data

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outline

regular (not gis) data: xls, csv, etc

gis data (has shapes, can make a map from it): shp, kml, etc

the 'join'

Example: NJ Home Values

DATA SOURCES

census data [probably do one week later]

mapping street addresses (geocoding)[if people having addressess already] [properly covered in advQ.pdf, but to just get you going]

old ps comments [if time]

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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; ex of attr?
- 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

- 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

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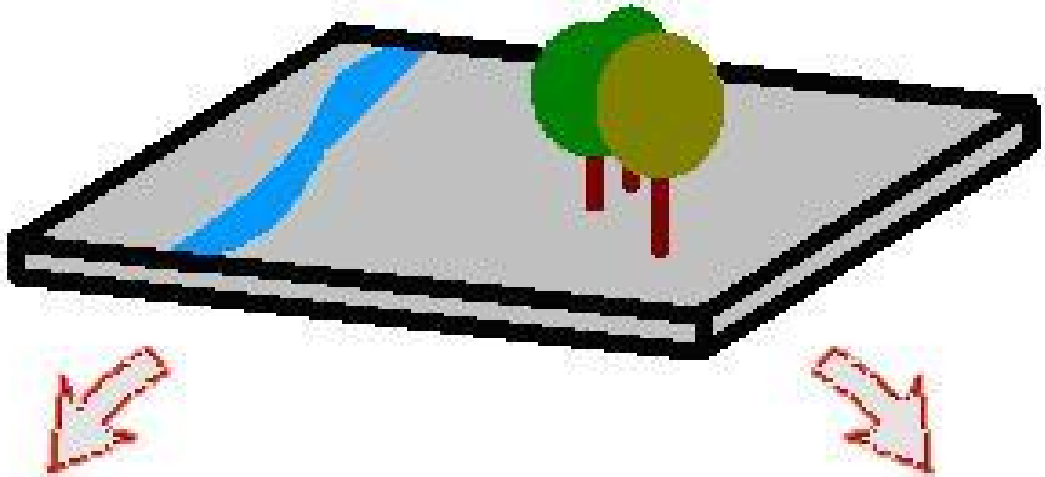
files

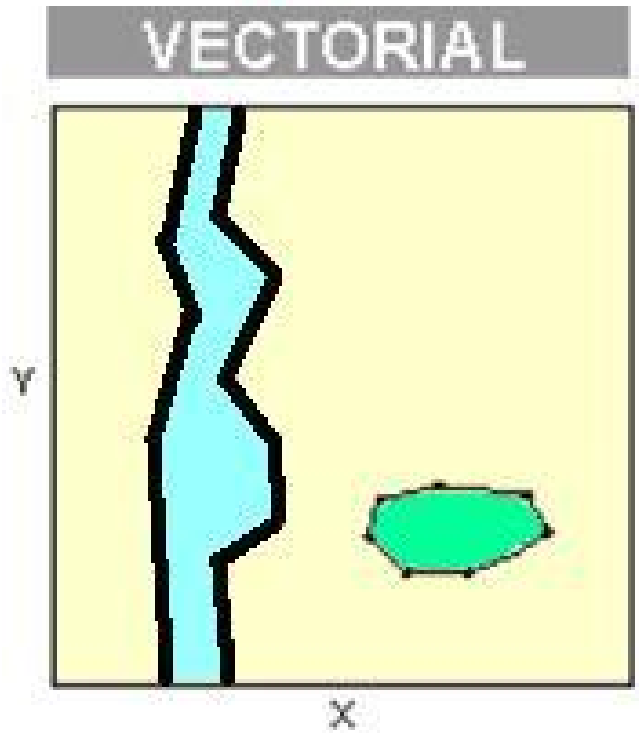
- .shp (along with bunch of others)
- .kml
- and there's much more
- we'll cover them on "as is" basis
  - if you bump into something weird, email listserv

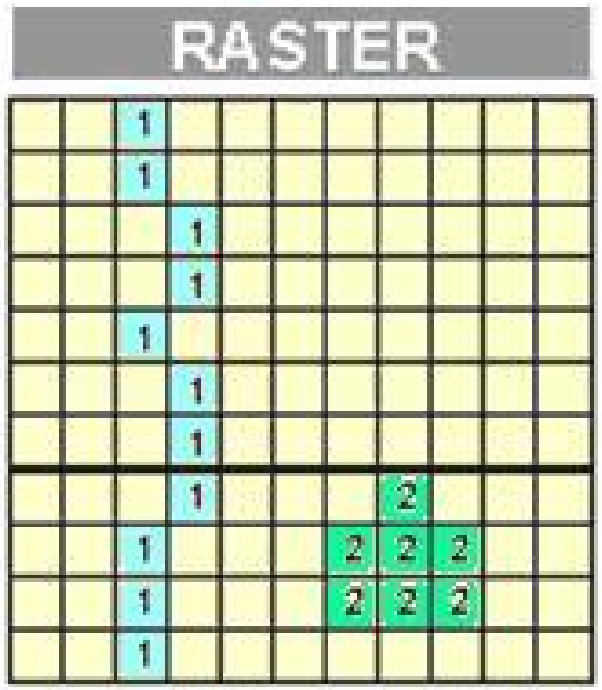
raster (picture) and vector (point, line, or polygon)

- 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 data as layers of shapes with regular data

- data are organized by *layers*, eg roads, admin boundaries, etc; show example/draw a picture
- each layer: loc info (shapes)+often some regular data
  - ie data table with loc info (shapes) must underlie a map
  - (the data table often has some regular data, too)
- often you want to produce thematic (choropleth) maps
  - thematic maps use different symbols/colors (themes) to show variation in regular data

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some real skills

- 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 already been 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://scholarship.libraries.rutgers.edu/view/delivery/01RUT_INST/12643382240004646/13643522850004646`

howto map regular (eg xls) 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

"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

- so say you've got housing prices for NJ counties
- then need to google matching gis data (shapefile)
  - google: "NJ counties shapefile"
  - load nj counties shp (same as alaways)

    `https://docs.google.com/uc?id=1xJDhcRCkgv7k4tNCa72Oog5bohV6dTB2&export=download`
- both have county variable so you can join
- both keys/ids must be coded exactly the same way!
  - characters and storage!
- and **you** need to figure this out and make sure

http://www.zillow.com/research/data

- subset reposted on my website https://github.com/theaok/data/raw/main/NJ-counties-Zillow-Home-Value-Index-TimeSeries.xls
- adjust ID: make counties uppercase
  - (or could drop 'County' from COUNTY LABEL variable)
  - make col (var) names short: eg <5 alphanumeric chars
- and clean up: dropped first row, excessive columns,$ (%,#, etc) and ","; cnty names upcase, saved as csv (first sheet)
- https://github.com/theaok/data/raw/main/all_homes.csv
  - note missing val for Morris; think abt missing data!

excel fix! [do this if trouble reading csv into qgis]

- excel is junk, and often adds special/weird characters!
- when save as csv, go to:
- tools-web options-encoding and select 'us ascii'
- other ideas: `https://www.webtoffee.com/how-to-save-csv-excel-file-as-utf-8-encoded`

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 joined output shapefile is where you can write!
  - 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: i like 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

printing to file: Project-New Print Layout

- left: blank icon "Add New Map" and draw a rectangle
- NJ is tall: on the right "Layout" and do "Resize layout"
- left: icon with arrows "Move Item Content" to adjust view
- right: "Item properties" change scale to adjust zoom and/or use mouse's wheel
- left: legend button "Add new legend" (legend needs fixing)
  - right: **uncheck** auto-update and beautify it:
  - drop items with minus sign; and edit by double clicking it
- top: on the left: Layout-Export as Image
  - probably png is fine, just increase resolution to say 600dpi
  - http://www.qgistutorials.com/en/docs/making_a_map.html and
  - https://docs.qgis.org/3.16/en/docs/training_manual/map_composer/map_composer.html?highlight=layout

print layout

- people always have toroubles
- so let's do it again!

don't trust anybody! neither yourself

- remember, always be critical
- triangulate your results: compare with other source
  - just goog picture, eg 'nj counties property values map'
- looks about right
  - (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 alcohol problems in Cape May
  - but it is just tourists!

tip1: triple check

- 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 say 2
  - and say make color ramp GnRd

tip3: what if traditional data is in weird format

- same as with gis data
- if you see something else than .shp or .kml, email us!
- 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!

tip 4: make sure it all joined the way it should have

- the pop-up for joining tells you how it did
- eg 10 + 10 csv= 10 features is nice and clean
- 10 + 5 csv= 5 may or may not be right; it's right if csv had only a subset and that was expected
- 10 + 5 csv= 3 is pretty much always wrong–2 from csv failed to match and thats pretty much always unexpected and a plain mistake

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old ps comments [if time]

data management takes time! value your time!

- producing maps fast; data management 50-95% of time
  - figuring out, understanding, cleaning, documenting, combining, etc
- so we start with data management: only 2 classes
- spend it on data you care about and will use in your career!
- think hard about data you'll use in your career
- otherwhise you'll waste 100+ hours !!!

gis data

- camden county https://camdencountynj-ccdpw.opendata.arcgis.com/search?collection=Dataset eg camden zoning :)
- NJ https://gisdata-njdep.opendata.arcgis.com
- Philly https://www.opendataphilly.org
- a lot!: http://geocommons.com/search.html
  - just search for what you are interested in, say 'road'
- https://www.policymap.com/maps
  - $ to downld data, but click 'Source' and download by hand
- open gov, especially city data, just few examples
- https://data.cityofchicago.org/ , http://opencityapps.org/ , http://www.opendataphilly.org/ , http://www.phila.gov/data/Pages/data.aspx

data

- https://tax1.co.monmouth.nj.us/cgi-bin/prc6.cgi?menu=index&ms_user=monm&passwd=data&district=1301&mode=11
  - can pick 'advanced srch' to srch say 'vacant'
  - and 'output format' excel
- NJ parcels https://njgin.nj.gov/njgin/edata/parcels/#!/
  - https://www.njmap2.com/parcels/parcels/
  - https://www.arcgis.com/apps/webappviewer/index.html?ic

gis data

- NJ DCA has a Data Hub: excel files and Community Assets Map
  - https://www.nj.gov/dca/services/xxdatahub.html
  - https://njdca.maps.arcgis.com/apps/webappviewer/index.html?id=96ec274c50a34890b23263f101e4ad9b
  - layer-View in Attr Tab; 'Options' at top left and Export all to csv
  - ineq, redlining, etc

https://dsl.richmond.edu/panorama/redlining/#loc=5/39.589/-94.57

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census data: 5-yr ACS

- census is a great source of data, even at neigh lev!
- for neigh lev (census tracts) want 5-yr ACS
- `https://geomap.ffiec.gov/FFIECGeocMap/GeocodeMap1.aspx`
- `https://data.census.gov/cedsci/advanced` (or socialexplorer.com)
- Geography: Tract: New Jersey: Camden County: All Census Tracts within Camden County
  - note: selection appears at the bottom in blue box
- Topics: Income and Poverty: Poverty: Official Poverty Measure
- Years: 2015
- Search
- click "POVERTY STATUS IN THE PAST 12 MONTHS"

cont

- take note of margins of errors!!
  - most precise is decennial census, but much fewer variables
- on the right click: Customize Table
- at the top: Transpose Table
- hit: Download
  - as CSV

again, always clean it up before getting into qgis

- open csv file, keep GEO ids (will use them for join)
  - and just keep only needed vars and rename them:
  - Total; Estimate; Population for whom poverty status is determined: "tot"
  - Total; Estimate; ALL INDIVIDUALS WITH INCOME BELOW THE FOLLOWING POVERTY RATIOS - 125 percent of poverty level: "pov125"
- then calculate ratio of pov to tot: "prop"
  - and save as csv
  - clean csv reposted: `https://docs.google.com/uc?id=1Hw-3nugfIpSvvyai7Jy-lwA2IsRA0Pz0&export=download`

get geo data

- census has geo data for any US geog!: `https://www.census.gov/geo/maps-data/data/tiger-line.html`
  - doing 2015 because we have 2011-2015 data
- Download-Web Interface: 2015: Census Tracts
- then note there are 2 similar IDs that would match census csv
  - shp: `https://docs.google.com/uc?id=1KNe_DSJQxiUiMVzKdVfHzYjUZSke2OnY&export=download`

join!

- load shp and then
- MMQGIS-Combine-Attributes join from CSV file
- MMQGIS: csv GEOid, shp: AFFGEOID
- do note match upon join: should be perfect!
- MMQGIS: modify: text to float: tot pov125 prop
  - (Ctrl and left click all three)
- right click layer-Properties-Style: "Graduated" map prop with say Blues 5 jenks
- move around and say zoom in on Camden

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geocoding: address→(lat,lon)

- say that we have some addresses and we want to geocode them
- `https://sites.google.com/site/adamokuliczkozaryn/gis_int/apartments-for-rent.xls`
- open, looks reasonably clean, save as csv

MMQGIS-Geocode

- MMQGIS-Geocode-Geocode CSV with Web Service
- Input CSV, and make sure Address Field, City Field, State Field are right; best if you give more info
- Web Service: OpenStreetMap/Nominatim
- put notfound.csv (and output shp) where you can write!

- >qgis3.5, seems can have everything just under address!

- btw, if already got X/Y lat/lon:
  just add your csv with "Add Delimited Text Layer" tool
  make sure geometry definition tab (X,Y) fits your data
- hit "Apply", note how many found, hit "Close"

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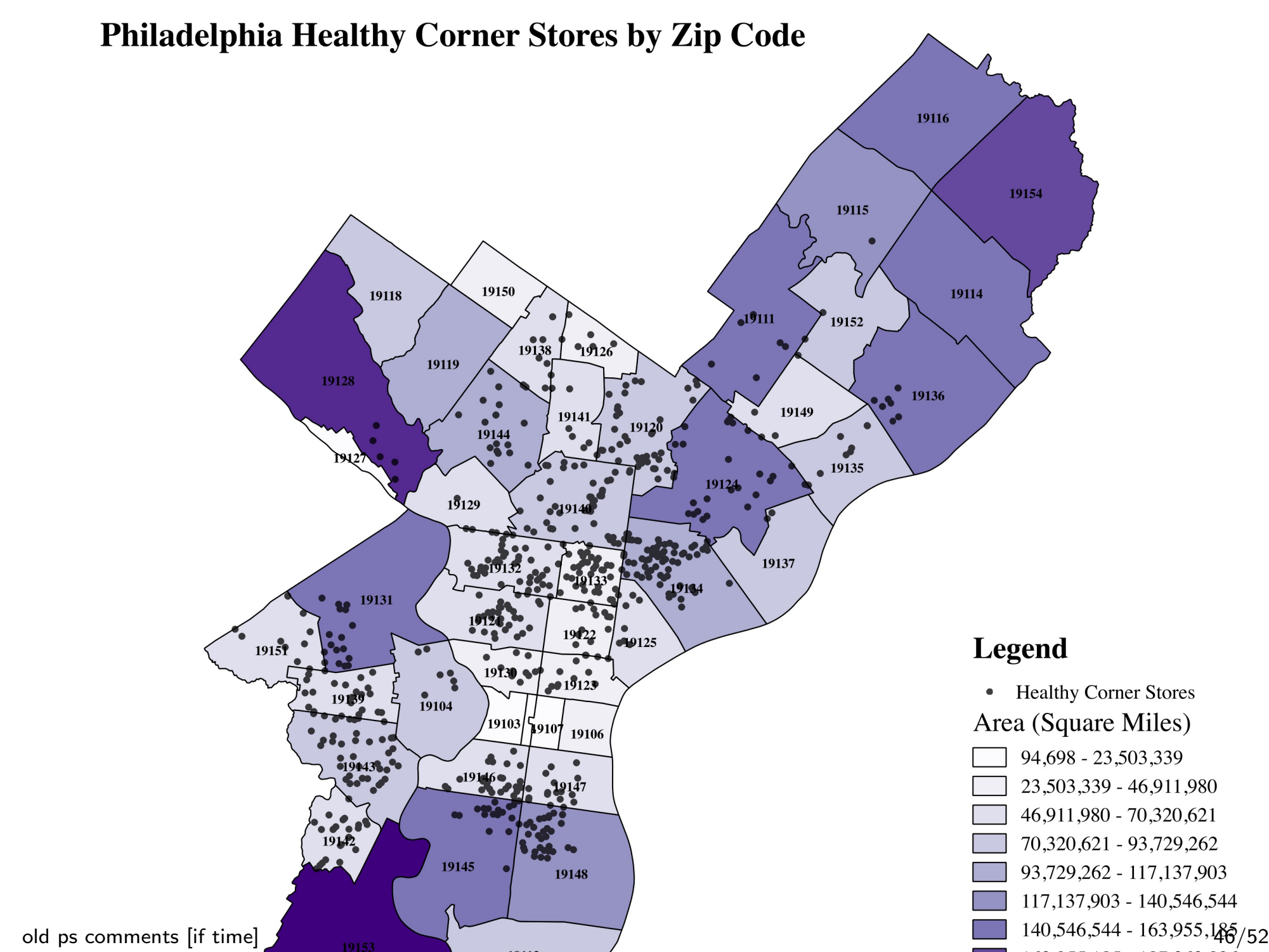
Philadelphia Healthy Corner Stores by Zip Code
19116
19154
19115
19114
19111
19152
19136
19149
19135
19124
19137
19118
19150
19119
19138
19126
19128
19141
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19144
19127
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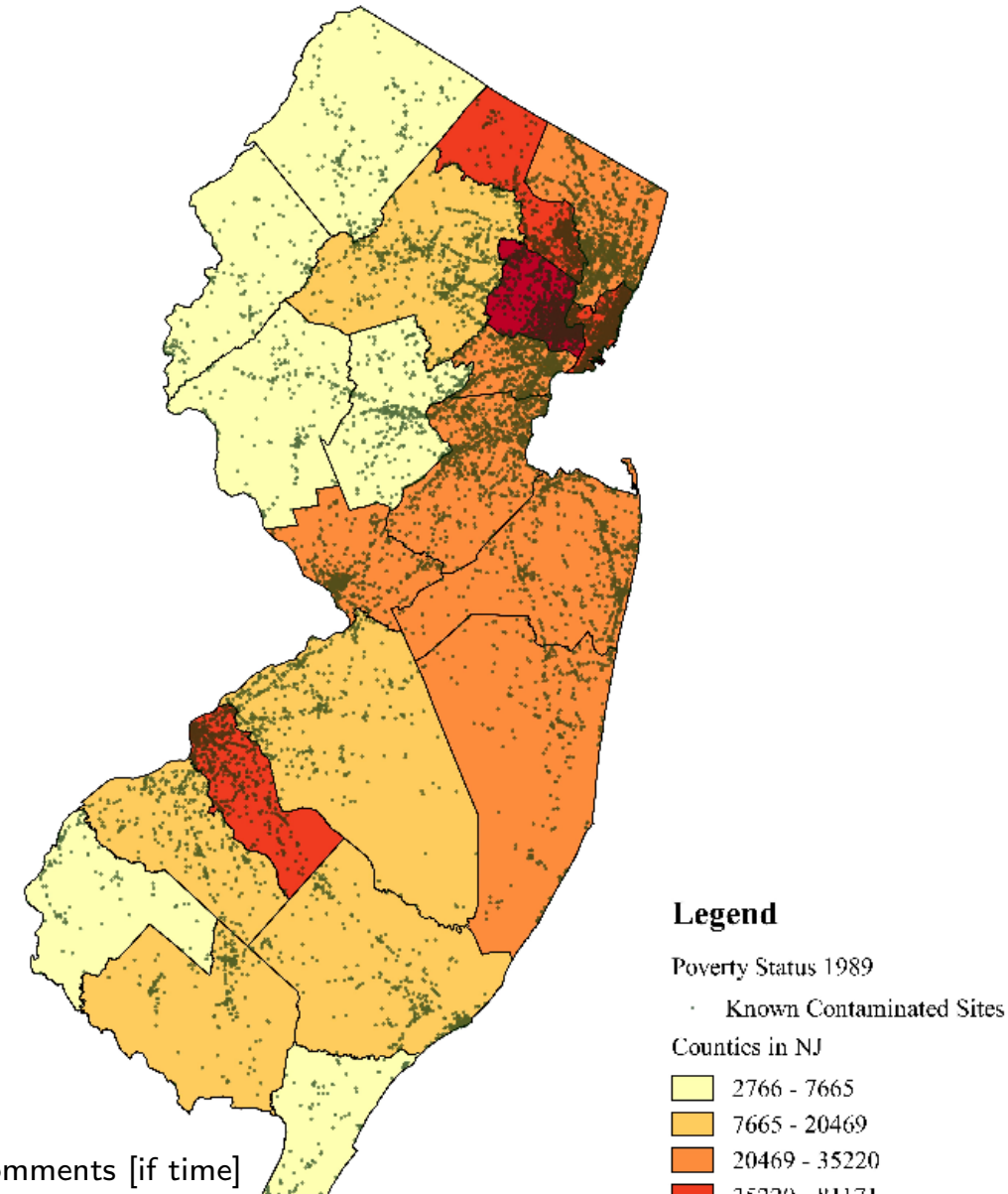
19134
19131
19121
19122
19125
19151
19130
19123
19139
19104
19103
19107
19106
19143
19146
19147
19142
19145
19148
19153
Legend
Healthy Corner Stores
Area (Square Miles)
94,698 - 23,503,339
23,503,339 - 46,911,980
46,911,980 - 70,320,621
70,320,621 - 93,729,262
93,729,262 - 117,137,903
117,137,903 - 140,546,544
140,546,544 - 163,955,185

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

Contaminations Sites in New Jersey 1992



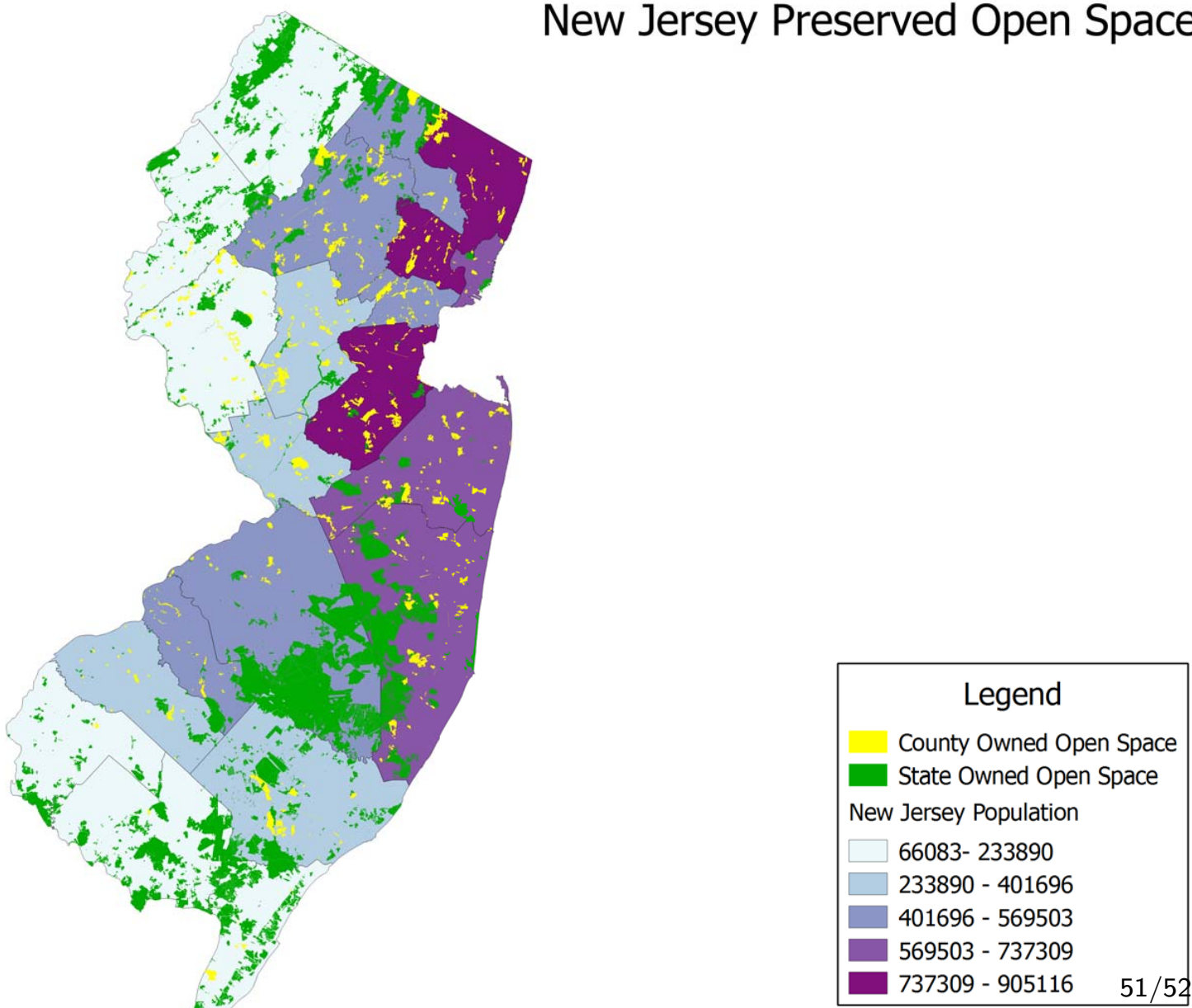
contaminations

- 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
- 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, have goog map in back

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

open space


New Jersey Preserved Open Space
Legend
County Owned Open Space
State Owned Open Space
New Jersey Population
66083- 233890
233890 - 401696
401696 - 569503
569503 - 737309
737309 - 905116

open space

- 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