HIV Status Detection Among Women Using Machine Learning – User Manual

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1.0 Introduction

This user manual is intended to guide the users on using the HIV status detection application which was deployed as a web application on the *shinyapps.io* platform.

This project aims to build an HIV status detection application. The application can detect whether an individual is HIV-positive or HIV-negative based on some questions answered by the user. The application can also find out the trends of keywords used by medical professionals and researchers especially in the field of HIV as well as AIDS by generating word clouds for them. This application can even receive file inputs and generate new files, easing the users in exploring the geographical map distribution of HIV, as well as looking into the dataset with plots and summary tables.
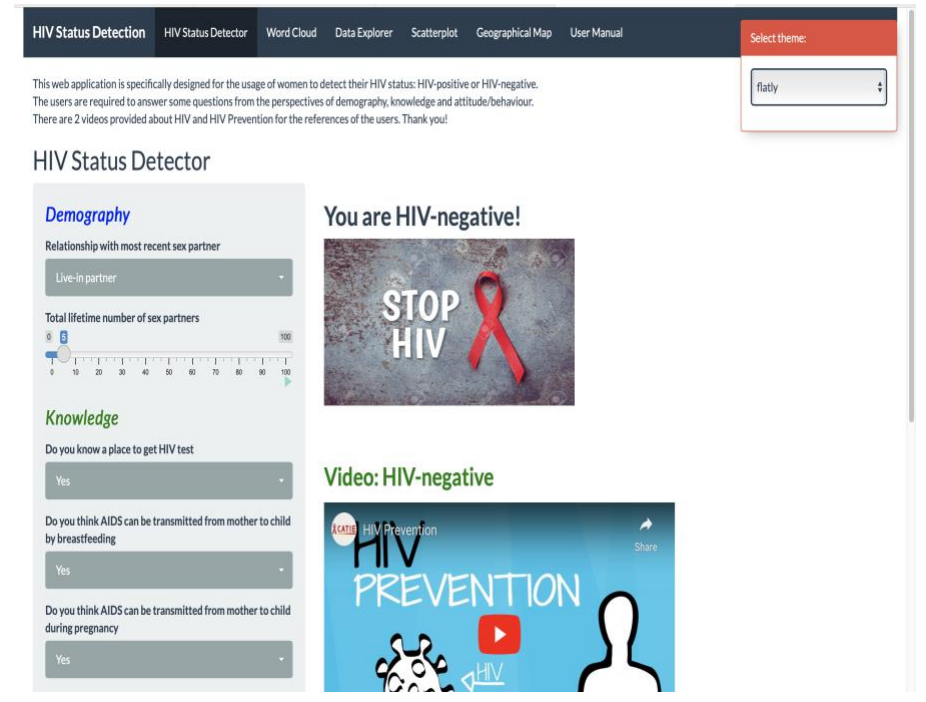
The usage of this application is divided into a few use cases. Each use case has a unique ID for searching, a description of the use case, step-by-step instructions with screenshots, and the expected outcome.
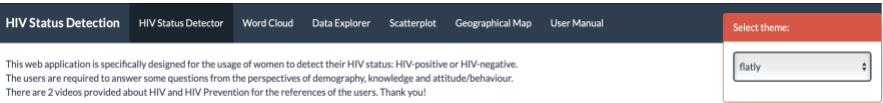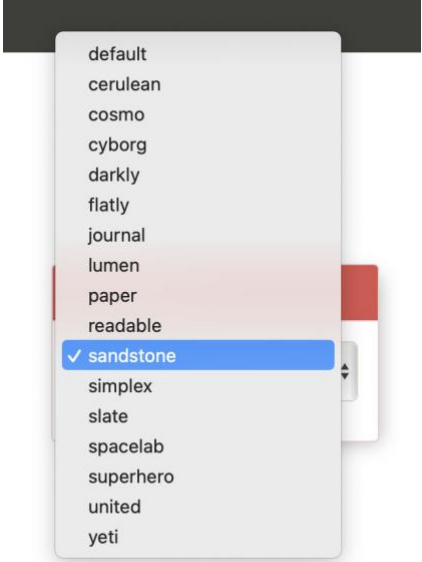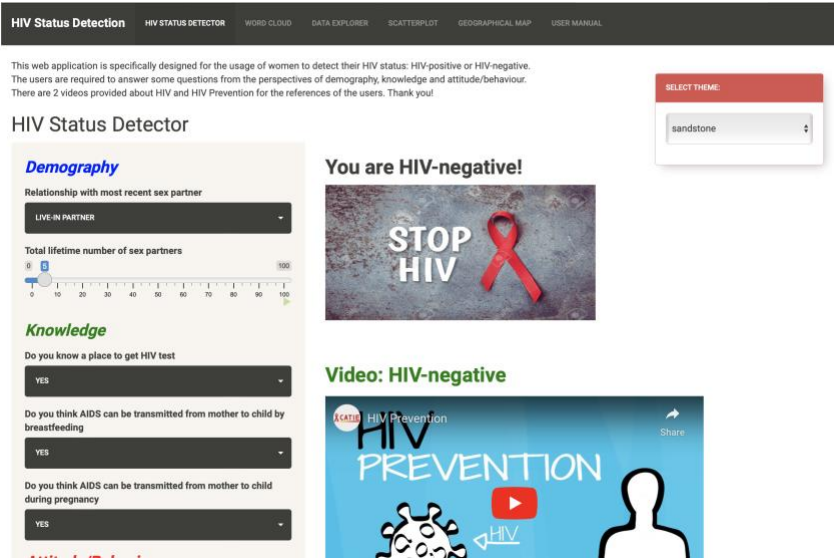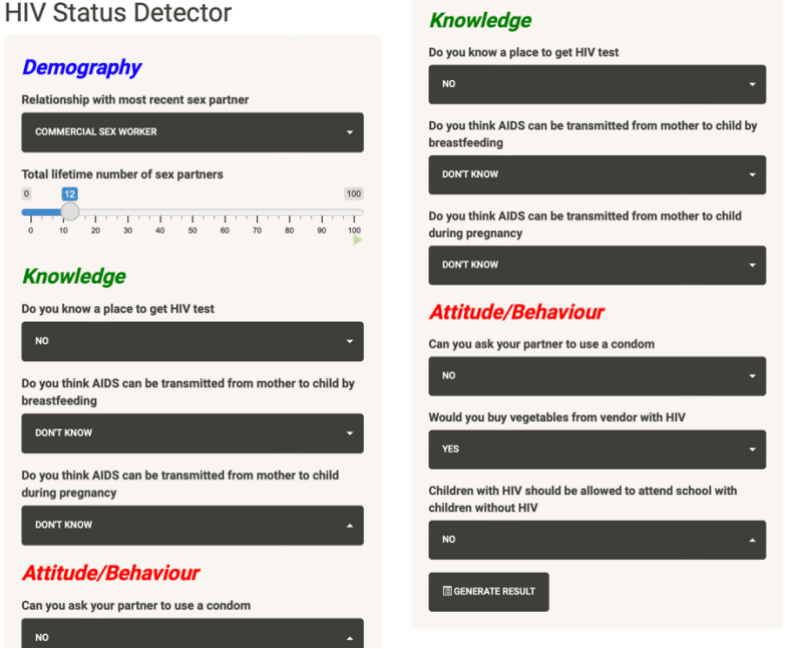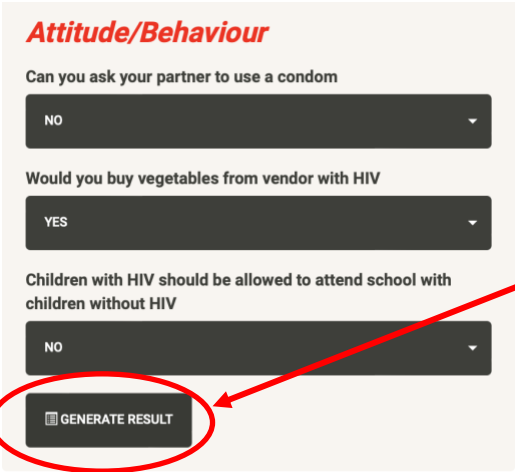
Terminologies

Vocabulary	Description
User	Users are people who have access to the HIV Status Detection site. They can use all the features in the application.
Main Tab Panel	A tab panel navigation bar atop that shows different features and helps users to direct to different pages of the application.
Theme Selector	Users can select up to 17 different themes for the web application for a better user interface.
Home Page (HIV Status Detector)	The website's landing page for users contains a brief introduction. This page consists of a trained machine learning model which allows users to input numbers and answers for detecting the HIV status of the individual. This page also contains videos for reference to the users.
Word Cloud Page	The page consists of word cloud visualizations that could help in visualizing and comprehending the datasets. There are also several ways for the users to generate the word sources and customizing the word cloud is also made available.
Data Explorer Page	The page lets the users explore datasets used for the model building and visualizations in this project by themselves. There are 4 sub-tab panels on this page which include an interactive data table, 2 summary tables (categorical and numerical variables), and a word cloud generator.
Scatterplot Page	The page will generate a scatterplot or pairs plot to show the correlation between 2 variables in the dataset.
Geographical Map	The page shows a geospatial visualization of HIV statistics in 14 different countries in Africa.

User Manual Page	The page shows the description of the basic functionalities of the application.

2.0 Home Page (HIV Status Detector)

ID & Description	C-1 Access Home Page

Steps	There are a few ways to access the Home Page:
	
	I. User enters the website:
	    1. It is the first page to be seen when users access the website
	
	II. User select "HIV Status Detector" selection from the main tab panel navigation bar:
	    1. Click the "HIV Status Detector" tab on the top navigation bar of the website
	
	    2. The home page is shown

Expected Result	User enters the Home Page

ID & Description	C-2 Change Website Theme
Steps	1) Click "Select theme:" in the top right of the website 2) Select one of the 17 themes available (in this case: *sandstone*) Change the theme to your desired one that suits your favor **IMPORTANT**: The "default" theme will be selected every time you enter the landing page
Expected Result	The "*sandstone*" theme is displayed.

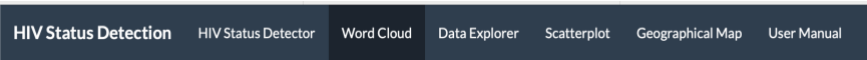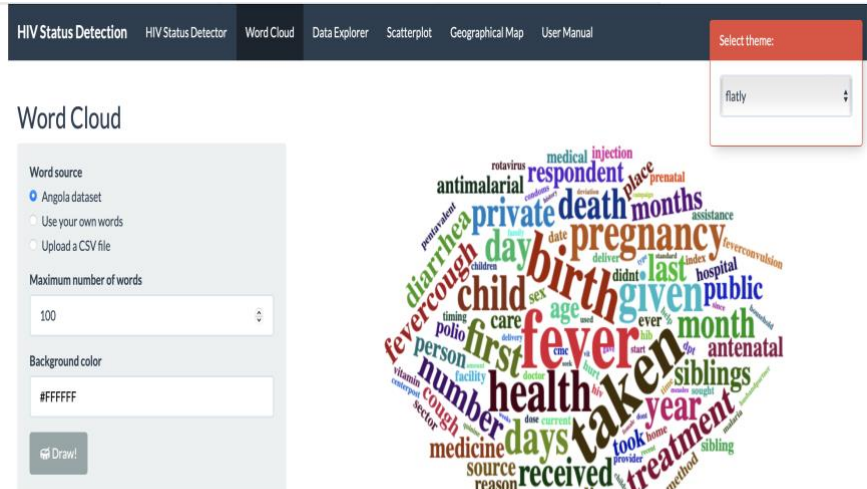| ID & Description	C-3 Detect HIV Status
Steps	1) Answer a series of questions honestly 2) There are 3 parts/sections to answer which include demography, knowledge, and attitude/behavior of the user 3) Hit the "GENERATE RESULT" button to submit your result for the detection
Expected Result	The result of the detection is shown

You are HIV-positive!

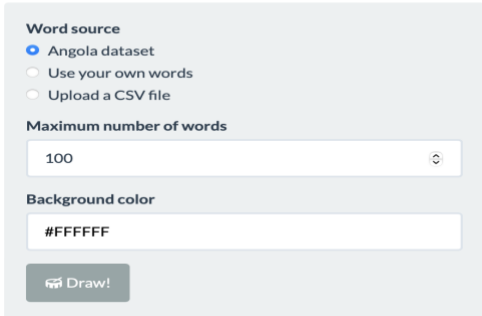| ID & Description	C-4 Access YouTube Videos
Steps	1) Click the 'play' button to view the embedded videos
Expected Result	The YouTube video will be played.

Video: HIV-negative

There are 2 videos. The first video is for individuals detected as HIV-negative and it is about HIV prevention. The second video is for individuals detected as HIV-positive and it is about HIV knowledge generally.

3.0 Word Cloud Page

ID & Description	C-5 Access Word Cloud Page
Steps	1) Click "Word Cloud" on the top navigation bar
Expected Result	User enters the Word Cloud Page

ID & Description	C-6 Display 'Angola Dataset' Word Cloud
Steps	1) Select the 'Angola dataset' option. 2) By default, 'Angola dataset' will be selected and the number of words shown in the word cloud is 100 and a 'white' background color.

3) User may adjust the number of words to be shown as well as the background color and hit the "Draw!" button.
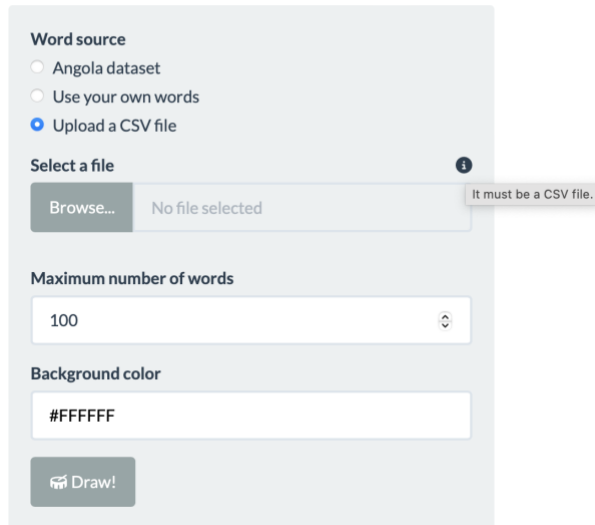

| Expected Result | The customized word cloud will be shown with the frequency of the word that appeared when hovering over that word. |

IMPORTANT: A different arrangement of word clouds will be displayed each time the "Draw!" button is pushed.
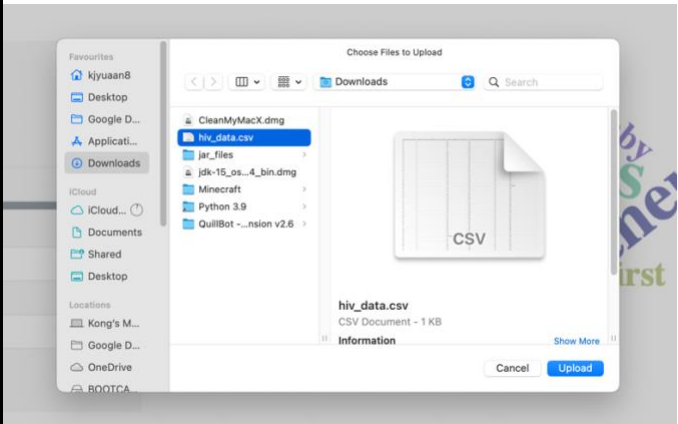
ID & Description	C-7 Display Own Word Cloud
Steps	1) Click on "Use your own words" to enter a new interface. 2) Users can enter their own texts or paragraphs, and choose the number of words, as well as the background color of the word cloud just like before. **IMPORTANT**: Medical professionals can utilize this functionality to paste text from a patient's report or an HIV-related article to generate insights from word sources.

Expected Result	A new word cloud will be produced with 12 number of words.

ID & Description	C-8 Display Word Cloud from a CSV File
Steps	1) Click on the radio button "Upload a CSV file" (last selection for word source). **IMPORTANT**: It must be a CSV file.

	2) Hit the "Browse…" button to select a local file from your PC and upload.
	## Word Cloud **Word source** ○ Angola dataset ○ Use your own words ● Upload a CSV file **Select a file** ❶ [Browse…] hiv_data.csv Upload complete **Maximum number of words** 15 **Background color** #FFFFFF [🎏 Draw!]
Expected Result	When no file was uploaded: ## Word Cloud **Word source** Please upload a CSV file! ○ Angola dataset ○ Use your own words ● Upload a CSV file **Select a file** ❶ [Browse…] No file selected **Maximum number of words** 15 **Background color** #FFFFFF [🎏 Draw!]

When a non-CSV file (i.e., PNG file) was uploaded:

Word Cloud

Word source
- Angola dataset
- Use your own words
- ● Upload a CSV file

Select a file ⓘ

| Browse... | 2.PNG |

Upload complete

Maximum number of words

| 15 | ◌ |

Background color

| #FFFFFF |

🔲 Draw!

Please upload a CSV file!

When a CSV file was uploaded:

Word Cloud

Word source
- Angola dataset
- Use your own words
- ● Upload a CSV file

Select a file ⓘ

| Browse... | hiv_data.csv |

Upload complete

Maximum number of words

| 15 | ◌ |

Background color

| #FFFFFF |

🔲 Draw!

excluding avoid age baby drugs months recent hiv sex last buy ago partner first long
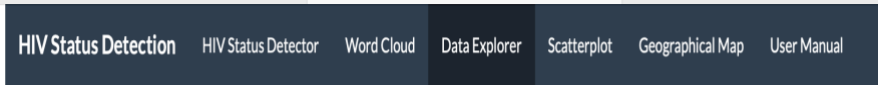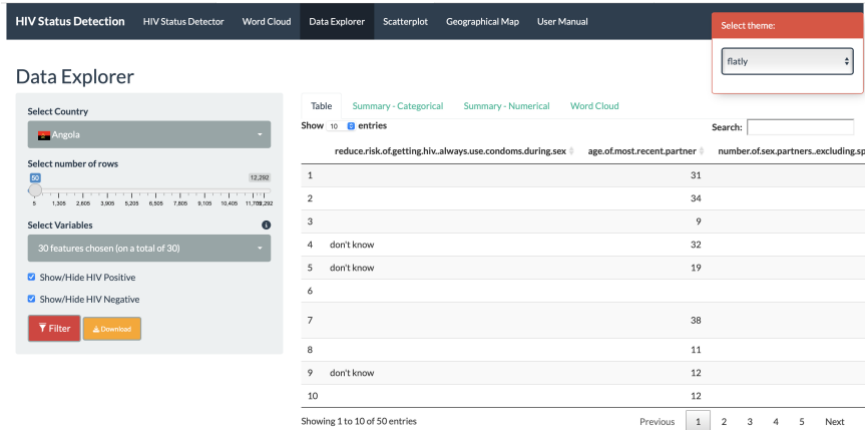
partner:2

4.0 Data Explorer Page

ID & Description	C-9 Access Data Explorer Page
Steps	1) Click "Data Explorer" on the top navigation bar.
Expected Result	User enters the Data Explorer Page. There are 4 sub-tab panels on this page which are "Table", "Summary – Categorical", "Summary – Numerical", and "Word Cloud".

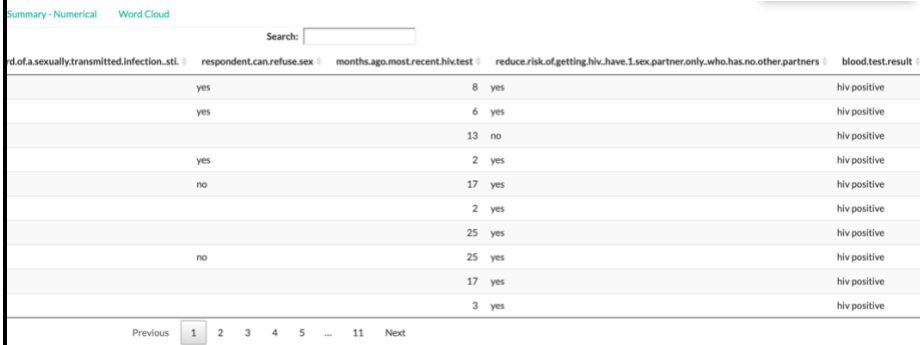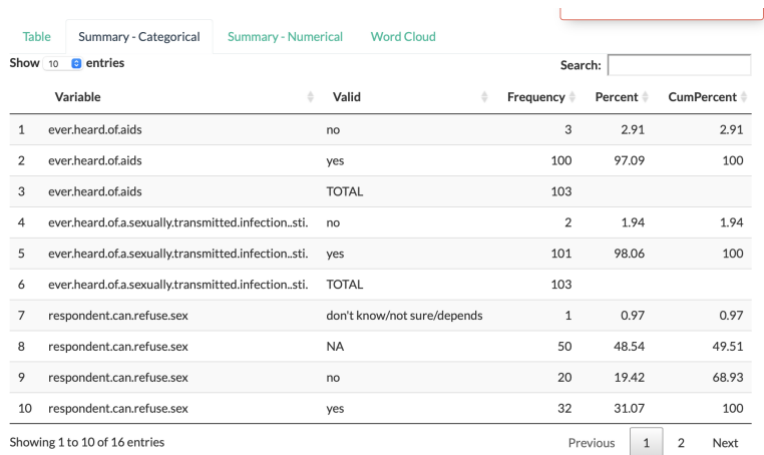| ID & Description	C-10 Display Table of Datasets
Steps	1) Select one of the 4 countries (access approved by The DHS Program). 2) Select the number of rows to be shown with respect to the

country selected.

3) Select variables/features from a list of 30. User can also click "Select All" to highlight all the features as well as "Deselect All" to remove selection of all features.
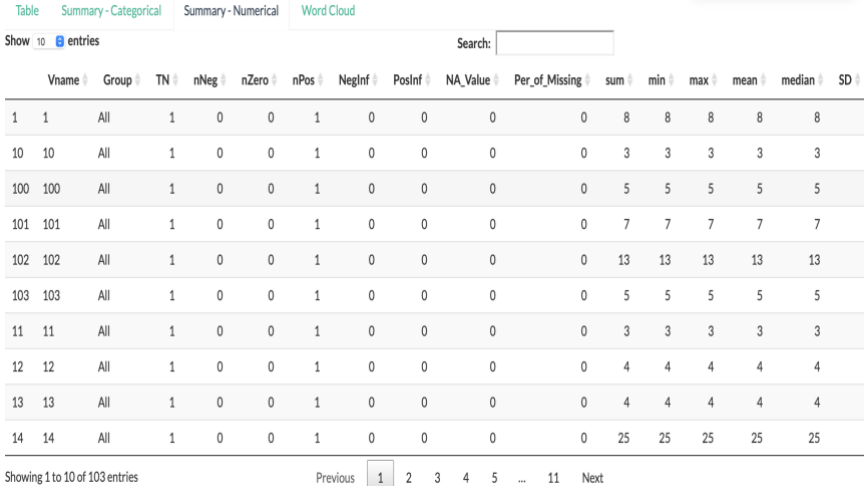

IMPORTANT: Out of the 30 features, 5 are numerical variables while the others are categorical variables. The lists of numerical variables will pop out when hovering over the helper/info symbol (*embedded tooltip icon*).

4) User can even choose to show or hide the HIV Positive cases or HIV Negative cases (blood test result).
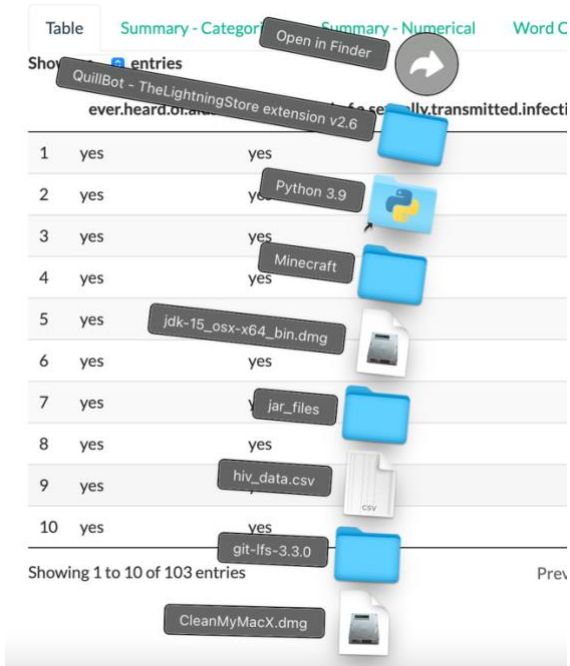
5) Hit the "Filter" button to view the results.

Expected Result	User can view the interactive data table filtered in the "Table" sub-tab panel.

ID & Description	C-11 Display Categorical Summary of Datasets
Steps	- Same as the steps in C-9 for all the inputs…
Expected Result	User can view the summary statistics of the categorical variables chosen in a tabular format. **IMPORTANT**: At least one categorical variable must be chosen in this section!

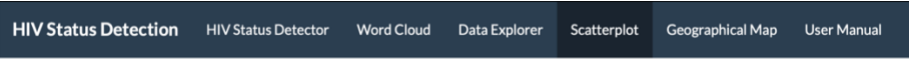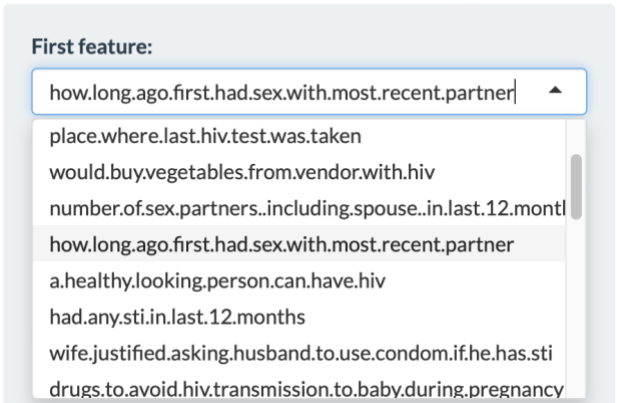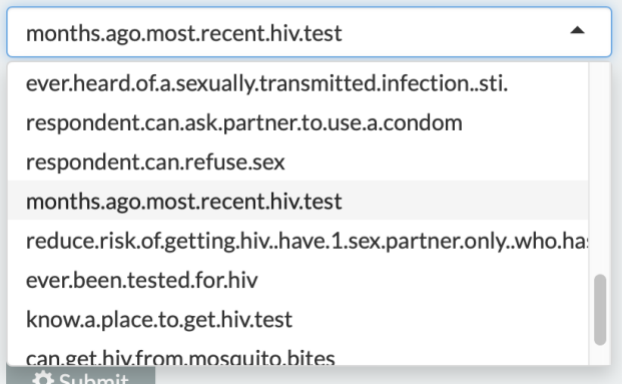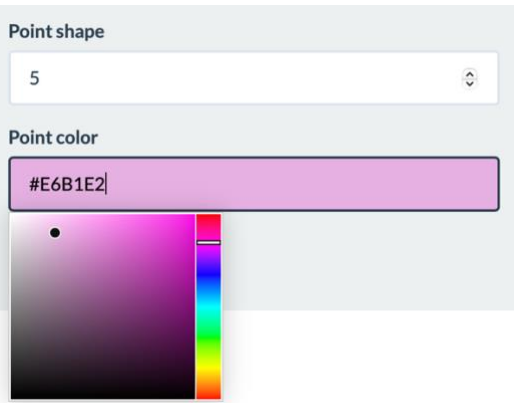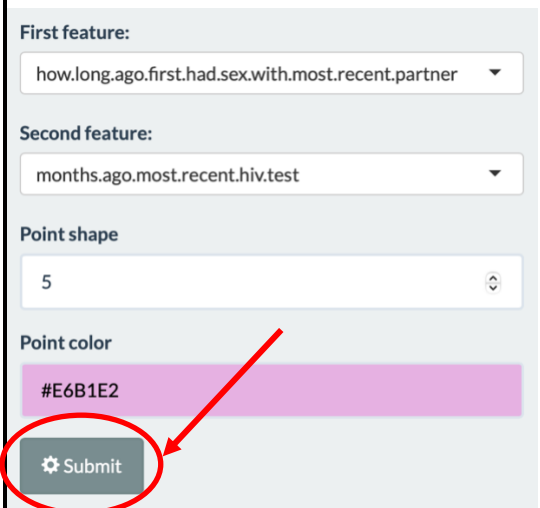| ID & Description	C-12 Display Numerical Summary of Datasets
Steps	- Same as the steps in C-9 for all the inputs…
Expected Result	User can view the summary statistics of the numerical variables chosen in a tabular format. **IMPORTANT**: At least one numerical variable must be chosen in this section! Table Summary - Categorical **Summary - Numerical** Word Cloud Show 10 entries Search: |	Vname	Group	TN	nNeg	nZero	nPos	NegInf	PosInf	NA_Value	Per_of_Missing	sum	min	max	mean	median	SD
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1	1	All	1	0	0	1	0	0	0	0	8	8	8	8	8	
10	10	All	1	0	0	1	0	0	0	0	3	3	3	3	3	
100	100	All	1	0	0	1	0	0	0	0	5	5	5	5	5	
101	101	All	1	0	0	1	0	0	0	0	7	7	7	7	7	
102	102	All	1	0	0	1	0	0	0	0	13	13	13	13	13	
103	103	All	1	0	0	1	0	0	0	0	5	5	5	5	5	
11	11	All	1	0	0	1	0	0	0	0	3	3	3	3	3	
12	12	All	1	0	0	1	0	0	0	0	4	4	4	4	4	
13	13	All	1	0	0	1	0	0	0	0	4	4	4	4	4	
14	14	All	1	0	0	1	0	0	0	0	25	25	25	25	25		 Showing 1 to 10 of 103 entries Previous 1 2 3 4 5 … 11 Next

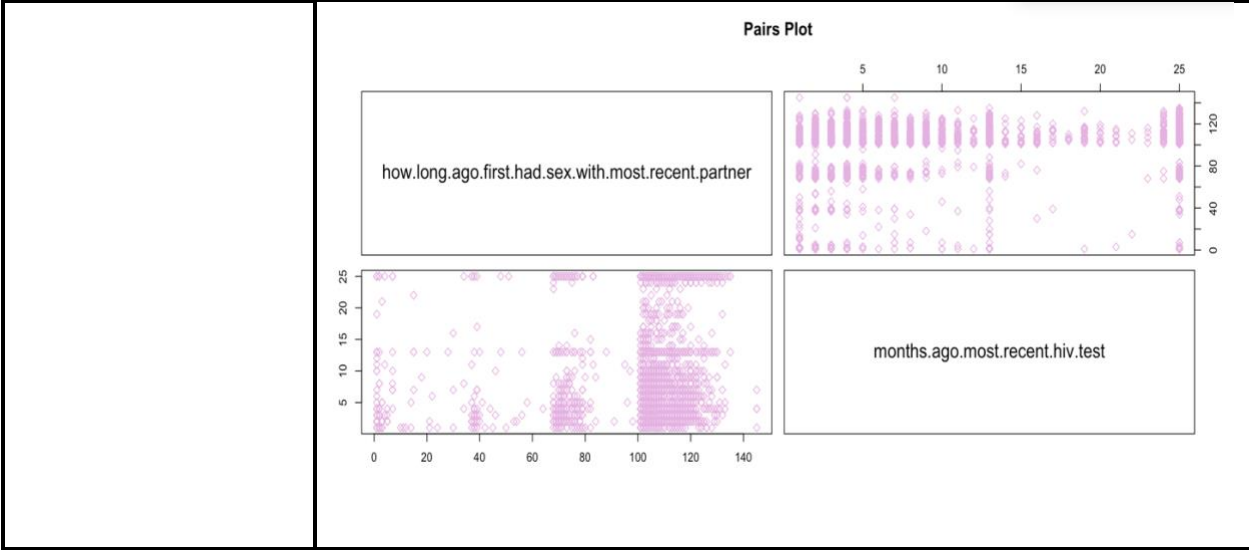| ID & Description	C-13 Display Word Cloud of Datasets
Steps	- Same as the steps in C-9 for all the inputs…
Expected Result	User can also view the word cloud with respect to the features chosen. Table Summary - Categorical Summary - Numerical **Word Cloud**

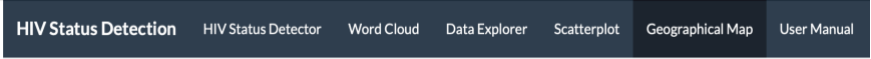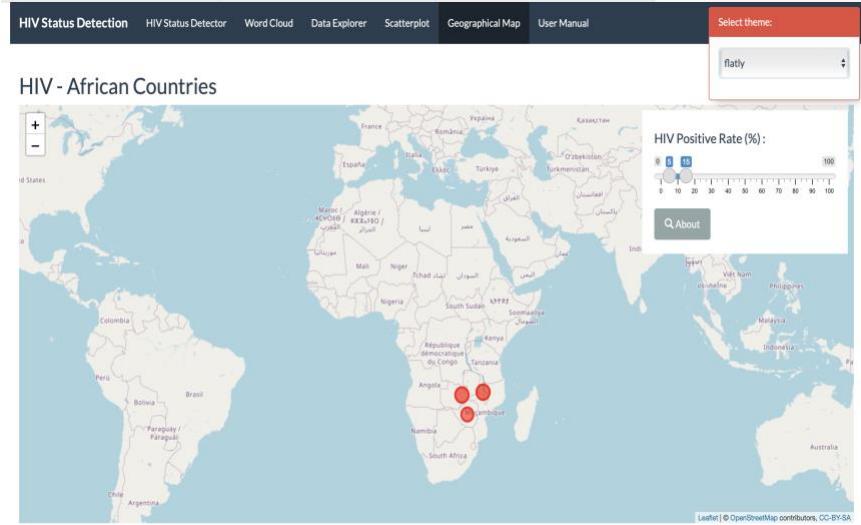| ID & Description	C-14 Download Filtered Datasets
Steps	1) Hit the "Download" button to download the filtered datasets.
Expected Result	A CSV file named "hiv_data.csv" will be downloaded and the user can find it in his/her personal computer's 'Downloads' folder.

5.0 Scatterplot Page

ID & Description	C-15 Access Scatterplot Page
Steps	1) Click "Scatterplot" on the top navigation bar. HIV Status Detection HIV Status Detector Word Cloud Data Explorer **Scatterplot** Geographical Map User Manual
Expected Result	User enters the Scatterplot Page.
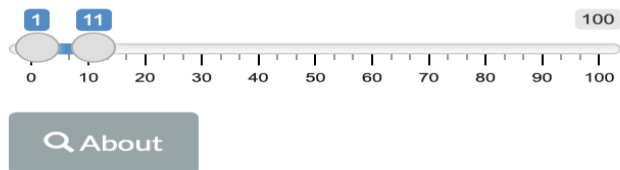
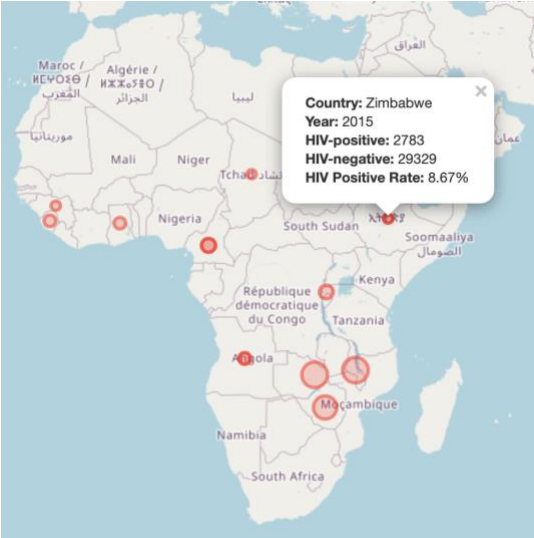| ID & Description	C-16 Display Scatterplot/Pairs Plot Between 2 Features
Steps	1) Select the first feature. 2) Select the second feature.

3) Specify the point shape and pick a color for the point.

4) Hit the "Submit" button to view the plot result.

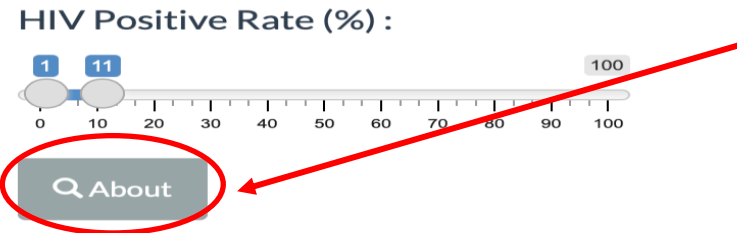| Expected Result	User can view the correlation between the 2 variables chosen from the scatterplot.

Pairs Plot

how.long.ago.first.had.sex.with.most.recent.partner

months.ago.most.recent.hiv.test

6.0 Geographical Map Page

| ID & Description	C-17 Access Geographical Map Page
Steps	1) Click "Geographical Map" on the top navigation bar
Expected Result	User enters the Geographical Map Page

ID & Description	C-18 Display HIV Statistics for Different African Countries
Steps	1) User can adjust the range of HIV positive rate and countries within the selected range will be shown in different red circle sizes **IMPORTANT**: Size of the red circle corresponds to the HIV Positive Rate 2) There are a total of 14 available African countries.

Expected Result	When hovering over the desired red circle, user can observe the statistics of HIV in that specific country. **IMPORTANT**: Observe that more countries appeared when the range is wider

ID & Description	C-19 Display 'About' Geographical Map
Steps	1) User can view the description of the map view when clicking the "About" button.

Expected Result	A description of the geospatial visualization, sources of the datasets, as well as the formula for calculating those parameters will be shown. User can click "Dismiss" to close the pop-up message.
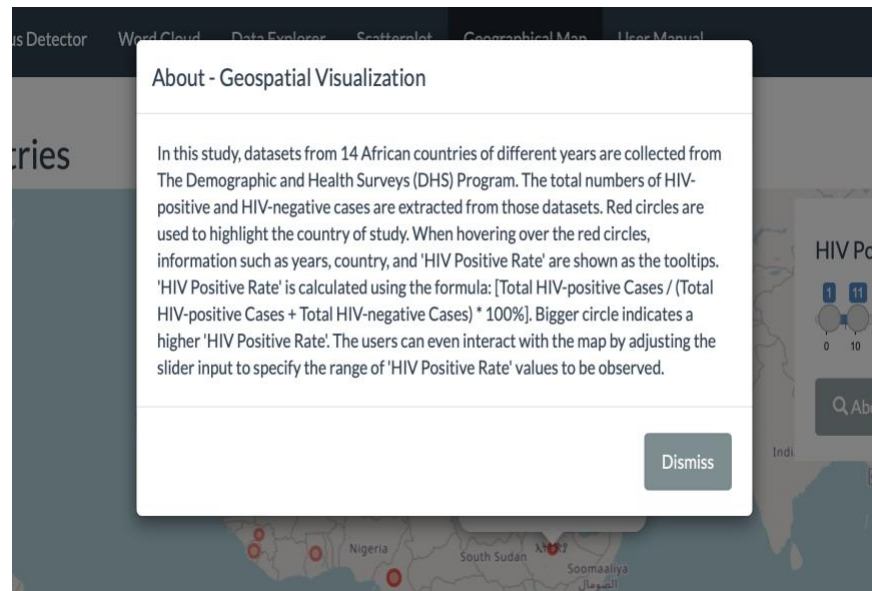
7.0 User Manual Page

ID & Description	C-20 Access User Manual Page
Steps	1) Click "User Manual" on the top navigation bar
Expected Result	User enters the User Manual Page