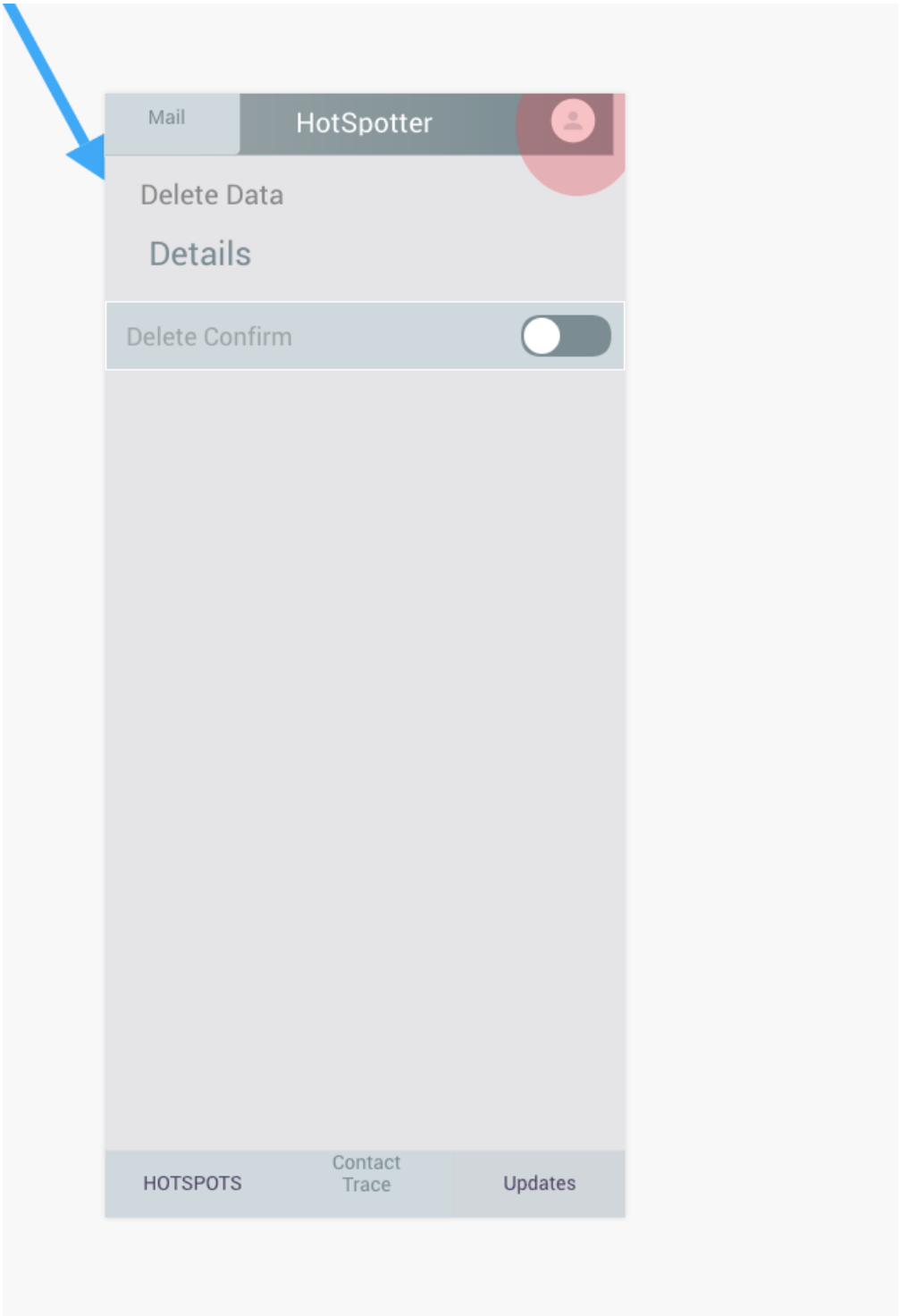

Figure 4.22: Settings - Right to be Forgotten

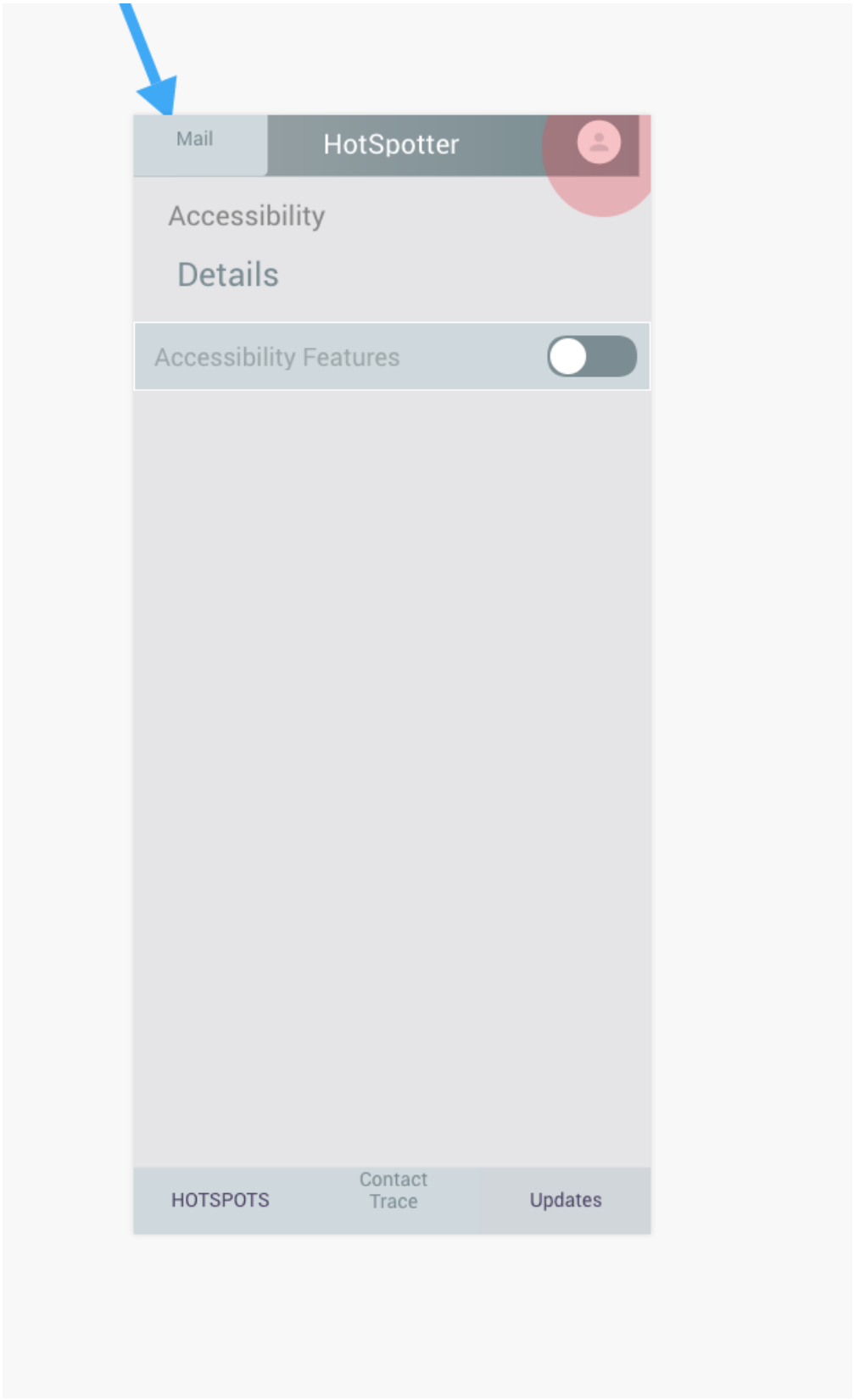

Figure 4.23: Settings - Accessibility