**Space Informatics Lab – University of Cincinnati** 



Working with racial dot maps in QGIS



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## High resolution demographic grids and racial dot map

#### SocScape – exploring U.S population/racial composition online

http://sil.uc.edu/webapps/socscape\_usa/



**SocScape** is a GeoWeb application for exploring and detecting change of population density and racial diversity over the entire U.S.

It allows to download data for selected region (up to 100 000 km<sup>2</sup>).

**Data availability:** total population and racial diversity grids for 1990, 2000, 2010

#### SocScape data – downloading data for counties and MSA

http://sil.uc.edu/cms/index.php?id=socscape-data



**Population, subpopulation and racial diversity** grids are available for each county and for 363 MSA as a zip archive containing data for 1990, 2000, 2010.

*Change maps* are available for urban areas within 363 MSA for 1990-2000, 2000-2010, 1990-2010 comparison.

Data are saved as GeoTiff and shapefiles (change map) and can be opened in GIS software (ArcGIS, QGIS)

#### SocScape – racial dot maps

#### http://sil.uc.edu/cms/index.php?id=socscape-racial-dot-map



**Racial dot map** was calculated based on 2010 high resolution grids for all counties in the conterminous U.S. Racial dot map include 7 race categories: (non Hispanic) white, black, Asians, Pacific Islander, Native American, Others and Hispanic.

Data are available as a shapefile for each county. Race categories are stored in race\_cat column in the attribute table, race\_id contain numeric identyficato of each race.

#### 2. Racial dots maps



Fig. 1. Racial dot map based on high resolution grids

Racial dot map is a type of dot density map (or dot distribution map) - a map that uses a dot symbol to show the presence of a feature and a color to indicate feature's type. In a racial dot map, features are people and colors correspond to their race. Dots are randomly placed within a census units or grid cell.

Racial dot maps were popularized by web applications from the University of Virginia (https://demographics.virginia.edu/DotMap/), which is one-person-perdot map based on census block data, and from the New York Times (https://www.nytimes.com/interactive/2015/07/08/us/census-race-map.html), which is a 40-people-per-dot map based on census tracts data.

Racial dot map are usually calculated based on census units. Here we calculated it based on high resolution grids.

#### 3. Download racial dot map for selected county

#### Download racial dot map for Cook County, IL.

- From the dropdown menu select the Illinois as a state name. Click on "Download" button to download a zip archive with the racial dot maps for all counties in the state of Illinois. Name of state zip archive contain 2-letters state code (i.e IL indicate Illinois)
- Unzip a downloaded zip archive named *IL.zip*. Directory will contain zip archives for each county in the state of Illinois.
- Find zip archive named *il\_cook.zip* and unzip it. The directory will contain racial dot map in the ESRI Shapefile format for the Cook county, IL.

Name of each zip archive contains 2-letters state code and county name. In this example file will be named il\_cook.zip, which indicates Cook county in the state of Illinois.

Select the state name from the dropdown menus below and click "Downolad"

Fig.2. Download racial dot map for Cook county, IL.

## 4. Getting started with QGIS

QGIS is available on Windows, MacOS X, Linux and can be downloaded from <a href="http://qgis.org/en/site/forusers/download.html">http://qgis.org/en/site/forusers/download.html</a>

To install QGIS download version for your operating system and follow the wizard installation instruction.



Fig.3. QGIS main window

QGIS has a lot of documentation which is available at <u>http://docs.qgis.org</u> Please visit <u>http://docs.qgis.org/2.18/en/docs/user\_manual/index.html</u> for detailed user manual.

QGIS GUI is described here: http://docs.qgis.org/2.18/en/docs/user\_manual/introduction/qgis\_gui.html

This short guide assumes using QGIS v2.18 for Windows.

# Open racial dot map in QGIS

Racial dot map is available as vector in shapefile format.

#### Load vector data to QGIS

- from main menu choose Layer Add vector Add Vector Layer or choose the icon V in the left panel of QGIS window.
- select *il\_cook from the direcotry with the same name as a vector file* and open it.

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Fig.4. Open il\_cook shapefile in QGIS

It will be assigned only one color to all dots. In the next step we need to assign colors based on racial categories.



Fig.5. Racial dot map in QGIS

# Symbolizing vector layer based on QGIS Style file

(Please download a *dot\_map\_color.qml* file from http://sil.uc.edu/cms/index.php?id=socscape-racial-dot-map)



To view and set the properties for a vector layer, double click on the layer name in the map legend, or right click on the layer name and choose *Properties* from the context menu. This will open the *Layer Properties* dialog.

#### Fig.6. Properties from context menu

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	Add Rename Current (default) Add select style name (dot_map_color.qml) click OK.	
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Fig.7. Vector layer properties dialog

## Symbolizing vector layer based on QGIS Style file

(Please download a *dot\_map\_color.qml* file from http://sil.uc.edu)

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#### Fig.8. Vector layer style dialog.



Fig.9. Racial dot map displayed using predefined colors.

# Navigate to area of interests

Using pan and zooming icon choose area of interests.



Pan a map



Zoom in/Zoom out



Fig.10. Racial dot map for the part of the Cook county (Chicago, IL)

#### Save map as image

Map displayed in Map window in QGIS can be saved as image (PNG, JPG) using *Projects – Save as image* from main menu.



Fig.11.Racial dot map for the part of the Cook county (Chicago, IL)

# Plugins

Plugins provide many new features and functions to QGIS. One of example is OpenLayers Plugin, which provides Google, Bing and Open Street map to be displayed in QGIS.

Plugins are available in *Manage and install plugins from Plugins menu.* 

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	🚖 AmigoCloud		download. Some plugins come with your QGIS						
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	🚖 ArcheoCAD		Via the plugin repositories.						
	🚖 Area Along Vector		You can temporarily enable or disable a plugin. To						
	🚖 Arrows		doubleclick its name						
	🚖 Attribute based clustering		Plugins showing in red are not loaded because						
	🚖 Attribute painter		there is a problem. They are also listed on the						
	🚖 AutoFields		'Invalid' tab. Click on the plugin name to see more						
	🚖 autoSaver		details, or to reinstall or uninstall this plugin.						
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	🚖 Backup layer								
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Fig.12. The 🊵 All menu (Plugins dialog)

# Install OpenLayers Plugin



- Select *All* in Plugin menu and choose **OpenLayers Plugin** from the available list.
- OpenLayers Plugin will be highlighted, then click on Install Plugin button on the bottom right part of the dialog window.
- OpenLayer Plugin will be installed.

Fig.13. Installation of OpenLayers Plugin.



Fig.14. Installation of OpenLayers Plugin.

Check OpenLayer Plugin to activate it.

## Working with OpenLayers Plugin

Choose *Web – OpenLayers plugin* menu and select one of the available basemap. There are available Bing Maps, Google Maps, OpenStreetMap and more. You can choose between "Street" map, "Satelitte image " map or "Hybrid".



Fig.15. OpenLayers Plugin menu.



Fig.16. Bing road maps and racial dot map in QGIS.

#### 6. Exploring racial dot map in QGIS Using pan 🖑 and zooming 🗩 🔎 icon choose area of interests. Edit View Layer Settings Plugins Vector Raster Database Web Processing Help / 🖯 ் 伝・:友 前 🌂 🕯 🚺 🖷 🌍 🖷 🧠 🦷 🖷 CSW W Oakdale Av V . .anaconda Po .ipython .matplotli q. .qgis2 Q 😽 🥼 💌 🚏 🖓 🔹 🕼 ≽ V il cook · ASIAN 9. 17 BLACK V ✓ HISPANIC V NATIVE AMERICANS V . OTHER\_RACE 🔽 · PI WHITE V **Bing Ro** orporation © 2018 HERE Tenhs of Use - A Magnifier 100% Rotation Render OFSG:3857 (OTF)

Fig. 17. Racial dot map for the part of Chicago.

Scale 1:4810

-9765586,5150689

0

0.0

# Change size of the dots

Dot size is dependent on the zoom of the map. For street level zoom you can change dots size for the bigger one.



🕺 Dialo	og	
Size	1.4	
	OK	Cancel

Fig.18. Changing dot size.



Fig.19. Racial dot map for the part of Chicago – changed dot size.

## 7. Symbolizing vector layers

#### Symbolizing vector layer based on racial categories

This part of the tutorial describe how to assign your own colors based on racial categories.



Fig.20. Properties from the context menu

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Fig.21. Vector layers properties dialog

#### 7. Symbolizing vector layer

#### Symbolizing vector layer based on racial categories



Fig.23. Symbol selector menu.

#### 7.Symbolizing vector layer

#### Symbolizing vector layer based on categories

(Please download a *dot\_map\_color.qml* file from http://sil.uc.edu)

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Click on Classify to assign random colors to each race categories.

#### Fig.24. OpenLayers Plugin menu.

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Right click on the name of race category and from the context menu choose "Change color". Assign selected color to each race category.

Fig.25. Change color for particular race

# **HIGH RESOLUTION GRIDS**

#### **Data description**

http://sil.uc.edu/cms/index.php?id=high-resolution-demographicgrids-data-description

#### SocScape User guide

http://sil.uc.edu/cms/data/uploads/pdf/manuals/socscape/socsca pe\_userguide.pdf

#### SocScape tutorial – working with demographic grids in QGIS

http://sil.uc.edu/cms/data/uploads/pdf/manuals/socscape/socsca pe\_qgis.pdf

#### PAPERS

A.Dmowska, T.F. Stepinski, P. Netzel (2017) *Comprehensive framework for visualizing and analyzing spatio-temporal dynamics of racial diversity in the entire United States.* PLoS ONE 12(3): e0174993. doi:10.1371/journal.pone.0174993

A.Dmowska, T.F. Stepinski (2017) *Mapping changes of racial composition in the United States: 1990–2010.* Annual Meeting of Population Association of America, Chicago, IL, April 26-29 2017