

Preliminary Maps of Substance Use Recovery Providers in Iowa
CRP 558: Final Project, Spring 2020
Kelsey Van Selous, MSW, LCSW
Human Development and Family Studies PhD Student

PRELIMINARY MAPS OF SUBSTANCE USE RECOVERY PROVIDERS IN IOWA

Introduction:

The Preliminary Maps of Substance Use Recovery Providers in Iowa included substance use mortality data for the United States and the state of Iowa, with overlaying layers of COVID-19 data and a preliminary list of Iowa substance use recovery providers across the state. The map aimed to replicate features from the [Your Life Iowa provider map](#) in effort to develop a preliminary tool to analyze and search Iowa recovery services. This project was successful in building filtering tools to display this information, as well as developing a variety of interactive features that enhance a viewer's ability to engage with the materials.

This project was unsuccessful in replicating the radio button and list features of the Your Life Iowa provider map and ran into challenges successfully geocoding each location of the Iowa substance use recovery provider list. This report will provide an overview of the data and tools used to build this project, as well as discuss the strengths and challenges of project development. This report will also provide example code and discuss future recommendations.

Data & Tool:

The overall project was established in collaboration with my graduate research assistant assignment to the Advancing Substance Use Recovery in Iowa project, a project led by an Iowa State team working with The Substance Abuse Bureau of the Iowa Department of Public Health and funded by the Substance Abuse and Mental Health Administration. One of the tasks of this team is to complete an environmental data scan of agencies that are currently providing substance use recovery services in the state of Iowa. The Advancing Substance Use Recovery in Iowa project was interested in mapping their preliminary data in effort to visualize their findings. As a result, I collaborated with the Principle Investigators of this project to include this visualization as part of my final web mapping project.

Table 1: Project Data and Tools

Data	Plugins and tools featured	Link to Data Source
Iowa substance use recovery providers	Brackets, GitHub, Leaflet, QGIS, MMQGIS, AwesomeMarker, MarkerCluster, Bootstrap, & JQuery	N/A
COVID-19 cases	Brackets, GitHub, Leaflet, Esri-Leaflet	https://services.arcgis.com/vPD5PVLi6sfkZ5E4/ArcGIS/rest/services/IA_COVID19_Cases/FeatureServer
United States substance induced mortality rates 2013--2018 per 100,000	Brackets, GitHub, Leaflet, & QGIS	https://wonder.cdc.gov/
Iowa number of substance induced deaths 1999--2018	Brackets, GitHub, Leaflet, & QGIS	https://wonder.cdc.gov/
Percent living below poverty in past 12 months: 5 year estimates 2013-2018. Table S1701	Brackets, GitHub, Leaflet, & QGIS	https://data.census.gov/cedsci/table?q=income%20and%20poverty&g=0400000US19.050000&hidePreview=false&tid=ACST5Y2018.S1701&t=Income%20and%20Poverty&vintage=2018
Iowa: County-level boundaries	Brackets, GitHub, Leaflet, & QGIS	https://geodata.iowa.gov/dataset/county-boundaries-iowa
United States: State-level boundaries	Brackets, GitHub, Leaflet, & QGIS	https://catalog.data.gov/dataset/tiger-line-shapefile-2017-nation-u-s-current-state-and-equivalent-national

The table above references the data and tools utilized to build the Preliminary Maps of Substance Use Recovery Providers in Iowa. This project was built with the code editor Brackets, the open source Javascript library Leaflet, and the software development platform Github. Substance induced mortality data was exported from the Center for Disease Control WONDER online database to highlight regional patterns of substance induced mortality across the United States and Iowa counties. Poverty levels were also downloaded from The United States Census Bureau.

The poverty and mortality datasets was used to provide an overall introduction to the topic of substance use as well as act as layers of analysis to visualize the locations of substance use recovery providers. This data was downloaded at both the country and county levels as text files, converted to .csv files and, uploaded into QGIS, joined to state and county boundary shapefiles, and then exported as geoJSON layers.

The preliminary list of Iowa substance use recovery providers was created in an excel file, saved as a .csv file, uploaded to QGIS, and then geocoded with the MMQGIS plugin. After this file was geocoded it was then exported as a geoJSON file and integrated into the web map. Once in the web map AwesomeMarker, MarkerCluster, Bootstrap, and JQuery were used to enhance the markers of this point file, as well as to build

buttons and filtering tools. This list was also divided into two geoJSON lists to map recovery providers and substance use treatment providers in the state.

The Esri-Leaflet plugin was also used to upload the representational state transfer (REST) COVID-19 data as a feature layer due to this project's desire to showcase daily COVID-19 data changes. This project also experimented with ArcGIS online to geocode and create feature layers but decided not to include this tool in the final project.

Example Code:

In addition to the above plugins and tools, I used a variety of code to create choropleth maps, circle markers, and legends. Additionally, the class example from Rakibul Ahasan's final project inspired me to include a series of maps, containers, and buttons. I used this project as a resource, as well as referenced CRP 558 lecture materials, leafletjs.com, and w3schools.com to create my code.

The below code is provided as an example of how I built the last map on my project. I refer to this map as *map 4* in my code. This example does not include the lines necessary to use the plugins or showcase my full geoJSON files. This information can be found in my CRP 558 repository in github by following this [link](#).

The code below is in the style section of my index file to tell the browser styling information related to map 4's container, map, and the buttons used to filter the layers on this map. Notice that there are two styling classes to differentiate between the sizes used in this section of the map.

```
#map4container {position: absolute; background-color: #D3D3D3; color: black; text-align: center;
margin-right: 0px; margin-left:0px; width:600px; height:400px; padding 0;}
#map4 {position: relative; height: 400px; margin-left:600px; border-left:2px; padding 0;
overflow: hidden;}

.button1 {
  background-color: #4CAF50;
  border: none;
  color: white;
  padding: 5px 10px;
  text-align: center;
  text-decoration: none;
  display: inline-block;
  font-size: 14px;
  width: 200px;
  height: 60px;
  margin: 4px 2px;
  cursor: pointer;
}

.button2 {
  background-color: #4CAF50;
  border: none;
  color: white;
  padding: 5px 10px;
  text-align: center;
  text-decoration: none;
  display: inline-block;
  font-size: 14px;
  width: 300px;
  height: 30px;
  margin: 4px 2px;
  cursor: pointer;
}
```

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The below code is built within the body section of my index file to build and identifying the location of map4's container, map, and buttons, as well as to build text and identify script id's to activate the functions of this map. Notice how each line of code for the buttons has a type, id, and class. The class refers to the styling information referenced on the previous page. The id references the JavaScript discussed on the next page.

```
<div id='map4container'>
<h2>Provider Filters</h2>
<p>Click on the buttons below to explore options of Iowa Substance Use Recovery Providers:</p>
<div class="btn-group">
  <button type="button" id="women" class="button1">Female Only</button>
  <button type="button" id="men" class="button1">Male Only </button>
  <br><button type="button" id="family" class="button1">Families</button>
  <button type="button" id="veteran" class="button1">Veterans</button>
  <br><button type="button" id="housing" class="button1">Housing </button>
  <button type="button" id="Religion" class="button1">Religious and Faith Based</button>
  <br><button type="button" id="twelve" class="button1">12-Step Programs</button>
  <button type="button" id="Out" class="button1">Outpatient Services</button>
  <br> <button type="button" id="all" class="button2">All Recovery Providers</button>
</div>
</div>
<div id="map4"></div>
```

The below information is housed within the script section of my index file to tell the browser how the above features behave and identifies the data associated. This code tells the browser what base layers to include in map 4 as well as the latitude, longitude, and zoom level showcased in map 4.

```
//map 4
var OSM4 = L.tileLayer('https://{s}.tile.osm.org/{z}/{x}/{y}.png', {
  attribution: '&copy; <a href="https://osm.org/copyright">OpenStreetMap</a> contributors',
  maxZoom: 18
});

var map4 = L.map('map4', {
  center: [42,-93],
  zoom: 7,
  layers: [OSM4]
});
```

The below code is also found within my script section. The variable 'phoneMarker' showcases how I implemented the awesome marker plug in to build the phone markers. The variable 'all' references the geoJSON variable SIRP (used to define the single layer of Iowa recovery providers in this map). The variable 'all' references the 'phoneMarker' function and includes a function to build the popups for this layer.

```
//awesome marker for phone icon
var phoneMarker = L.AwesomeMarkers.icon({
  icon: 'phone',
  prefix: 'fa',
  markerColor: 'blue'
});

//map 4 data
var all = L.geoJSON(SIRP, {
  pointToLayer: function(feature, latlng) {
    return L.marker(latlng, {
      icon: phoneMarker})
  },
  onEachFeature: function (feature, layer) {
    popupOptions = {maxWidth: 200};
    if (feature.properties.URL == "NA"){
      layer.bindPopup("<b>Site name: </b>" + feature.properties.Name +
        "<br><b>Phone Number: </b>" + feature.properties.Phone +
        "<br><b>Link:</b> No URL available",popupOptions);}
    else{layer.bindPopup("<b>Site name: </b>" + feature.properties.Name +
      "<br><b>Phone Number: </b>" + feature.properties.Phone +
      "<br><b>Link: </b>" + '<a
        href="'+feature.properties.URL+'"'>'+feature.properties.URL+'</a>'
      ,popupOptions); }
    }}
  )
  .addTo(map4);
```

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The below code also appears in the script section of my index file and creates a popup function referenced by a series of variables that were created to build the buttons in this map. The first several lines of this section reference a function I created to define the popup information for the variables that follow. The variable 'housing' is an example of a variable that follows this function and was created to build the buttons on this map. This variable references the SIRP variable in my geoJSON file and filters the information in this file to only show the points in this layer that are referenced by the Service Type: Recovery Housing. This variable then references the popup function to include the below information when the button is clicked.

```
//map 4 pop up function
function popupProvider(feature, layer) {
  popupOptions = {maxWidth: 200};
  if (feature.properties.URL == "NA"){
    layer.bindPopup("<b>Site name: </b>" + feature.properties.Name +
      "<br><b>Phone Number: </b>" + feature.properties.Phone +
      "<br><b>Link:</b> No URL available",popupOptions);}
  else{layer.bindPopup("<b>Site name: </b>" + feature.properties.Name +
    "<br><b>Phone Number: </b>" + feature.properties.Phone +
    "<br><b>Link: </b>" + '<a
      href="'+feature.properties.URL+'"'>'+feature.properties.URL+'</a>'
    ,popupOptions);  }
}

//map 4 data for buttons
var housing = L.geoJSON(SIRP, {
  onEachFeature: popupProvider,
  filter: function(feature, layer) {
    if (feature.properties.ServiceTyp == 'RecoveryHousing') {
      return true;
    }
  },
  pointToLayer: function(feature, latlng) {
    return L.marker(latlng, {icon: phoneMarker});
  },
})
```

Finally, the last several lines of this example show the function that is referenced by the housing button. This section of code builds the legend associated with this layer and tells the associated button what to display and what to remove from the map when the button is activated. In this example, the housing button removes all layers except for the housing variable and housing legend.

```
var legend4b = L.control({
  position: 'bottomleft'
});

legend4b.onAdd = function(map4) {
  var div = L.DomUtil.create('div', 'info legend'),
  all = [],
  labels = [];
  div.innerHTML += "<b>Iowa Substance Use Recovery Providers</b><br><b>With Housing</b>";
  return div;
};

//map 4 filtering
$("#housing").click(function() {
  map4.addLayer(housing);
  map4.addControl(legend4b);
  map4.removeLayer(all);
  map4.removeLayer(women);
  map4.removeLayer(family);
  map4.removeLayer(veteran);
  map4.removeLayer(men);
  map4.removeLayer(twelve);
  map4.removeLayer(Out);
  map4.removeLayer(Religion);
  map4.removeControl(legend4a);
  map4.removeControl(legend4c);
  map4.removeControl(legend4d);
  map4.removeControl(legend4e);
  map4.removeControl(legend4f);
  map4.removeControl(legend4g);
  map4.removeControl(legend4h);
});
```

Strengths:

The strengths of this project include the overall interactivity of the map and the inclusion of a variety of tools to build this web map. The interactivity features not only include the use of unique markers, clustering markers, buttons, and filters, but also includes popups with useful information related to the dataset, as well as features that highlight the polygon features of the map. In addition, this project includes REST services that allow the data to be updated automatically with COVID data. This not only provides a unique level of analysis but also creates the opportunity to monitor changes overtime without having to manually update the map.

Challenges:

Working with a preliminary dataset introduced challenges to this project as the dataset required geocoding and adjustments in effort to prepare for mapping and filtering. I was unsuccessful in geocoding several points due to limitations with MMQGIS's ability to locate several providers. To problem solve, I utilized ArcGIS online which allowed all points to be mapped. I did not continue with ArcGIS online as this tool required the layer to be publicly published and I did not feel comfortable publishing a preliminary dataset to this source. As a result, the current map is missing 10 providers originally collected in this round of data.

Additionally, because this was a preliminary dataset built by the Advancing Substance Use Recovery in Iowa team, additional time was taken to collaborate and explore privacy procedures regarding the dataset. This collaboration resulted in permission to use the preliminary dataset and make it available as needed to create the project. Similarly, data collection and adjustments to this dataset continued by the Iowa State team throughout project development. This resulted in the Iowa Recovery Providers dataset being split into two groups of treatment providers and recovery providers while this project was in development. I decided to split these groups into two geoJSON files and primarily focus on the Iowa Recovery Provider list in my mapping, however, both datapoints are included in the main Iowa Provider dataset by the Iowa State team. That is why I decided to keep the treatment provider group as a single layer instead of as part of the cluster in map 3.

Additionally, map 3 became challenging as there are a multitude of datasets on this map that may be distracting. I decided to keep all of this information in map 3 to help my team visualize their dataset with multiple layers in one location. Creating the legends for map 3 also was challenging, as my legends were appearing inconsistently between map 2 and map 3 due to the use of the same variables. As a result, I ended up duplicating these layers by renaming them as variables with lowercase letters for map 3. Overall, this created additional code that may have been able to be consolidated with further consultation. I also had difficulty creating legends for my point files in this map and decided to leave them as text boxes. Finally, the mortality data was challenging to work with as data was not reported for counties that had below 10 deaths in effort to protect the confidentiality of family's that may have experienced a death in that county. This resulted in various data pulls that did not display data for each county.

Next Steps:

Overall, improvements could have been made to the legends of point files and the code in my file could have been updated to reduce redundancies. Data collection and mapping will continue by the Advancing Substance Recovery in Iowa project team to locate additional substance use recovery providers in Iowa and visualize their locations in the state. Web mapping will also continue and aim to replicate the tool by Your Life Iowa in effort to provide users with an ability to search and locate substance use recovery providers across Iowa. Additional steps may include adding additional columns to the provider dataset in effort to provide more filtering options, as the current filtering categories were added manually for use of this project.

Conclusion

In conclusion, the Preliminary Maps of Iowa Substance Use Recovery Infrastructure final project successfully mapped preliminary data of Iowa substance use recovery providers. The project also successfully added substance induced mortality data, COVID-19 data, and provided interactive tools that allow users to spatially explore this preliminary dataset. While this project was unsuccessful in recreating the radio button and list features of the [Your Life Iowa provider map](#) and was unable to geocode 7 providers, this project was able to implement a variety of learnings from the CRP 558 course that will aide in the projects future development.