

Document Title

AUTHOR

Your Name

Reading Public Health Services- Chicago Primary Care Community Health Centers Maps

```
import geopandas as gpd
import pandas as pd
from shapely.geometry import Point

import matplotlib.pyplot as plt
from matplotlib.colors import ListedColormap
```

```
filepath = "/Users/tsaili-ting/Uchicago/Year2/Y2Fall/Python2/final_project/Map_-_Public_H
map = gpd.read_file(filepath)
```

```
# Clean the dataset and make it a geo dataframe
df = pd.DataFrame(map)

# Extract Coordinates
df[['address', 'coordinates']] = df['Address'].str.extract(r'^(.*)\n\((.*)\)$')
df[['latitude', 'longitude']] = df['coordinates'].str.split(',', expand=True)

# Convert Latitude and Longitude to Numeric
df['latitude'] = pd.to_numeric(df['latitude'])
df['longitude'] = pd.to_numeric(df['longitude'])

# Create Geometry Column
df['geometry'] = df.apply(lambda row: Point(row['longitude'], row['latitude']), axis=1)

# Convert to GeoDataFrame
gdf = gpd.GeoDataFrame(df, geometry='geometry')

# Drop unnecessary columns if desired
gdf = gdf.drop(columns=['Address', 'coordinates'])

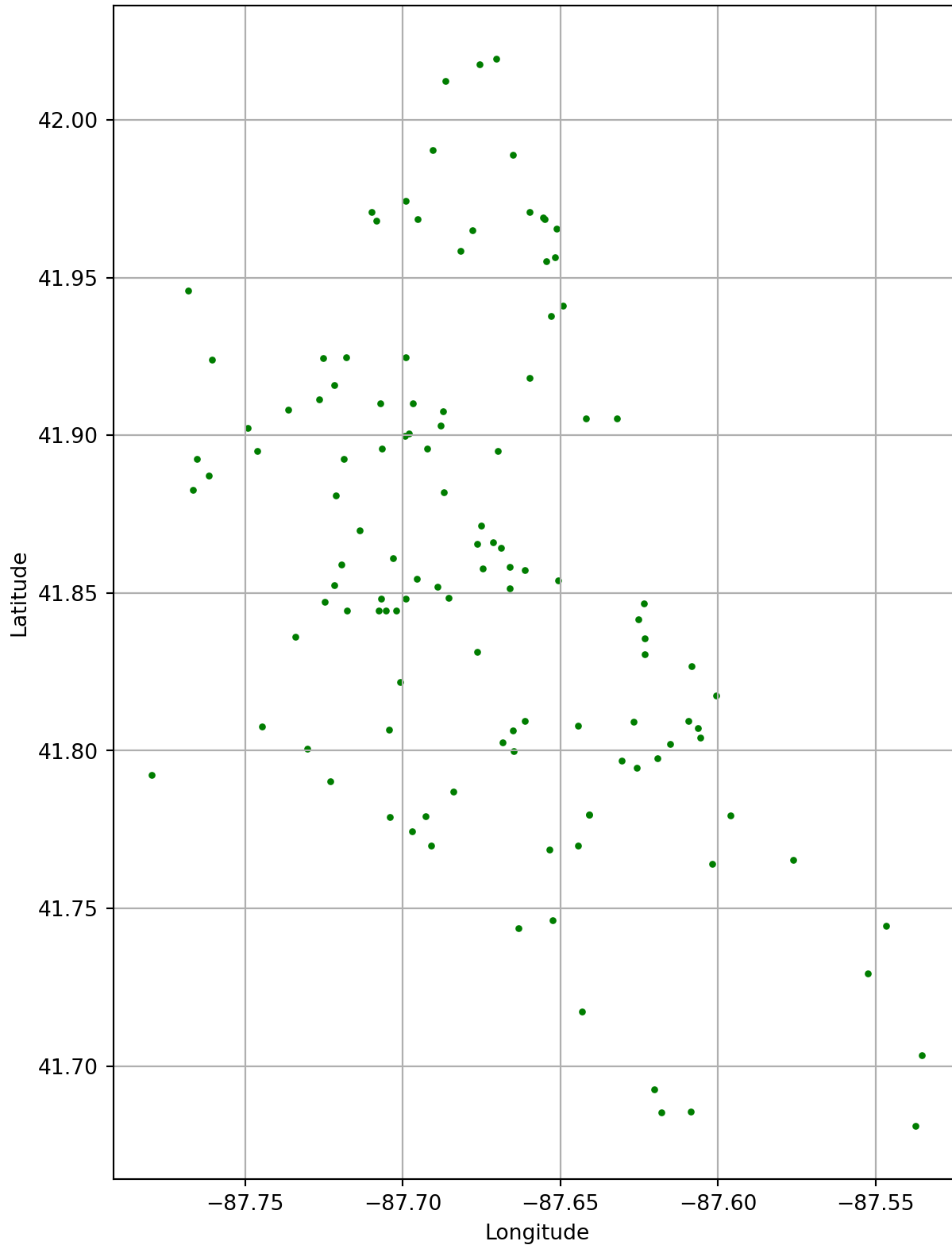
# Display the GeoDataFrame
gdf.head()
```

Facility	Community Area (#)	Phone	FQHC, Look-alike, or Neither; Special Notes	address	latitude	longitude	geometry
0 Mercy Family Health Center @ Oakwood Shores	OAKLAND (36)	(773) 451-0460	Look-alike	3753 S. Cottage Grove60653	41.826722	-87.608287	POINT (-87.60829 41.82672)
1 ACCESS Southwest Family Health Center	GARFIELD RIDGE (56)	(866) 882-2237	FQHC	4839 W. 47th Street60638	41.807575	-87.744602	POINT (-87.7446 41.80757)
2 Heartland Health Outreach-Refugee Health	UPTOWN (3)	(773) 751-1744	FQHC; specialize in refugee health	4750 N Sheridan Rd60640	41.968431	-87.654857	POINT (-87.65486 41.96843)
3 Heartland Health Center-Hibbard Elementary Sc...	ALBANY PARK (14)	(773) 336-6100	FQHC; School-based health center (open to comm...	4930 North Sawyer Avenue60625	41.970847	-87.709774	POINT (-87.70977 41.97085)
4 Near North - Winfield Moody Health Center	NEAR NORTH SIDE (8)	(312) 337-1073	FQHC	1276 N. Clybourn60610	41.905355	-87.641786	POINT (-87.64179 41.90535)

```
# Filter GeoDataFrame to keep points within Chicago's bounding box
point = gdf[
    (gdf['latitude'] >= 41.64) & (gdf['latitude'] <= 42.02) &
    (gdf['longitude'] >= -87.94) & (gdf['longitude'] <= -87.52)
]
```

```
# Plot only the points in Chicago
point.plot(marker='o', color='green', markersize=5, figsize=(10, 10))
plt.title("Map of Locations in Chicago")
plt.xlabel("Longitude")
plt.ylabel("Latitude")
plt.grid(True)
plt.show()
```

Map of Locations in Chicago



```
# layering with chicago community shape file
```

```
chi_shp = gpd.read_file("/Users/tsaili-ting/Uchicago/Year2/Y2Fall/GIS/Final project/chico
```

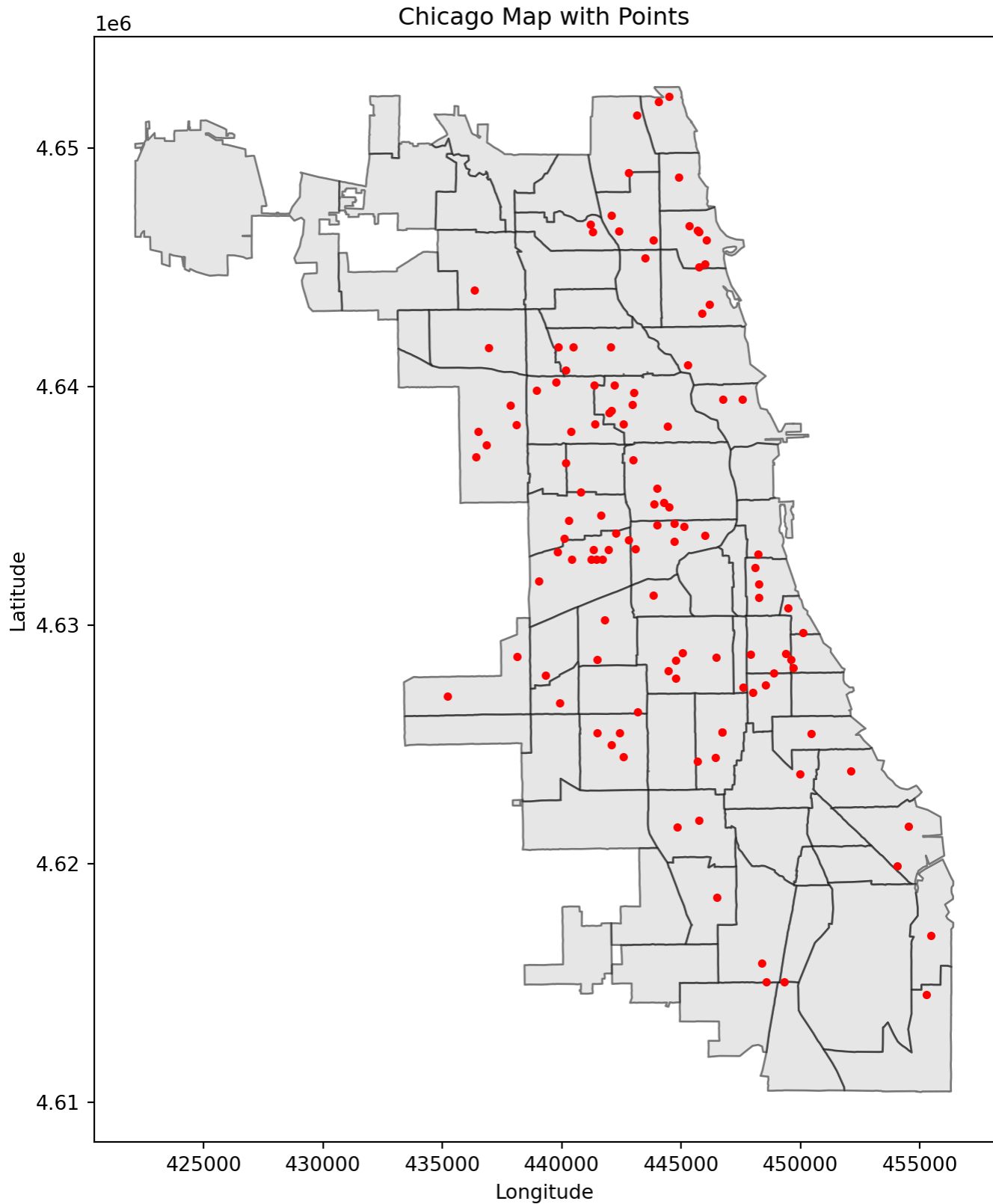
```
point = point.set_crs(epsg=4326)
point = point.to_crs(epsg=32616)
chi_shp = chi_shp.to_crs(epsg=32616)
```

Base Map with the points

```
# Create a base map with the shapefile
ax = chi_shp.plot(color='lightgrey', edgecolor='black', figsize=(10, 10), alpha=0.5)

# Overlay the points on the map
point.plot(ax=ax, marker='o', color='red', markersize=10)

# Add a title and labels
plt.title("Chicago Map with Points")
plt.xlabel("Longitude")
plt.ylabel("Latitude")
plt.show()
```



Highlight the area with the health centers

```
# highlight the area that has Chicago Primary Care Community Health Centers
# Perform spatial join
highlighted_areas = chi_shp.sjoin(point, how='inner', predicate='intersects')
```

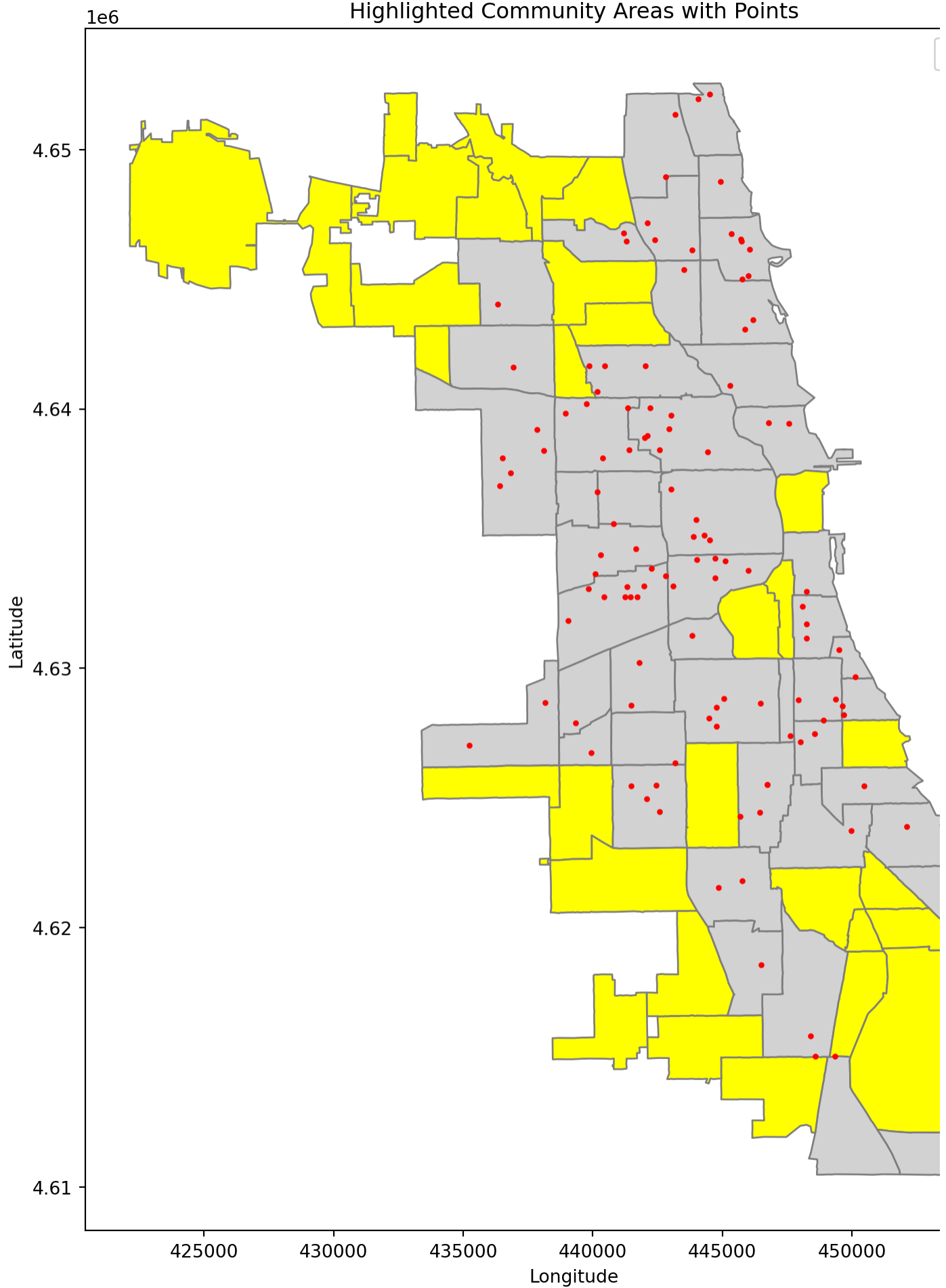
```
# Keep only unique community areas
highlighted_areas = highlighted_areas.drop_duplicates(subset=chi_shp.geometry.name)
```

```
# Add a highlight flag
chi_shp["has_points"] = chi_shp.geometry.apply(lambda geom: geom in highlighted_areas.geo
```

```
# Plot shapefile, highlighting areas with points
custom_cmap = ListedColormap(["yellow", "lightgrey"])
ax = chi_shp.plot(
    column="has_points",
    cmap=custom_cmap, # Colors: cool areas without points, warm areas with points
    edgecolor="grey",
    figsize=(12, 12),
    legend=True
)
```

```
# Add the points to the map
point.plot(ax=ax, marker='o', color='red', markersize=5, label="Points")
```

```
# Add labels and title
plt.title("Highlighted Community Areas with Points")
plt.xlabel("Longitude")
plt.ylabel("Latitude")
plt.legend()
plt.show()
```



Combined Demographic and Health outcome data

```
# Spatial join demographic data
chi_dem = pd.read_csv("Public_Health_Statistics_-_Selected_public_health_indicators_by_Ch

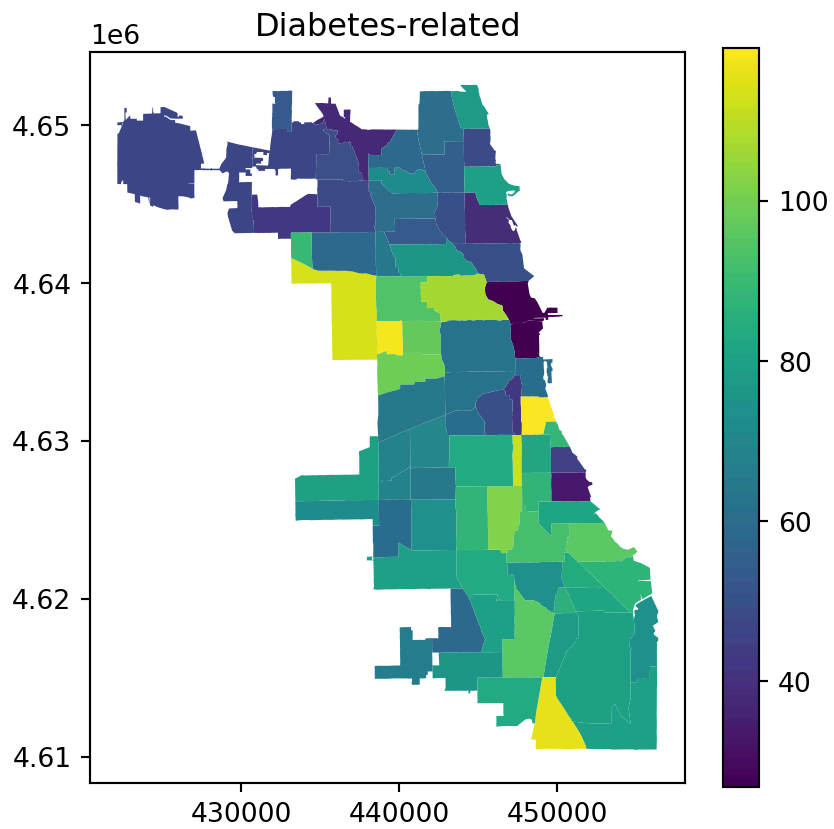
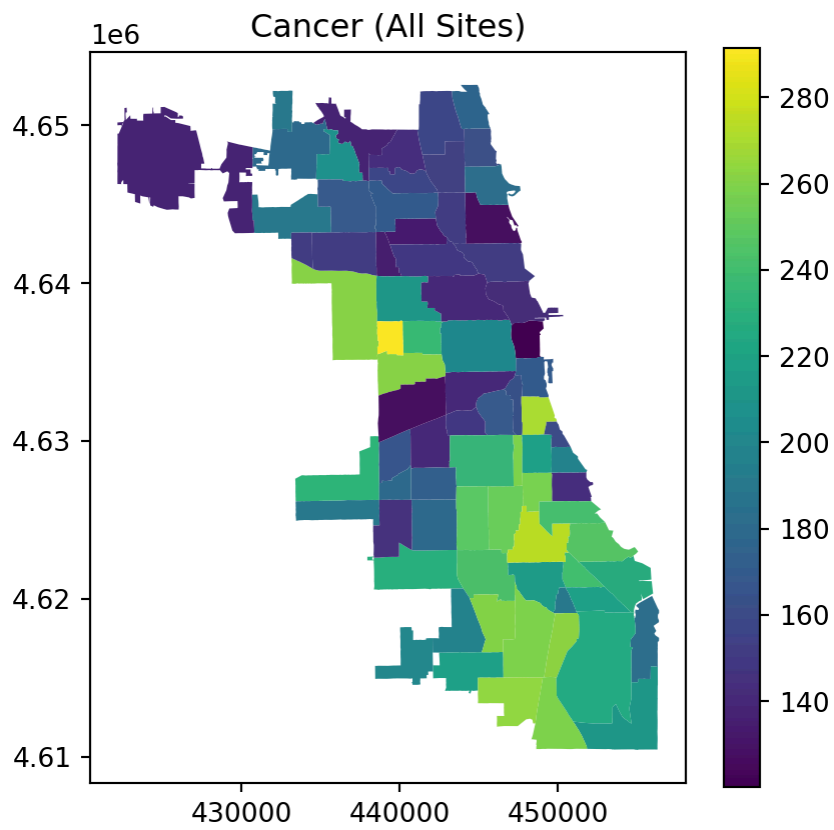
# fix the wrong community name
chi_dem["Community Area Name"] = chi_dem["Community Area Name"].replace(
    {"Montclair": "Montclare"}
)

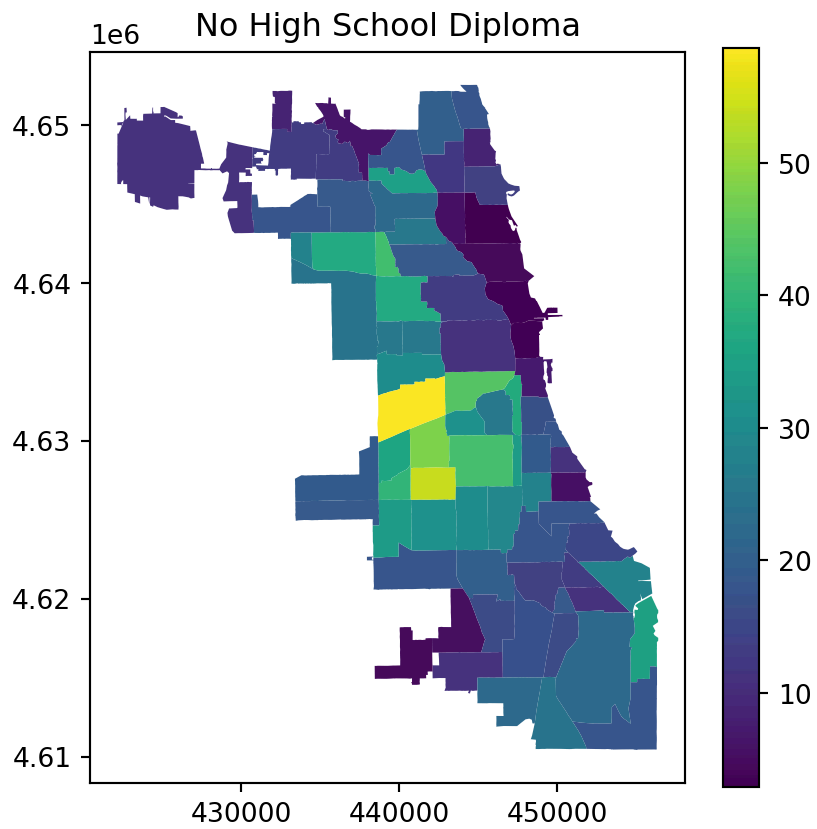
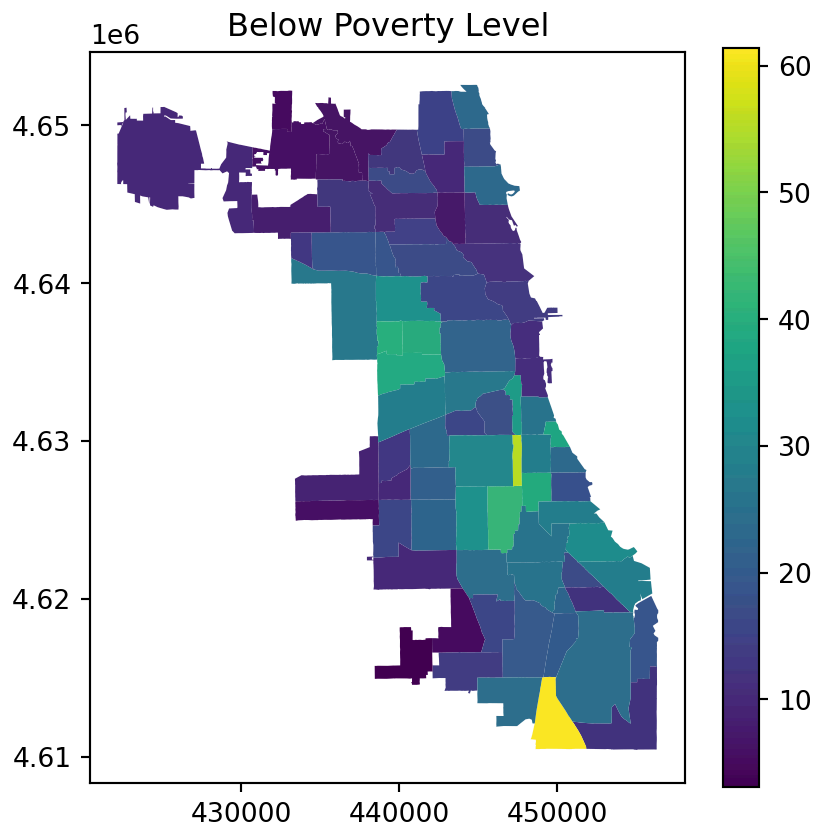
# Merge shp with the demographic dataset
chi_shp_dem = chi_shp.merge(chi_dem, left_on="DISTITLE", right_on = "Community Area Name",
chi_shp_dem = chi_shp_dem.to_crs(epsg=32616)
```

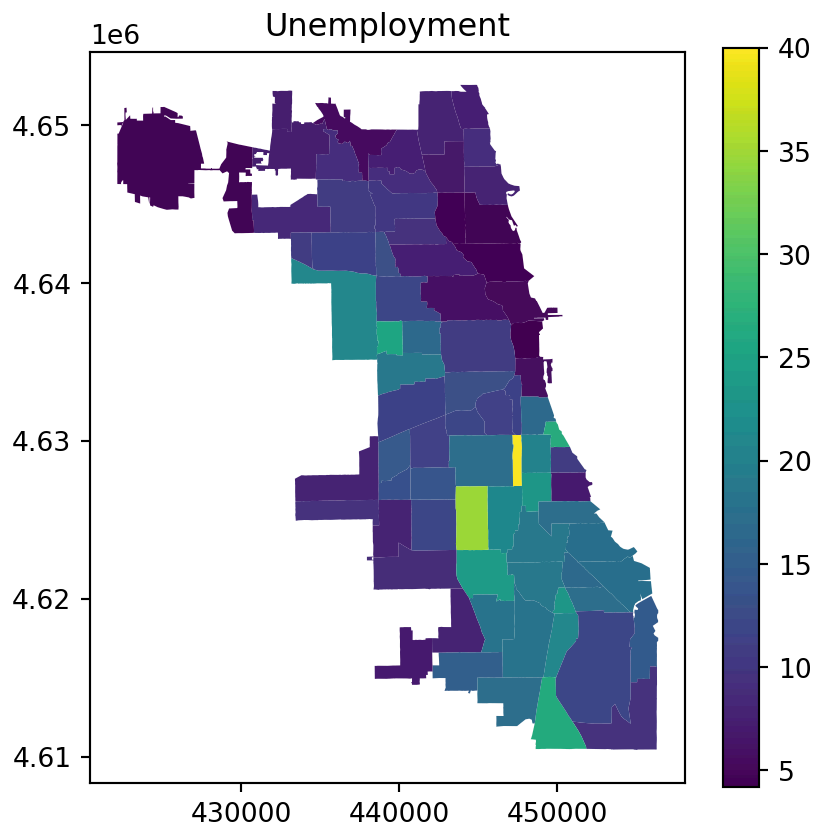
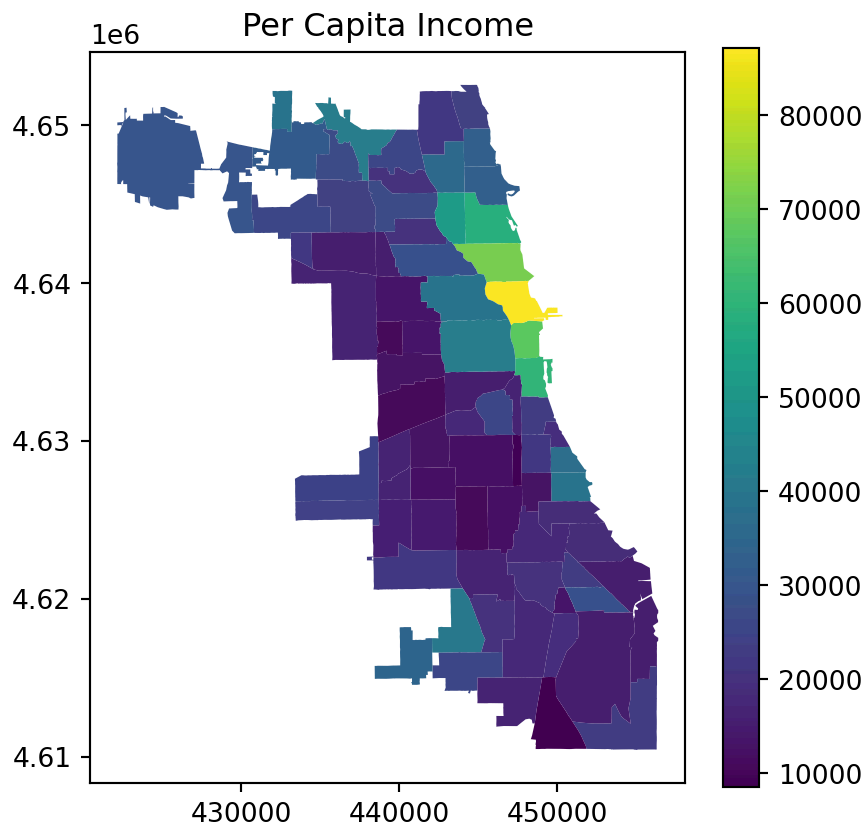
Look at the color map in income, education, poverty rate, and health outcome

```
columns = ['Cancer (All Sites)', 'Diabetes-related', 'Below Poverty Level', 'No High School

for col in columns:
    fig, ax = plt.subplots(1, 1, figsize=(5, 5))
    chi_shp_dem.plot(
        column=col,
        legend=True,
        ax=ax
    )
    ax.set_title(col) # Set the title for the plot
plt.show()
```





Look at the 1 mile buffer for the primary care center

```
# create the 1 mile buffer
point["buffer"] = point.geometry.buffer(1609)
buffers = gpd.GeoDataFrame(point, geometry="buffer", crs=point.crs)
```

Look at 1 mile buffer with health outcome

Cancer Rate in Community Area

```
fig, ax = plt.subplots(1, 1, figsize=(5, 5))
chi_shp_dem.plot(ax=ax, column="Cancer (All Sites)", cmap="Reds", edgecolor="lightgrey", l
buffers.plot(ax=ax, color="blue", alpha=0.2, edgecolor="None")

plt.title(" 1 Mile Buffers and Cancer Rates in Community Areas")
plt.legend()
plt.show()
```

```
/var/folders/xp/13j7_6qs0bjcjm3r53h36v0h0000gn/T/ipykernel_45914/3426493884.py:6:
```

UserWarning: Legend does not support handles for PatchCollection instances.

See: https://matplotlib.org/stable/tutorials/intermediate/legend_guide.html#implementing-a-custom-legend-handler

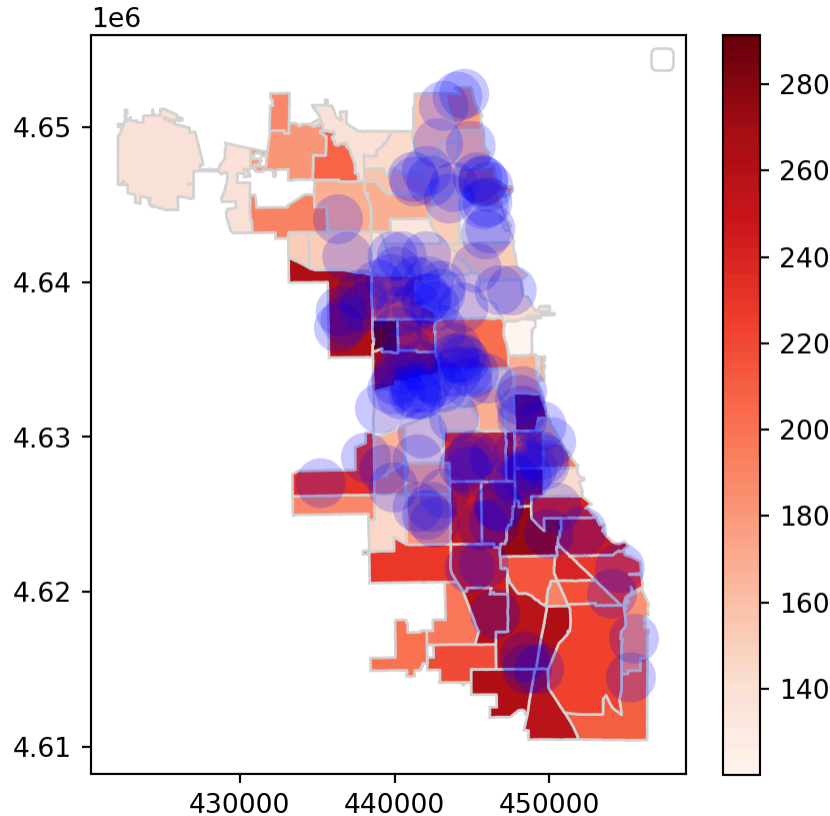
```
plt.legend()
```

```
/var/folders/xp/13j7_6qs0bjcjm3r53h36v0h0000gn/T/ipykernel_45914/3426493884.py:6:
```

UserWarning: No artists with labels found to put in legend. Note that artists whose label start with an underscore are ignored when legend() is called with no argument.

```
plt.legend()
```

1 Mile Buffers and Cancer Rates in Community Areas



Diabetes rate in Community Area

```
fig, ax = plt.subplots(1, 1, figsize=(5, 5))
chi_shp_dem.plot(ax=ax, column="Diabetes-related", cmap="Blues", edgecolor="lightgrey", le
buffers.plot(ax=ax, color="blue", alpha=0.2, edgecolor="None")

plt.title(" 1 Mile Buffers and Diabetes in Community Areas")
plt.legend()
plt.show()
```

/var/folders/xp/13j7_6qs0bjcjm3r53h36v0h0000gn/T/ipykernel_45914/1093011981.py:6:

UserWarning: Legend does not support handles for PatchCollection instances.

See: https://matplotlib.org/stable/tutorials/intermediate/legend_guide.html#implementing-a-custom-legend-handler

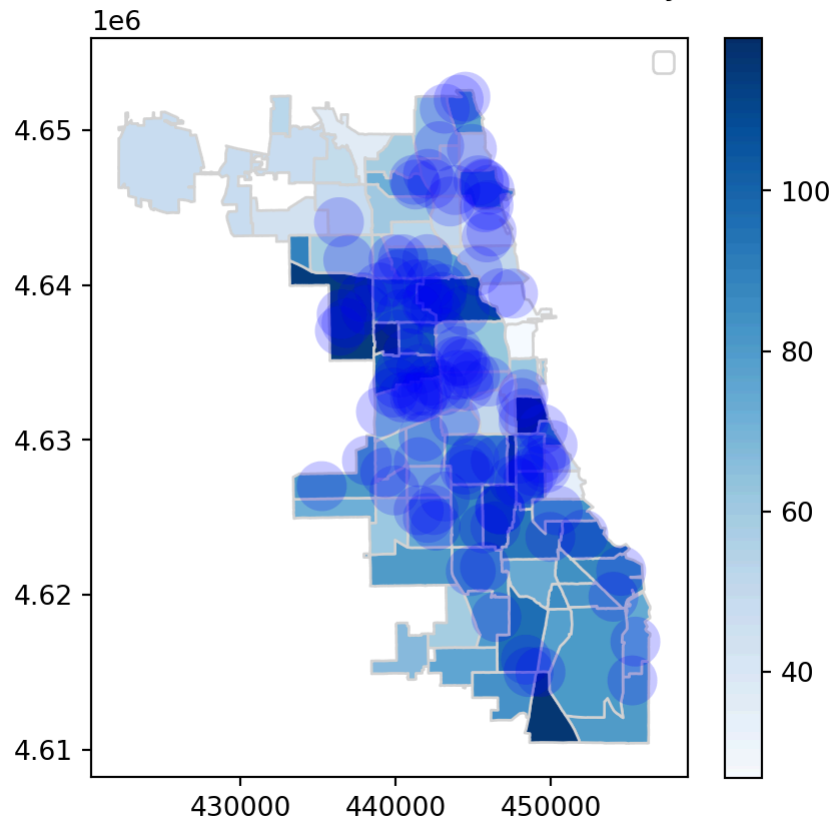
```
plt.legend()
```

/var/folders/xp/13j7_6qs0bjcjm3r53h36v0h0000gn/T/ipykernel_45914/1093011981.py:6:

UserWarning: No artists with labels found to put in legend. Note that artists whose label start with an underscore are ignored when legend() is called with no argument.

```
plt.legend()
```

1 Mile Buffers and Diabetes in Community Areas



Below Poverty Level in Community Area

```
fig, ax = plt.subplots(1, 1, figsize=(5, 5))
chi_shp_dem.plot(ax=ax, column="Below Poverty Level", cmap="Greens", edgecolor="lightgrey")
buffers.plot(ax=ax, color="blue", alpha=0.2, edgecolor="None")

plt.title(" 1 Mile Buffers and Below Poverty Level in Community Areas")
plt.legend()
plt.show()
```

/var/folders/xp/13j7_6qs0bjcjm3r53h36v0h0000gn/T/ipykernel_45914/1547493664.py:6:

UserWarning: Legend does not support handles for PatchCollection instances.

See: https://matplotlib.org/stable/tutorials/intermediate/legend_guide.html#implementing-a-custom-legend-handler

```
plt.legend()
```

/var/folders/xp/13j7_6qs0bjcjm3r53h36v0h0000gn/T/ipykernel_45914/1547493664.py:6:

UserWarning: No artists with labels found to put in legend. Note that artists whose label start with an underscore are ignored when legend() is called with no argument.

```
plt.legend()
```

1 Mile Buffers and Below Poverty Levelin Community Areas

