



# Introduction to CartoDB

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# Data Visualization - Colour

- For categorical variables:
  - Use different colours but keep in mind that people have trouble differentiating between more than 5-7 hues.
- For numerical variables:
  - Use sequential shades of colour with white shade to more saturated indicating going from lower to higher values.
  - Rainbow color gradients are very problematic.
  - For highest contrast, only use color to highlight.

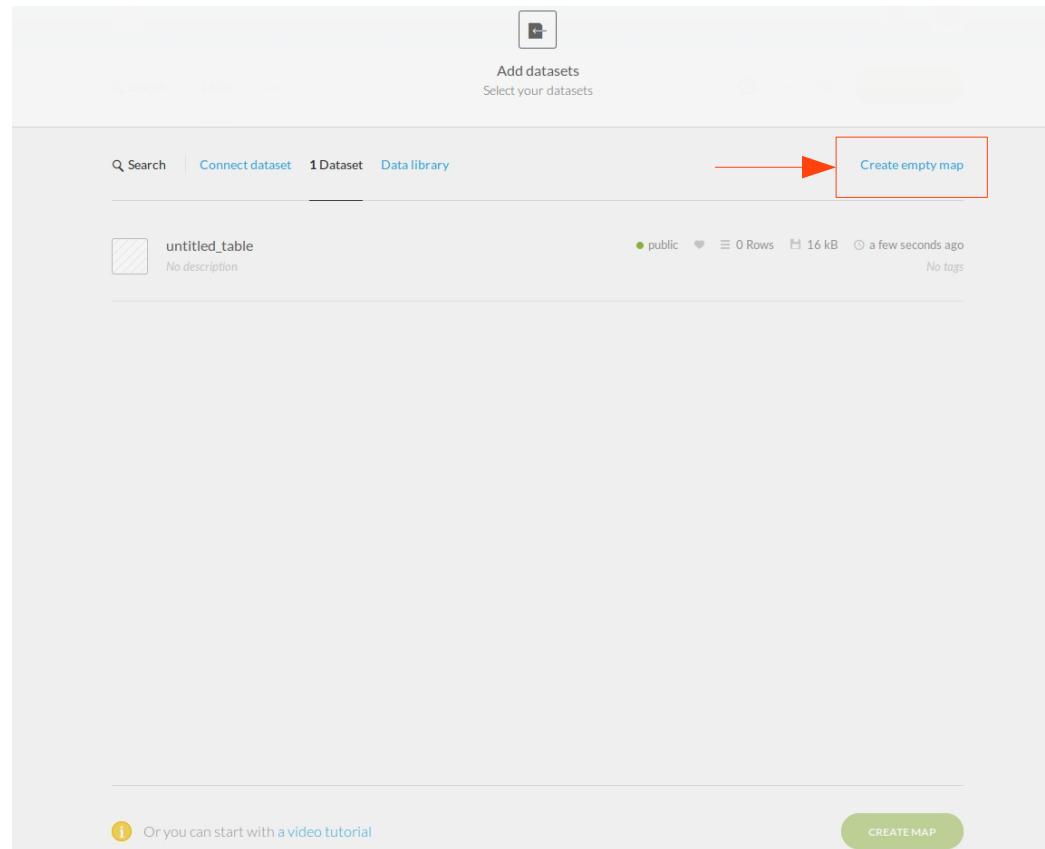
<http://guides.library.duke.edu/datavis/topten>

# English Index of Multiple Deprivation (IMD) 2015

- The 2015 IMD ranks all LSOAs in England from 1 (most deprived) to 32.844 (least deprived).
- Can be used to compare different small areas in terms of deprivation.
- The following domain indices scores are also provided: Income, Living Environment, Health, Housing, Education, Employment and Crime.
- The larger the score of the domain indices the more deprived an area is.
- You could look at the domain indices to explore which types of deprivation, e.g. income or health, are more prominent within areas.
- You could focus on particular types of deprivation and explore how areas rank on these.

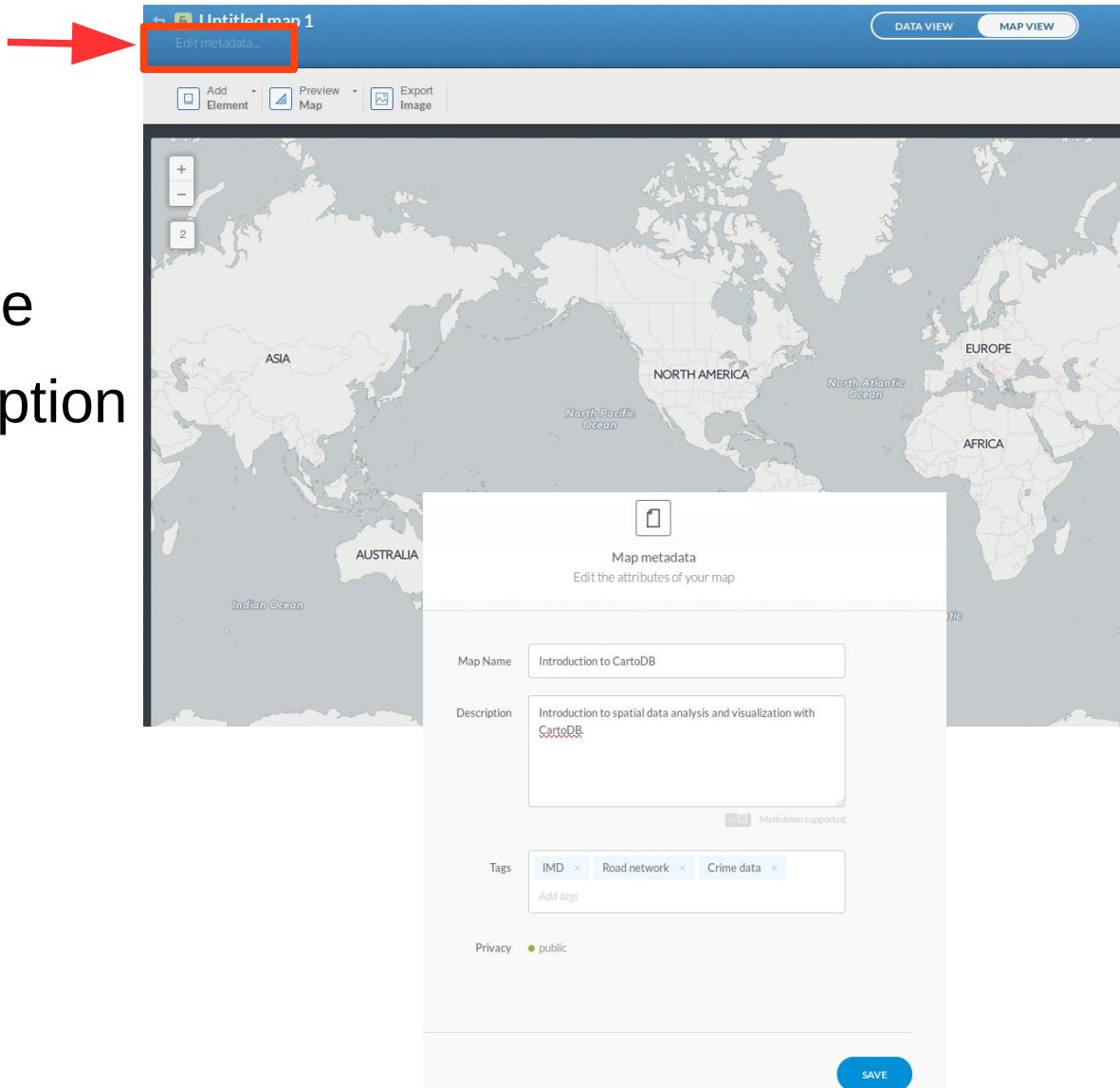
# Create a New Map

- Visit CartoDB to create an account:  
<https://cartodb.com/>
- Login and click on “New Map” and then “Create empty map”.
- Click Skip on the next screen.



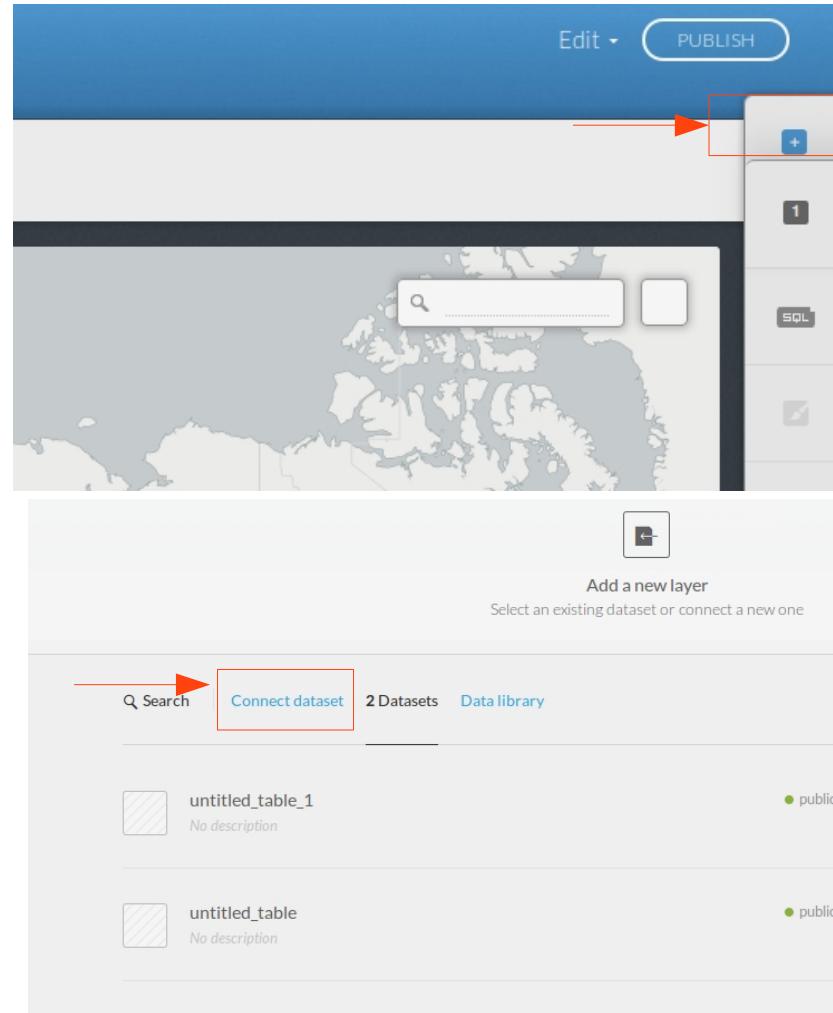
# Edit Map Metadata

- Click on Edit Metadata.
  - Provide a map name
  - Write a short description
  - Add tags
- Click “SAVE”



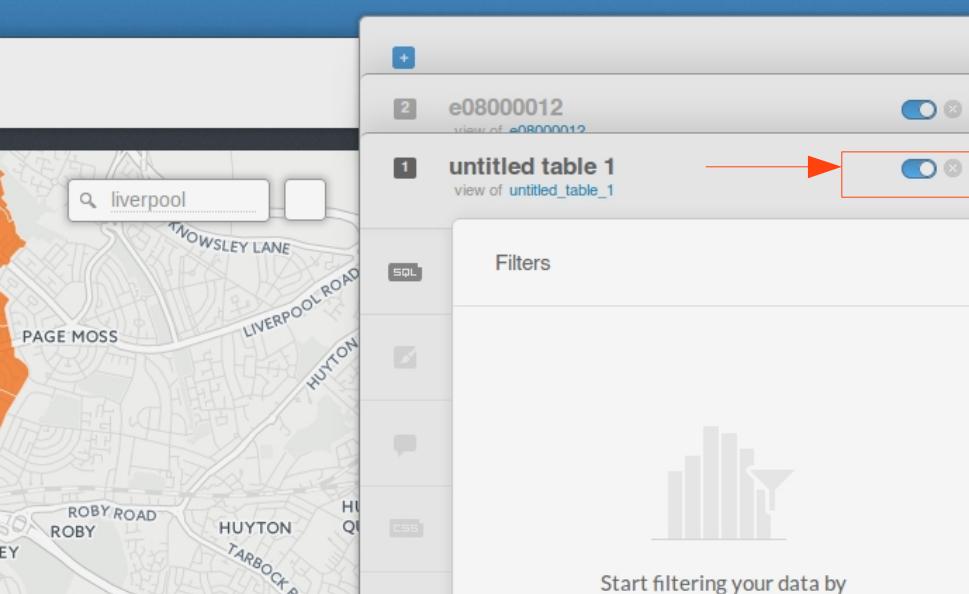
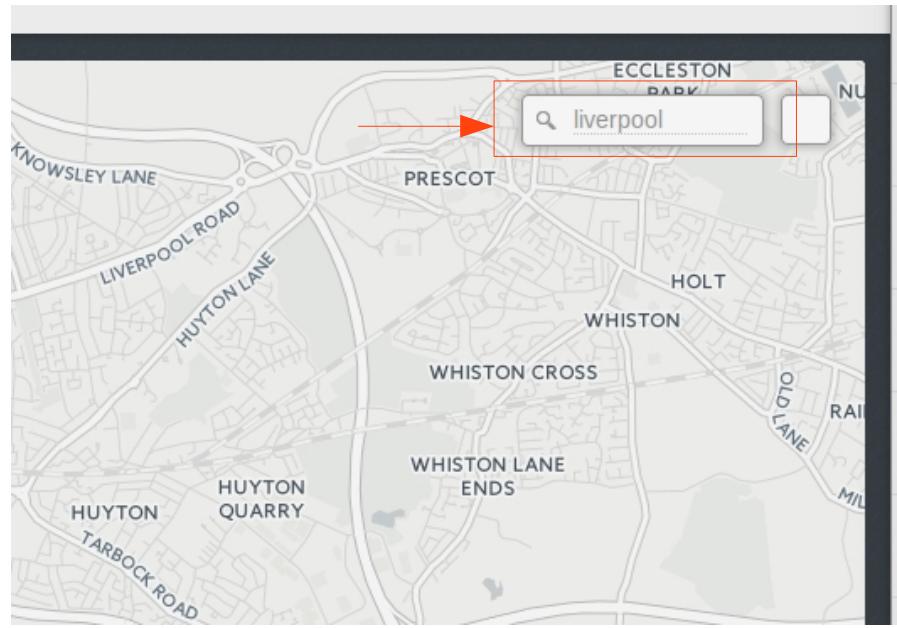
# Uploading your data to CartoDB

- Click on “Add Layer” on the right hand side.
- Click on “Connect dataset”.
- Shapefiles can only be uploaded as zip files.
- Click “BROWSE”, browse to the “IMD.zip” file.
- Click on “Add Layer”.



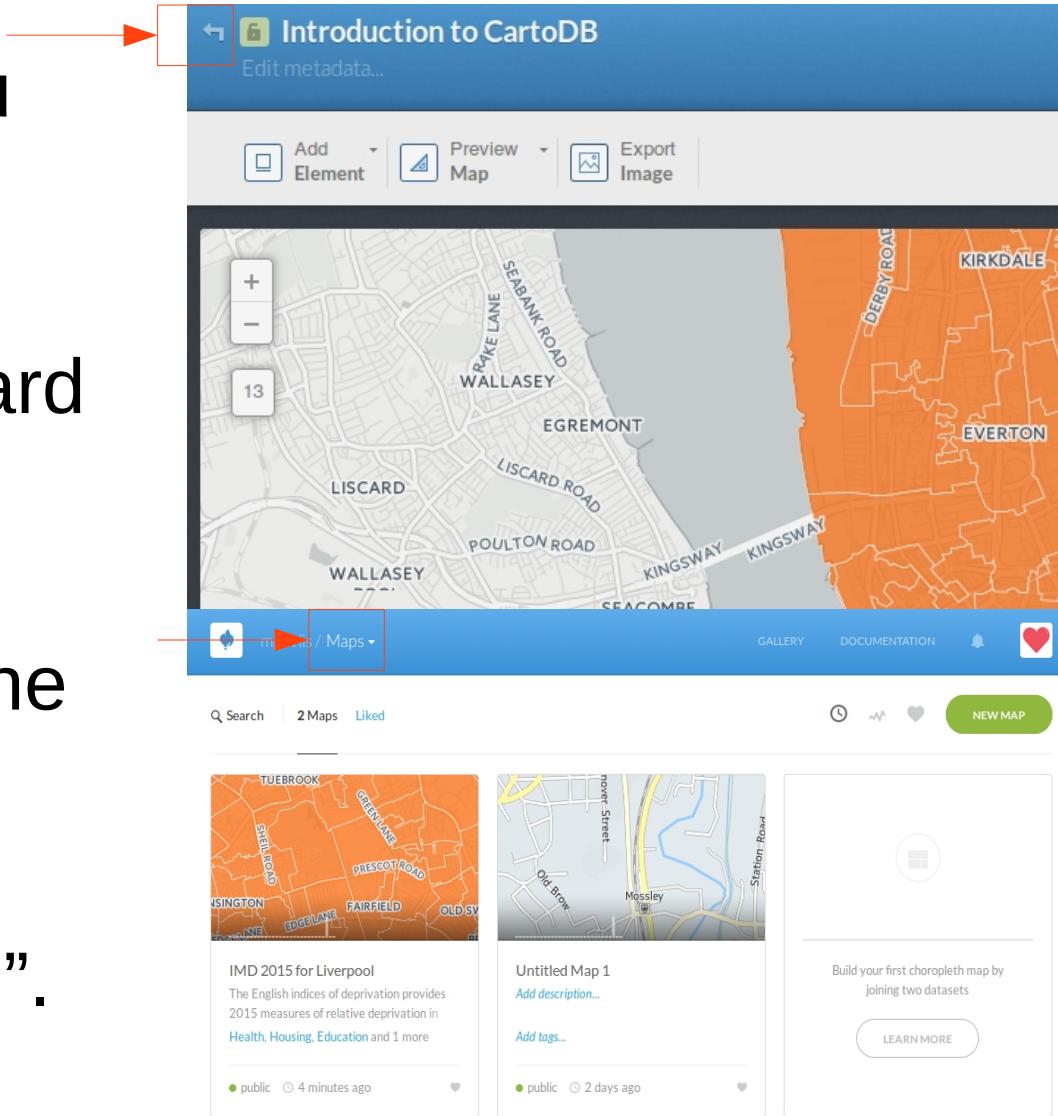
# Zoom in to the Area of Study

- Zoom in to Liverpool.
- Delete untitled layer:
  - First click on layer 1 (untitled table) on the right hand side.
  - Then click on the sign x to delete the layer from your map.



# Dashboard

- The place where you organize your maps and datasets.
- Click on the dashboard icon on the left hand side.
- Click on “Maps” on the top and select “Your datasets”.
- Click on “e08000012”.



# Edit Dataset Metadata

- Click on “Edit Metadata”.
- Change the dataset name to `imd`.
- Change the following:
  - Provide a short description
  - Provide data source
  - Add attribution
  - Add license
  - Add tags
- Click “SAVE”

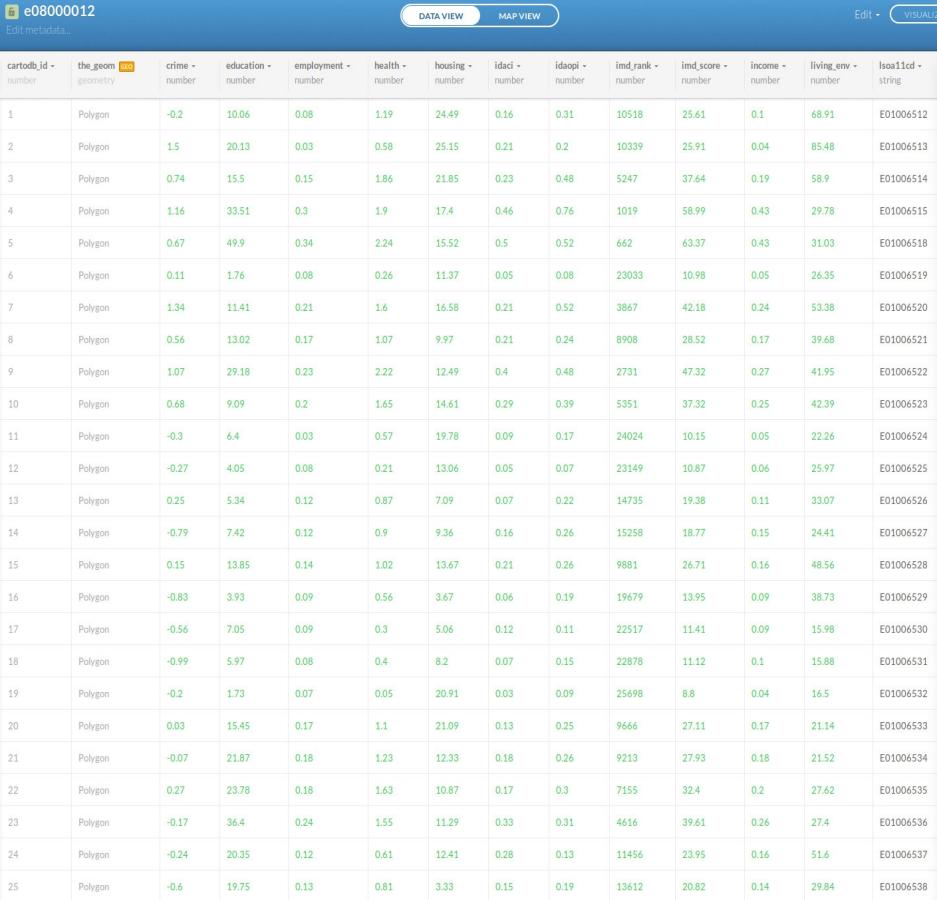
The screenshot shows the 'Dataset metadata' page with the following details:

- Dataset Name:** `imd`
- Description:** The English indices of deprivation for 2015 provides measures of relative deprivation in England for the Local Authority District: Liverpool (E08000012) at the LSOA scale.
- Source:** Office for National Statistics
- Attributions:** ESRC Consumer Data Research Centre
- License:** Open Government License
- Tags:** Demographics, Health, Housing, Crime (with an 'Add tags' button)
- Privacy:** public

A blue 'SAVE' button is located at the bottom right.

# Data View

- cartodb\_id: unique geometry identifier.
- the\_geom: geometry column, projection WGS84 (epsg: 4326). Double click in a cell to see the geometry's coordinates.
- the\_geom\_webmercator: hidden geometry column for displaying your data on a map, projection web mercator (epsg: 3857).
- Better to include these columns in custom SQL queries.
- Look at the minimum and maximum values of some of the variables.

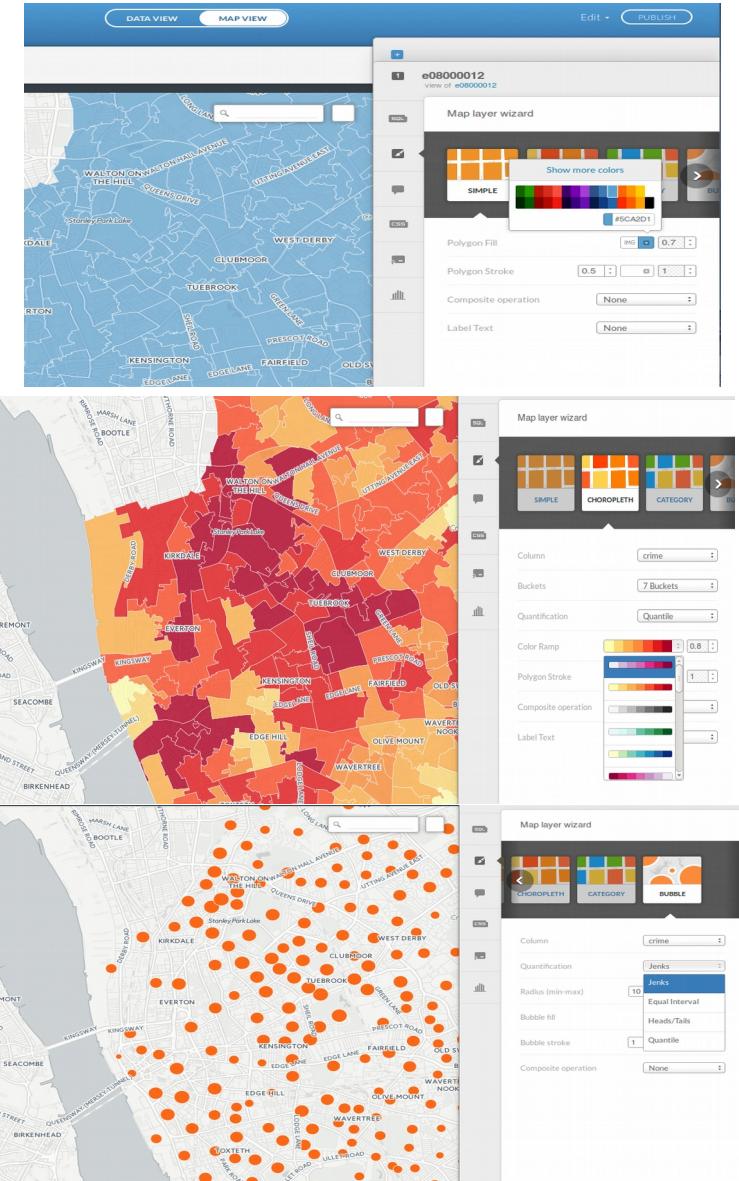


The screenshot shows a data view interface with a table containing 25 rows of data. The columns represent various socio-economic variables:

cartodb_id	the_geom	crime	education	employment	health	housing	idaci	idsopi	imd_rank	imd_score	income	living_env	lsoa11cd
number	geometry	number	number	number	number	number	number	number	number	number	number	number	string
1	Polygon	-0.2	10.06	0.08	1.19	24.49	0.16	0.31	10518	25.61	0.1	68.91	E01006512
2	Polygon	1.5	20.13	0.03	0.58	25.15	0.21	0.2	10339	25.91	0.04	85.48	E01006513
3	Polygon	0.74	15.5	0.15	1.86	21.85	0.23	0.48	5247	37.64	0.19	58.9	E01006514
4	Polygon	1.16	33.51	0.3	1.9	17.4	0.46	0.76	1019	58.99	0.43	29.78	E01006515
5	Polygon	0.67	49.9	0.34	2.24	15.52	0.5	0.52	662	63.37	0.43	31.03	E01006518
6	Polygon	0.11	1.76	0.08	0.26	11.37	0.05	0.08	23033	10.98	0.05	26.35	E01006519
7	Polygon	1.34	11.41	0.21	1.6	16.58	0.21	0.52	3867	42.18	0.24	53.38	E01006520
8	Polygon	0.56	13.02	0.17	1.07	9.97	0.21	0.24	8908	28.52	0.17	39.68	E01006521
9	Polygon	1.07	29.18	0.23	2.22	12.49	0.4	0.48	2731	47.32	0.27	41.95	E01006522
10	Polygon	0.68	9.09	0.2	1.65	14.61	0.29	0.39	5351	37.32	0.25	42.39	E01006523
11	Polygon	-0.3	6.4	0.03	0.57	19.78	0.09	0.17	24024	10.15	0.05	22.26	E01006524
12	Polygon	-0.27	4.05	0.08	0.21	13.06	0.05	0.07	23149	10.87	0.06	25.97	E01006525
13	Polygon	0.25	5.34	0.12	0.87	7.09	0.07	0.22	14735	19.38	0.11	33.07	E01006526
14	Polygon	-0.79	7.42	0.12	0.9	9.36	0.16	0.26	15258	18.77	0.15	24.41	E01006527
15	Polygon	0.15	13.85	0.14	1.02	13.67	0.21	0.26	9881	26.71	0.16	48.56	E01006528
16	Polygon	-0.83	3.93	0.09	0.56	3.67	0.06	0.19	19679	13.95	0.09	38.73	E01006529
17	Polygon	-0.56	7.05	0.09	0.3	5.06	0.12	0.11	22517	11.41	0.09	15.98	E01006530
18	Polygon	-0.99	5.97	0.08	0.4	8.2	0.07	0.15	22878	11.12	0.1	15.88	E01006531
19	Polygon	-0.2	1.73	0.07	0.05	20.91	0.03	0.09	25698	8.8	0.04	16.5	E01006532
20	Polygon	0.03	15.45	0.17	1.1	21.09	0.13	0.25	9666	27.11	0.17	21.14	E01006533
21	Polygon	-0.07	21.87	0.18	1.23	12.33	0.18	0.26	9213	27.93	0.18	21.52	E01006534
22	Polygon	0.27	23.78	0.18	1.63	10.87	0.17	0.3	7155	32.4	0.2	27.62	E01006535
23	Polygon	-0.17	3.64	0.24	1.55	11.29	0.33	0.31	4616	39.61	0.26	27.4	E01006536
24	Polygon	-0.24	20.35	0.12	0.61	12.41	0.28	0.13	11456	23.95	0.16	51.6	E01006537
25	Polygon	-0.6	19.75	0.13	0.81	3.33	0.15	0.19	13612	20.82	0.14	29.84	E01006538

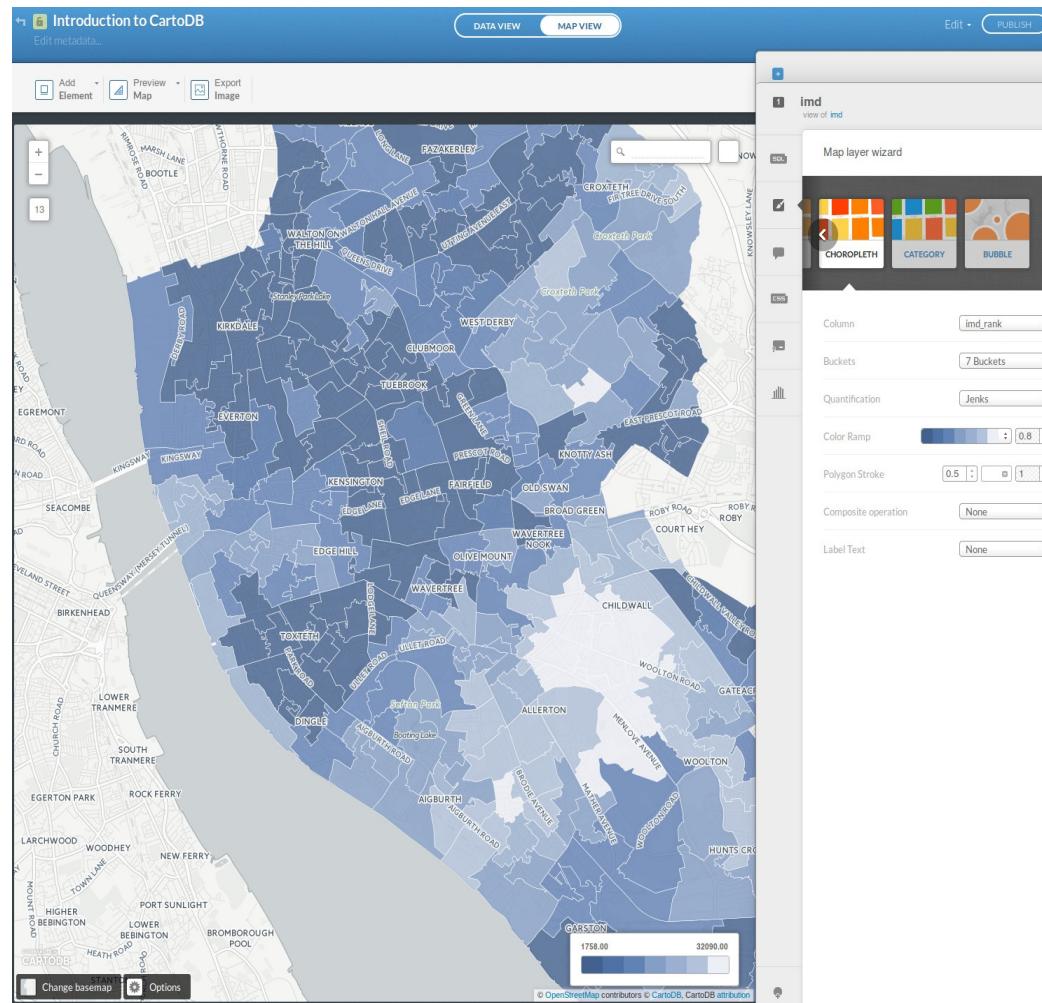
# Map Layer Wizard

- Go back to the dashboard, click on “Datasets” on the top and select “Your Maps”.
- Click on the map “Introduction to CartoDB”.
- Click on the paintbrush icon on the right hand side.
  - Change the polygon fill (colour, opacity) and boundary (width, opacity).
  - Create a choropleth map (test different classification methods e.g. Quantiles vs Natural Breaks (Jenks)).
  - Create a bubble map.



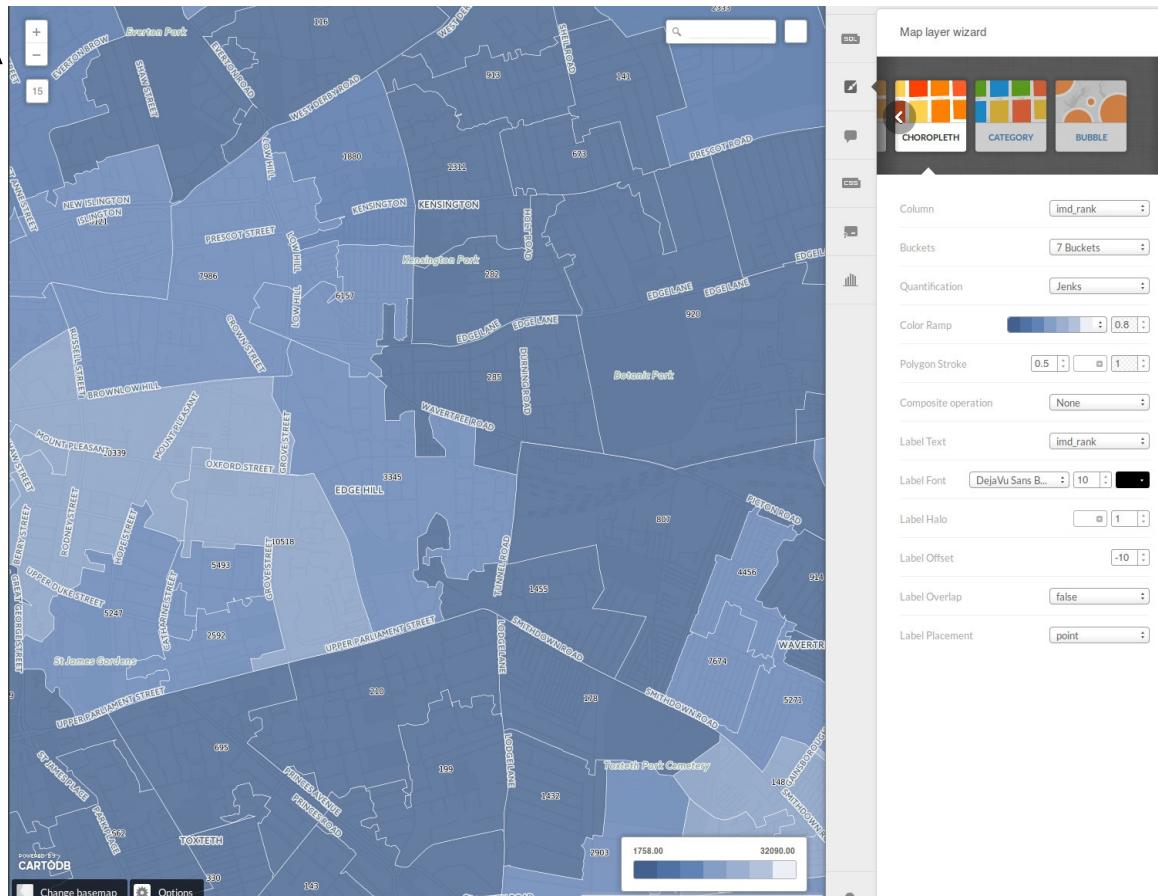
# Map Layer Wizard

- Create a choropleth map for IMD rank (select column `imd_rank`).
- Remember that a lower IMD rank is assigned to more deprived areas.
- Make sure that you pick a colour scheme that assigns darker hue to more deprived areas and lighter hue to less deprived areas.



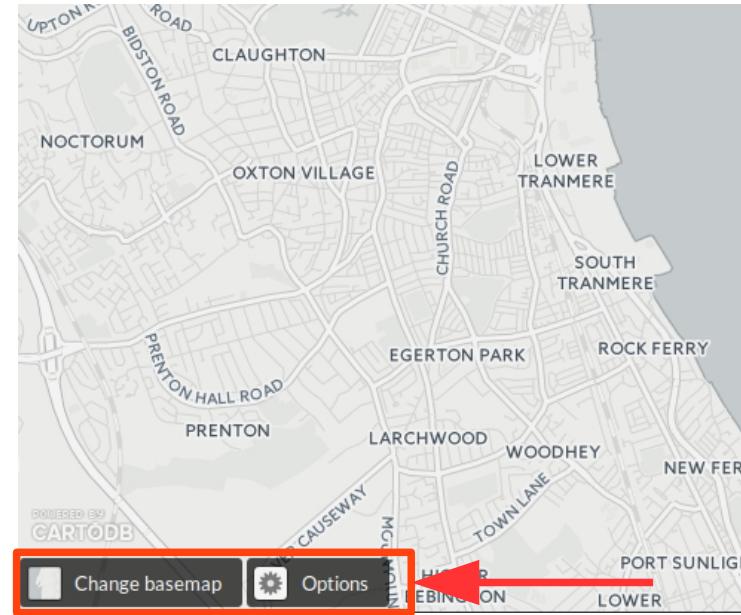
# Map Layer Wizard

- You can label the LSOA polygons to display the IMD rank.
  - Label Text: imd\_rank
- Increase Label Halo (colour buffer around a label) to improve label legibility.
  - Label Halo: 2
- Additionally you can set Label Overlap to False.



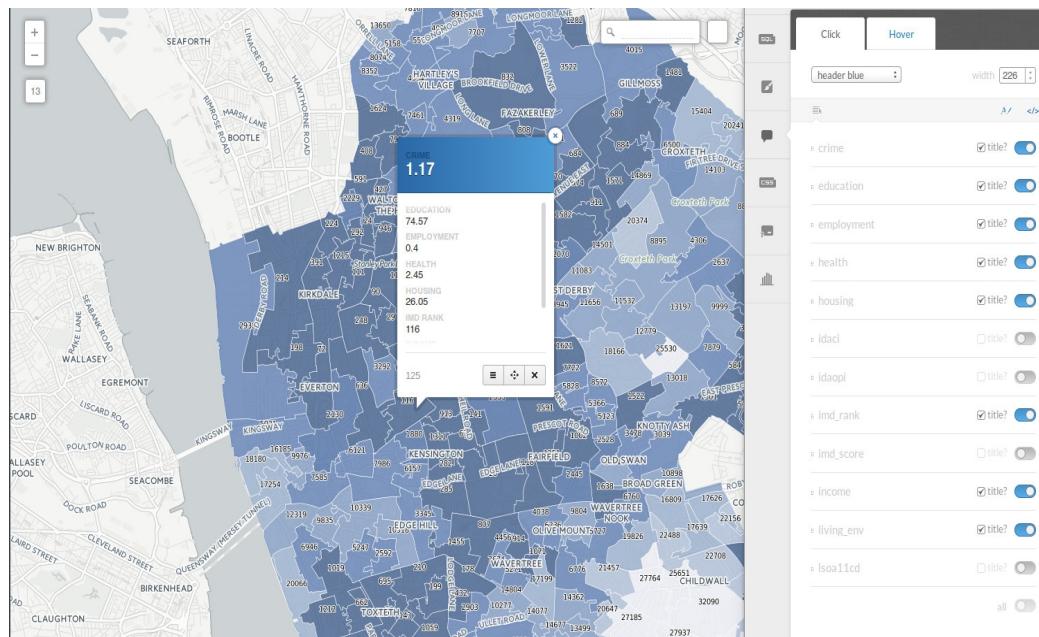
# Change Basemap

- Click on “Change Basemap” to set the basemap labels to the background, change background colour and visible datasets (e.g. road network).
- Click on Options to add Scroll zoom.



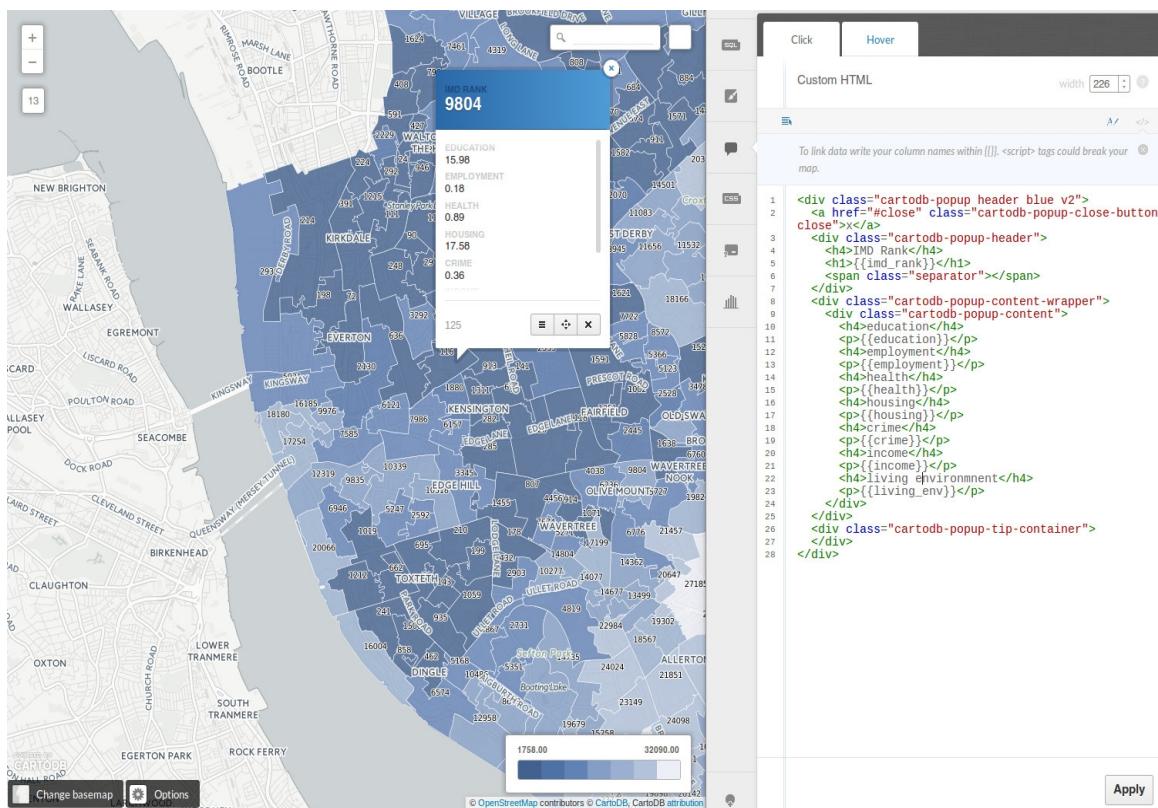
# Interactivity

- Alter the visible information in pop-up windows by clicking on “infowindow”.
  - You could select to display information from specific columns either when you click on the map or when you hover over a feature.
- Select to display columns crime, education, employment, health, housing, imd\_rank, income, liv\_env when you click on the map.
- Select header blue from the drop down menu on the top of the “infowindow”.



# Interactivity

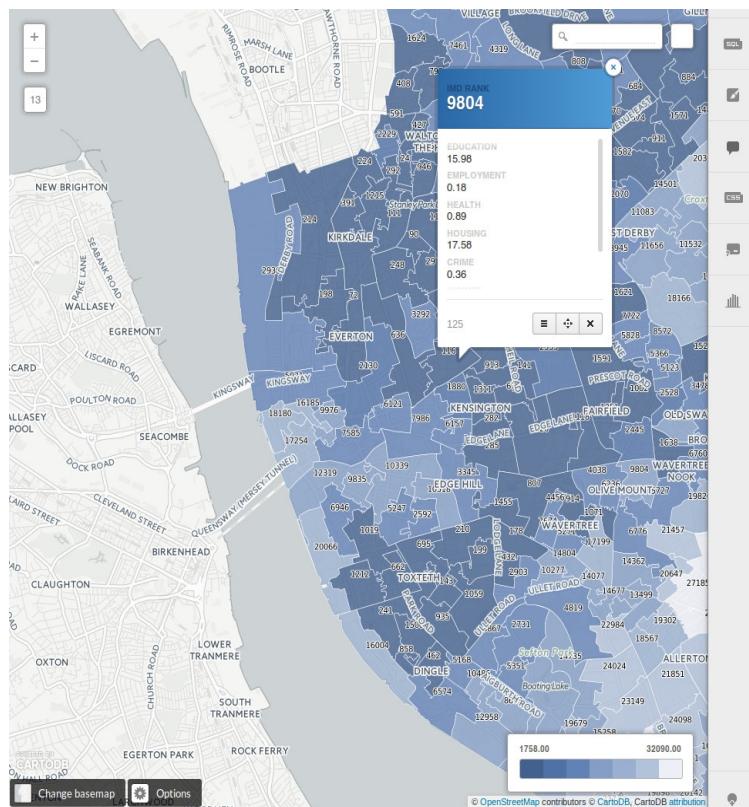
- You can use HTML to customise the “infowindow”:
  - Click on Change HTML
- CartoDB uses Mustache<sup>1</sup> templates.
- Variables (i.e. field names) are in double curly brackets {{ }}.



<sup>1</sup> <https://mustache.github.io/mustache.5.html>

# Interactivity

- Display IMD Rank as header.
  - Line 4:  
`<h4>IMD Rank</h4>`
  - Line 5:  
`<h1>{{imd_rank}}</h1>`
- Change label living\_env to living environment.
  - Line 22:  
`<h4>living environment</h4>`
- Add field crime.
  - Line 18:  
`<h4>crime</h4>`
  - Line 19:  
`<p>{{crime}}</p>`



```
To link data write your column names within [[]]. <script> tags could break your map.

1  <div class="cartodb-popup header blue v2">
2    <a href="#" class="cartodb-popup-close-button close"></a>
3    <div class="cartodb-popup-header">
4      <h4>IMD Rank</h4>
5      <span>{{imd_rank}}</span>
6      <span class="separator"></span>
7    </div>
8    <div class="cartodb-popup-content-wrapper">
9      <div class="cartodb-popup-content">
10        <h4>education</h4>
11        <p>{{education}}</p>
12        <h4>employment</h4>
13        <p>{{employment}}</p>
14        <h4>health</h4>
15        <p>{{health}}</p>
16        <h4>housing</h4>
17        <p>{{housing}}</p>
18        <h4>crime</h4>
19        <p>{{crime}}</p>
20        <h4>income</h4>
21        <p>{{income}}</p>
22        <h4>living environment</h4>
23        <p>{{living_env}}</p>
24      </div>
25    </div>
26  </div>
27  <div class="cartodb-popup-tip-container">
28    <div>
29      <span>Click</span>
30      <span>Hover</span>
31    </div>
32  </div>
33  <div>
34    <span>Custom HTML</span>
35    <input type="text" value="width 226 :)">
36  </div>
37  <div>
38    <span>Edit</span>
39    <span>Delete</span>
40    <span>More</span>
41  </div>
42  <div>
43    <span>Map</span>
44    <span>Table</span>
45    <span>List</span>
46  </div>
47  <div>
48    <span>Legend</span>
49    <span>Scale</span>
50  </div>
51  <div>
52    <span>Change basemap</span>
53    <span>Options</span>
54  </div>
55  <div>
56    <span>OpenStreetMap contributors &lt;br&gt; CartoDB, CartoDB attribution</span>
57  </div>
58  <div>
59    <span>Apply</span>
60  </div>
61</div>
```

# Edit Attributes

- Click anywhere on the map.
- Click on “edit data” in the “infowindow” pop up window.
- You can edit your data or add new columns.
- It might be a more convenient alternative to using the “Data View” as you can edit locations that you see on a map.

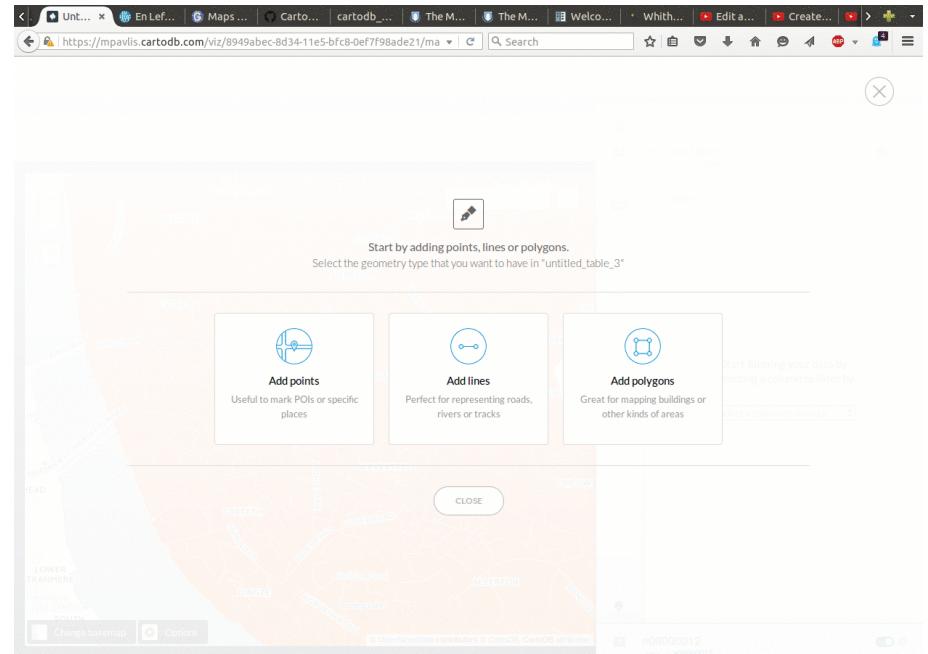
The screenshot shows a map of a city area with a specific location highlighted in blue. Above the map, there is a button labeled "Edit metadata" with a location pin icon. Below the map, a table lists various data fields and their current values:

Field	Value	Type
crime	1.17	number
education	74.57	number
employment	0.4	number
health	2.45	number
housing	26.05	number
idaci	0.52	number
idaopi	0.53	number
imd_rank	116	number
imd_score	74.75	number
income	0.47	number
living_env	15.07	number
lsoa11cd	E01006647	string

At the bottom right of the form is a blue "SAVE" button.

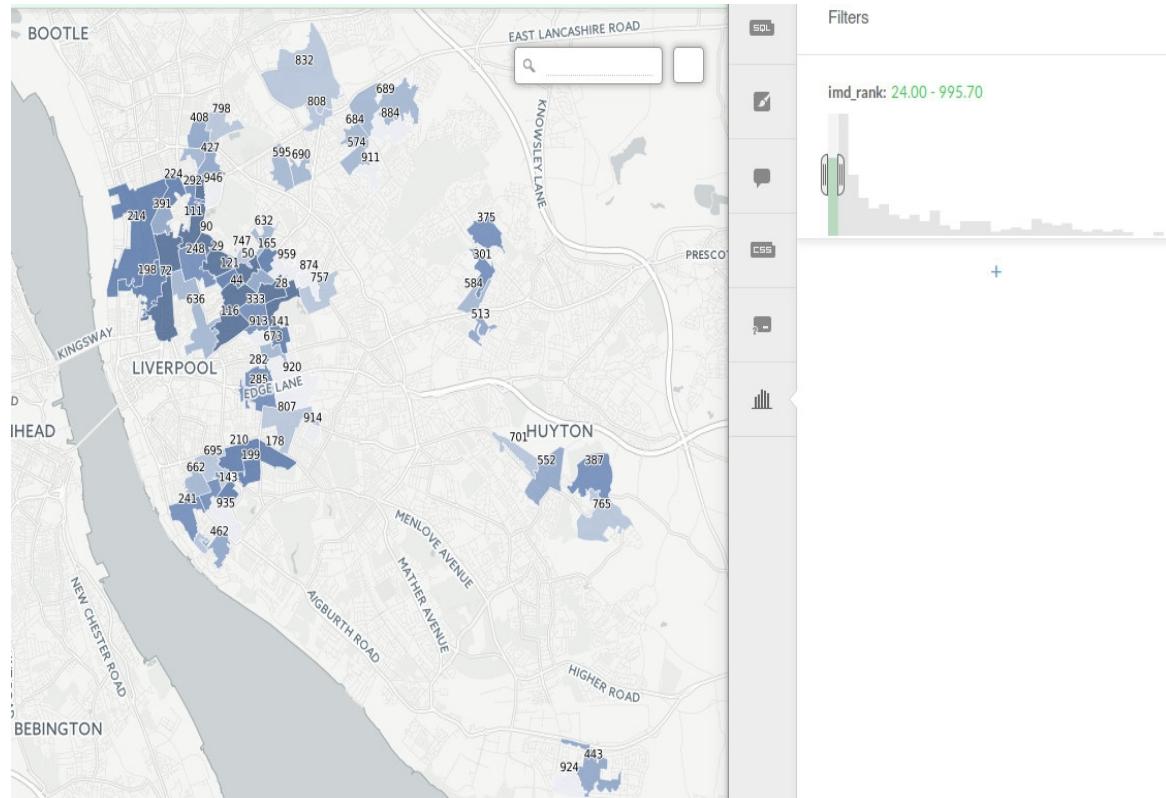
# Edit Features

- Click on “add feature” on the lower right hand side.
- Draw a polygon, click done.
- Click on the polygon and edit it (edit geometry).
- Click on the polygon and delete it.



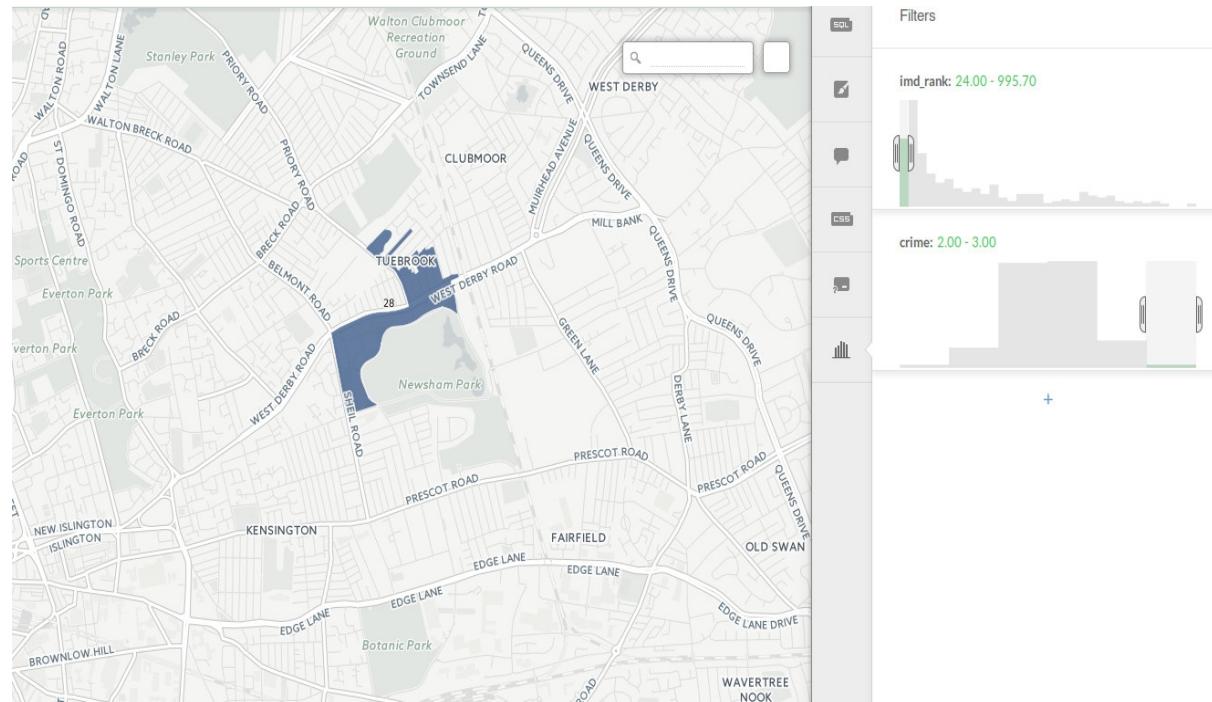
# Filtering Data

- Filter your data to display the most deprived areas in Liverpool
- Click on Filters on the right hand side and select column `imd_rank`.
- Slide the bar from the right hand side to the left so as the maximum IMD rank to be less than 1000.
  - Skewed distribution, long right tail (many values far from the main part of the distribution).



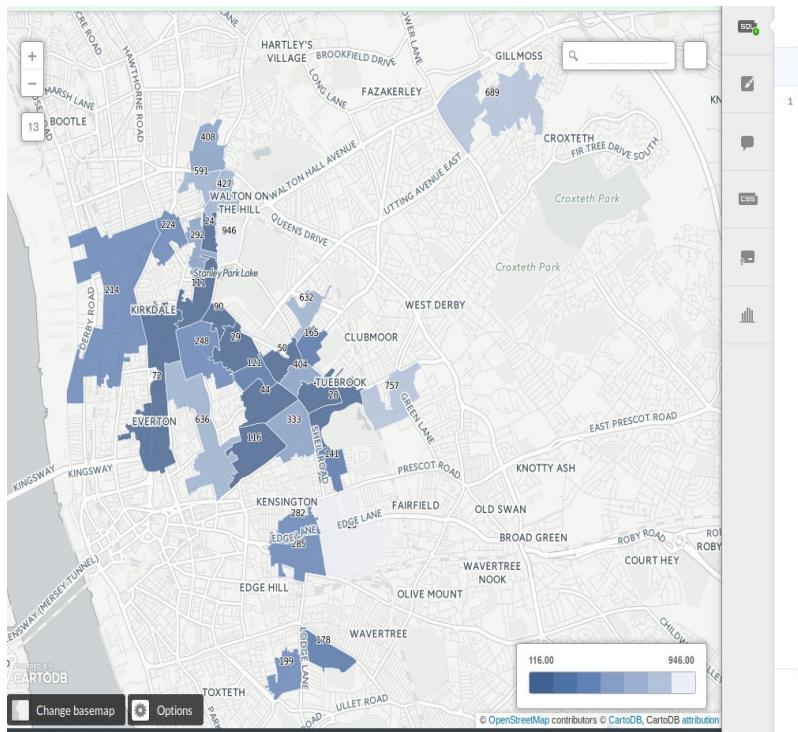
# Filtering Data

- Add filter to identify the areas of high crime occurrence.
  - Click on the + sign and select column crime.
- Fat distribution for crime (compared to a Normal distribution).
- Slide the bar from the left hand side to the right so as the minimum value for crime score to be equal to 2.



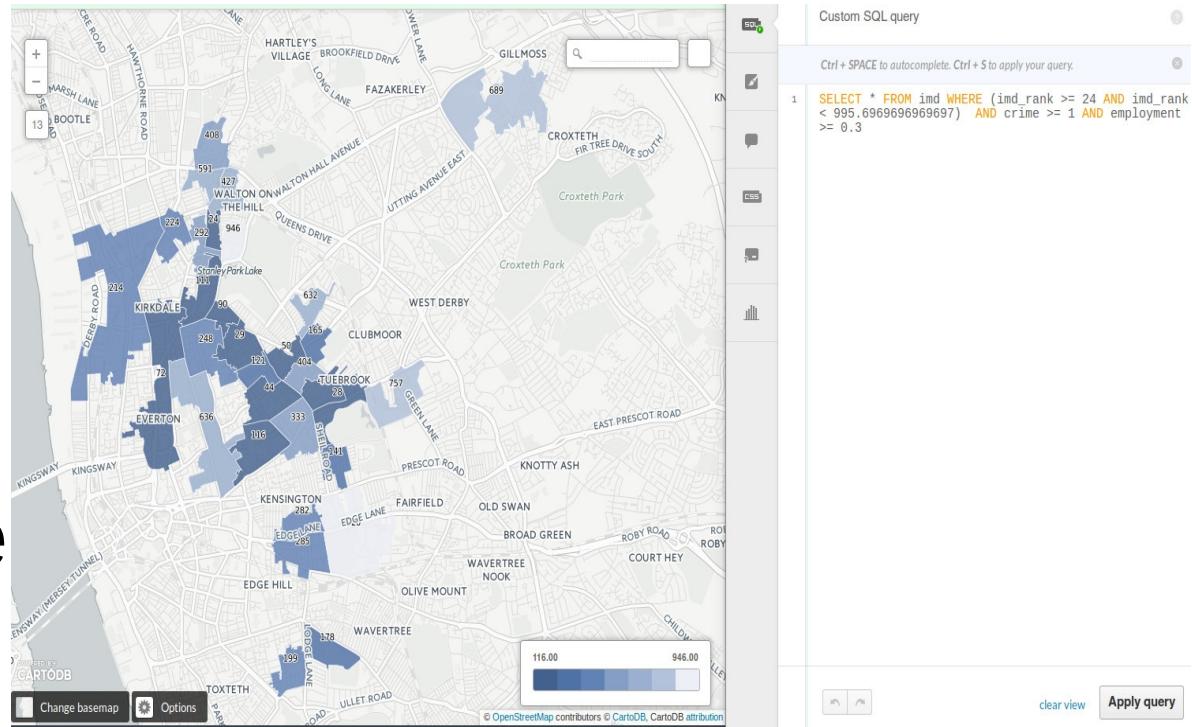
# SQL Queries

- You can also filter your data using custom SQL queries (click on SQL on the right hand side).
- The SQL statement begins with the SELECT keyword. The basic SELECT statement has 3 clauses:
  - SELECT
  - FROM
  - WHERE (optional)
- SELECT specifies the table columns that are retrieved.
- FROM specifies the tables accessed.
- WHERE specifies which table rows are used, if missing all table rows are used.



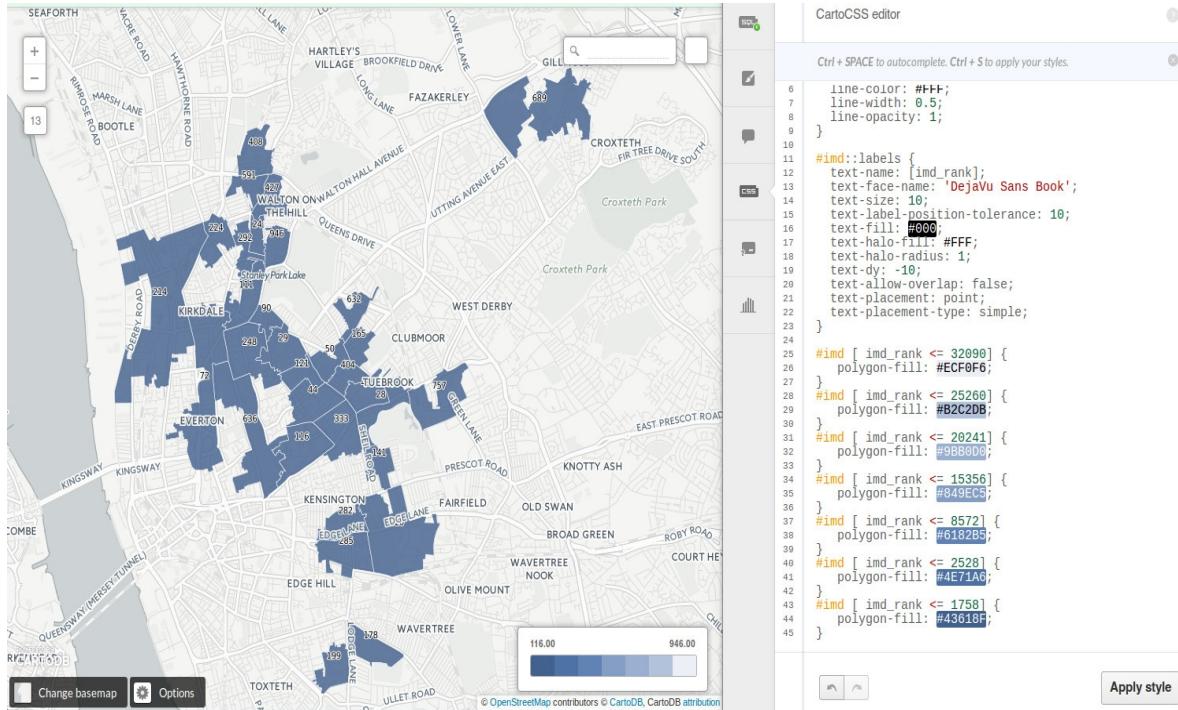
# SQL Queries

- Write an SQL query to select the LSOAs with IMD rank between 24 and 996, crime score  $\geq 1$  and employment score  $\geq 0.3$



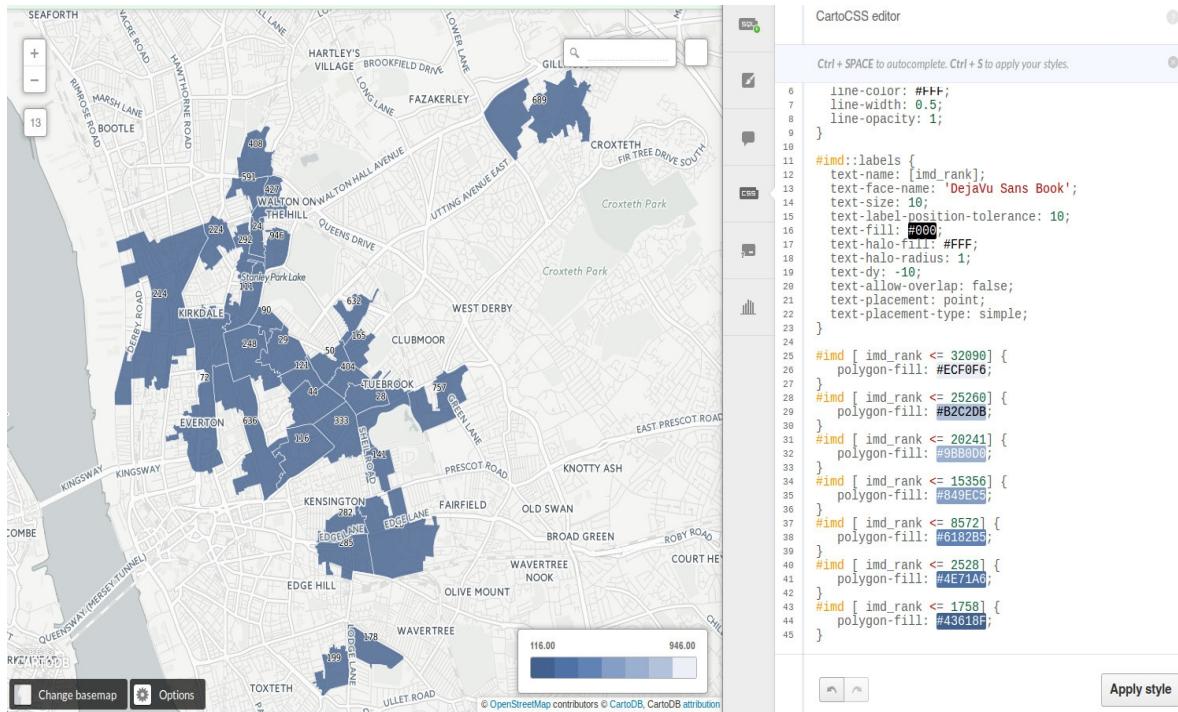
# CartoCSS

- When you filter the data the classification thresholds change.
- What if you wanted to use the same thresholds every time?
- Using CartoCSS you can also edit polygon fill colour, opacity, border line colour and width, number of bins.
  - Click on cartocss on the right hand side.



# CartoCSS

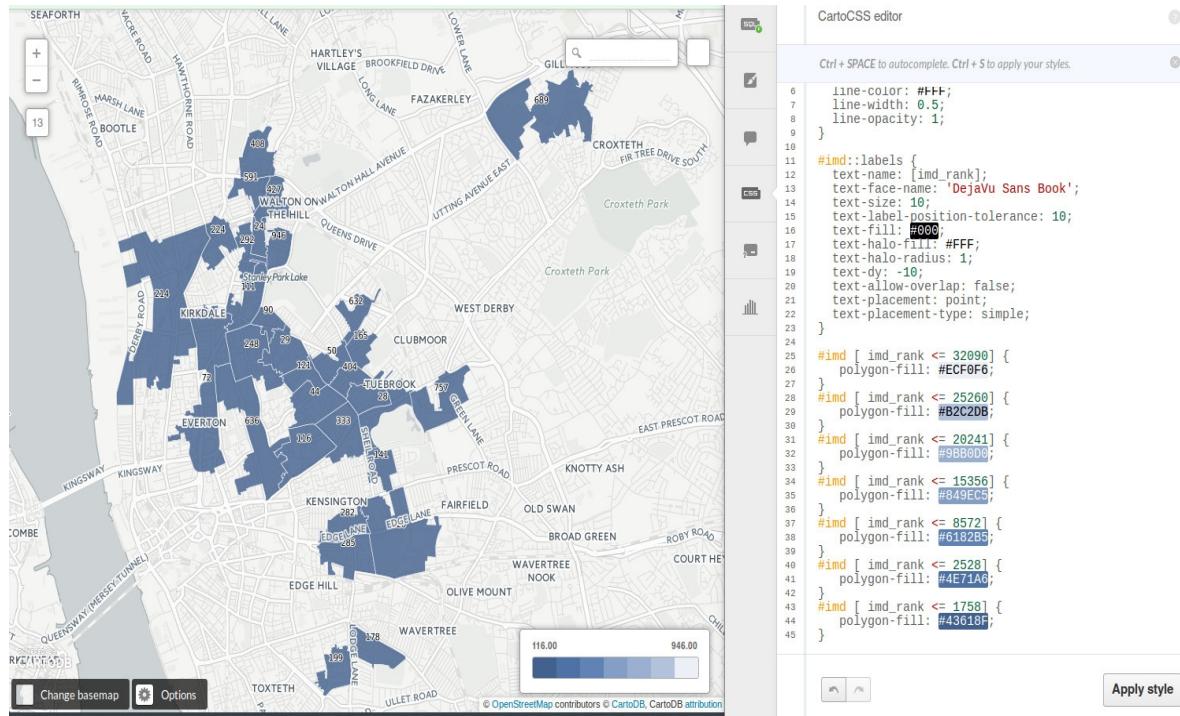
- CartoCSS uses selectors.
  - selector {  
    property: value;  
}
- The selector is the layer's ID and is preceded by #:
  - #imd{  
    property:value;  
}
- Filters can be used to apply different styles to specific layer attributes.
  - Filters are declared in square brackets []  
#imd[imd\_rank<=32090]
  - imd\_rank is an attribute (field) of the layer imd.
  - polygon-fill is a property of all polygon layers.



# CartoCSS

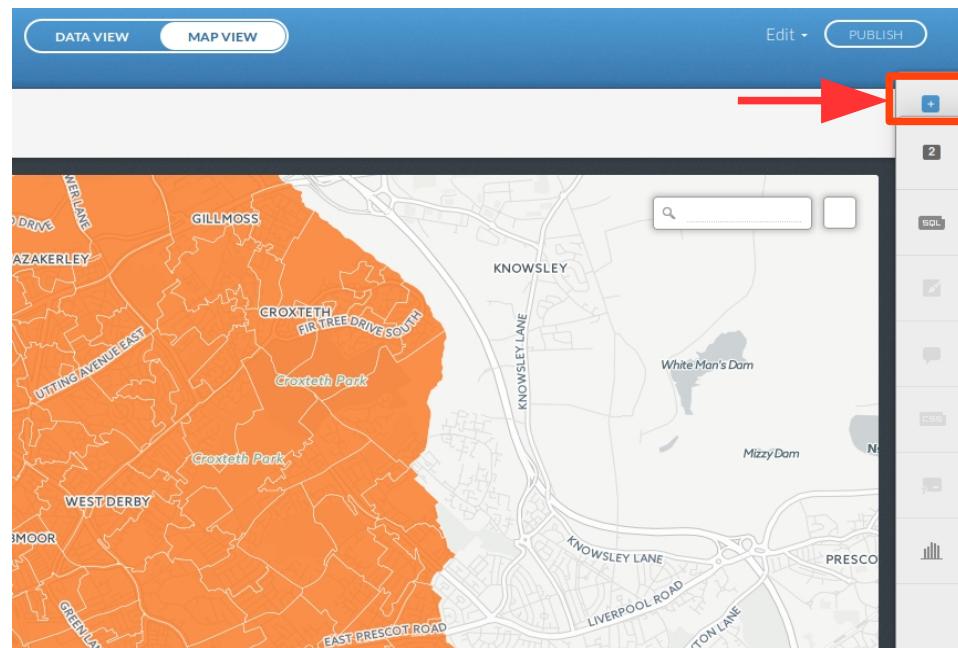
- Using CartoCSS apply the following style (from line 25):

```
#imd [ imd_rank <= 32090] {  
  polygon-fill: #ECF0F6; }  
  
#imd [ imd_rank <= 25260] {  
  polygon-fill: #B2C2DB; }  
  
#imd [ imd_rank <= 20241] {  
  polygon-fill: #9BB0D0; }  
  
#imd [ imd_rank <= 15356] {  
  polygon-fill: #849EC5; }  
  
#imd [ imd_rank <= 8572] {  
  polygon-fill: #6182B5; }  
  
#imd [ imd_rank <= 2528] {  
  polygon-fill: #4E71A6; }  
  
#imd [ imd_rank <= 1758] {  
  polygon-fill: #43618F; }
```



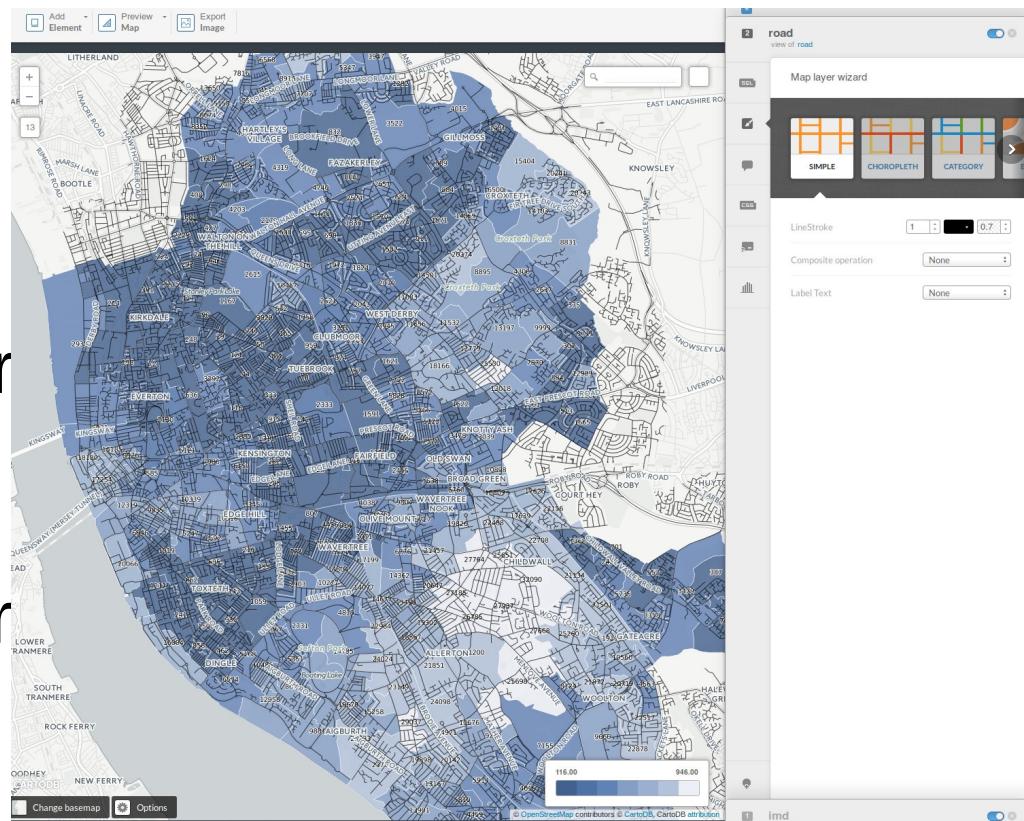
# Add Road Layer

- First click on “Clear View” on the top.
- Add a new layer in your map:
  - Click on the add layer icon.
  - Connect dataset.
  - Browse to road.zip.
  - Add Layer.



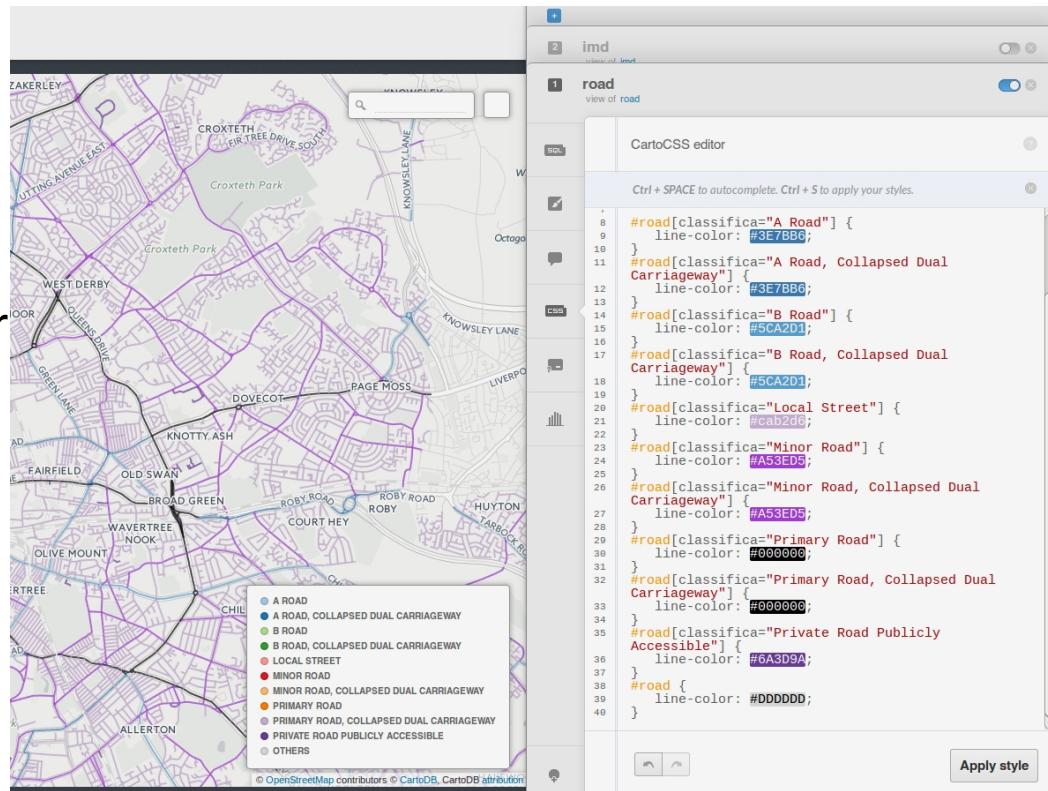
# Style the Road Layer

- Click on the “Map Wizards” tab on the right hand side:
  - Reduce LineStroke to 1, change colour to black.
- You can change the layer order in your map by dragging and dropping IMD above the road layer
  - You might have to click “Clear View”.



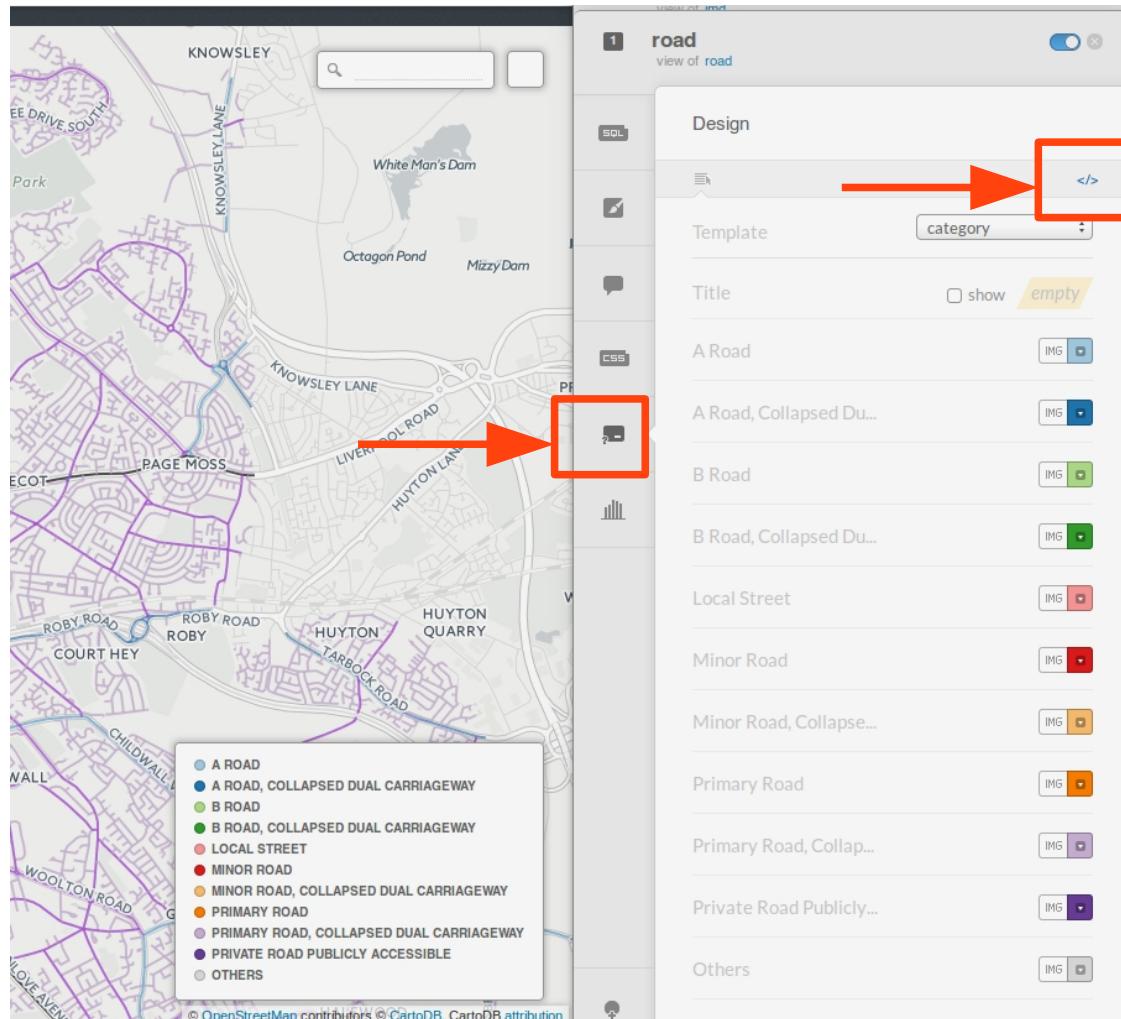
# Visualising Line Spatial Data – Group road categories

- Hide the imd layer (click on the slide bar on the right) and then click on the road layer.
- Select “Category” from the “Map Wizards” and select column “classifica”.
- Click on “CSS” and group similar types of road by colour, use the following values for line-color:
  - #3E7BB6 for all types of A Road
  - #5CA2D1 for all types of B Road
  - #cab2d6 for local street
  - #A53ED5 for all types of minor road
  - #000000 for all types of Primary roads



# Visualising Line Spatial Data – Group road categories

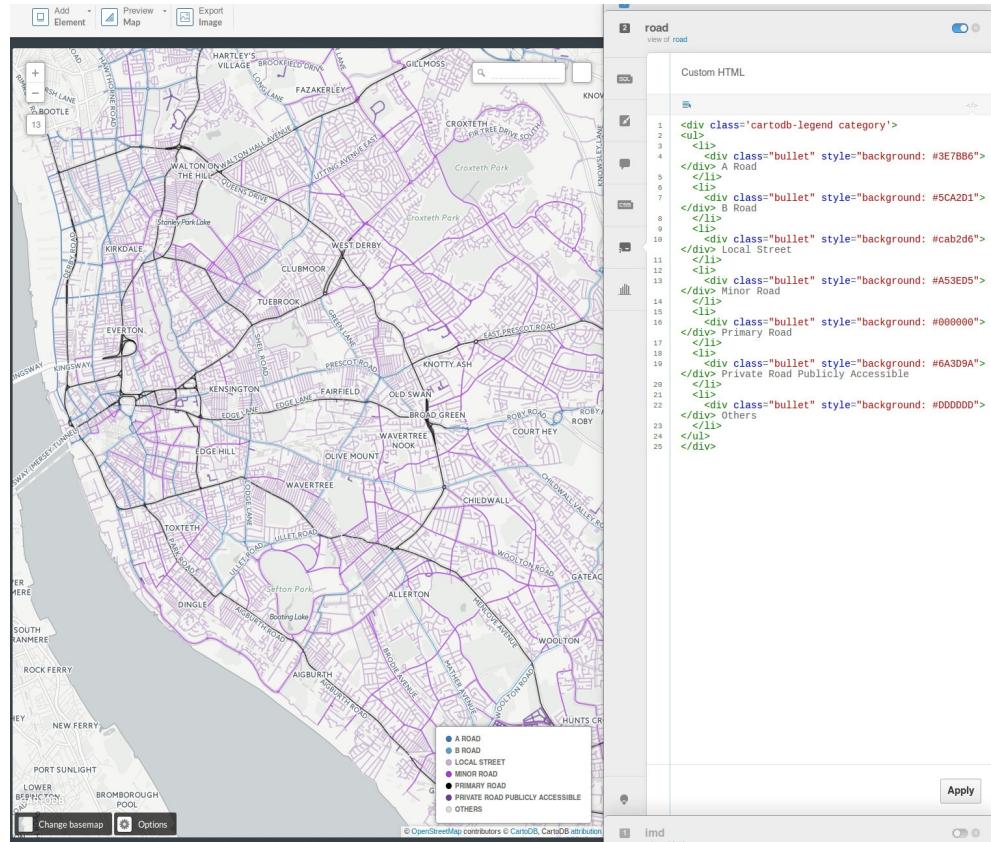
- We also need to group the elements of the map legend.
- Click on “legends” on the right hand side.
- Click on Change HTML.



# Visualising Line Spatial Data – Group road categories

- Replace the HTML with the following:

```
<div class='cartodb-legend category'>
<ul>
<li><div class="bullet" style="background: #3E7BB6"></div> A Road</li>
<li><div class="bullet" style="background: #5CA2D1"></div> B Road</li>
<li><div class="bullet" style="background: #cab2d6"></div> Local Street</li>
<li><div class="bullet" style="background: #A53ED5"></div> Minor Road</li>
<li><div class="bullet" style="background: #000000"></div> Primary Road</li>
<li><div class="bullet" style="background: #6A3D9A"></div> Private Road Publicly Accessible</li>
<li><div class="bullet" style="background: #DDDDDD"></div> Others</li>
</ul></div>
```



# Select Smithdown Road

- Activate the imd layer.
- Select again “Simple” from “Map Wizards” for the road layer”.
- Drag and drop the road layer on top of the imd layer.
- Type the following in the “sql” field of the road layer.

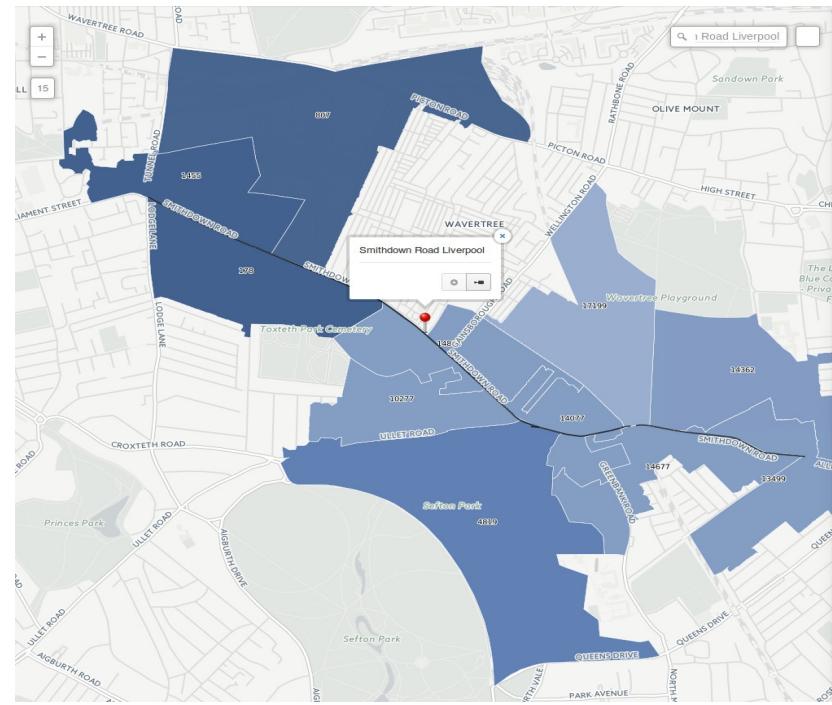
```
SELECT * FROM road  
WHERE name = 'Smithdown  
Road'
```
- Use the search box to zoom in on Smithdown Road Liverpool.



# Select all LSOAs that Intersect with Smithdown Road

- ST\_Intersects: PostGIS function returns true if the geometries share any portion of space. Can be used with “WHERE” clause.
- WITH: SQL subquery, consider it as a temporary table that exists only for this query.
- Click on the imd layer.
- In the “sql” field of the imd layer:

```
WITH
t1 AS
(SELECT * FROM road WHERE name =
'Smithdown Road')
SELECT t2.* FROM imd AS t2, t1
WHERE ST_Intersects(t1.the_geom,
t2.the_geom)
```

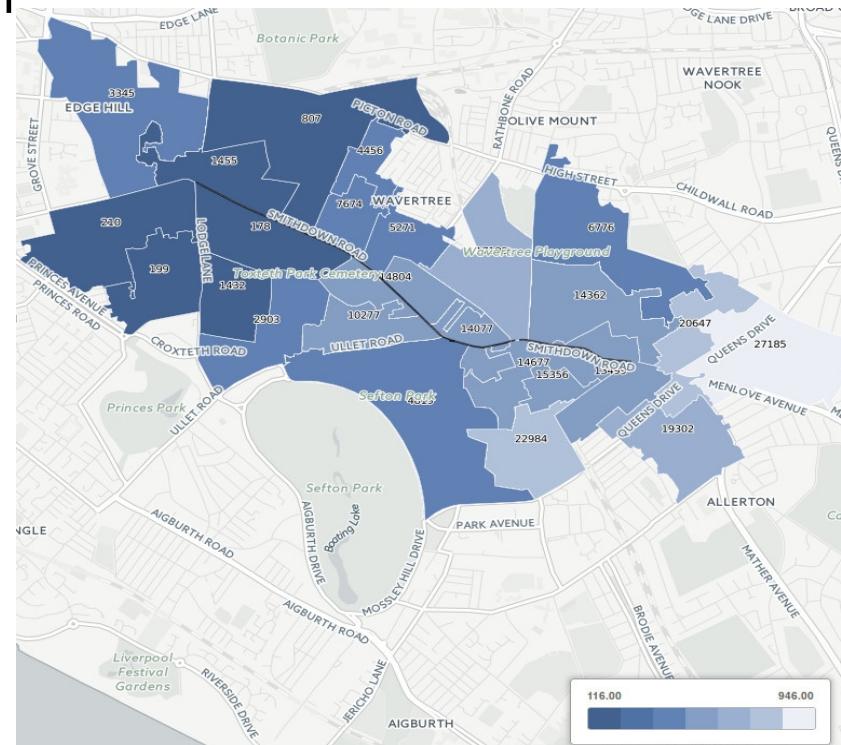


Instead of ST\_Intersects try other spatial join functions, e.g. ST\_Touches and ST\_Within

# Select all LSOAs within 500m from Smithdown Road

- The ST\_Dwithin function, returns true if the geometries are within specified distance, can be used with “WHERE” clause.
- Usage: ST\_Dwithin(geometry, geometry, distance)
- Replace the previous sql query with the following:

```
WITH
t1 AS
(SELECT * FROM road WHERE name =
'Smithdown Road')
SELECT t2.* FROM imd AS t2, t1
WHERE
ST_DWithin(t2.the_geom_webmercator,
r, t1.the_geom_webmercator, 500)
```

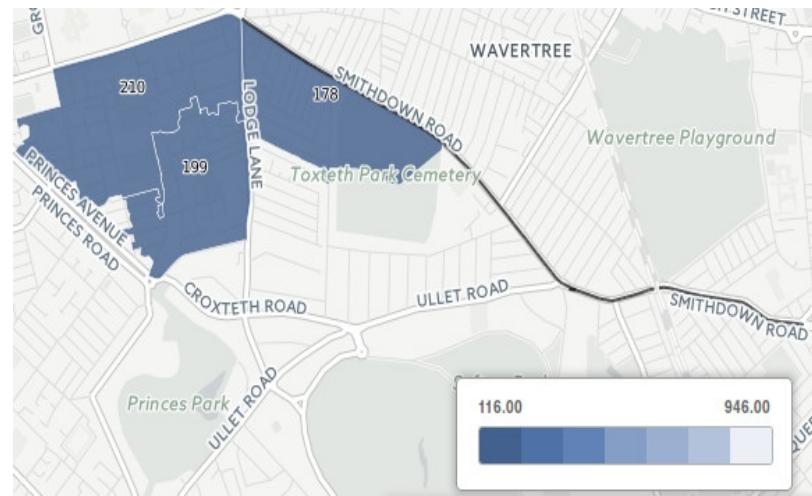


ST\_Dwithin uses PostGIS spatial index (gist) that indices the bounding boxes so it doesn't have to search the entire dataset nor work with individual point geometries

# Select the 3 most deprived LSOAs within 500m from Smithdown Road

```
WITH
t1 AS
(SELECT
ST_Collect(the_geom_webmercator)
AS the_geom_webmercator
FROM road WHERE name = 'Smithdown
Road')
SELECT imd.cartodb_id,
imd.imd_rank,
ST_Collect(imd.the_geom_webmercato
r) AS the_geom_webmercator
FROM imd, t1 WHERE
ST_DWithin(imd.the_geom_webmercato
r, t1.the_geom_webmercator, 500)
GROUP BY imd.cartodb_id,
imd.imd_rank
ORDER BY imd.imd_rank LIMIT 3
```

- ST\_Collect to group geometries.
- GROUP BY to group attributes.
- ORDER BY to order by ascending imd\_rank.
- LIMIT to select only top 3.



# Select the 3 most deprived LSOAs within 500m from Smithdown Road

- Why do we need to use ST\_Collect and GROUP BY?
- Try the following:

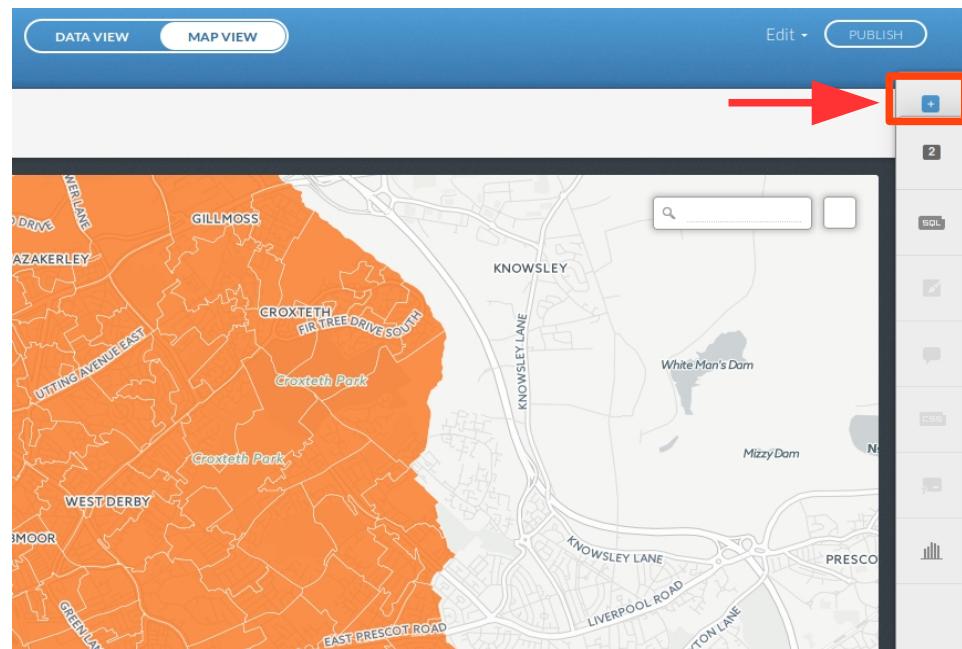
```
WITH
t1 AS
(SELECT the_geom_webmercator FROM
road WHERE name = 'Smithdown
Road')
SELECT imd.cartodb_id,
imd.imd_rank,
imd.the_geom_webmercator
FROM imd, t1 WHERE
ST_DWithin(imd.the_geom_webmercator, t1.the_geom_webmercator, 500)
ORDER BY imd.imd_rank LIMIT 3
```
- Then change the LIMIT to 10
- Any difference?



We group geometries to perform spatial queries for the entire geometry instead of individual points, as a consequence we need to group the data attributes as well

# Add Crime Data

- First click on “Clear View” on the top.
- Add a new layer to your map:
  - Click on the add layer icon.
  - Connect dataset.
  - Browse to crime.csv.
  - Add Layer.
- Hide the road layer.



# Crime Data Variables

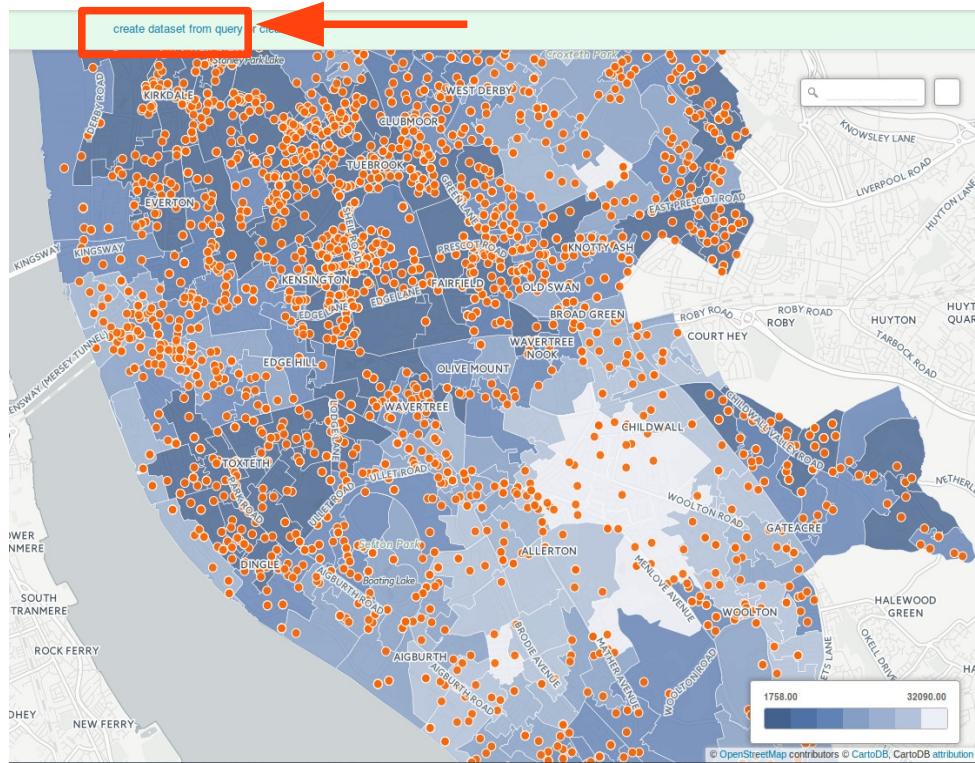
- Click on the crime layer and then Data View.
- the\_geom: Spatial information about crime location, can be used to look at the density of crime occurrence.
- crime\_type: Categorical variable could be used to look at the co-location of different types of crime.
- last\_outcome: could be interesting however there are missing entries.

cartodb_id	the_geom	context	crime_id	crime_type	falls_within	last_outcome_category	latitude	location
	geometry	string	string	string	string	string	number	string
1183	-2.9445, 53.4726			Anti-social behaviour	Merseyside Police		53.472554	On or near Anglo Close
1184	-2.9384, 53.4699			Anti-social behaviour	Merseyside Police		53.469915	On or near Croft Lane
1185	-2.9365, 53.4730			Anti-social behaviour	Merseyside Police		53.472977	On or near Canter Close
1186	-2.9384, 53.4699			Anti-social behaviour	Merseyside Police		53.469915	On or near Croft Lane
1187	-2.9391, 53.4710			Anti-social behaviour	Merseyside Police		53.47097	On or near Sherburn Close
1188	-2.9410, 53.4717	f5fc419ff3e915933d01cd1effd17fb93f96c50...		Drugs	Merseyside Police	Offender given a drugs possession warning	53.471702	On or near Red Rum Close
1189	-2.9460, 53.4725	f95a0f7fcbb0f7dd4357f0ac1745cb6bf554c...		Violence and sexual offences	Merseyside Police	Formal action is not in the public interest	53.472507	On or near Seagram Close
1190	-2.9220, 53.4709			Anti-social behaviour	Merseyside Police		53.470923	On or near Haven Road
1191	-2.9225, 53.4731			Anti-social behaviour	Merseyside Police		53.473113	On or near Leagate
1192	-2.9252, 53.4688			Anti-social behaviour	Merseyside Police		53.468751	On or near Dereham Crescent
1193	-2.9202, 53.4687	89adfe133fd5d0e7e14ba4092b944e300701...		Criminal damage and arson	Merseyside Police	Investigation complete; no suspect identified	53.468672	On or near Mond Road
1194	-2.9220, 53.4709	509e4450851df845fe2f10b5ed9328e66e6c...		Criminal damage and arson	Merseyside Police	Investigation complete; no suspect identified	53.470923	On or near Haven Road
1195	-2.9252, 53.4688	d0ffbfd6c8ab332e5def27b90155ee2453dd3c...		Criminal damage and arson	Merseyside Police	Investigation complete; no suspect identified	53.468751	On or near Dereham Crescent
1196	-2.9241, 53.4735	f96c91f5aa8da370a1d80781abb16182f928...		Criminal damage and arson	Merseyside Police	Investigation complete; no suspect identified	53.473505	On or near Twigden Close
1197	-2.9252, 53.4688	d31032e4fb0b05263586d48fb994ea5af1...		Criminal damage and arson	Merseyside Police	Unable to prosecute suspect	53.468751	On or near Dereham Crescent
1198	-2.9220, 53.4709	22b5f63455df7e13f5e48db301a548b22d2...		Criminal damage and arson	Merseyside Police	Investigation complete; no suspect identified	53.470923	On or near Haven Road
1199	-2.9195, 53.4686	6f2970ee55e46ce73713aa01ce7c7c241c7...		Violence and sexual offences	Merseyside Police	Offender given conditional discharge	53.468579	On or near Drake Way
1200	-2.9249, 53.4673	1310a6fe6c697c1d0f08dc880492a92ea7de...		Violence and sexual offences	Merseyside Police	Unable to prosecute suspect	53.467305	On or near Karonga Way
1201	-2.9239, 53.4676	23ea5ef12c780a36d51407e809554d0e4a4...		Violence and sexual offences	Merseyside Police	Unable to prosecute suspect	53.467619	On or near Formosa Drive
1202	-2.9252, 53.4688	caa3860a1195e942b3a998d4fadfb4cce9a9e...		Violence and sexual offences	Merseyside Police	Unable to prosecute suspect	53.468751	On or near Dereham Crescent
1203	-2.9356, 53.4673			Anti-social behaviour	Merseyside Police		53.467322	On or near Sixth Avenue
1204	-2.9338, 53.4698			Anti-social behaviour	Merseyside Police		53.469771	On or near Adlam Crescent
1205	-2.9347, 53.4718			Anti-social behaviour	Merseyside Police		53.471823	On or near Papillon Drive
1206	-2.9338, 53.4698			Anti-social behaviour	Merseyside Police		53.469771	On or near Adlam Crescent
1207	-2.9306, 53.4688			Anti-social behaviour	Merseyside Police		53.468808	On or near Longmoor Close
1208	-2.9347, 53.4718			Anti-social behaviour	Merseyside Police		53.471823	On or near Papillon Drive

# Select crime locations within Liverpool

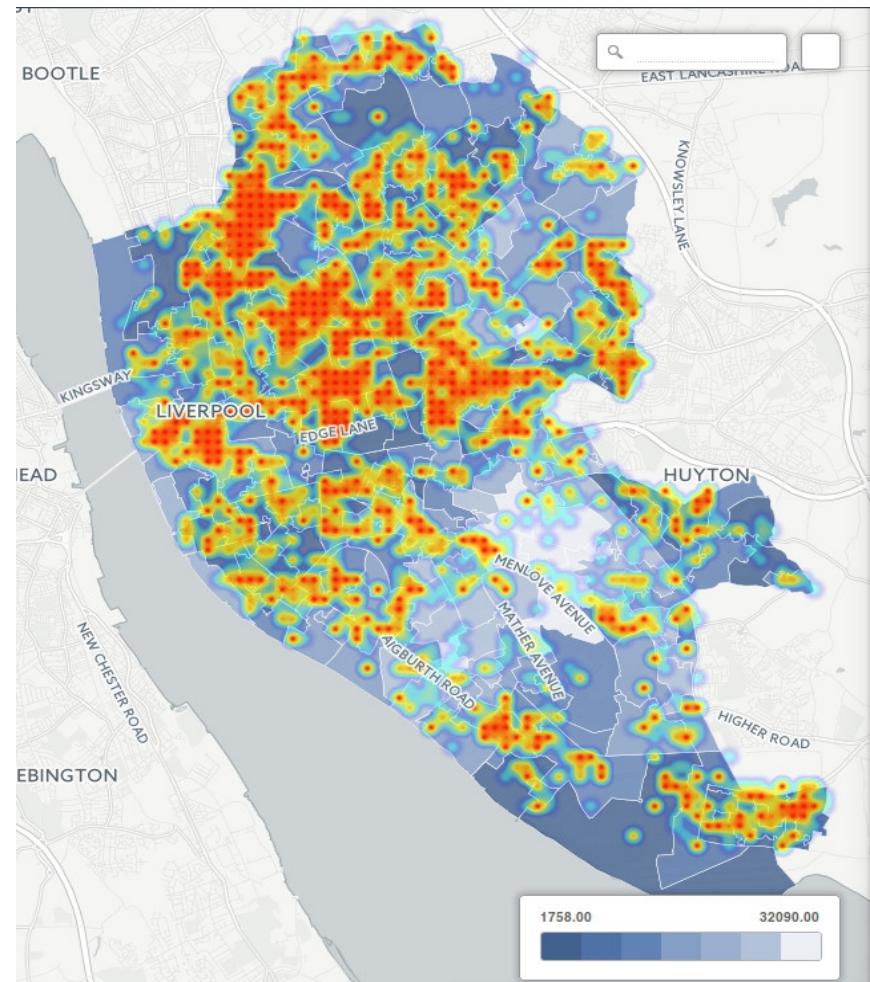
- Click on Map View and then on the “sql” tab of the crime layer.
- We will select all the incidents that are within our area of study:

```
SELECT crime.* FROM
crime, imd WHERE
ST_Within(crime.the
_geom,
imd.the_geom)
```



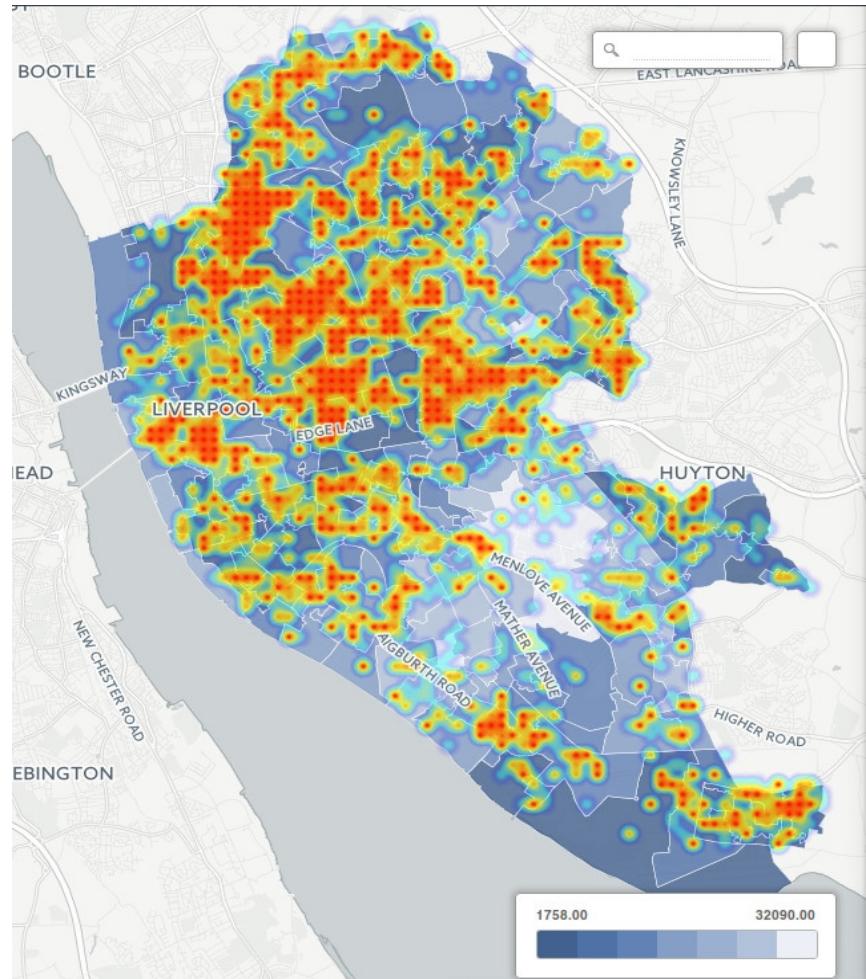
# Using Heatmaps to Map Crime Density

- Heatmaps are created by placing a grid over the map and calculating the points within an area using a Kernel Density method.
- Click on the “Map Wizards” tab.
- Reduce marker size to reduce smoothing the density (around 15 should provide local information without being under-smoothed).



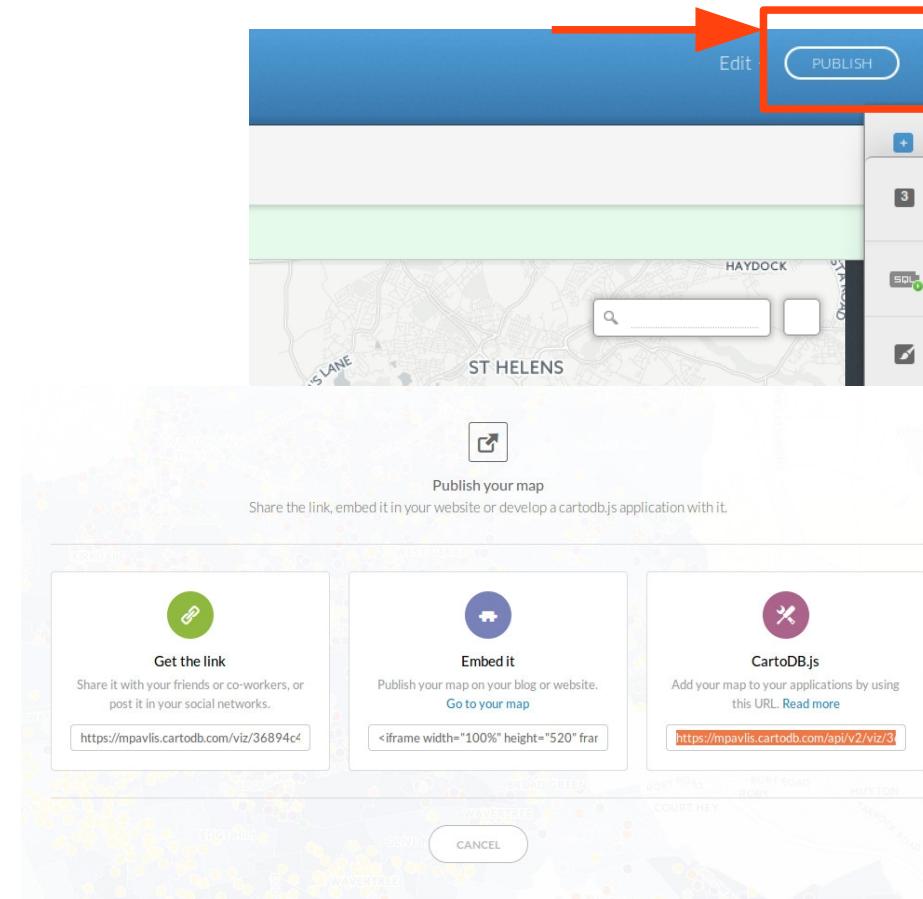
# Using Heatmaps to Map Crime Density

- Higher crime density in the north of Liverpool.
- Lower crime density in less deprived LSOAs (however what is the relationship with population density?).



# Embedding maps in your own application

- Open the “template.html”<sup>1</sup> in your favourite editor.
- Click on “Publish” on the right hand side.
- Copy the link from CartoDB.js



# Embedding maps in your own application

- Paste your json link in line 26 of the template.html document.
- Your document should look like this.

```
24 <script>
25   function main() {
26     cartodb.createVis('map', 'https://mpavlis.cartodb.com/api/v2/viz/dad042e8-9453-11e5-8cb3-0e5db1731f59/viz.json', {
27       shareable: true,
28       title: true,
29       ...
30     });
31   }
32 
```

# Embedding maps in your own application

- Uncomment lines 46 and 47
- Set “map.setZoom” to 12
- Set “map.panTo” to [53.42, -2.9887]
- Your document should look like this:

```
45 // now, perform any operations you need  
46 map.setZoom(12);  
47 map.panTo([53.42, -2.9887]);
```

- Double click on template.html

# Using the SQL API to import data in R from CartoDB

- Using CartoDB's SQL API it is easy to import data in any programming language.
- The url format is
  - `https://{account}.cartodb.com/api/v2/sql?q={SQL statement}`
  - Make sure that any spaces in the SQL statement are replaced with `%20`
- By default the format is json, to change it:
  - `https://{account}.cartodb.com/api/v2/sql?format=csv&q={SQL statement}`
  - `https://{account}.cartodb.com/api/v2/sql?format=geojson&q={SQL statement}`

# Using the SQL API to import data in R from CartoDB

- Spaces in sql queries have to be replaced with %20
- SQL query to select all imd\_rank entries with value smaller than 50:

```
SELECT imd_rank FROM imd WHERE  
imd_rank < 50;
```

- The same query with spaces replaced:

```
SELECT%20imd_rank%20FROM%20imd%20WHERE  
%20imd_rank%20<50
```

# Using the SQL API to import data in R from CartoDB

- Open R and use the previous query to import as csv all entries with imd\_rank less than 50:

```
url_imd =  
"http://mpavlis.cartodb.com/api/v2/sql?  
format=csv&q=SELECT%20cartodb_id,  
%20imd_rank%20FROM%20imd%20WHERE  
%20imd_rank%20<50"  
imd = read.csv(url(url_imd))
```

# Many thanks...

