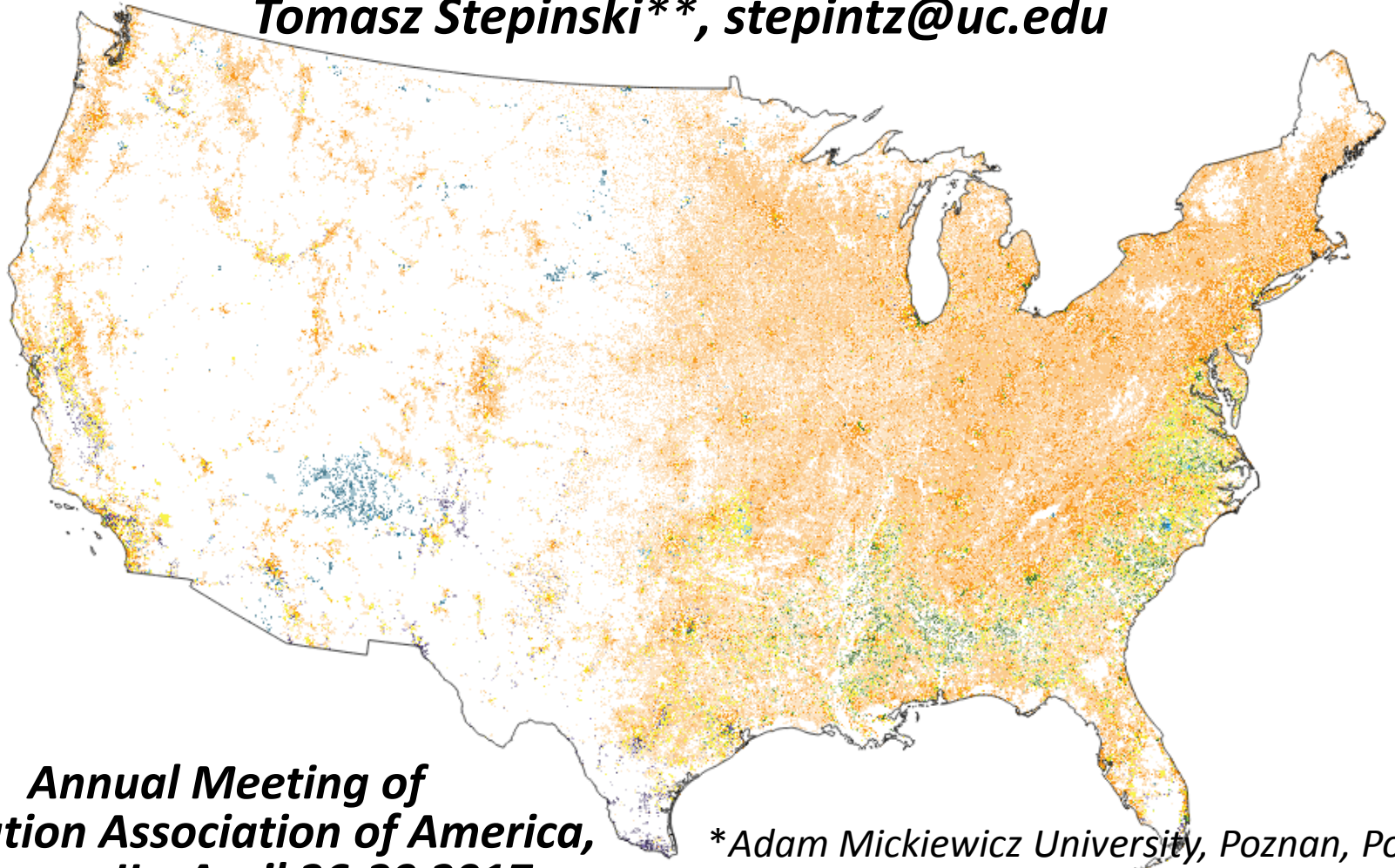# Mapping changes of racial composition in the United States: 1990-2000-2010.

Anna Dmowska,dmowska@amu.edu.pl*
*Tomasz Stepinski**, stepintz@uc.edu*
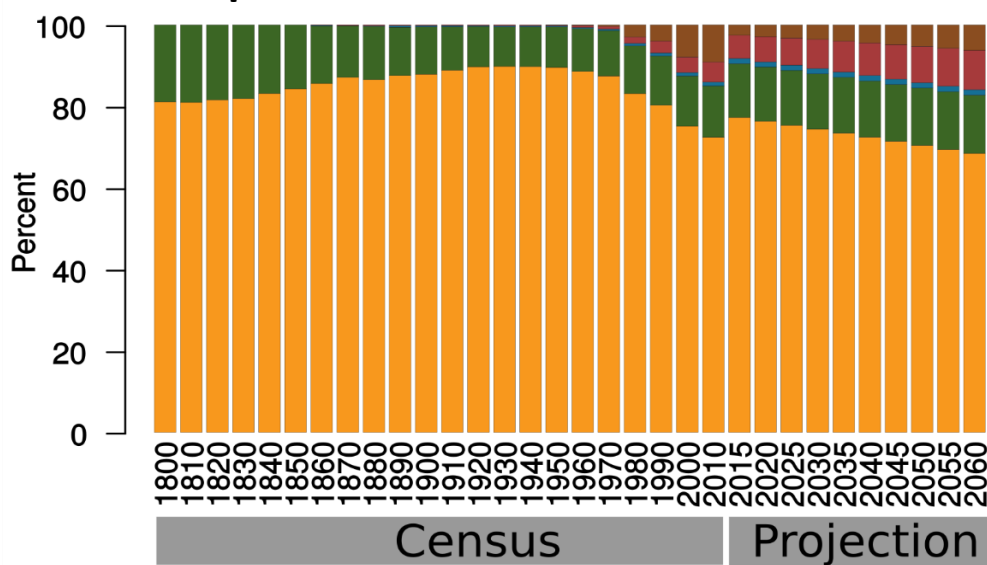
Annual Meeting of
Population Association of America,
Chicago, IL, April 26-29 2017

Adam Mickiewicz University, Poznan, Poland
** University of Cincinnati, Cincinnati, OH*

Racial makeup in the United States

**Racial composition in the United States: 1800-2060**

- The American society is a composition of different race and ethnicity groups.
- Racial composition changes over time and is steering U.S into overall multiethnic society by **2045** (U.S Census population projection).

Will overall multiethnicity translate into spatialy diverse communities?

- To answer this questions we need high quality, multi-year compatible data and spatial methods to its analysis.

Racial/ethnic composition in the U.S. 1990-2060

White Black Asian Native American Other Hispanic
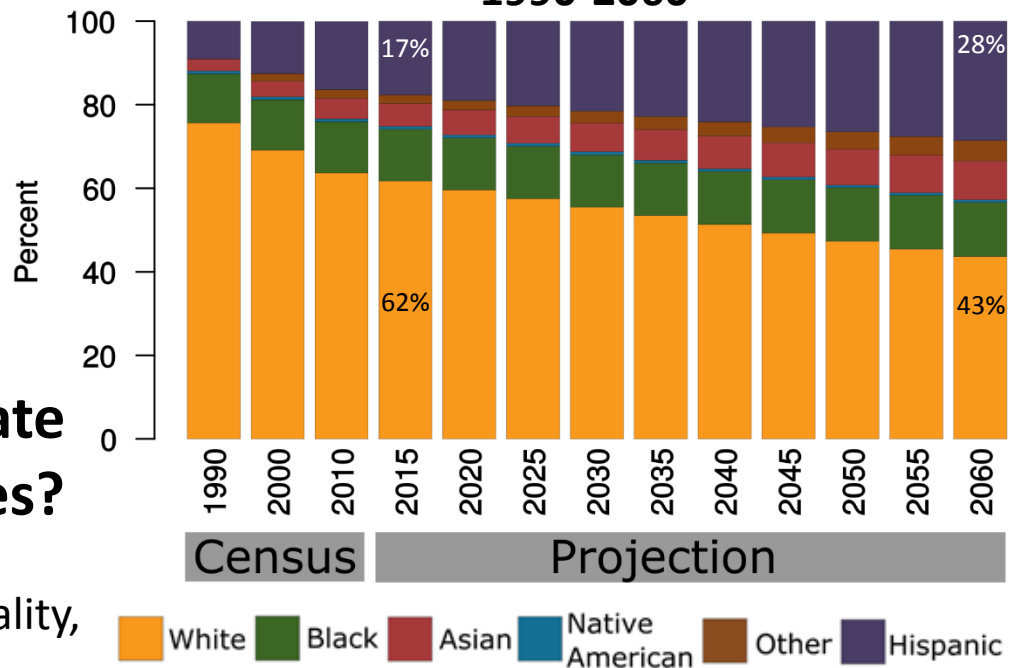
Approach to racial diversity analysis

Percentage of race/ethnicity group

Race	1990	2000	2010
White	33.9	27.2	29.6
Black	33.6	31.8	27.2
Amer.	0.2	0.3	0.3
Asian	2.6	4.1	6.7
Other	0.1	0.6	0.2
Hipanic	29.6	36	36

Single number indices

Dissimilarity index

Race	1990	2000	2010
B-W	0.86	0.81	0.73
As-W	0.52	0.47	0.43
Am.-W	0.72	0.38	0.38
O-W	0.77	0.40	0.32
H-W	0.67	0.66	0.70

H index

1990	2000	2010
0.58	0.51	0.45

Classification schemes

Mixed Metro project

Classess	# of census tract		
	1990	2000	2010
UNH	9	3	0
WL	45	17	16
BL	110	106	84
AL	1	1	2
HL	42	52	53
WM	63	76	87
BM	13	22	38
AM	6	9	8
HM	50	52	48
Hdiv	0	1	3
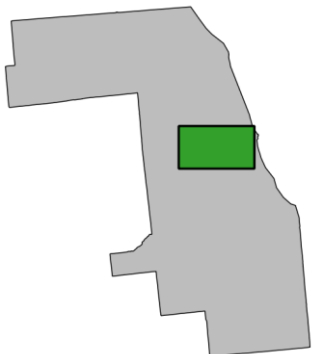
All calculation and maps in this presentation are for the part of the Cook County, IL (central Chicago).

Approach to racial diversity analysis

Class	WL	BL	AL	HL	UNH
#	16	84	2	53	0
Class	WM	BM	AM	HM	Hdiv
#	87	38	8	48	3
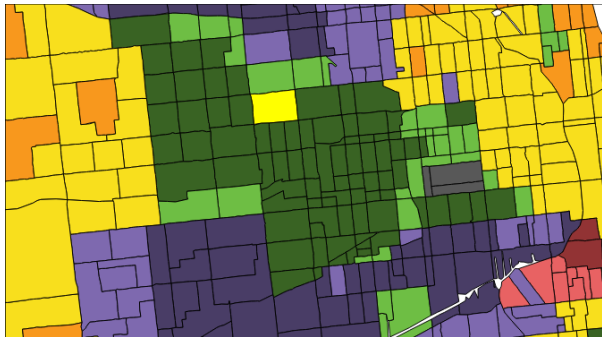
- They are **based on tabular data available for aggregated census units** (mostly census tracts) and the **results are also summarized in tabular**, non-spatial form.

- These approaches **are prepared to compare racial composition between cities**, but they don't tell much about spatial pattern within cities.

- Logan (2016) pointed out **that the most powerful tool for spatial analysis of residential segregation is creating the maps** that visualize a spatial pattern of different communities.

- Although **maps became more popular in demographic studies**, they are still **not widely used**.

- Preparing maps required GIS skills and software to handle different types of data.

- Availability of "ready-to-use" maps is limited.

Resources for mapping racial diversity change
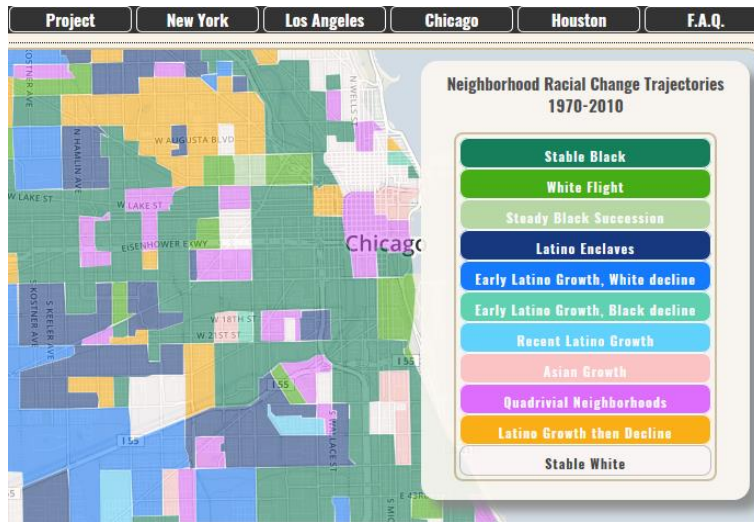
Neighboorhood racial change trajectories: 1970 – 2010

http://mikebader.net/media/neighborhoodtrajectories/

- Provided as classified census tracts only for Chicago, New York, Houston, Los Angeles
- Available only as web application
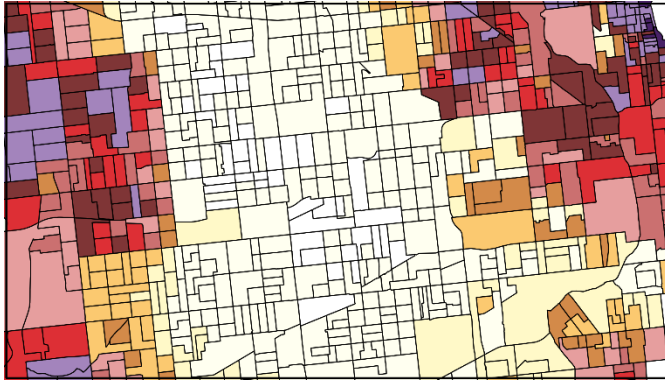- No option for dowload maps

Mixed metro project

http://mixedmetro.com/
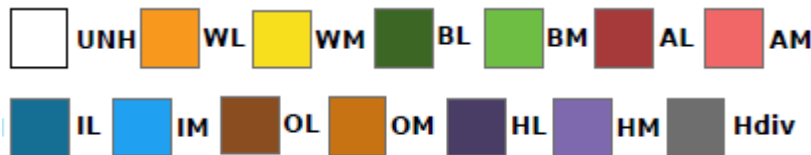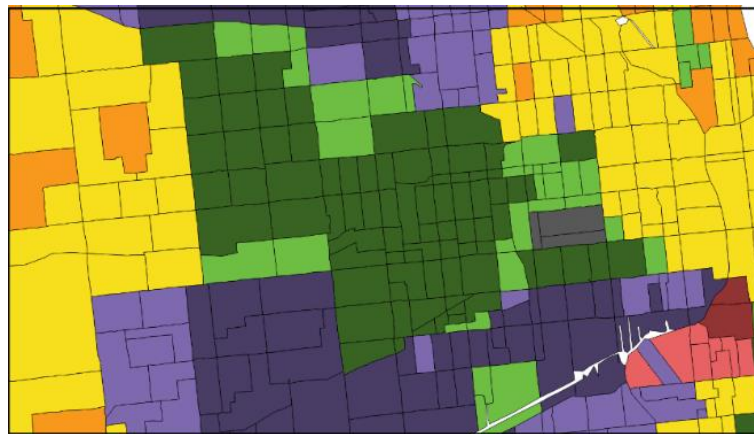
- Provided as classified census tracts for 53 MSAs and all states for 1990, 2000, 2010
- Web application and shapefiles for download

Limitation of aggregated data

Percentage of whites in 2010

Block groups

Census tracts
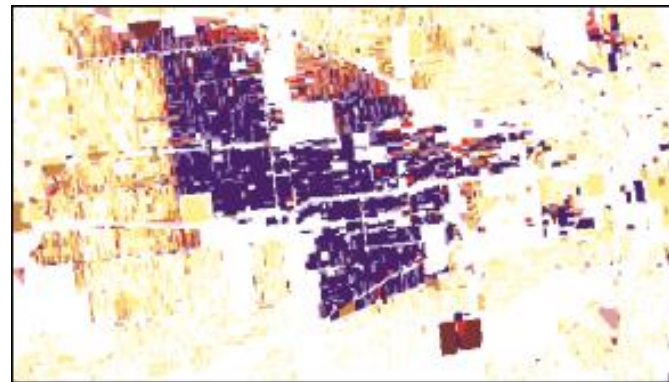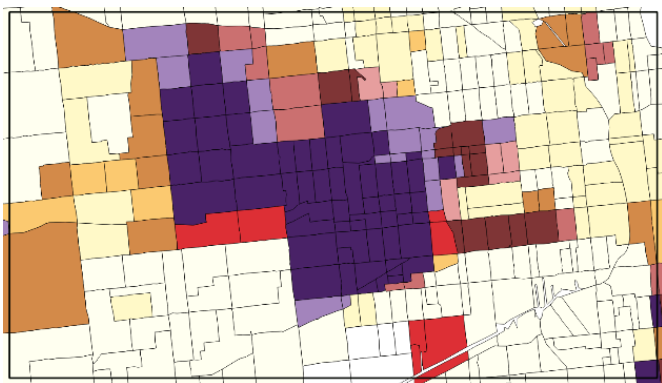

Census tract 2000 and 2010
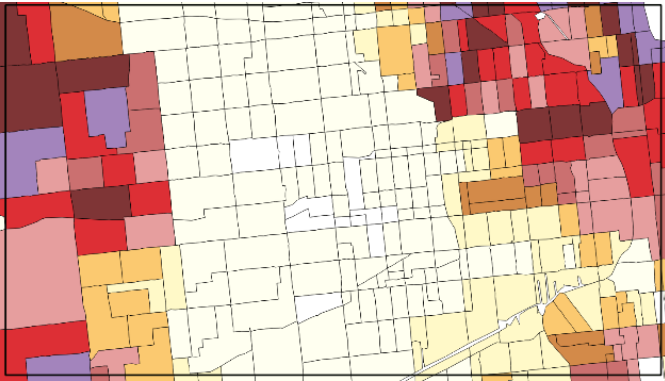
DATA AGGREGATED TO UNITS

Spatial resolution dependent on the choice of Census units and spatially varying; lower in rural areas, higher in urban areas

Mapped population is **distributed uniformly** within each Census unit

The extents of **Census units change with time**, which makes difficult year-to-year comparison

Aggregated vs. gridded data

ELEMENT	DATA AGGREGATED TO UNITS	GRIDDED DATA
Spatial resolution	**dependent on the choice of Census units** and spatially varying; lower in rural areas	**high and spatially constant**; defined by the size of the cell
Uniformity	mapped population **distributed uniformly** within each Census unit	mapped population density **changes continuously from cell to cell**
Temporal change	the extents of **Census units change with time**, which makes difficult year-to-year comparison	grid **enables direct** cell-to-cell **temporal comparison**

Since 2013 we undertook a project aimed at **developing "ready-to-use" high resolution grids** of population and racial diversity and making it **freely available for the entire U.S.**

# High resolution population, racial diversity grids
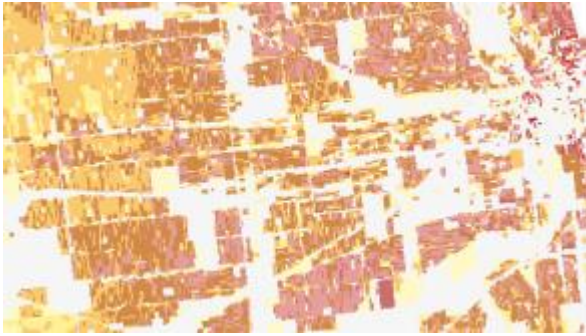
Population and subpopulation grids

Results of dissagregation of block-level data into grid cells using dasymetric modeling.
Subpopulation grids are available for 7 race/ethnicity groups.

Racial diversity classification grids

Racial diversity maps show **spatial character of racial diversity accross the U.S**. It is a result of **three dimensional** (diversity, dominant race, population density**) classification** of grids cells based on population/subpopulation grids.
The resultant map has **40 categories.**
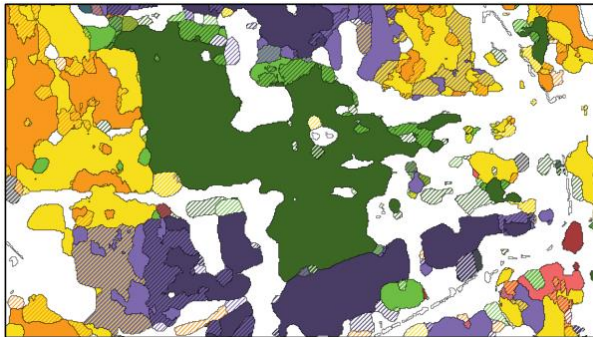
Racial diversity change dataset

Show temporal change in racial diversity in **a single map**.

Providing open access to hi-res grids

http://sil.uc.edu/webapps/socscape_usa/

Selected region

Download tool

Use mouse to select region of the map. Size of the region is limited to 100000 km²

Population data to download:

Racial diversity 2000

Download extent:
(41° 56' 27"N 87° 50' 7" W)
(41° 49' 33"N 87° 36' 12" W)

GeoTIFF
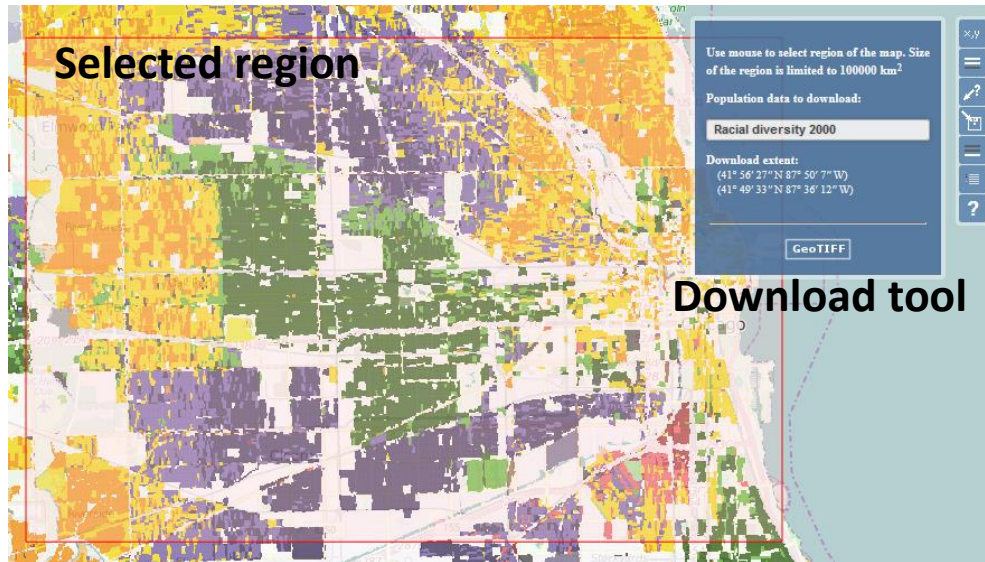
SocScape:

- **Exploring and detecting change** of population density and racial diversity **in different scales** (from U.S. down to the street)
- **Download data** for selected region (to 100 000 km²)
- Data:
  - Population grids
  - Racial diversity classification
- Time: 1990/2000/2010

Illinois — Cook County — Download

Zip archives for counties and metropolitan areas

- Spatial extent:
  - 3100 counties
  - 363 MSA
- Data:
  - Population and race/ethnicity grids
  - Racial diversity classification
  - Racial change dataset (only MSA)
- Time: 1990/2000/2010

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

From aggregated data into hi-res grid

Block 1006, census tract 3000 Hamilton County, Ohio

Aggregated data

256

Ancillary data

Residential areas

Non-Urban areas

Uninhabited areas

Dasymetric model

People/km²

0	5-10	100-500	5000-10000
0-1	10-50	500-1000	> 10000
1-5	50-100	1000-5000	

NHW	NHB	NHAS	NHO	H
153	18	78	4	3

From aggregated data into hi-res grid

Dasymetric modeling refers to a process of **disaggregating spatial data to a finer unit** of analysis, **using additional** (or **ancillary**) **data** to help refine locations of population or other phenomena (Mennis 2003).

Aggregated data

Ancillary data

Residential areas

Non-Urban areas

Uninhabited areas

Dasymetric model

0.25% pop.

99.75% pop.

255 pop

77

Total population

Asians

People/km²

0	100-500
0-1	500-1000
1-5	1000-5000
5-10	5000-10000
10-50	> 10000
50-100	
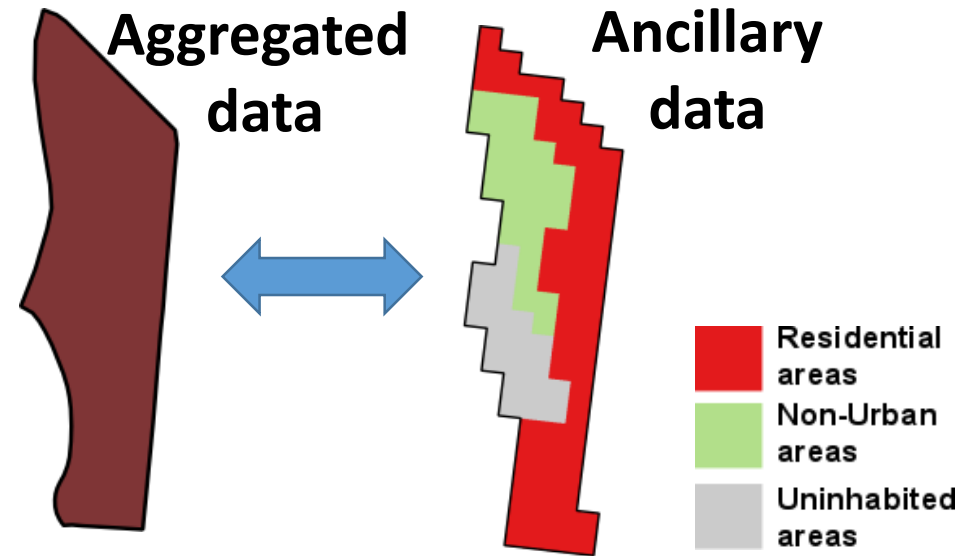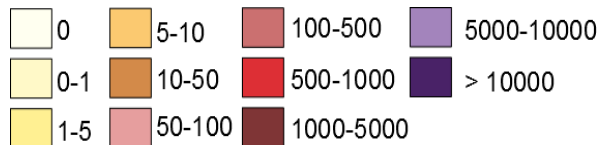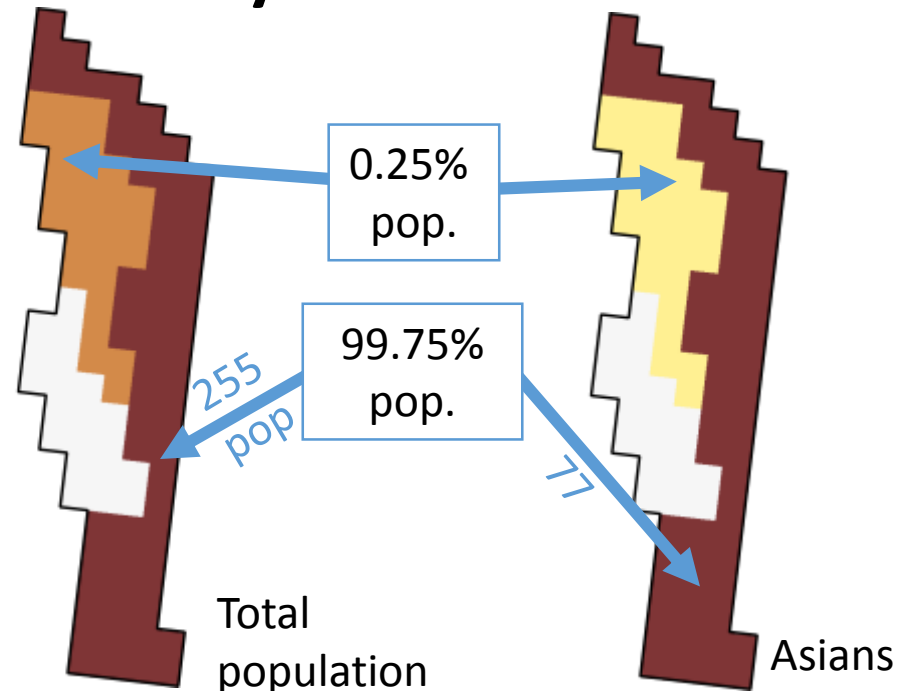
Dependence of racial diversity classification on spatial resolution

Census tract
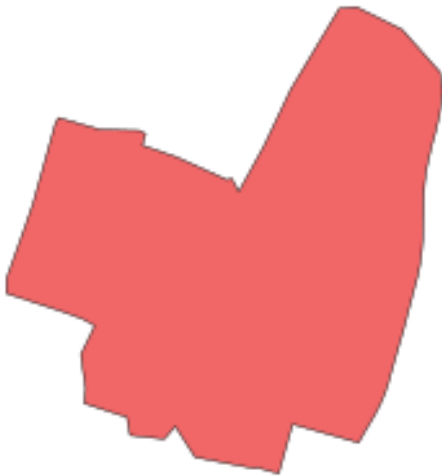
Block level

Hi-res grid

Medium diversity dominated by Asians
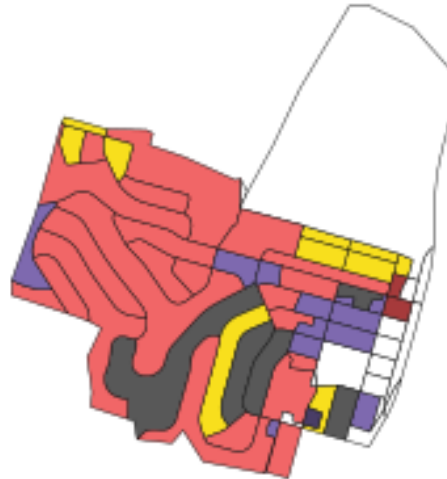
Medium diversity dominated by Whites

Low diversity dominated by Asians

Medium diversity dominated by Hispanic

High diversity

Uninhabited
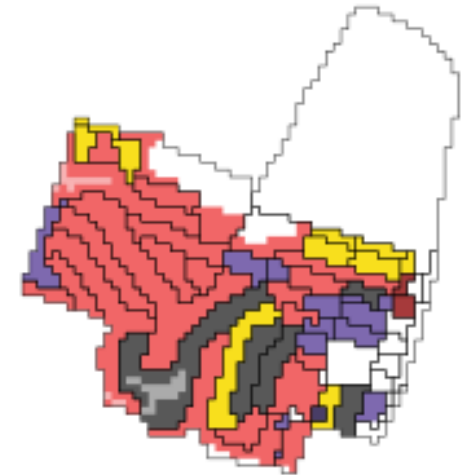
Medium diversity, low density dominated by Asians

High diversity, low density

Accuracy of block level data with additional information about uninhabited areas and population density

Percentage of

	Aggregated data	High resolution grids
white		
black		
Asian		
Hispanic		

From aggregated data into hi-res grid

Legend:
- 0
- 0-10
- 10-20
- 20-30
- 30-40
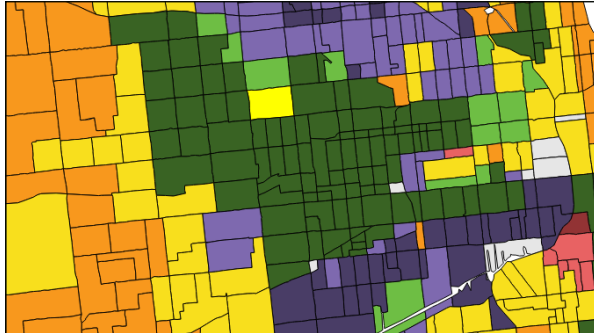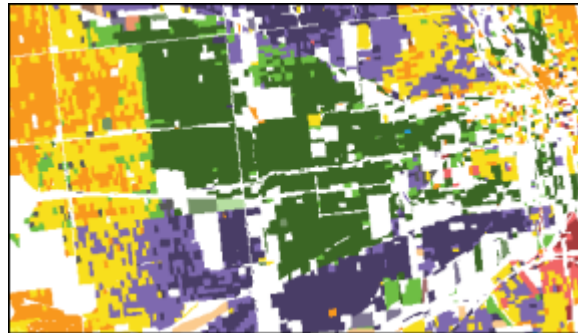- 40-50
- 50-60
- 60-70
- 70-80
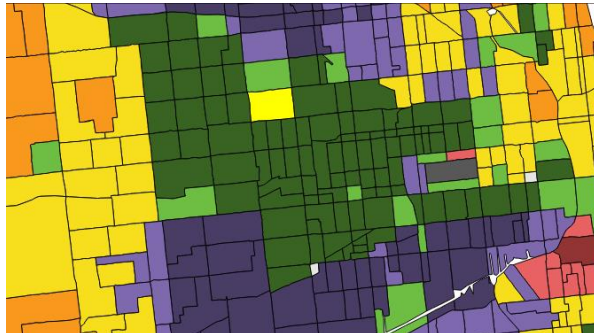- 80-90
- 90-100%
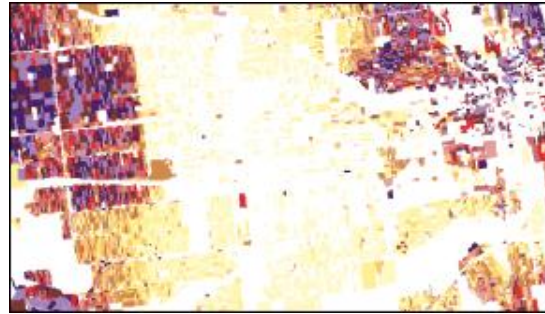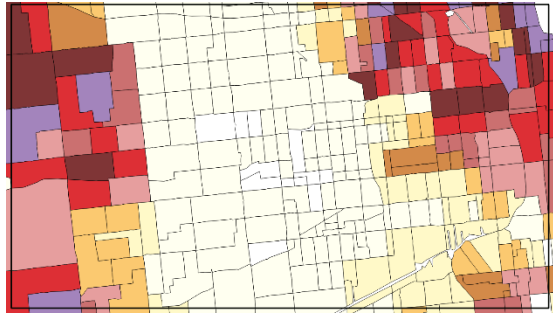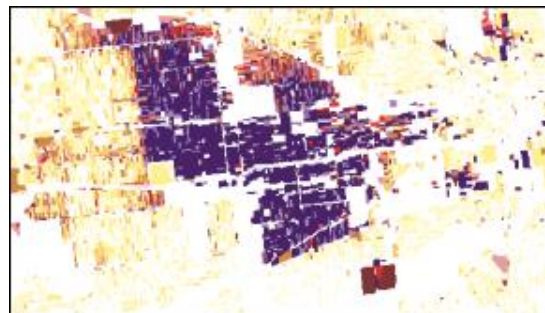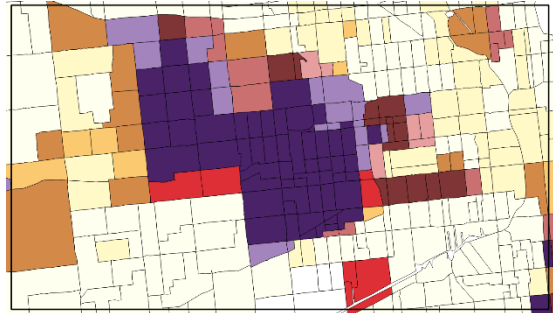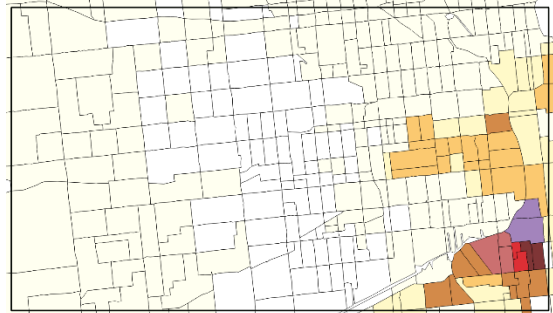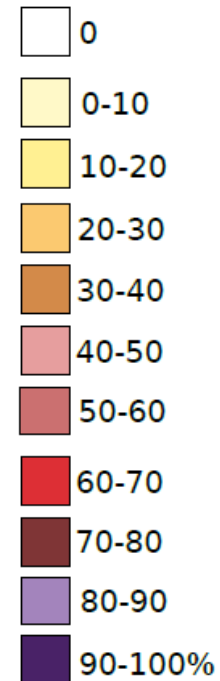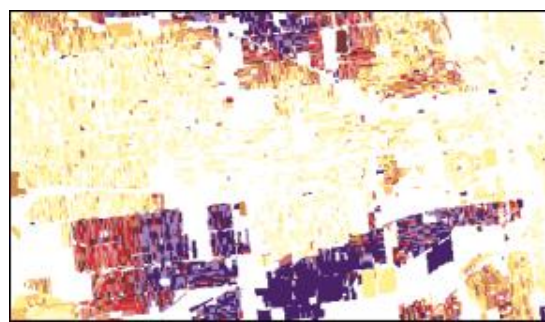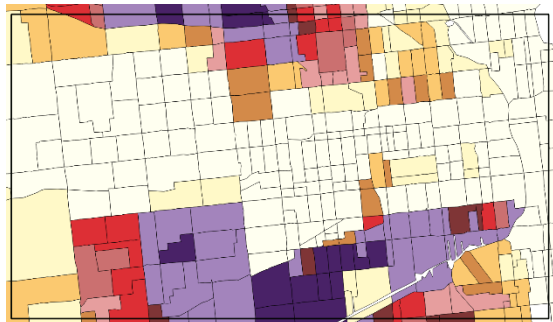
Racial diversity classification
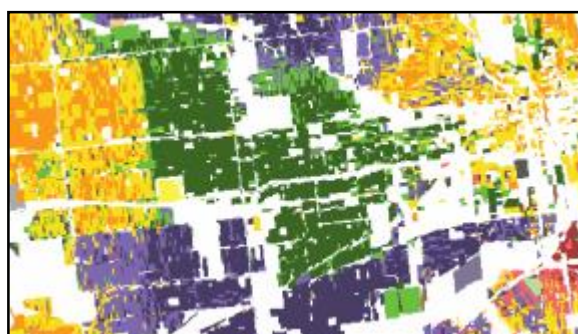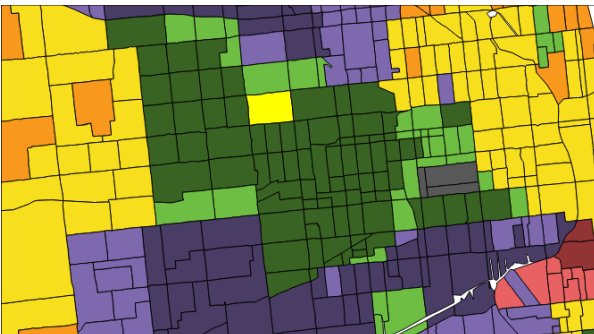
Aggregated data

High resolution grids

1990
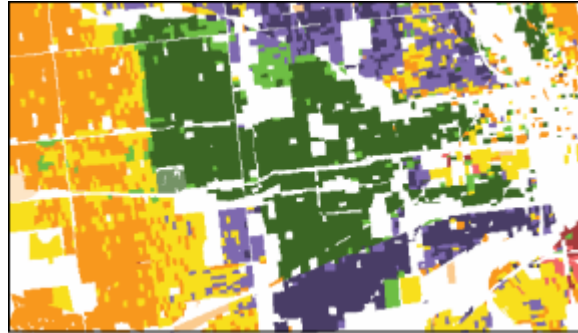
2000

2010

Mixed Metro project

White
High **Med** *Low*
Low
Med

Black
Low
Med

Asians
Low
Med

Native Am.
Low
Med

Other
Low
Med

Hispanic
Low
Med
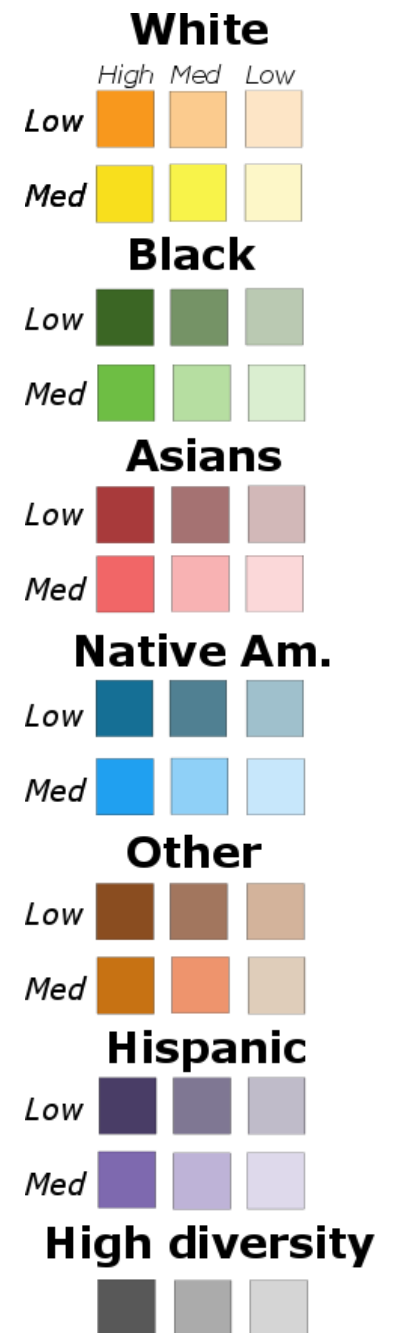
High diversity
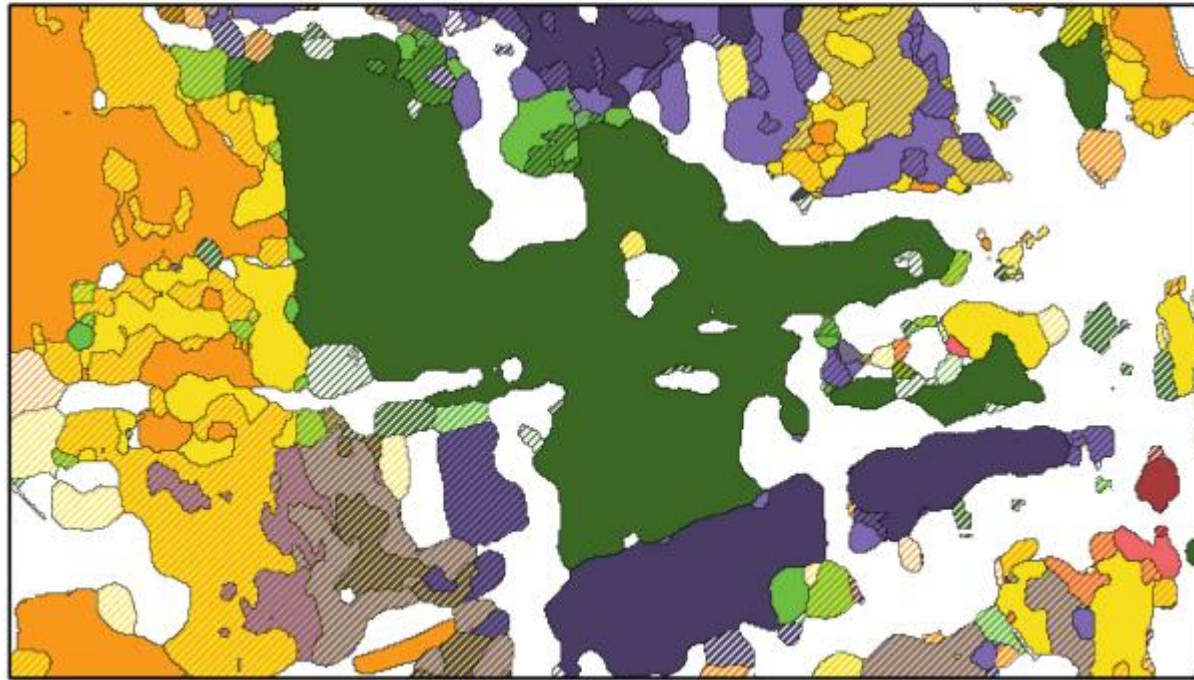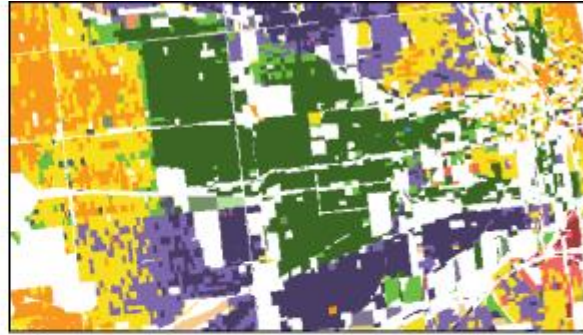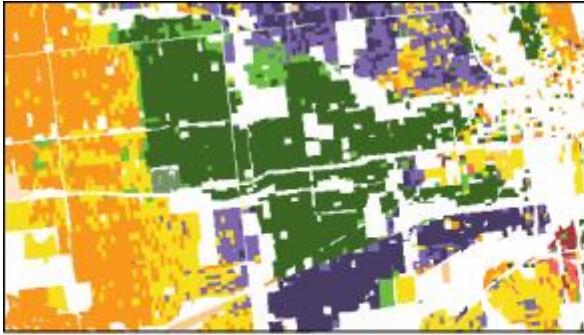
Racial diversity change classification

1990
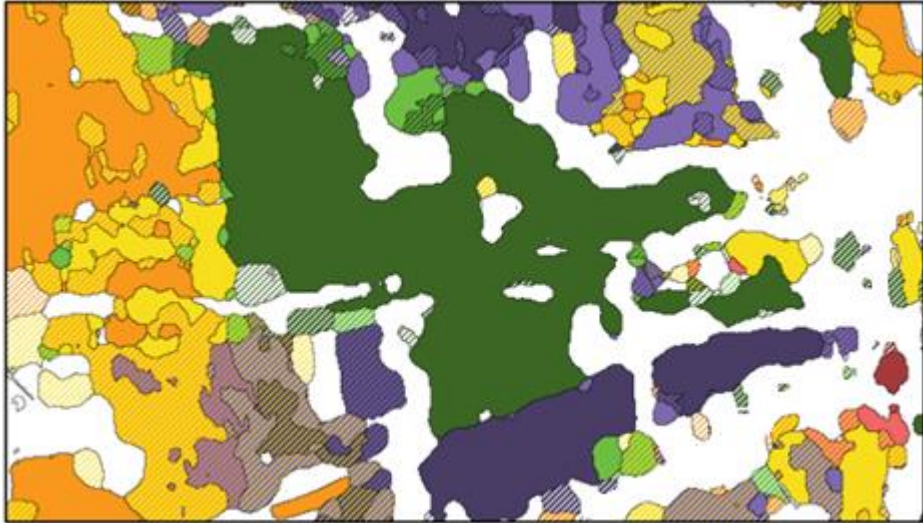

2000

1990-2000

White low diversity (no change between two years)

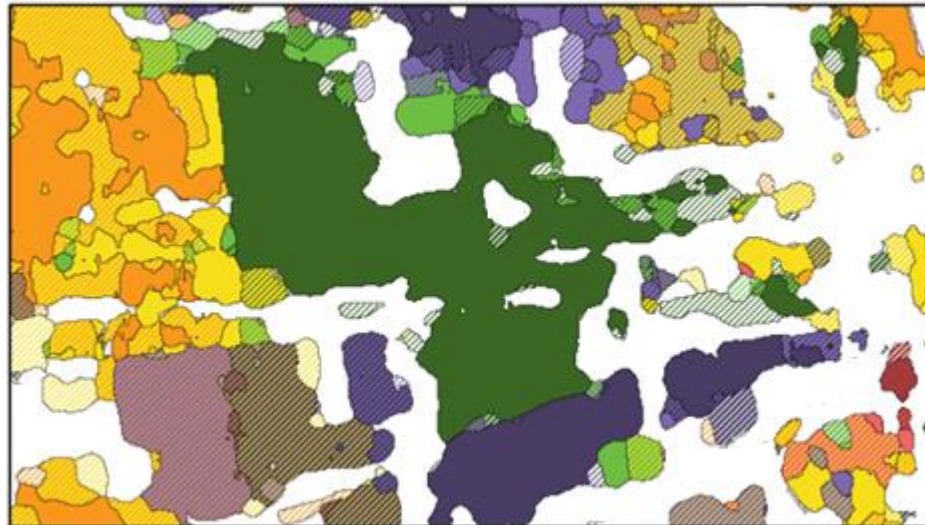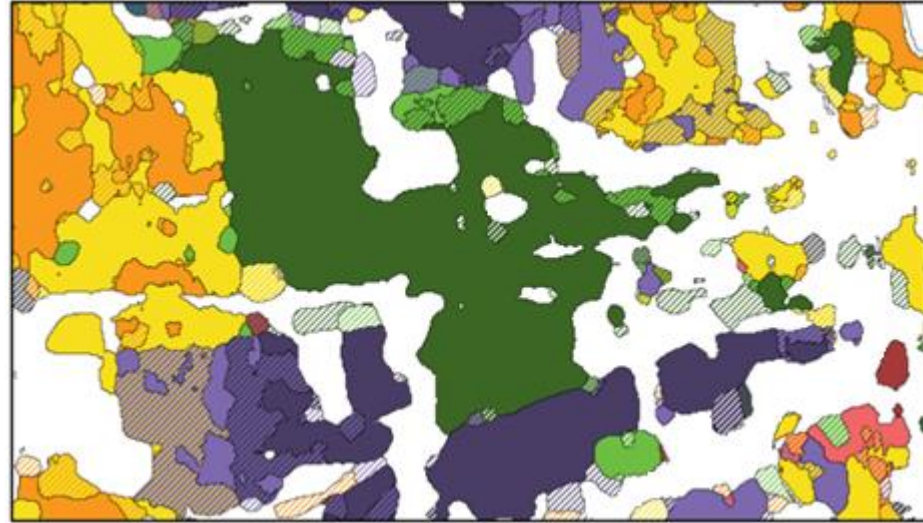Change from *white low diversity* (narrow orange stripes) into *white medium diversity* (broader yellow stripes)

UNH   WL   WM   BL   BM   AL   AM

IL   IM   OL   OM   HL   HM   Hdiv

Racial diversity change classification

1990-2000
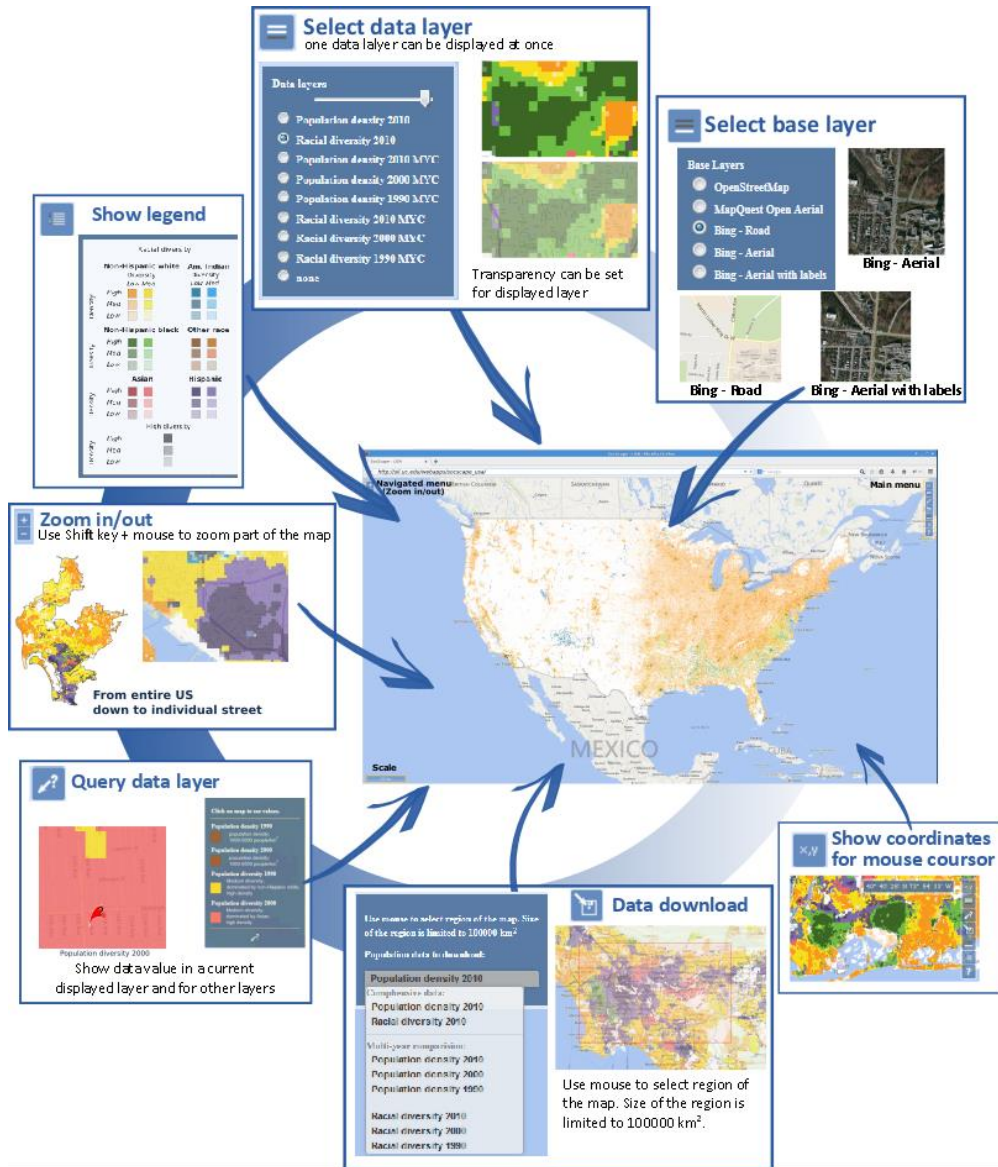
2000-2010

1990-2010

Conlusion

- **Mapping changes** in racial composition of neighboorhoods **helps in understanding** the spatial component of racial dynamics.

- **Easy access to ready-to-use maps can extend their use.** Unlike self-prepared maps, it doesn't required GIS skills to handle them.

- **As a contribution to the comunity we have developed a U.S-wide database** of population and racial diversity grids **which are easy to access and work with.**

- We developed **SocScape** – a Geoweb applitacion to **provide free, open and easy access to our resources.**

http://sil.uc.edu/webapps/socscape_usa/