A Web Application for Visualizing Sexually Transmitted Infection (STI/STD) Prevalence in the United States

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ABSTRACT

The purpose of this paper is to describe a web-based application for visualizing STI/STD data among the 50 states.

Keywords

Web mapping, Leaflet, Carto, Javascript, choropleth, SQL, sexually transmitted infection, web application

1. INTRODUCTION

The World Health Organization estimates that over 1 million sexually transmitted infections (STIs) are transmitted every day worldwide [1]. On any given day in 2018, approximately one in five people in the United States had an STI [2]. It must be noted that these statistics do not reflect the true number of STIs, as many infections are not reported to the CDC, and many go undetected due to subtle (or even absent) symptoms and infrequent testing.

The web application described in this paper uses an open-source application programming interface (API) to allow the user to explore CDC data about prevalence rates of chlamydia, gonorrhea, and syphilis (primary and secondary type). In addition, the web application provides three resources for the user to explore if they desire.

2. DATASET

Data were obtained from the Center for Disease Control's NCHHSTP AtlasPlus dataset. The data used for analysis is aggregated by state, and only one year (2019) is used for analysis. Variables of interest are prevalence rates (per 100,000) and total cases for each of three common STIs (chlamydia, gonorrhea, and syphilis). This data was joined with the *covid_data* GeoJSON file, which already contained the spatial data for the 50 states.
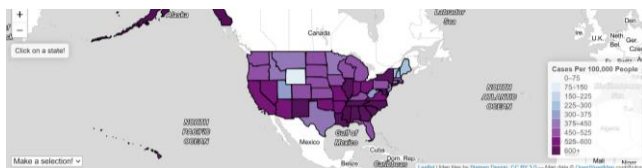

Figure 1 The web map

3. ARCHITECTURE

The web application was built using Carto data warehouse, Codepen code editor, and the Leaflet package. The majority of the code is written in Javascript, though there are snippets in HTML and CSS in Codepen.

3.1 Carto

The STI data (in .csv format) was imported into Carto along with the GeoJSON *covid_data* file. A SQL query was used to join the tabular STI data to the GeoJSON data.

```sql
1  CREATE TABLE projectdata AS (
2    SELECT c.the_geom, c.state, c.pop_2020,
3    s.chlamydia, s.gonorrhea, s.syphilis
4    FROM covid_data AS c, usstd AS s
5    WHERE c.state = s.state)
```

Figure 2 SQL Query in Carto

In order to access the Carto data from the web application, an API was used to call the data from the query.

3.2 Codepen

Codepen is an online code editor that features HTML, CSS, and Javascript code snippets. Codepen was used to write the Javascript code necessary for building the web application.

3.3 Leaflet

The web application described in this paper relies heavily on Leaflet, an open source Javascript library commonly used for web applications.

3.4 Javascript

The map's center is at (39.828175, -98.5795) and OpenStreetMap was used as the basemap. The data is called from Carto using the SQL API and then added to the map.

```javascript
var query =
  "https://lsaxman.carto.com/api/v2/sql?format=GeoJSON&q=SELECT * FROM projectdata";
console.log("Query: " + query);

$.getJSON(query, function (cartodbdata) {
  geojson = L.geoJson(cartodbdata, {
    // add popup with info to each state
    style: style, //style state polygons
    onEachFeature: onEachFeature //attached popup behavior
  }).addTo(map);

  map.fitBounds(geojson.getBounds()); // zooms to fit data
});
```

Figure 3 Importing Carto data using SQL API

4. FUNCTIONALITY

The main feature of the web application is the ability to switch between layers in order to visualize the infection of interest. Users can choose between chlamydia, gonorrhea, and syphilis to display a choropleth map of the United States featuring prevalence data of the infection they selected.
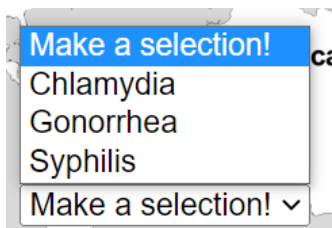

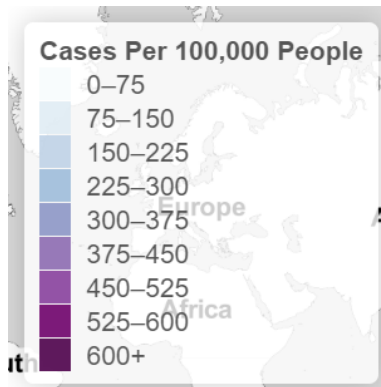**Figure 4 Dropdown menu functionality**

Figure 5 Legend of the web application

Click functionality is used in this application to allow the user to select any state on the map. Once clicked, a popup containing the data included in analysis for that state (prevalence rate and total cases) along with a couple of links from the CDC that could be helpful to users looking for additional information.

Figure 6 Popup example

The first link shows the user a CDC webpage with the most recent STD prevalence information.

Figure 7 CDC Webpage https://www.cdc.gov/std/default.htm [3]

The second link is very informative, as its target audience is teenagers. It provides a lot of meaningful information that many would find useful.
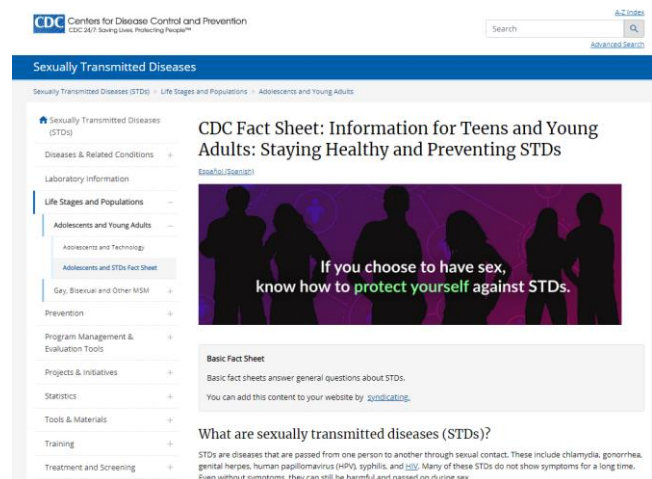

Figure 8 CDC Fact Sheet for Teens and Young Adults https://www.cdc.gov/std/life-stages-populations/stdfact-teens.htm [5]

The third link included in the popup is most beneficial for users that have been diagnosed with an STI or are looking to get tested for STIs. The CDC website provides many resources for treatment and testing.
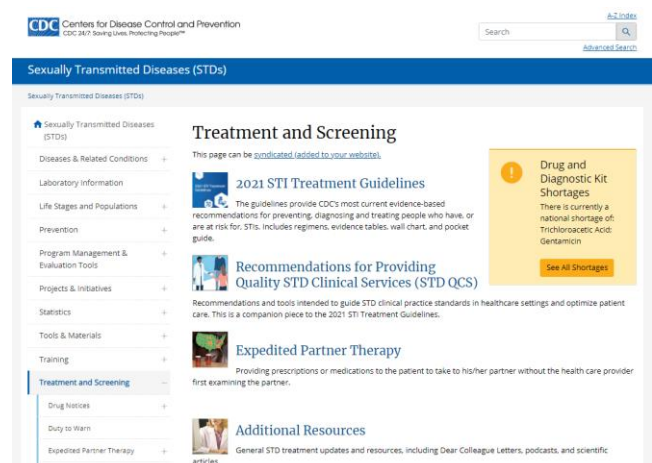

Figure 9 CDC STD Treatment and Screening Webpage https://www.cdc.gov/std/treatment/default.htm [4]

In addition to the click functionality, there is functionality for the mouse hover as well. The popup contains all of the information to display, but the mouse hover popup only displays the state name. The purpose of this small addition in functionality is to cover the (hopefully) rare case in which a person does not know where a state is located or what a state is called.

5. CONCLUSION

In summary, the web application described in this paper uses click functionality and a dropdown menu in order to allow the user to select the layer they want, and to provide resources for the user. There are still countless possibilities of functionality to explore. One future improvement to this web application is a timeline. A timeline can be useful to visualize the data over many years, instead of just one year. Another improvement would be to include another layer that contains the locations of testing sites or women's clinics.

6. REFERENCES

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[6] https://pfoser2.carto.com/tables/covid_data/public/