# data

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# outline

regular (not gis) data

gis data (has shapes, can make a map from it)

the 'join'

Example: New Jersey Home Values

ps2 Spring2016 comments

old ps2

# ps0 comments

- i uploaded comments as comments.txt to your dropbox
- shapefile contains several files, not just .shp!
- remember about metadata: at least:
  - url of data
  - u/a
  - # of obs
- if you cannot find the right data, just email me

# data management takes time! value your time!

- producing maps and spatial statistics is fast
- most time (i'd say 50-95%) is data management:
  - figuring out, cleaning, documenting, combining, etc
- so we start with data management
- but only about 20% of class is dat mgmt
  - but it'll be about 80% of your time
- spend it on data you care about and will use in your career!
- note: join is difficult! start today/tomorrow on ps, ask Q!

# data

- a lot of data here:
  - `http://geocommons.com/search.html`
  - just search for what you are interested in, say 'road'
  - and see `https://www.policymap.com/maps`
  - they make you pay to downlad data, but can see source and download by hand

# open govt, especially city data

- just few examples
- trend is that more and more local, state, fed opens up
- `http://phlapi.com/` , `https://data.cityofchicago.org/` , `http://opencityapps.org/` , `https://www.metrochicagodata.org/` , `http://www.opendataphilly.org/` , `http://www.phila.gov/data/Pages/data.aspx`

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# files

- .xls(x)
- .csv
- etc etc
- but also .dbf! (part of shapefile)

## what are data?

- u/a: unit of analysis: what do you study?
- u/a=# of obs=# of rows=sample size
  - dataset has variables, which are the attributes of u/as
- say students: age; counties: water area
- if several layers: may have several u/as
- eg counties: #18; hospitals:#700
- dataset is a matrix/spreadsheet/2D object
- cols are vars, rows are obs
- vars are characteristics of obs
- eg: edu, age, inc are vars
  - and persons are obs–each row is a different person

# storage type: numeric v string

- string format is characters, eg "Camden"
- numeric is a number, eg "22"
  - real (can have decimals), eg "22.01"
  - integer (no decimals), eg "22"
- cannot do any math with strings; eg no thematic map
- it is a storage format, not data recognition
  - storage type=how computer sees it, not you (human)
  - numbers can be stored as strings; strings cannot be stored as numbers (this is how computer sees it)

# storage type: numeric v string

- strings are safer; eg string "0821" made into a number results in "821", which is a mistake !
  - that's why many software packages, incl qgis often store numbers as strings
  - but then we often need to make them into numeric to do the math or mapping
- be careful about it, triple check, there are often problems and it's non-intuitive

# metadata

- it's data about data, ie documentation of data
- have it, use it
  - most basic and important: u/a, # of obs, source/url
  - all ps require you have these "metadata"
- but there's also other metadata
  - eg codebook and variable definitions
  - it's important stuff for science:
- critical to have thorough/organized documentation of data

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# files

- .shp
- .kml
- etc etc

# shapefiles

- probably most popular
- actually 3 (or more) files:
  - .shp spatial data/coordinates ("main one" load this one)
  - .dbf attribute data
  - .shx other stuff
  - .prj projection
  - just manage it with gis soft, eg qgis

# kml

- another popular format: google .kml
- this is Google Maps format
- will cover it later

# other gis data

- there's much more
- we'll cover them on "as is" basis
  - if you bump into something else–let me know–we'll cover it

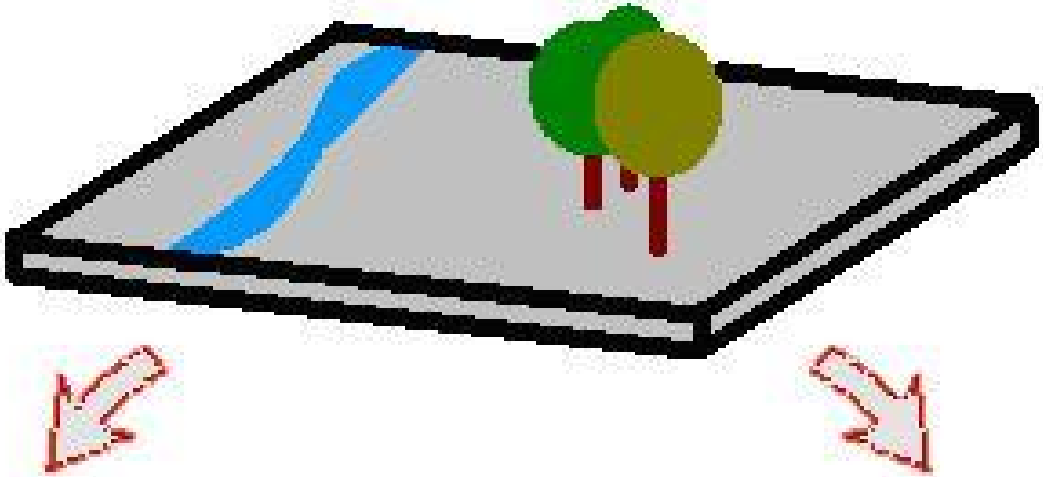
# spatial and attribute data

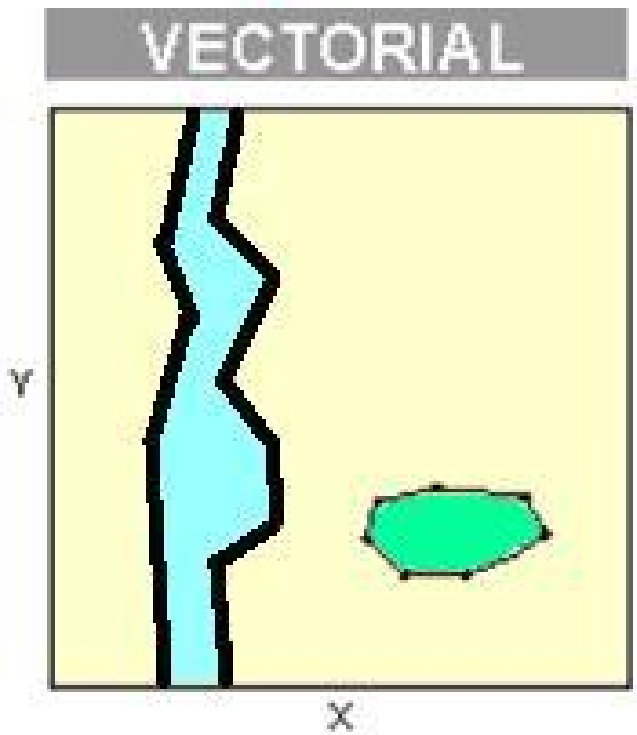
- spatial=location: where ?
  - coordinates, lat/lon
- attribute
  - what, how much, when
  - these are characteristics of a location
  - so the unit of analysis (U/A) is a location

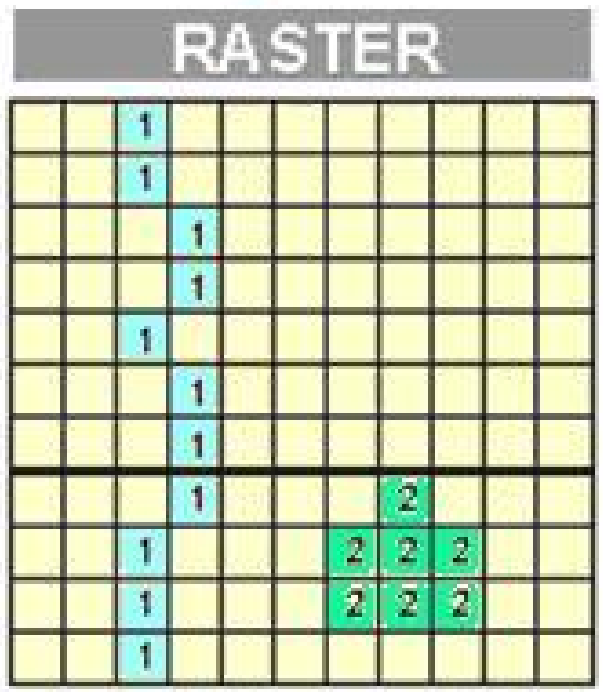
# raster and vector

- raster (has resolution)
  - area covered by cells/pixels
  - each cell/pixel have values/colors
- vector (no resolution): all real world features:
  - points (dots/nodes): airports, cities, trees
  - lines (arcs): rivers, roads
  - polygons (areas): counties, cities

# raster and vector





# gis or spatial data

- point: X,Y
- line: at least 2 X,Y
- polygon: at least 3 X,Y
- draw

# layers

- data is organized by *layers* covering themes, eg roads, admin boundaries, etc etc
- show example/draw a picture

## data, layers

- gis data is (always) location info (lat/long)+(usually) some regular data
- there always must be a data table with location info/shapes that underlies a map (and the data table usually contains some regular data, too)
- most of the time you want to superimpose different layers of gis data eg roads, cities, state boundaries, schools
- often you want to produce thematic (choropleth) maps
- thematic maps use different symbols/colors to show variation in data

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## some real skills

- anybody can load a shapefile and make a map
- dealing with real data, you'll typically have to do a join
- again, you'll spend most time on data management
  - even say over 90% of the time
- this is where the real value come from:
  - to bring different vars together to produce new insight
- if you just map vars from same or similar data:
  - it has probably been already done!
  - just goog: "what you study, map" and see images
- but combining creatively variety of vars:
  - there is no such map in the world!
- eg `https://sites.google.com/site/adamokuliczkozaryn/pubs/rel_inn.pdf`

# howto map it

- ok you have some data–it would likely have geo id:
  - ISD name/code, county name/id, etc
  - codes/ids are great: unique! (as opposed to names)
  - then google a shapefile that you can join with your data
- google "geo in you data, shapefile"
  - eg "NJ counties, shapefile"
- and then join the two to produce a map
- beware of representativeness of your data for areas
  - i spent months coding provinces from WVS
  - then emailed them and found out that they are not representative

# "the join problems": some examples

- "Camden county" $\neq$ "Camden"
- "Congo" $\neq$ "Congo, Republic of"
- "Great Britain" $\neq$ "United Kingdom"
- "Camden" $\neq$ "CAMDEN"
- "Camden " $\neq$ "Camden" (space is a character !)
- "08012" $\neq$ "8012"
- be very careful; check the tables to see if it merged right
- does it make sense? eg Camden richer than Cherry Hill?

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# figuring things out

- you got housing prices for NJ counties
- and we've found matching gis data (shapefile)
  - by goog "NJ counties shapefile"
- both have county variable so you can join
- but both keys/ids need to be coded in exactly the same way
  - characters and storage!
- and **you** need to figure this out

# Zillow housing prices

- the "traditional" (non-gis) data in excel from
  `http://www.zillow.com/research/data/`
- i reposted on my website
  `https://sites.google.com/site/adamokuliczkozaryn/gis_int/NJ-counties-Zillow-Home-Value-Index-TimeSeries.xls`
- and cleaned up: dropped first row, excessive columns,$ and "," ; cnty names upcase, saved as csv (first sheet)
- `https://sites.google.com/site/adamokuliczkozaryn/gis_int/all_homes.csv`
  - note missing val for Morris; think abt missing data!
- nj counties data (same as alaways)
  `https://docs.google.com/uc?id=1xJDhcRCkgv7k4tNCa72Oog5bohV6dTB2&export=download`

## adjusting and cleaning up spreadsheets

- adjust ID: make counties uppercase
  - (or could drop 'County' from COUNTY LABEL variable)
- always clean up the spreadsheet:
  - one row header (I dropped first row)
  - make col (variable) names brief: say <5 alphanumeric chars
    drop excessive columns you wont need, keep it clean
  - important! leave only plain numbers!
  - drop all special chars from vals: "#" "$" "," etc
- save as csv (just one sheet); reposted:
  `https://sites.google.com/site/adamokuliczkozaryn/gis_int/all_homes.csv`
  - note missing value! and save in project folder

# install MMQGIS (just once) if not there already

- Plugins-Manage and Install Plugins:
  - Search: MMQGIS
  - and install
- now we can use MMQGIS to join and fix the data!
  - [another way to do joins:

    `http://www.qgistutorials.com/en/docs/performing_table_joins.html`]

# MMQGIS: join; and text to float

- MMQGIS-Combine-Attributes Join From CSV File
- Input CSV: all_homes.csv
- CSV File Field: UPPER
- Join Layer: nj_counties
- Join Layer Attribute: COUNTY
- make sure notfound.csv is where you want it
- check notfound.csv: header and 'NEW JERSEY': makes sense!
- check the tables to see if it joined right; be very careful!
- MMQGIS-Modify-Text to Float (almost always need this!)
- highlight "Dec 2012" only (others are not clean:"$","","")

# missing value

- right click layer-Open Attribute Table
- note that now MORRIS has 0 for "Dec 2012"
- this is incorrect!
- hit pen icon at top left: "Toggle Editing Mode"
  - and remove zero from that cell
- hit "Toggle Editing Mode" again and Save

## and the thematic map

- nj_counties-Properties-Style and from drop-down: "Graduated"
- Column: "Dec 2012"
- Color ramp: can just leave Blues
- many ways to classify [if time, discuss later]
- usually good: 'natural breaks/jenks' say 3-7
- and hit "Classify" button
- and hit "OK" to see the map–viola!
- zoom in as much as needed

# print a map: Print Composer

- Project-New Print Composer
- NJ is tall: on the right "Composition" and do "portrait"
- left: blank icon "Add New Map" and draw a rectangle
- left: icon with arrows "Move Item Content" to adjust view
- right: "Item properties" change scale to adjust zoom
- left: legend button "Add new legend"
  - normally legend requires lots of editing
  - right: **uncheck** auto-update and beautify it:
  - drop items with minus sign; and edit by double clicking it
- top: on the left: Composer-Export as Image
  - probably jpg is fine, just increase resolution to say 600dpi
  - `http://www.qgistutorials.com/en/docs/making_a_map.html` and
  - `http://docs.qgis.org/2.0/en/docs/user_manual/print_composer/print_composer.html`

## don't trust anybody!

- remember, always be critical
- triangulate your results: compare with other source
  - just goog picture, eg 'nj counties property values map'
  - `http://www.trulia.com/home_prices/New_Jersey/`
- looks about right (they have some other definition of the prices, but correlation is important)
- show to others, ask for comments, present locally or at a conference
- i mistakengly thought a lot of aclohol problems in Cape May
  - but it is just tourists!

# tip1

- merging (joining) data is tedious and tricky
- be careful, double, triple check
- easy to make mistake

# tip2: missing vals

- tricky! pay extra attention to it!
- sometimes qgis makes '' to 0! esp MMQGIS: str to float
- sometimes qgis colors it yellow sometimes transparent:
  - (i guess: ''=transparent, 'NULL'=yellow)
- to make it stand out can change color ramp
  - eg if NULL is white, make even number of classes on 2 color ramp (say BlueRed)

# tip3: what if traditional data is in weird format

- same as with gis data
  - if you see something else than .shp or .kml, email me!
  - there are many data formats, and we cannot cover them all
  - we'll do them if we bump into them–do let us know what you've found!

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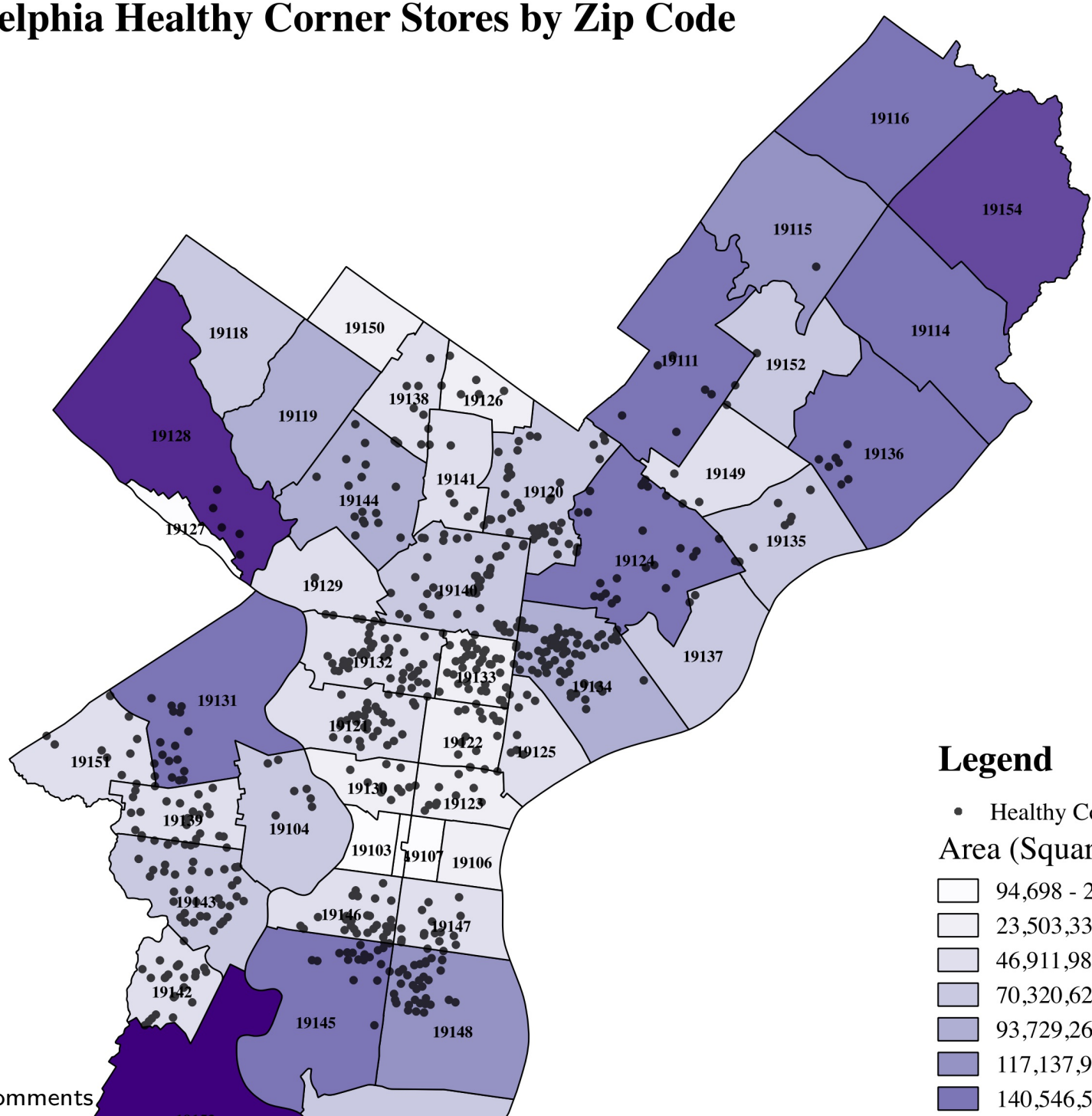
## general comments

- please no ms word! txt or pdf
- remember to specify u/a and num of obs
- need to email me *all* data you've used
  - (incl data you used for joining (toady's class))
  - eg do not assume i have NJ counties
- send me the whole thing! you can just zip the whole project folder
  - or share good drive, dropbox.com etc
  - if you just send me one .shp file, it won't run! (need .dbf .prj, etc)
- again, in journal you can ask me questions!

# Philadelphia Healthy Corner Stores by Zip Code

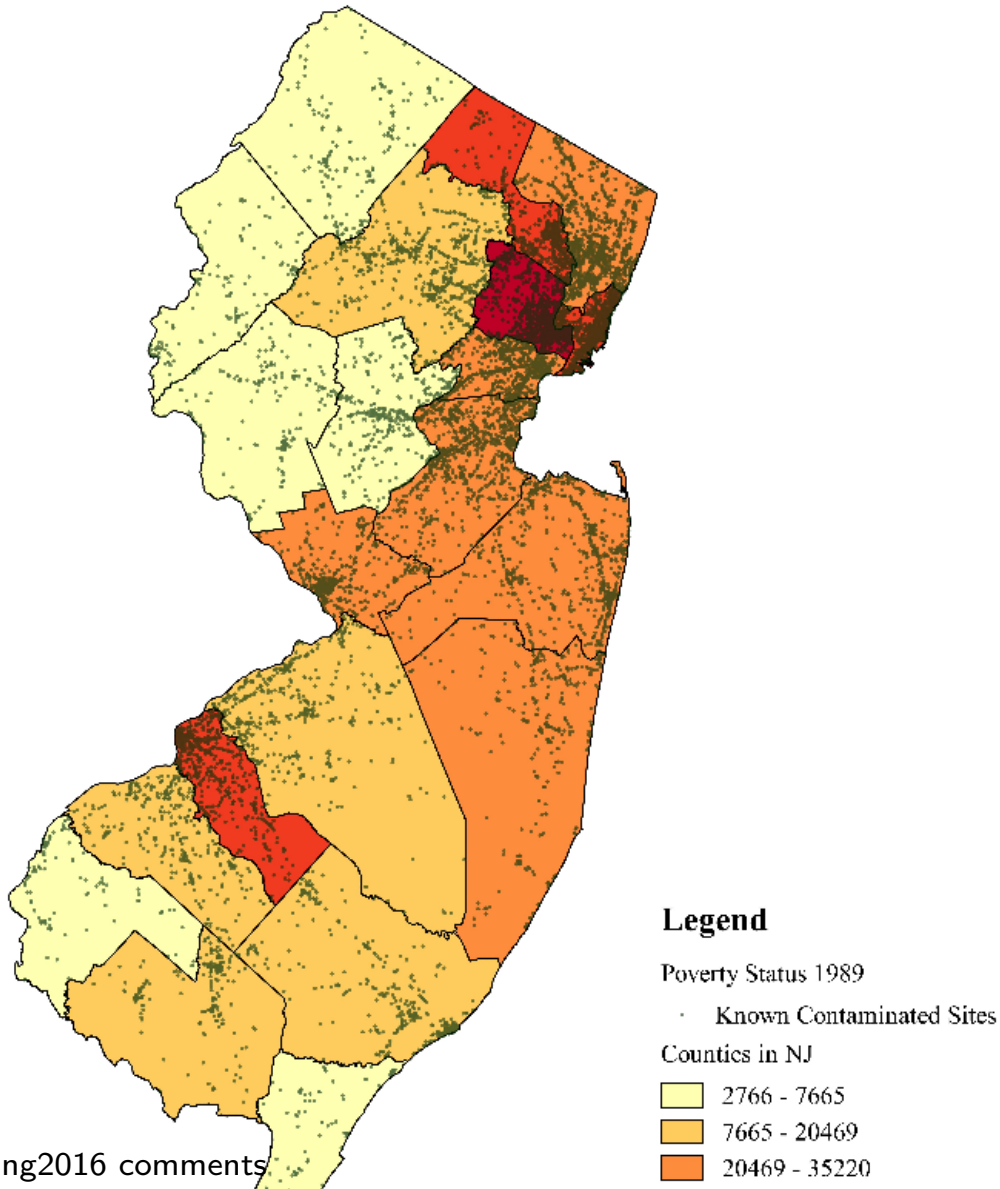


## healthy corner stores

- makes sense to label zipcodes; right proportions
- these aren't sq miles! sq ft or meters!
  - colors denote polygon sizes–so same info twice
  - better could map educ, inc, age, bmi, etc
  - dots could be little smaller or hollow so they overlap less
- make goog map and zoom in: show more detail

  see environ: other businesses, pub transpo, sch, etc
- wonder about big healthy stores like wholefoods
  - could dentote big ones with big dots
- usually may want to put year on a map
  - (at very least in metadata/journal)

# Contaminations Sites in New Jersey 1992



## contaminations

- perfect size and color for contaminated sites!
  - doesn't overlap much but big enough to see
  - and grayish good for contamination
- informative– NYC and Philly the worst
- excellent idea to relate poverty to contamination
  - there is lit linking them! so nice test! [also can do race]
  - could do poverty at municipal or census tract levels
- use space better! NJ should be bigger like Philly stores map
- thousands must be set off by commas in legend
- very good to match contaminations and poverty by year!
- "poverty status"–guess counts; better %
- as in Philly map: zoom to Camden or Newark, have goog map in background

## contaminations

- `http://www.nytimes.com/interactive/2015/07/08/us/census-race-map.html?_r=0`
- in couple classes we'll be making online maps like this
- but already now you can do sth similar
  - see footnote: census and socialexplorer.com: download data
- map in qgis and bring in background from googmaps
  - with openlayers plugin

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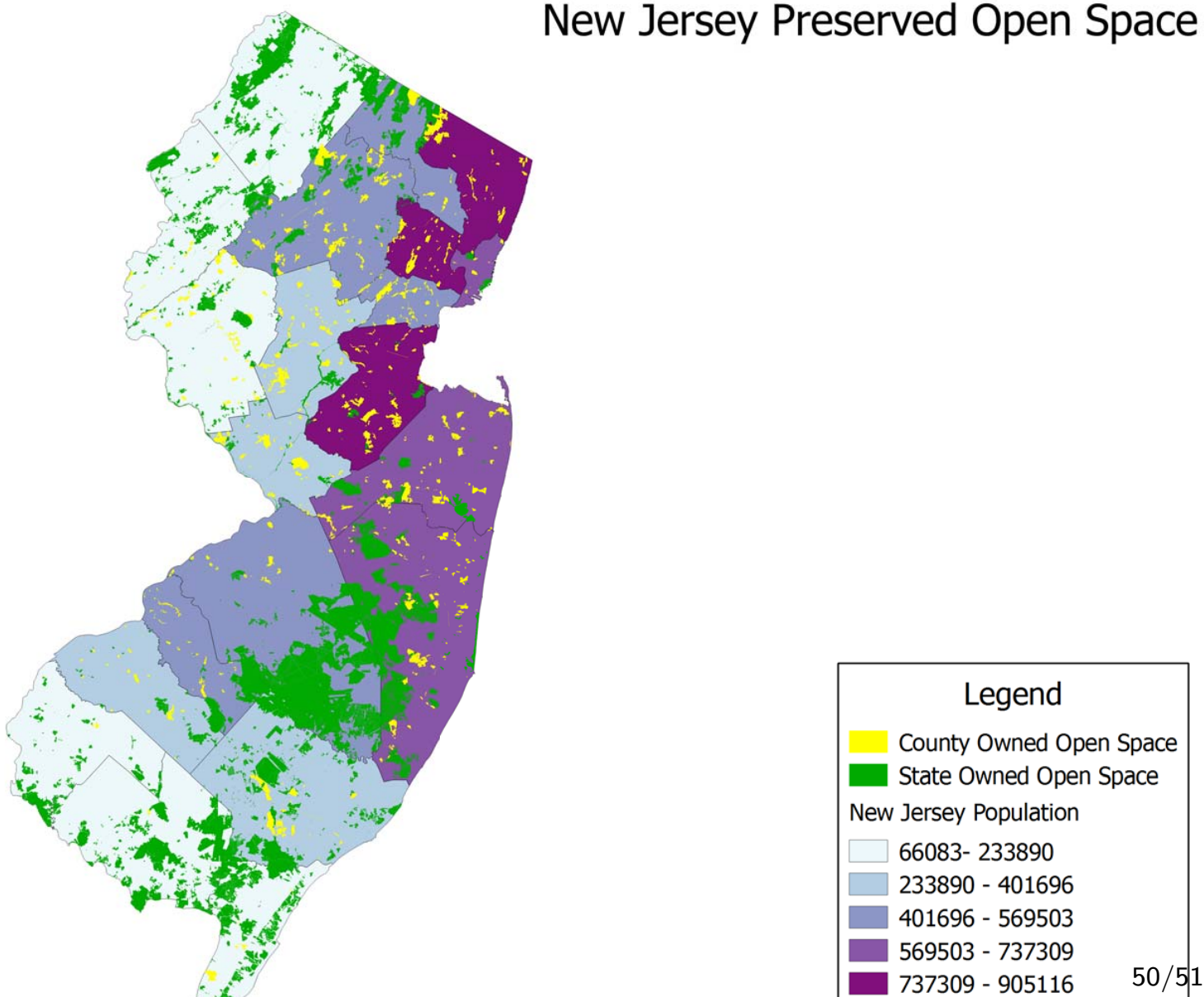
# ps2: open space

◇



# ps2

- excellent idea for map–open space related to population
- great use of multiple layers
- great non-cluttered borders
- can use space better-portrait orientation, bigger NJ
- use commas for population
- say for which year it is
- pop den probably more meaningful
  - on the other hand, we already see size from map
  - and so we can sort out density