

5 June
2013

Smart Cities

Session 4: Lecture 1:
Web Mapping, Analytics and Data Visualisation

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 @jmichaelbatty

<http://www.spatialcomplexcity.info/>

<http://www.casa.ucl.ac.uk/>



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Outline of the Lecture

1. The Context: A Dramatic Change in Media for Display and Dissemination
2. Web 2+ and Online Mapping
3. Integrating Diverse Data: Adding Value
4. Generating New and Complementary Data: Crowd-Sourcing
5. Visual Analytics – which refers to material we have seen in earlier lectures
6. Census Analytics
7. Next Steps: What Can We Expect?



The Context: A Dramatic Change in Media for Display and Dissemination



British Library - Press and Policy Centre - Europeana's huge cultural dataset opens for re-use -

http://pressandpolicy.bl.uk/Resource-Library/Augustus-Petermann-s-population-density-map-1841-cred

Edit View Favorites Tools Help

Google S Search 4 blocked ABC Check AutoL

Favorites Suggested Sites Free Hotmail Web Slice Gallery

British Library - Press and Policy Centre - Europeana's...

PRESS AND POLICY

bl.uk > Press and Policy Home > Press Images >

14 Feb 2011 14:12
Augustus Petermann's population density map, 1841 (credit British Library Board)

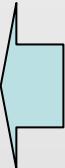
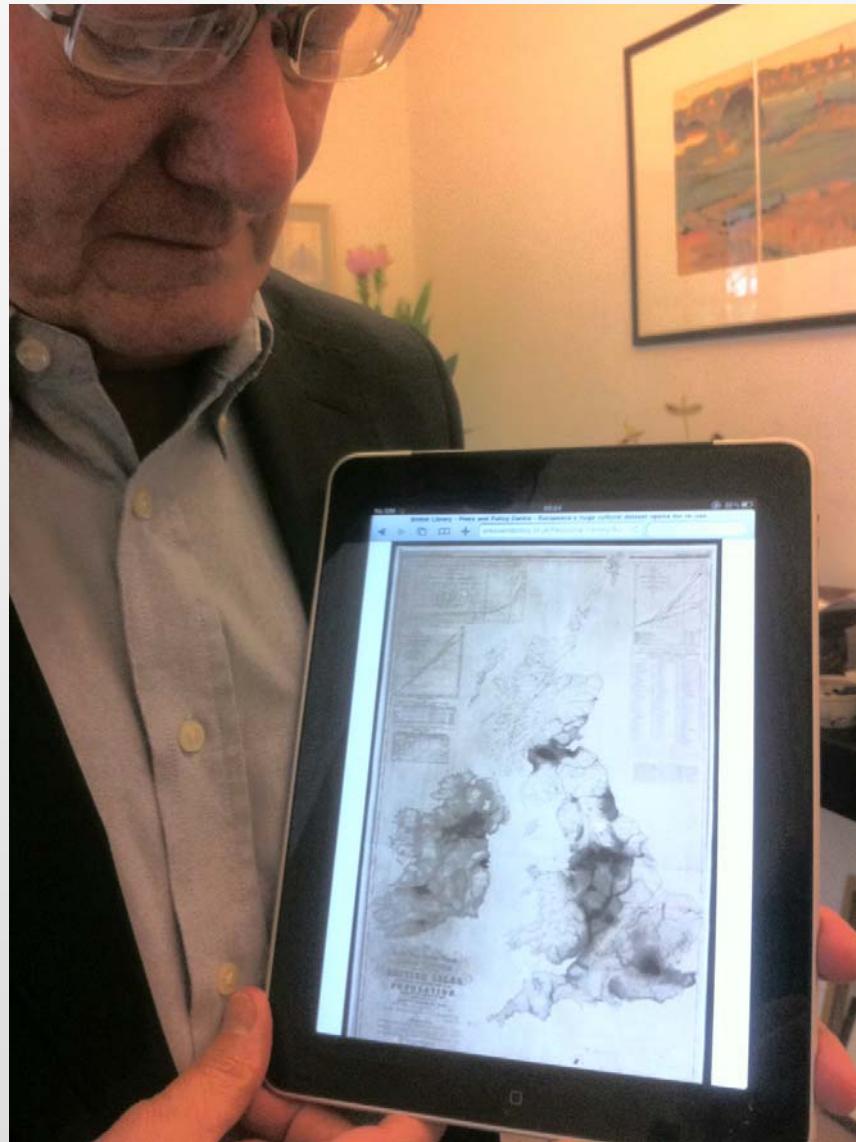
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Augustus Petermann's population density map, 1841 (credit British Library Board)

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Today



To an extent, much if not most of what I will talk about relates to how new technologies are changing the way we are able to display and disseminate.

Web 2 is essentially a medium in which we can interact with data in an online context, consuming and producing new data

Enormous strides are being made in this new world but we do need to exercise a degree of caution. Our science is being changed for sure but it is not clear that it is getting better. Our analytics as we now call them, are not moving as fast as our ability to visualise.



I am going to begin with looking at the sorts of maps we can now visualise online and there are many of these sites where one can do this and interact to produce simple analysis and new data

We usually do it on the desktop, but there are various applications to smaller devices such as tablets and phones and doubtless when we get digital paper, we will have yet another medium to enable us to create new ways of interaction.

I am going to start by showing you our entry into this world some 5 or 6 years ago when we created our site called Maptube: www.maptube.org



Web 2 and Online Mapping

The screenshot shows the homepage of MapTube.org. At the top, there's a navigation bar with links for home, about, login, search, help, and casa. The main title "Welcome to MapTube" is followed by a brief description: "MapTube is a free resource for viewing, sharing, mixing and mashing maps online. Created by UCL's Centre for Advanced Spatial Analysis, users can select any number of maps to overlay and view." Below this is a "QuickStart" section with instructions on how to use the site.

A "Featured Map" section highlights "Oyster Card Overcharging 2010", showing a map of London with colored dots representing overcharging at various stations. A caption explains: "Overcharging on Oyster cards for each London Underground and DLR station. This map was built using the data recently released by TfL." There's a link "[View Map]".

The page includes a navigation menu with tabs: All, Population, Education, Health, Crime, Transport, Politics, Economics, and Land. Below the menu, there are several map thumbnails:

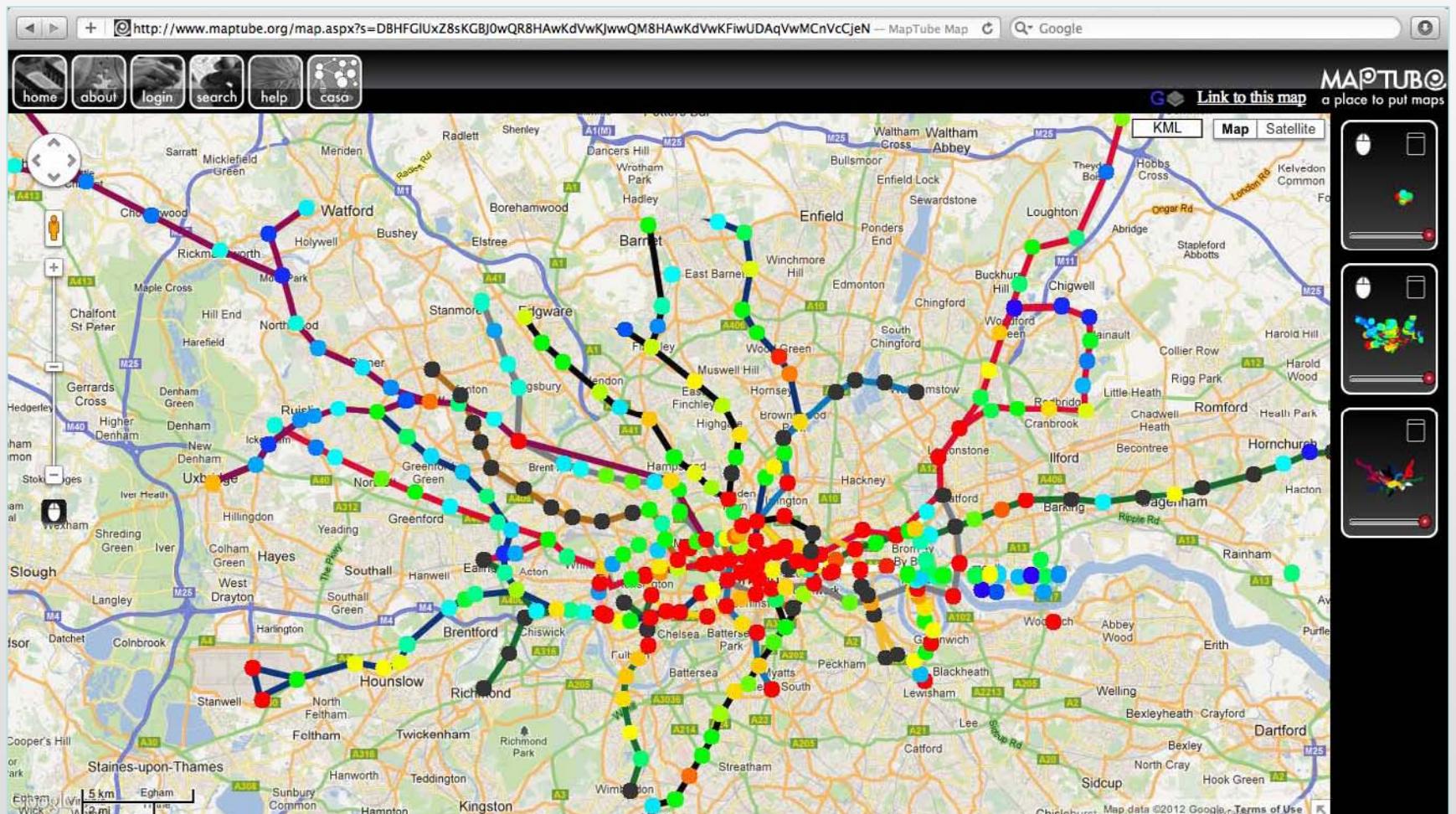
- London Tube Map**: A map of the London Underground with geographically correct station positions taken from wikimedia. It has been viewed 61362 times.
- Weather Underground Air Temperatures**: Weather underground air temperatures 1 June 2011 at 20:00. It has been viewed 508 times.
- KML**: A world map in KML format. It has been viewed 1034 times.
- world map**: This is the world map with country details. It has been viewed 292 times.
- UK Political Parties 2005**: This map shows the results of the 2005 UK General Election with Westminster constituencies coloured according to the winning party.
- Social Cohesion**: Percentage of residents who agree that their local area is a place where people from different backgrounds get on well together.



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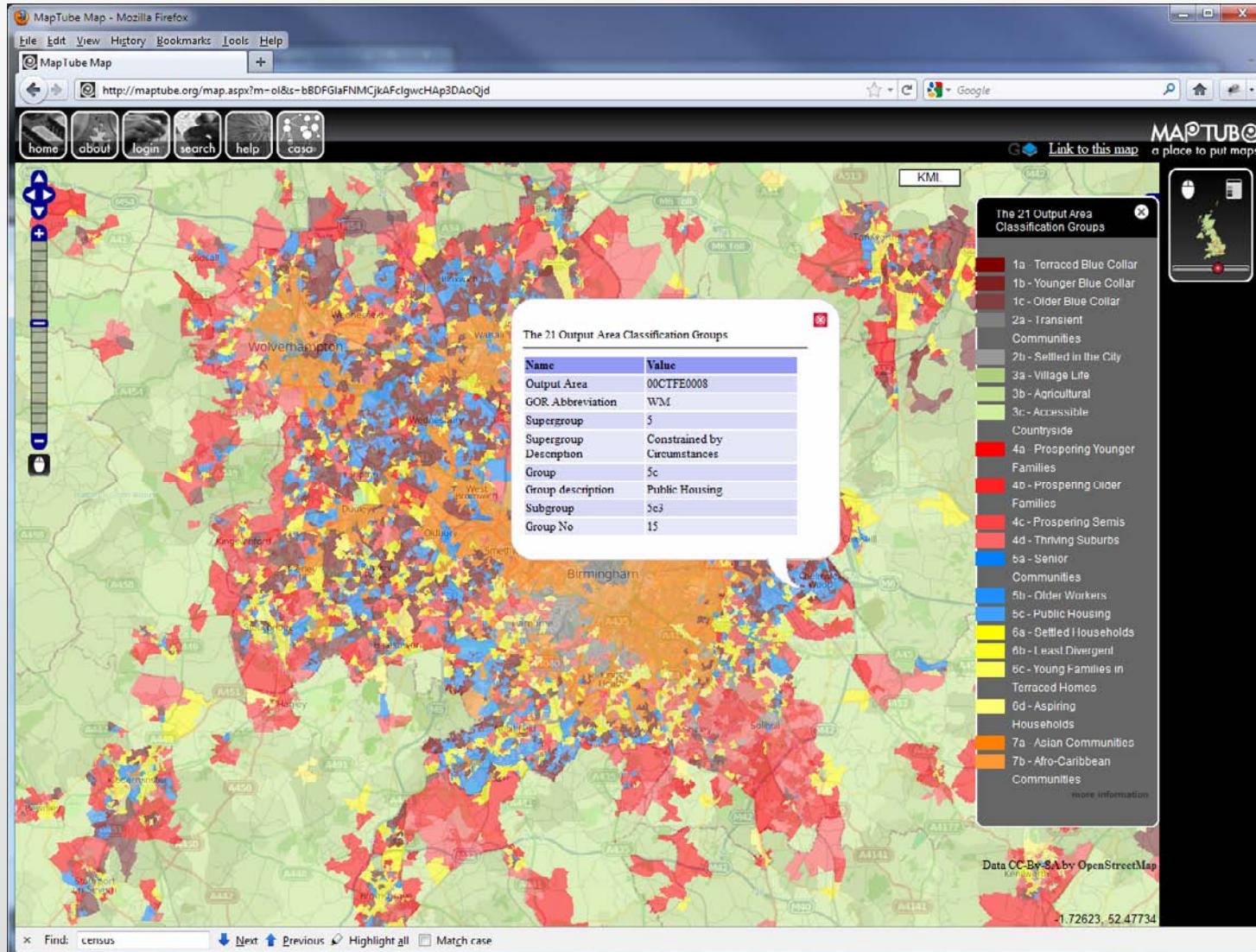
UCL

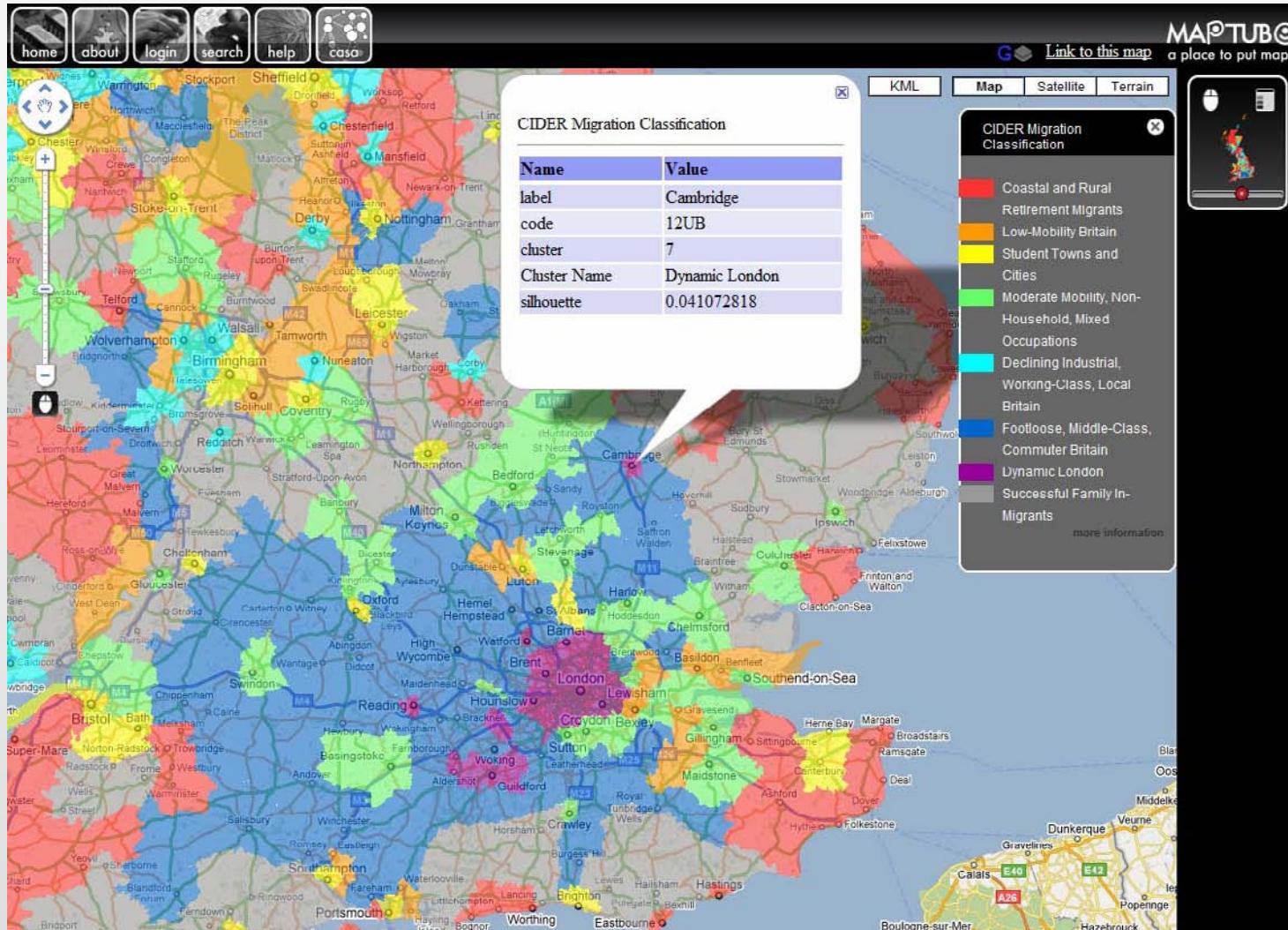
Web 2 and Online Mapping



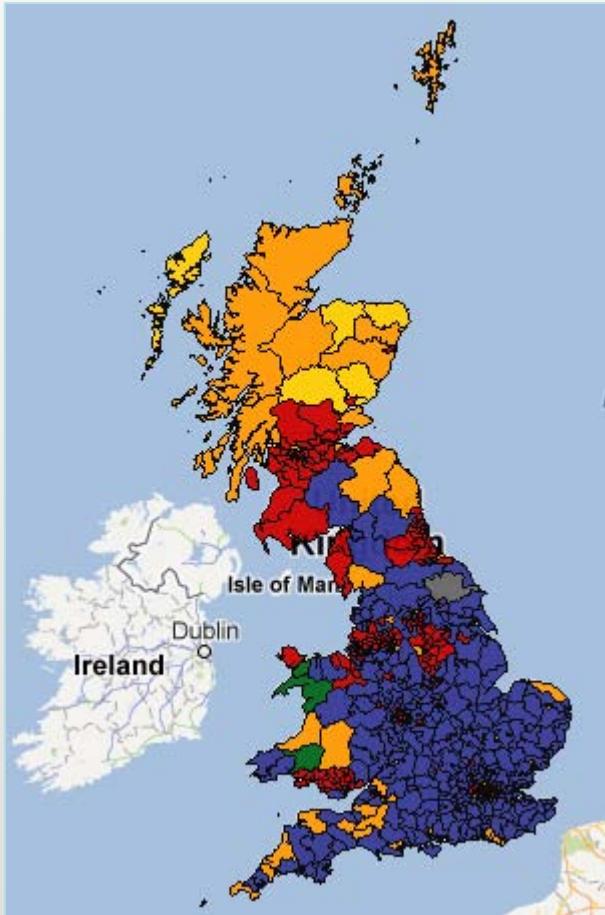
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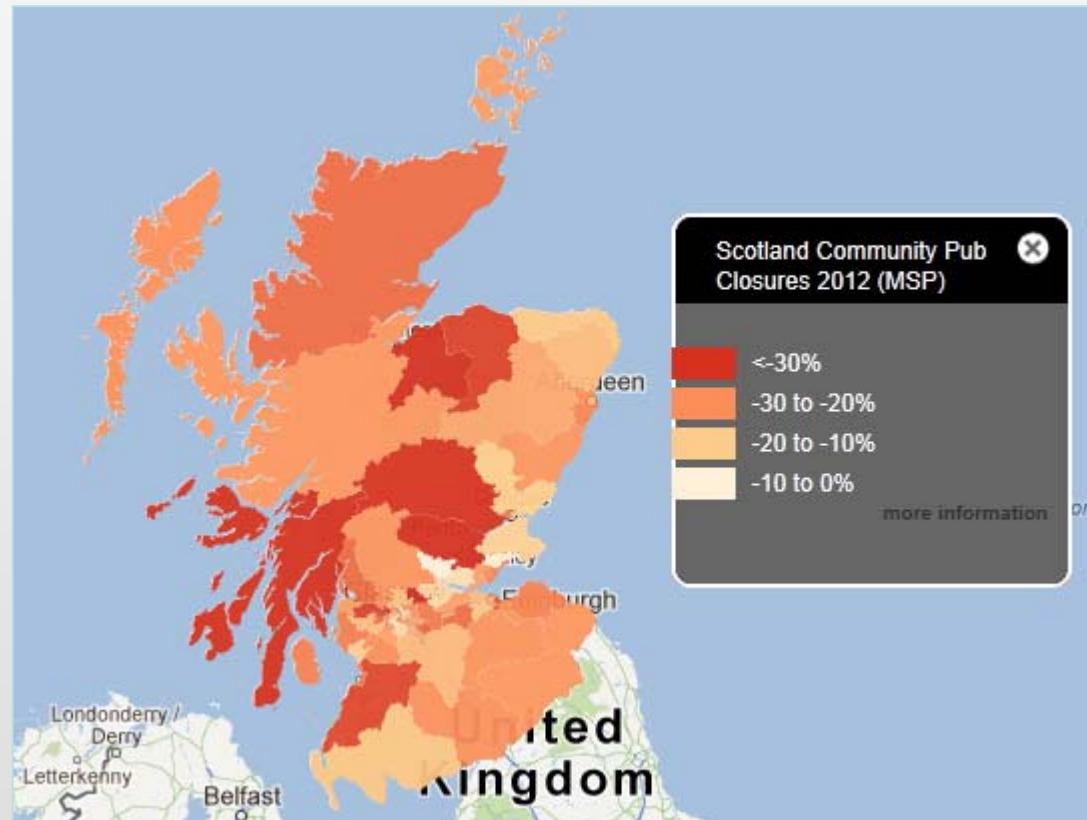




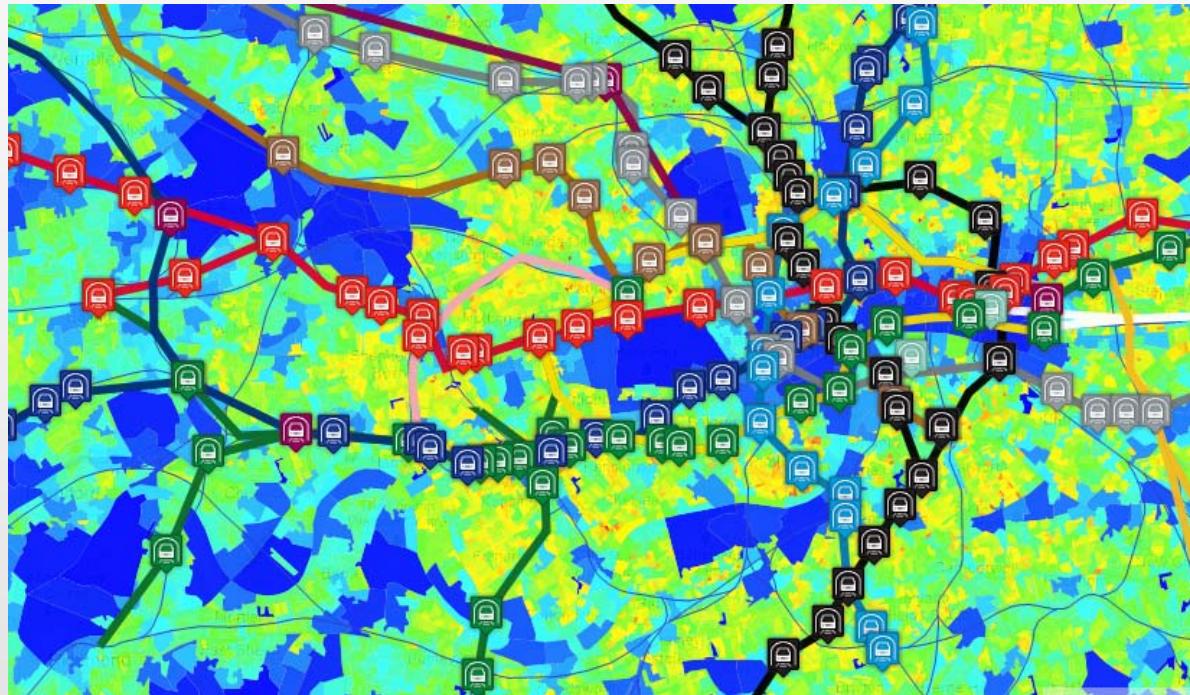
Produced by Adam Dennett (CASA) – Census data Copyright ONS –
see <http://www.adamdennett.co.uk/> and <http://www.maptube.org/>



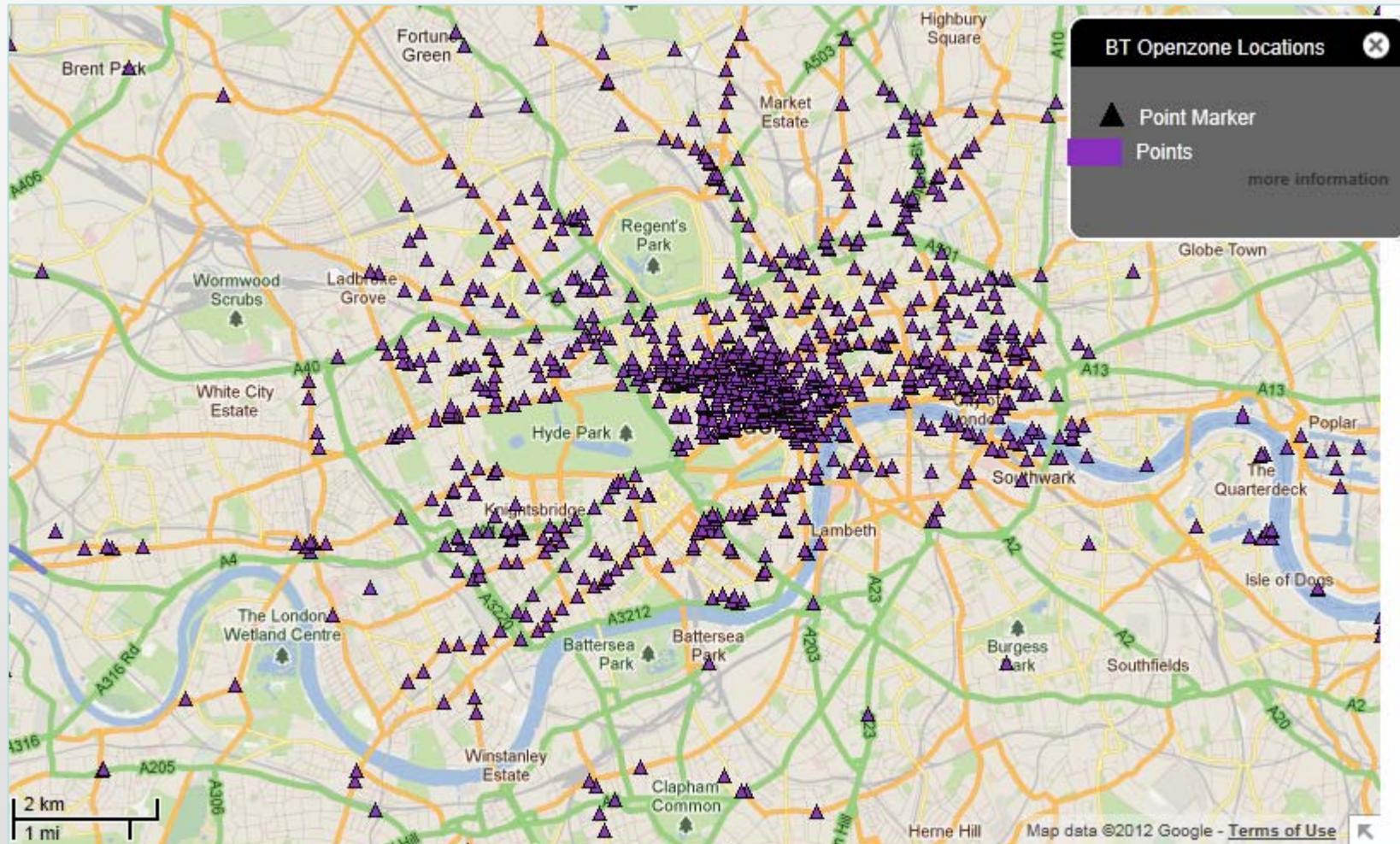
May 2010 General Election
Result



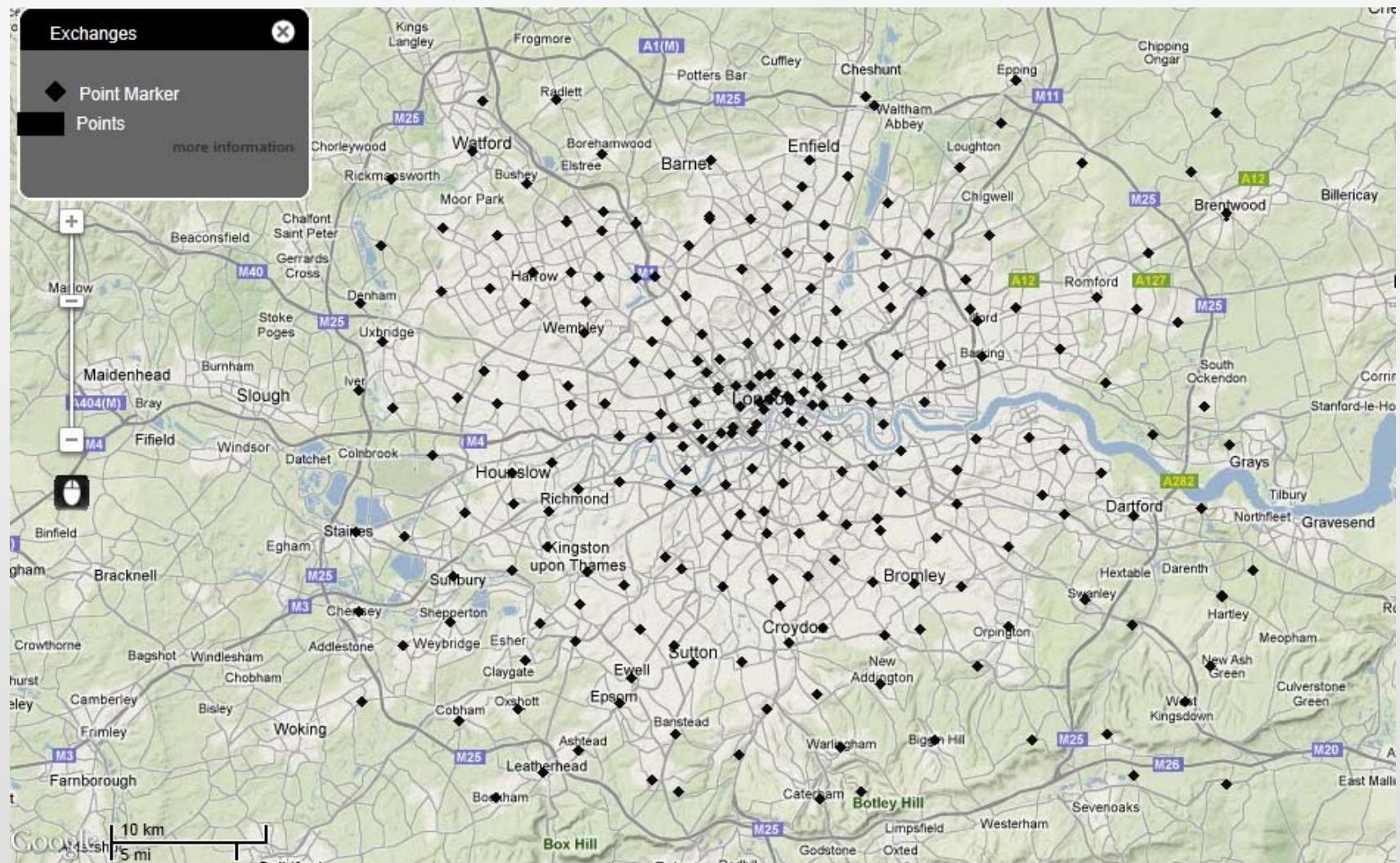
Scotland Community Pub
Closures 2012 (MSP)
source: CGA Strategy



Adding Value – Comparing Data Sets
Population density (2001 Census) with tube lines
and real-time tube positions



Information Infrastructure: BT Openzone Hotspots, March 2012



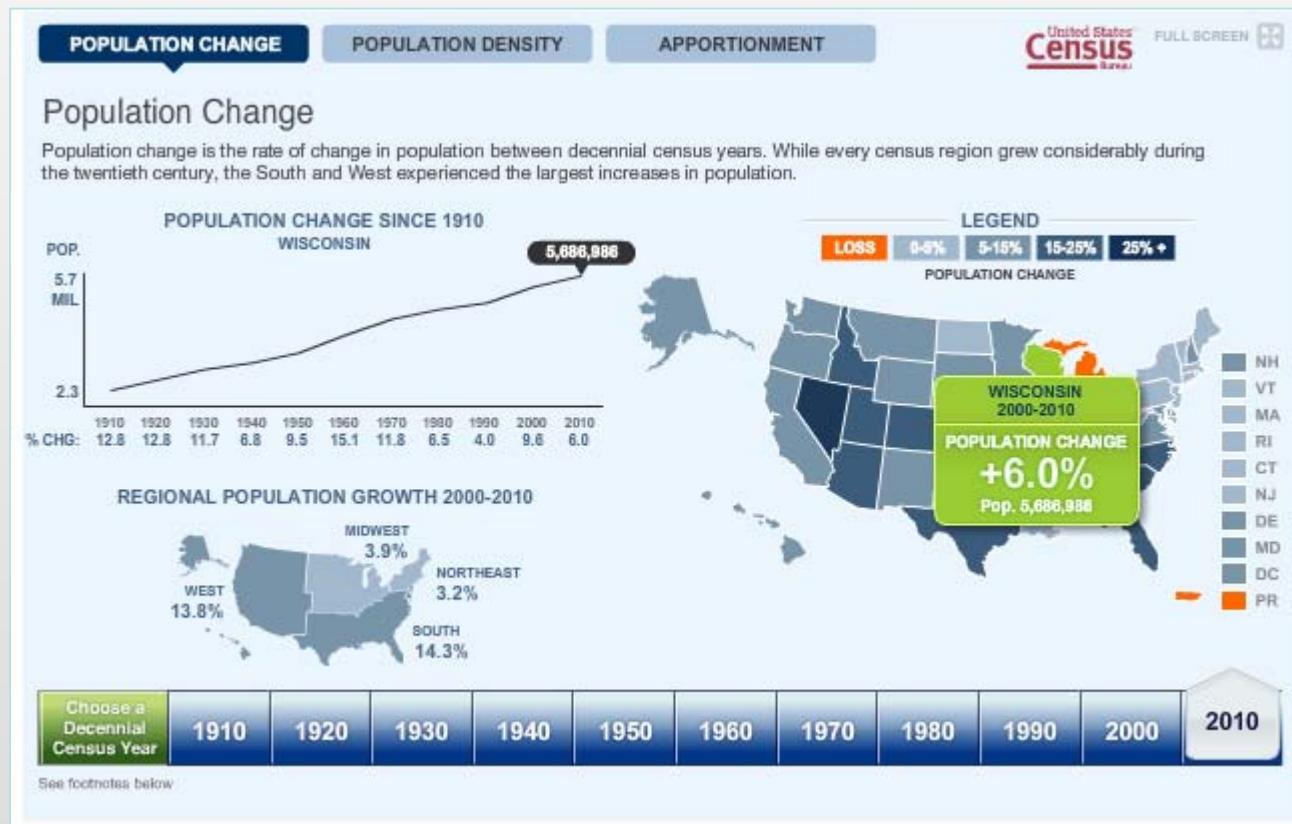
Information Infrastructure: Telephone Exchanges



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There are a whole variety of web sites now enabling you to explore maps based on various mashups. I will show some from the 2010 US Census stimulated by its release.

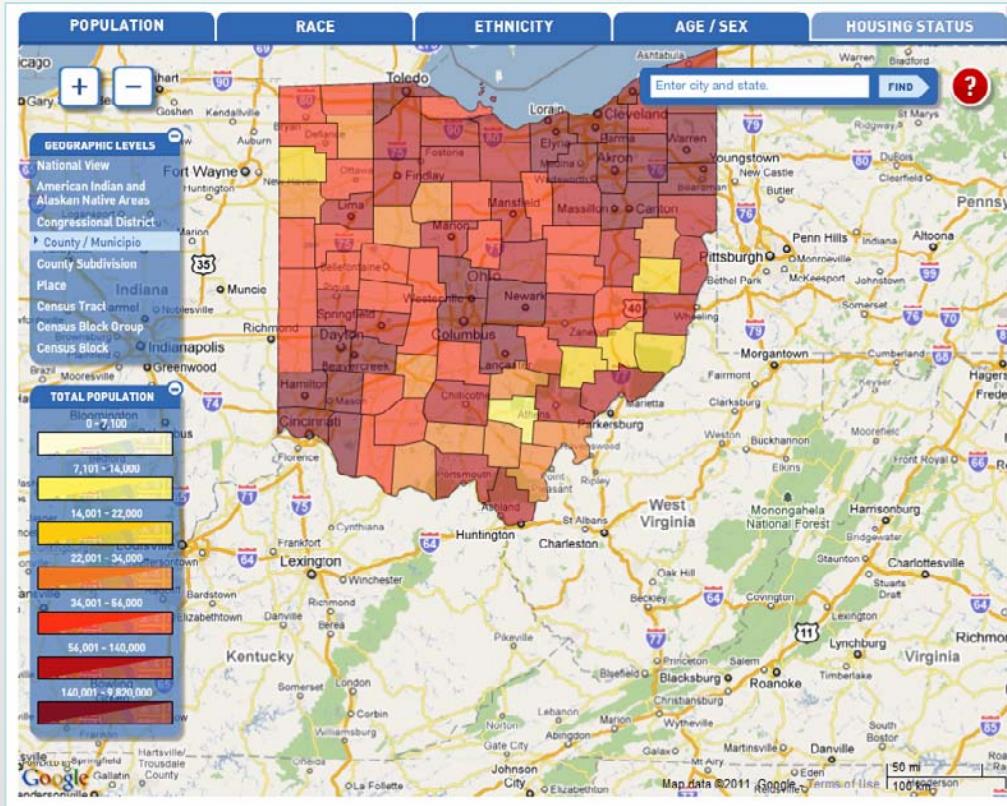


<http://www.zerohedge.com/article/interactive-visualization-2010-census-results>

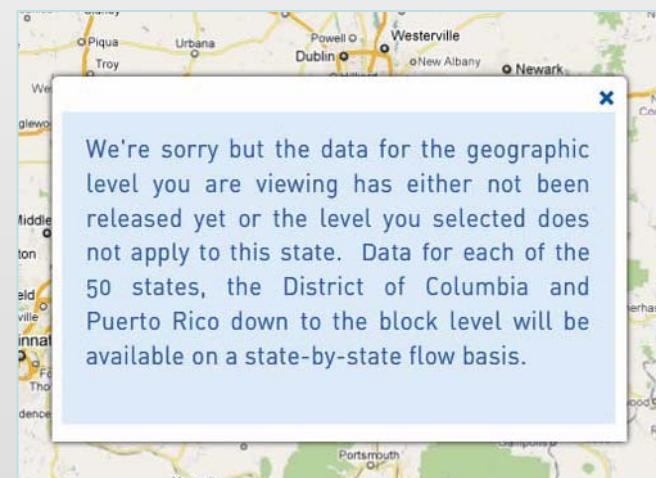
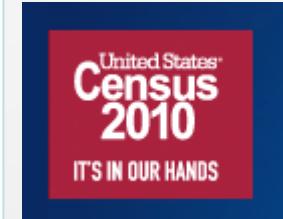


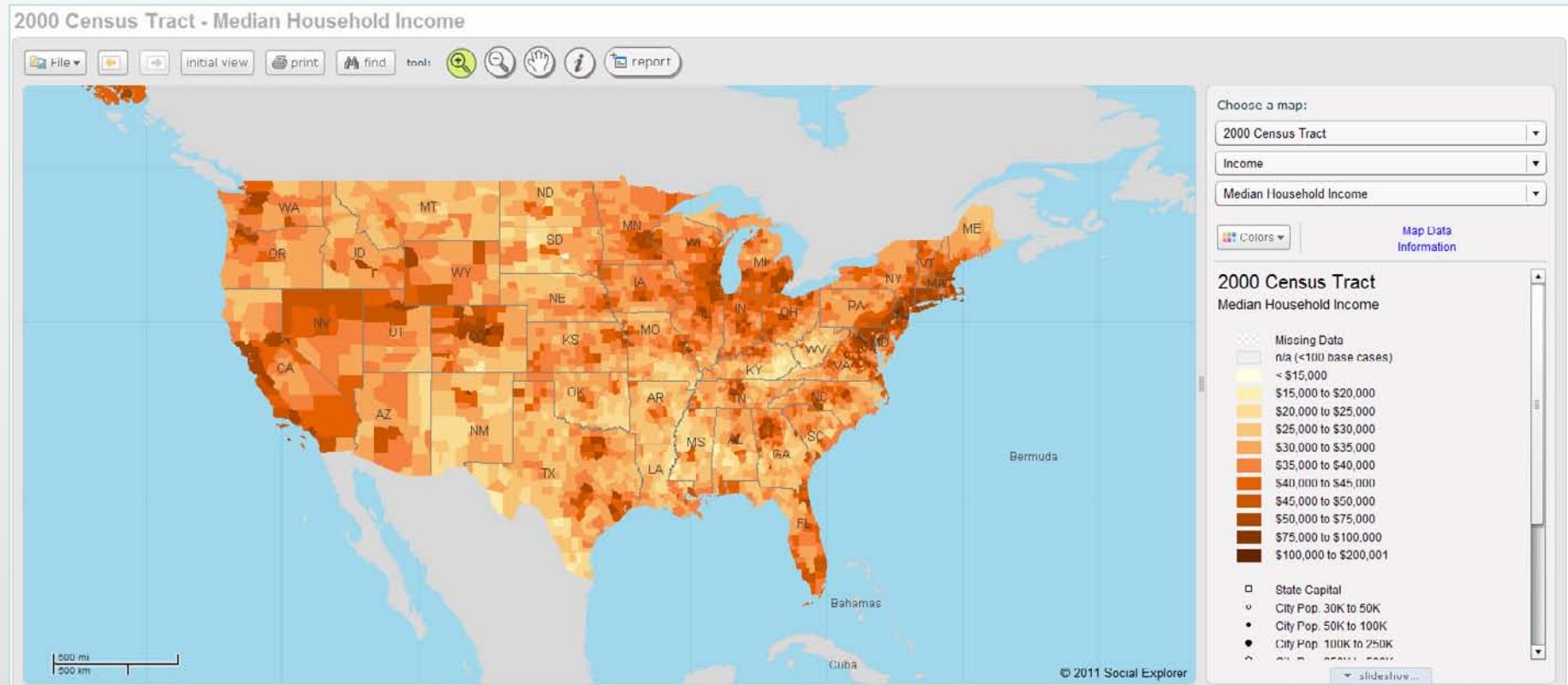
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<http://2010.census.gov/2010census/popmap/index.php>



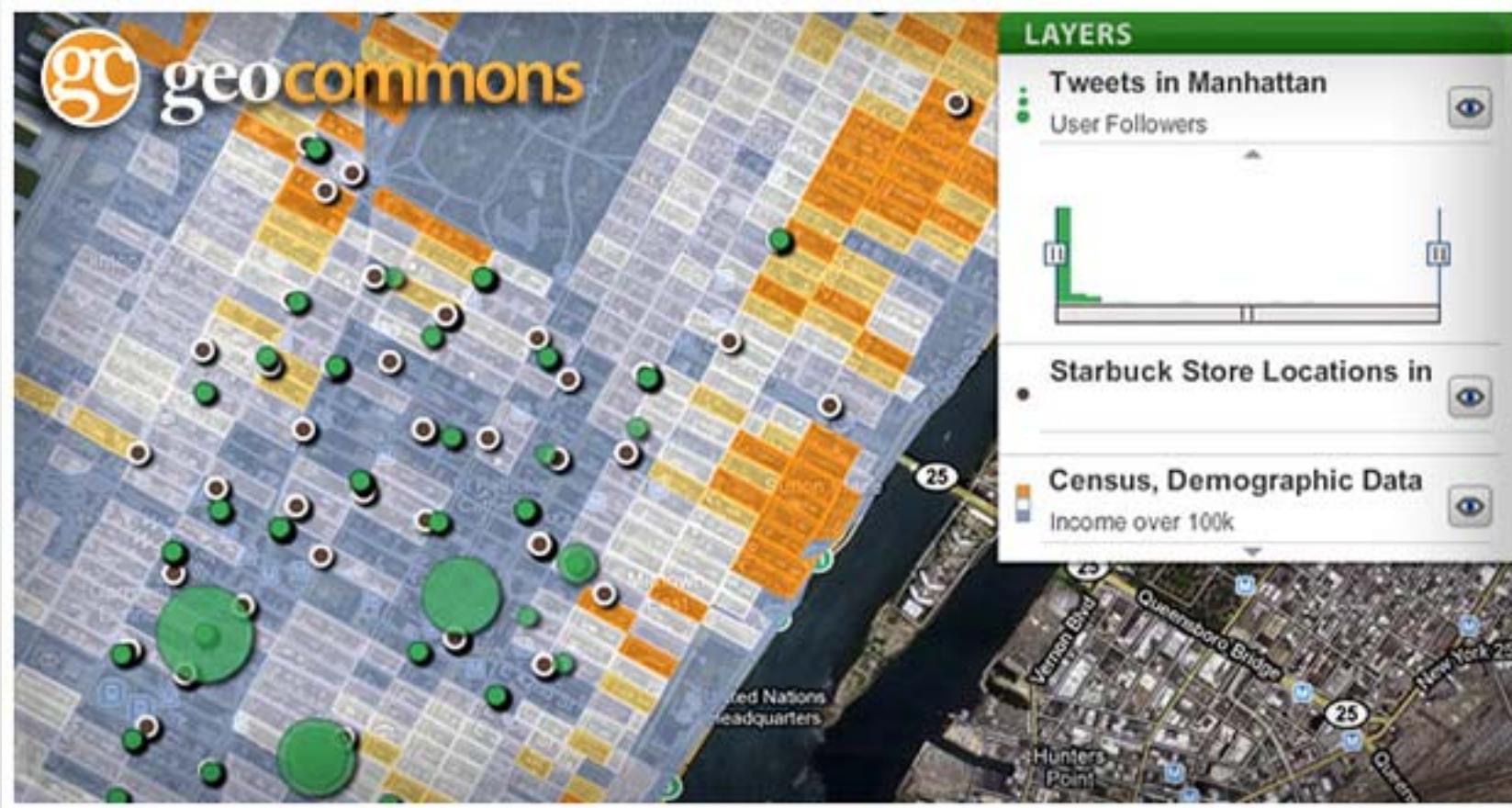


<http://www.socialexplorer.com/pub/maps/map3.aspx?g=0&mapi=SE0012>



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<http://multimedia.journalism.berkeley.edu/tutorials/build-interactive-census-map-geocommons/>

Our Census Profiler

Image-based

Faster on the web browser

Not delivering restricted data to
the web browser

Open Source software

Leverage the powerful

OpenLayers mapping software

More powerful than Google Maps
equivalent

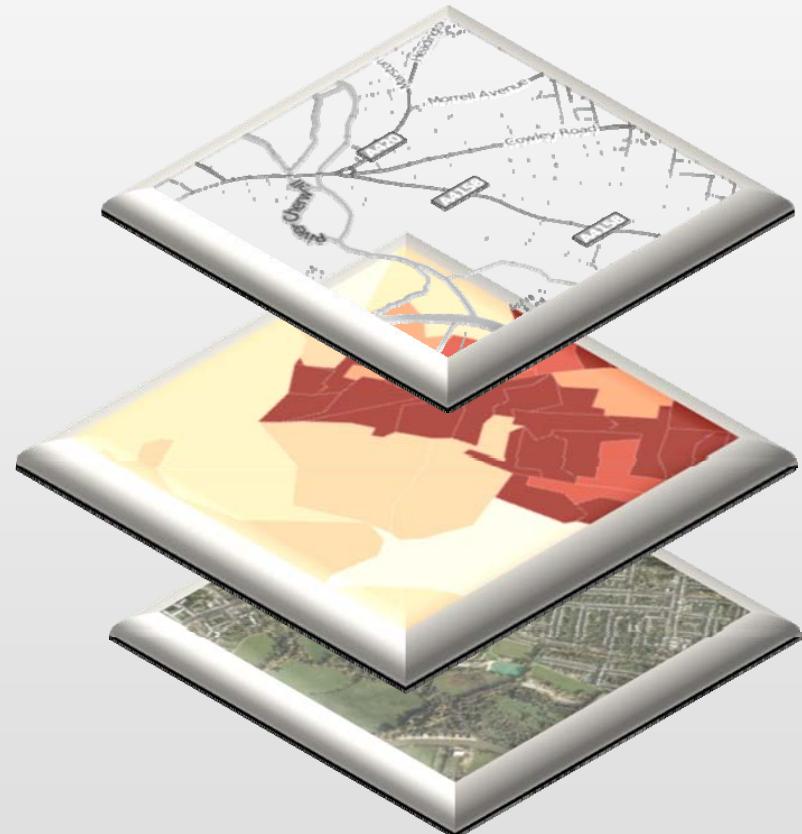
An active development
community

Full access to the underlying code
– greater flexibility

“Slippy” map

Intuitive

Encourages exploration

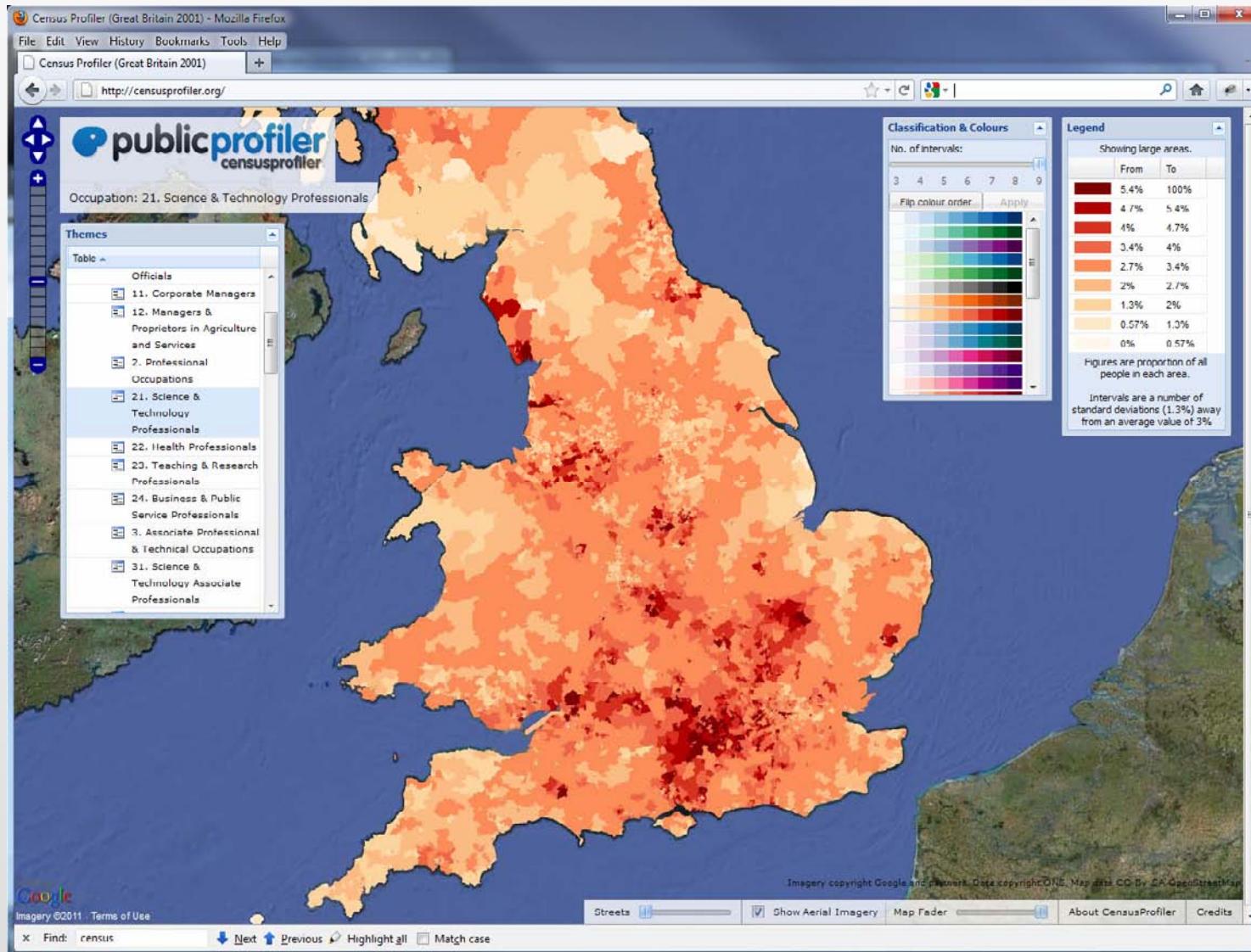


Map data CC-BY-SA OpenStreetMap, Aerial imagery Copyright Google, Census data Copyright ONS



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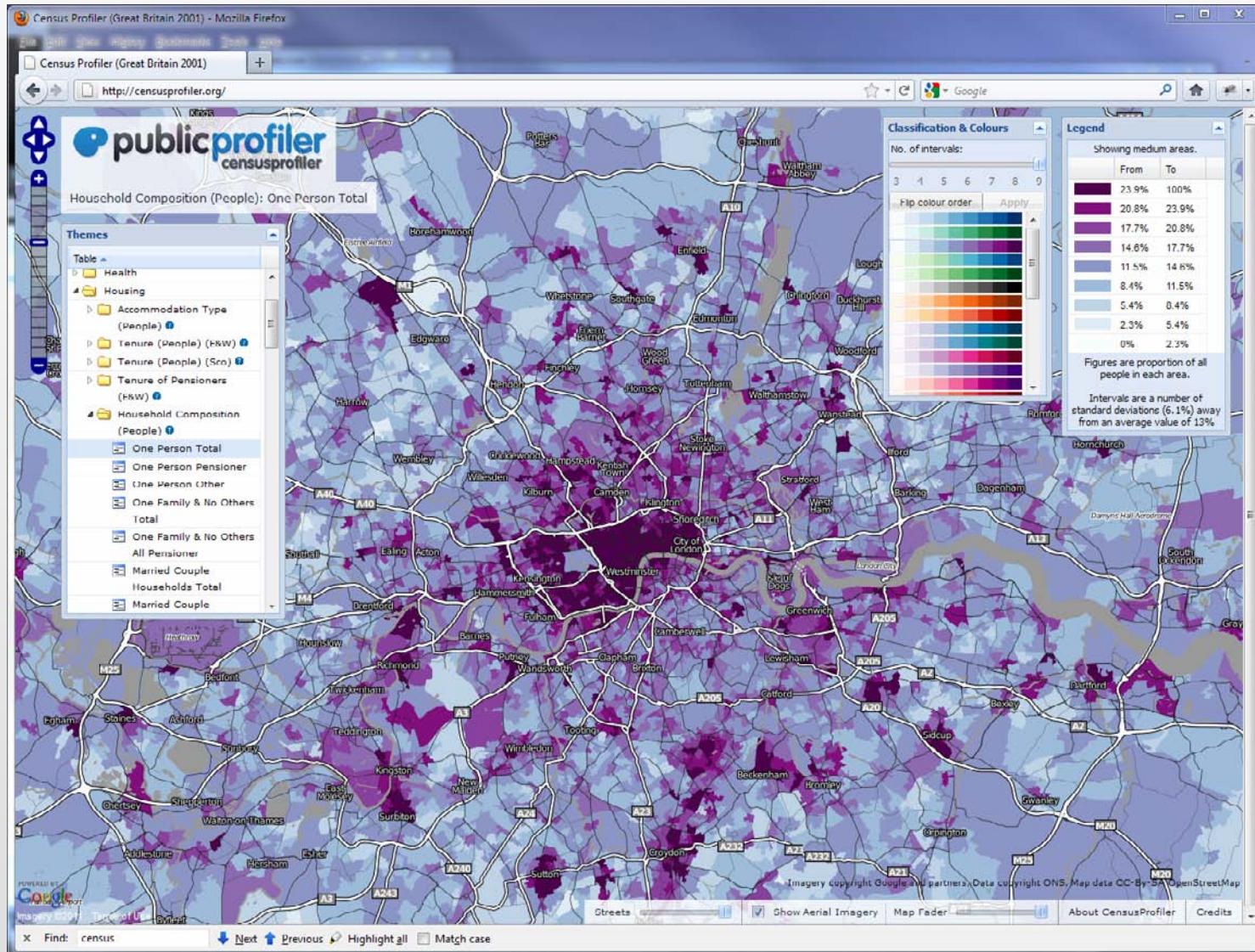


Map data CC-By-SA OpenStreetMap, Aerial imagery Copyright Google, Census data Copyright ONS



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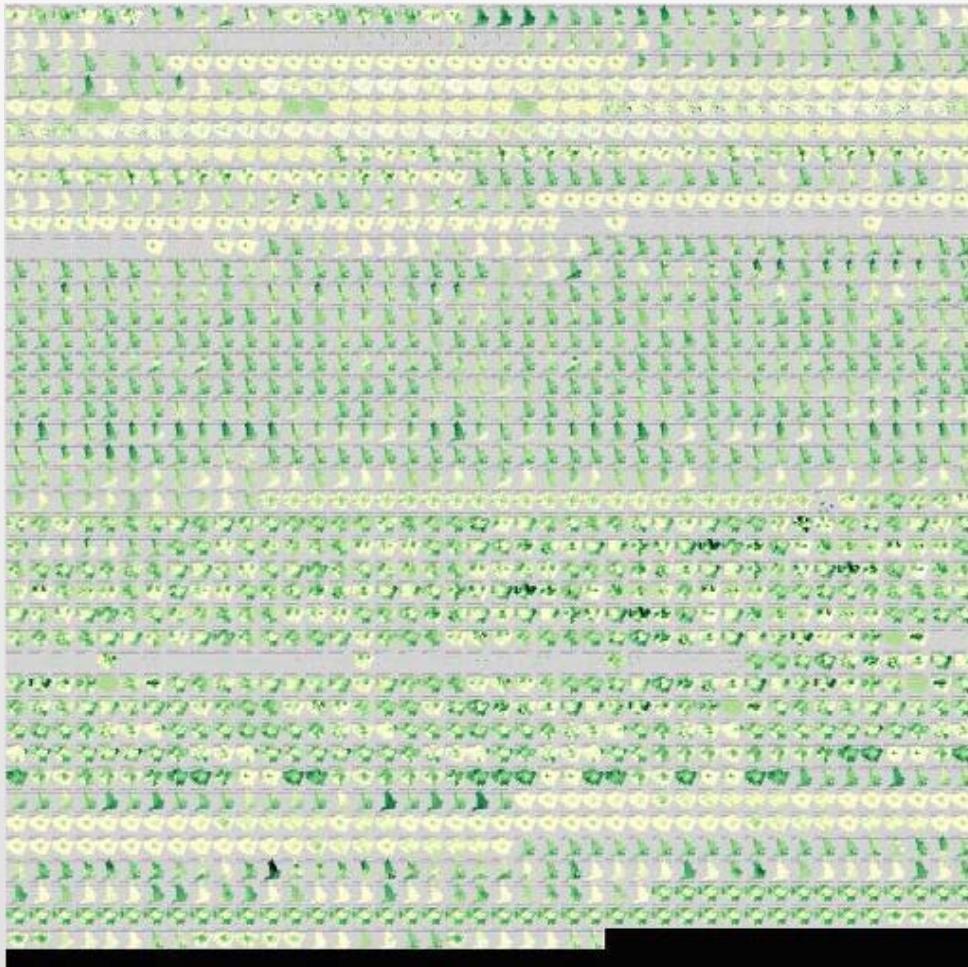


Map data CC-By-SA OpenStreetMap, Aerial imagery Copyright Google, Census data Copyright ONS

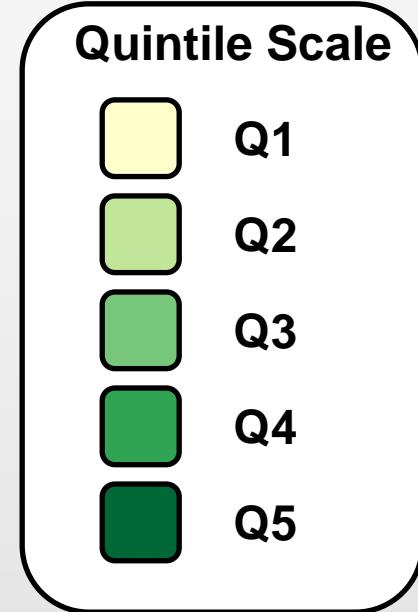


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102 datasets
1706 variables (~50%)



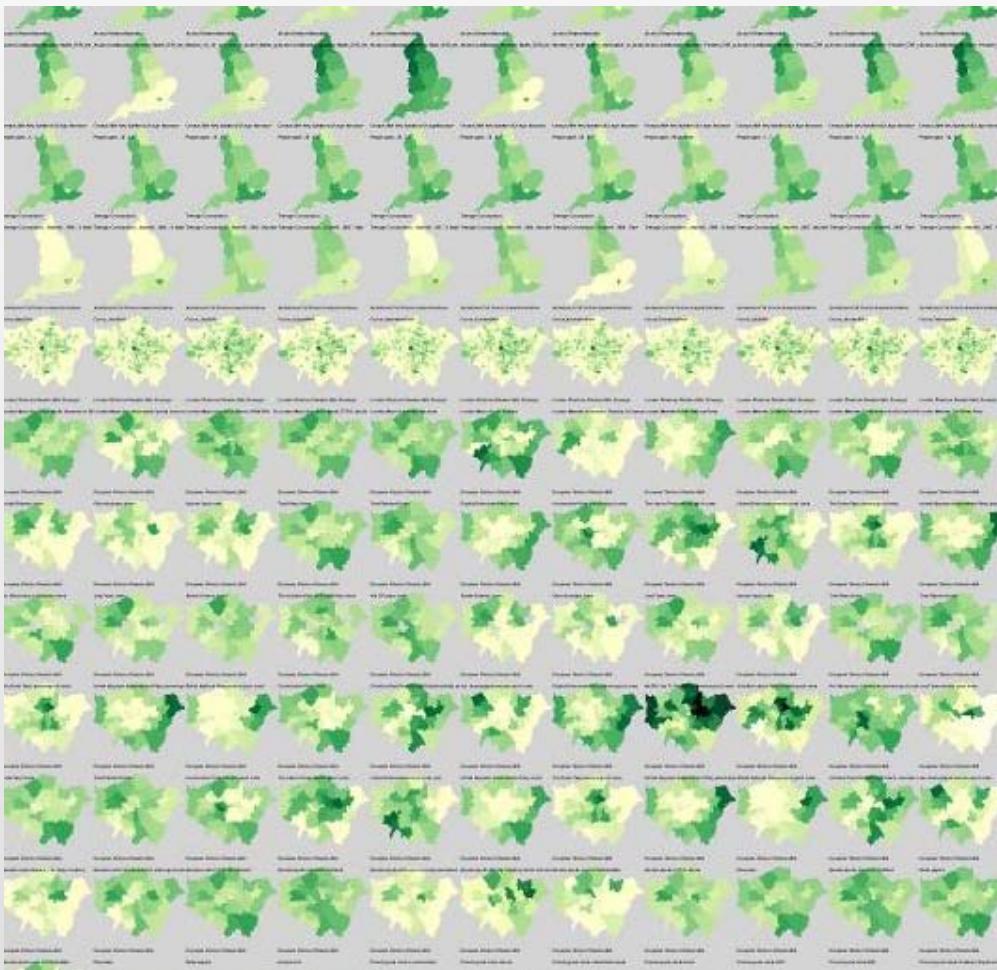
london.gov.uk

Mining a Datastore: Ordering and Visualising Data



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102 datasets
1706 variables (~50%)

Quintile Scale

-  Q1
 -  Q2
 -  Q3
 -  Q4
 -  Q5

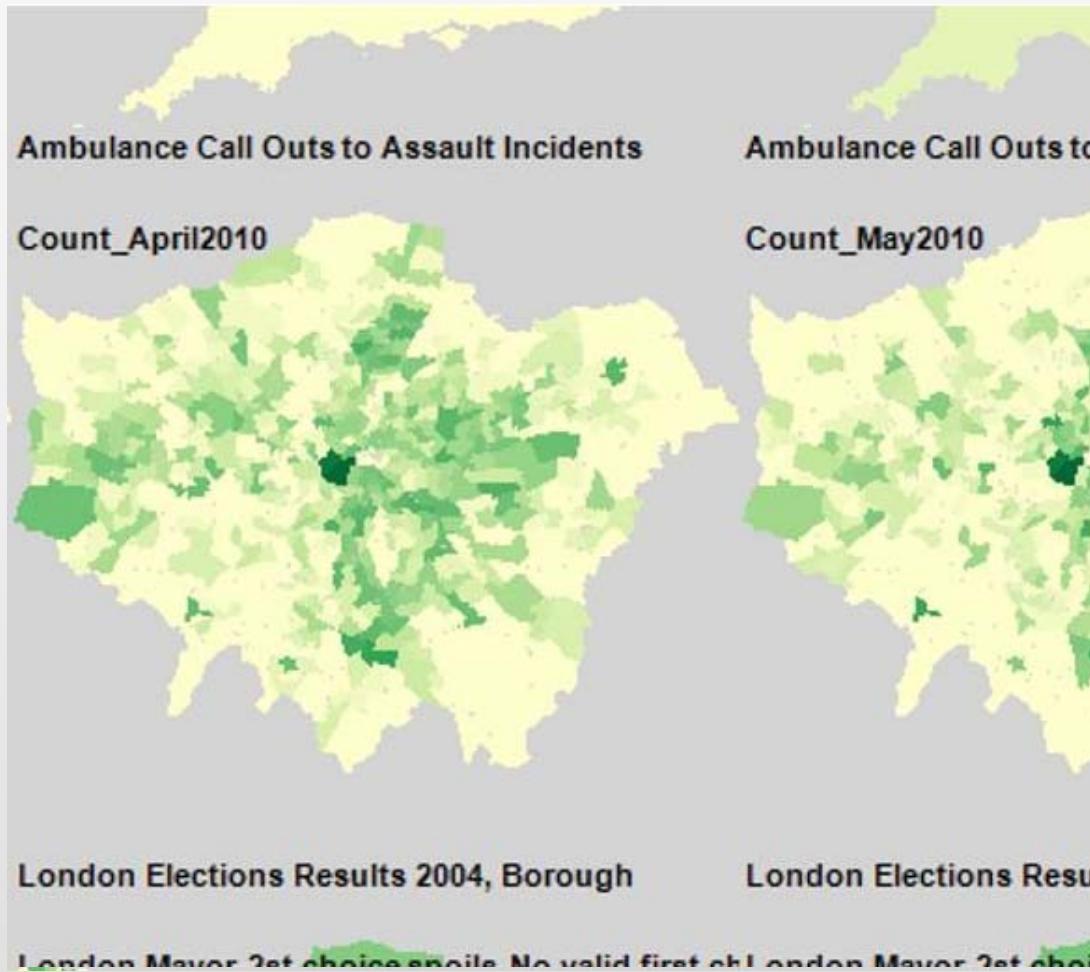
london.gov.uk

Mining a Datastore: Ordering and Visualising Data

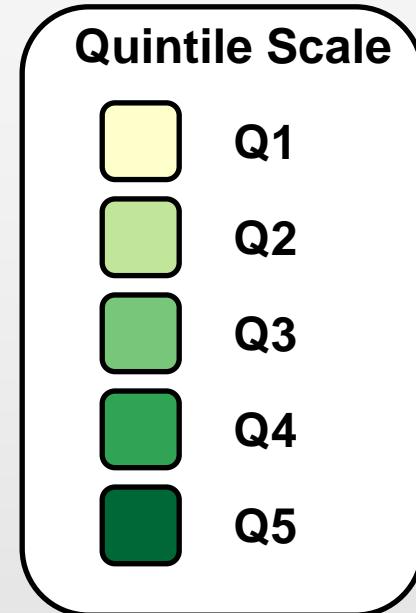


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102 datasets
1706 variables (~50%)



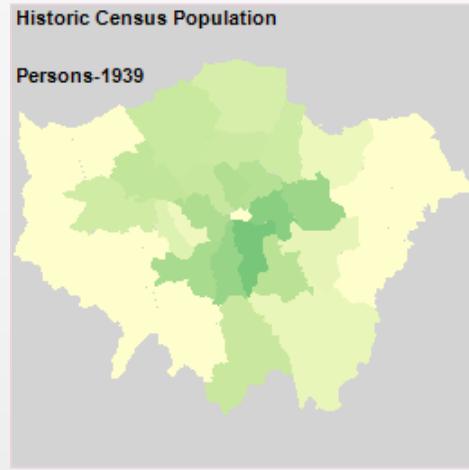
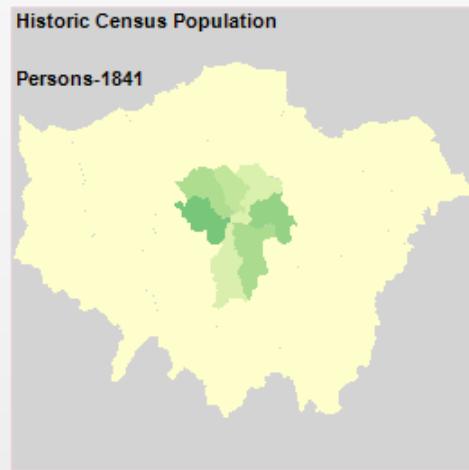
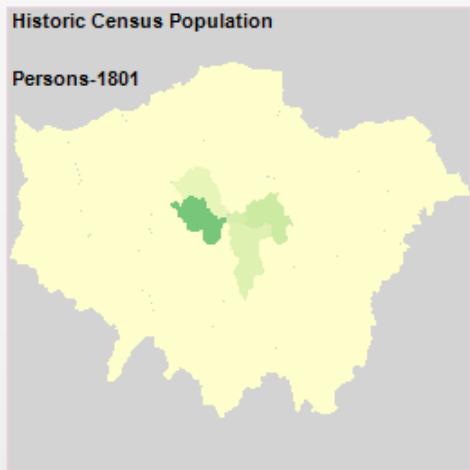
london.gov.uk

Mining a Datastore: Ordering and Visualising Data

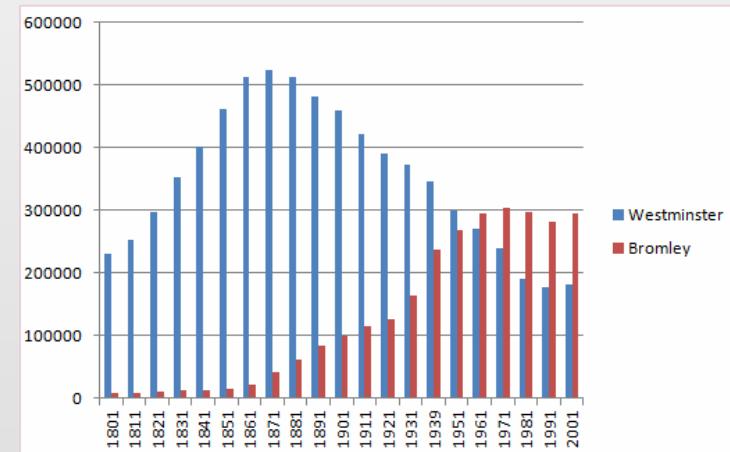
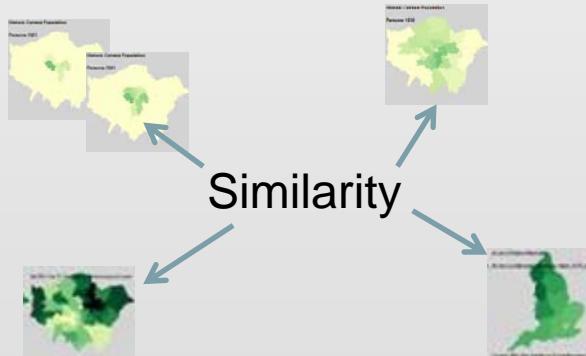


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London Datastore Historic Census Population: 1801, 1841 and 1939



Mining a Datastore: Historic Populations for London

Integrating Diverse Data: Adding Value

The screenshot shows a web browser window displaying the london.gov.uk Datastore. The URL in the address bar is data.london.gov.uk/datastore/package/average-house-prices-borough. The page title is "Average House Prices, Borough". The main content area displays the following information:

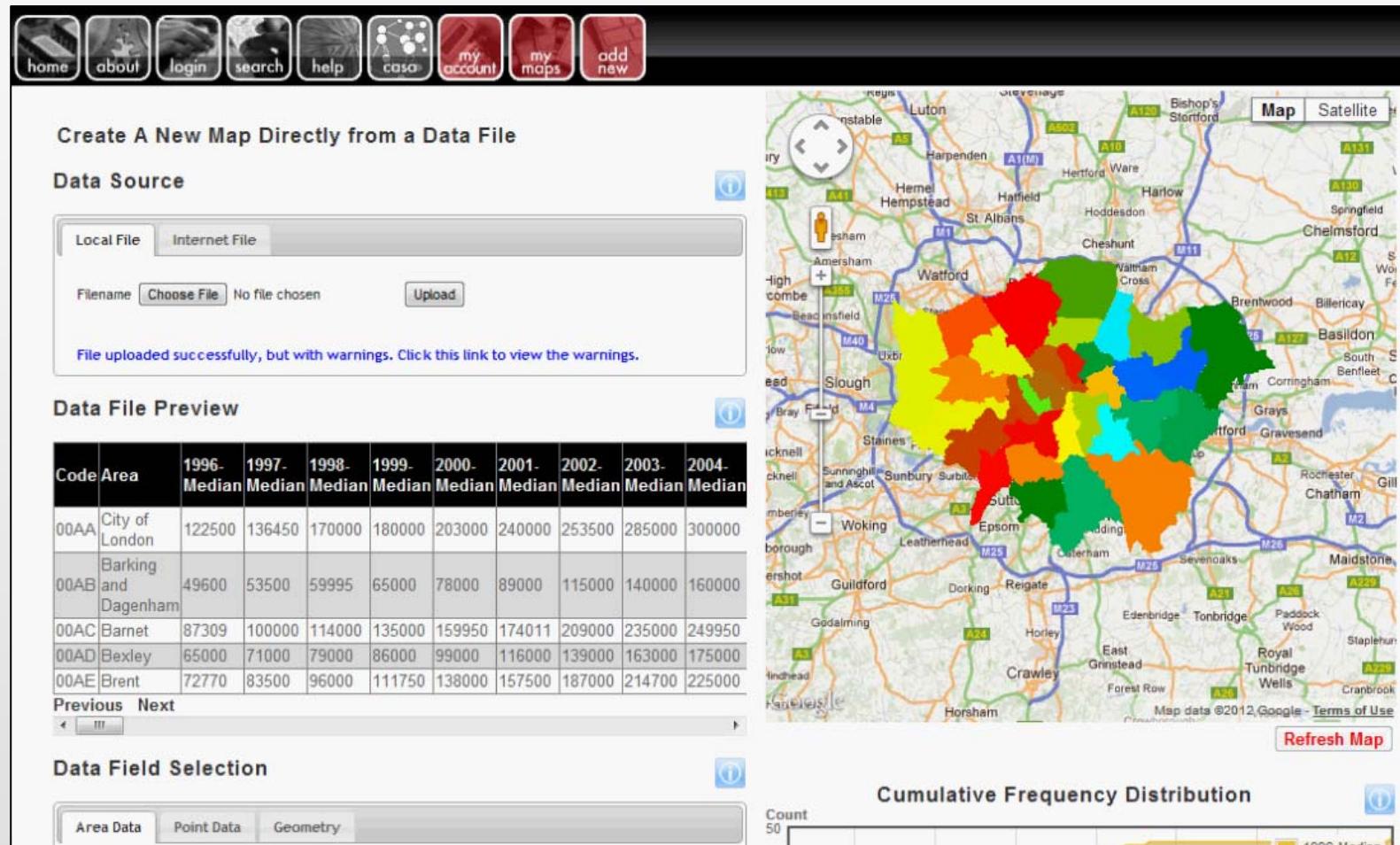
- Average:** ★★★★☆ (Average: 4.7 (6 votes))
- Description:** Average annual and quarterly house prices based on Land Registry data, by borough.
- Exclusions:** Excluded from the above figures are sales at less than market price (e.g. Right To Buy), sales below £1,000 and sales above £20m.
- Median Price:** The "median" property price is determined by ranking all property prices in ascending order.
- Median Definition:** The median is the mid-point of this ranking with 50 per cent of prices below the median and 50 per cent above.
- Latest Figures:** The figures for the latest quarter are provisional and figures for all other quarters have been revised.
- Data Source:** Data from CLG Table numbers: 581, 582, 585 and 586
- Geography:** Local Authority
- Extent:** Greater London
- Author Name:** DCLG, based on Land Registry data

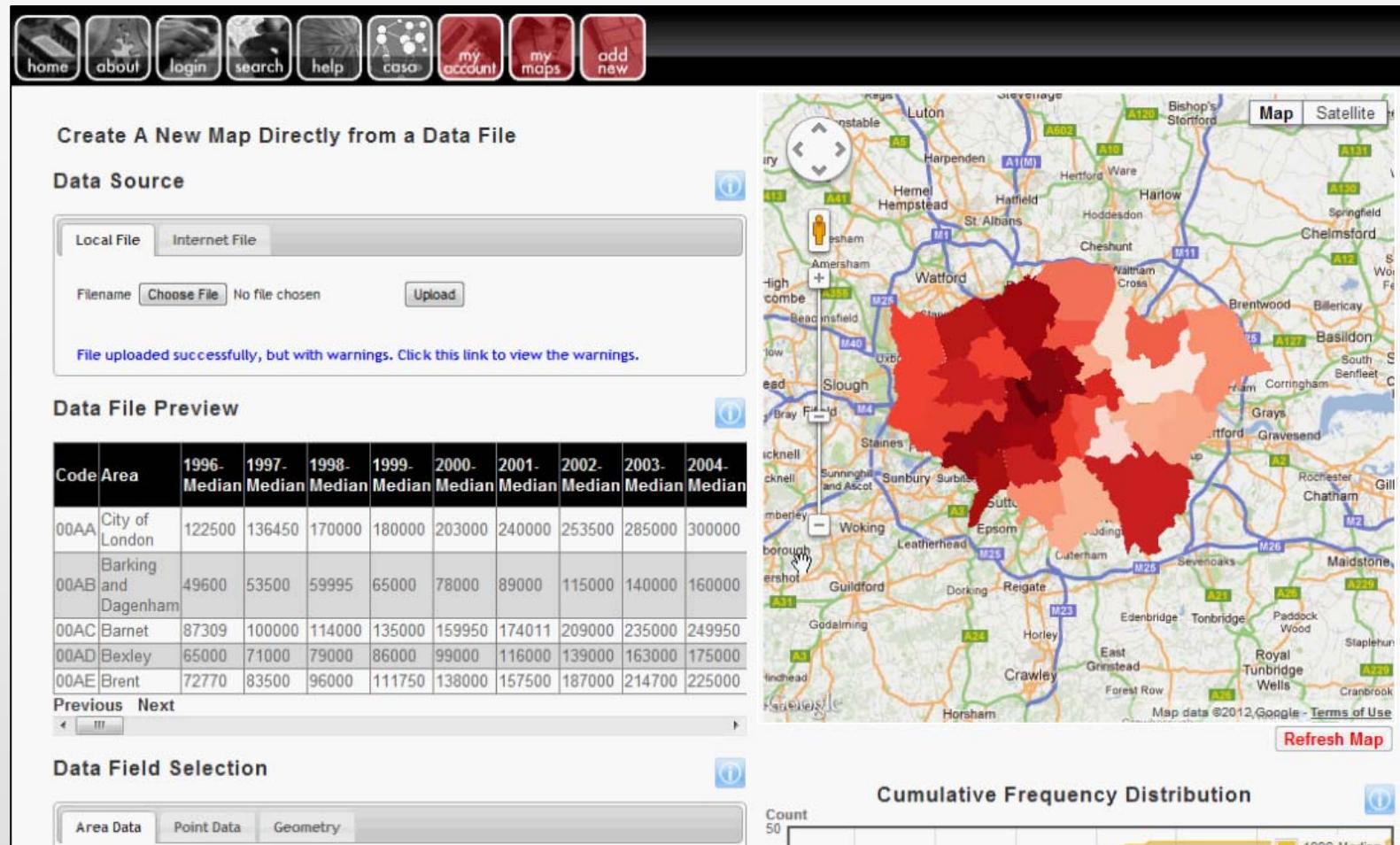
Using our MapTube resource developed under DSR Genesis programme, we can now extract many open data

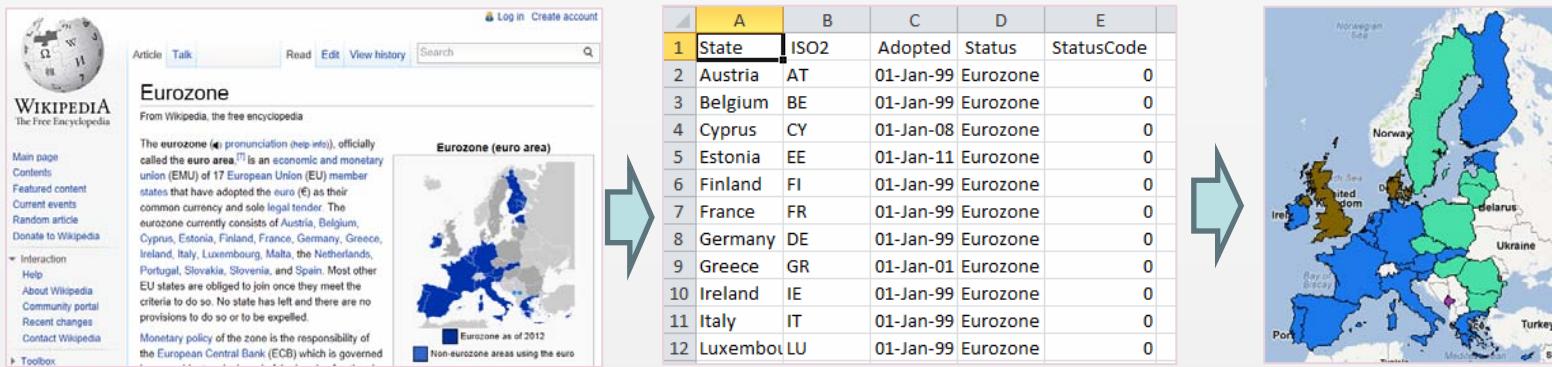


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Algorithm

Polygons

1. For the first N rows ($N=10,000$) of every column, use a RegEx test to rule out any columns that can't possibly match
2. For the first N rows ($N=1,000$) of the remaining columns, lookup key text in geocode database containing tuples of (key,dataset name) for every geography
3. Assign probability to column (prob, dataset) tuple based on number of matched rows

Points

1. Compute statistics on columns for: Min, Max, IsNumeric, IsProgression and Column Name Weight
2. Find X and Y Columns based on IsNumeric&!IsProgression
3. Choose CRS based on Min and Max

We are developing many new versions of MapTube that enable us to extract data from web sources



Generating New and Complementary Data: Crowd-Sourcing

We will show some early work dating to the beginning of the credit crunch. But the classic example is Open Street Map, that we are proud to say has its origins in UCL, if not in CASA where Steve Coast was an intern – terrible word – in the late 1990s

To generate data through eliciting responses to questions or ideas via the web, one needs a good broadcast medium and this is essential – our entry into this domain was through the BBC who came to use, having seen MapTube and asked us to help them elicit responses to how people felt about the credit crunch



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BBC RADIO **4**

Radio 4: Mapping the Credit Crunch

Welcome to Radio 4 Listeners, below is the Credit Crunch question, simply select an option and then input the first part of your postcode - for example RG11

MapTube will then take your answer and every hour automatically create a map of the nation's mood.

What single factor is hurting you most about the credit crunch?

- Mortgage or Rent
- Petrol
- Food Prices
- Job Security
- Utility Bills
- Not Affected

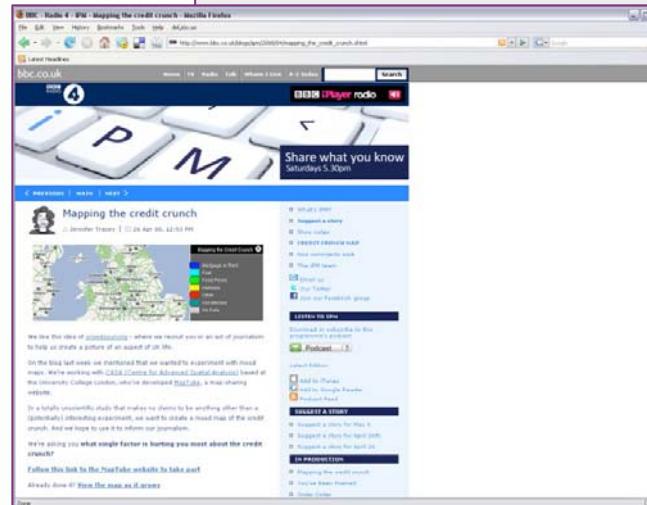
Enter the first part of your postcode:

Submit

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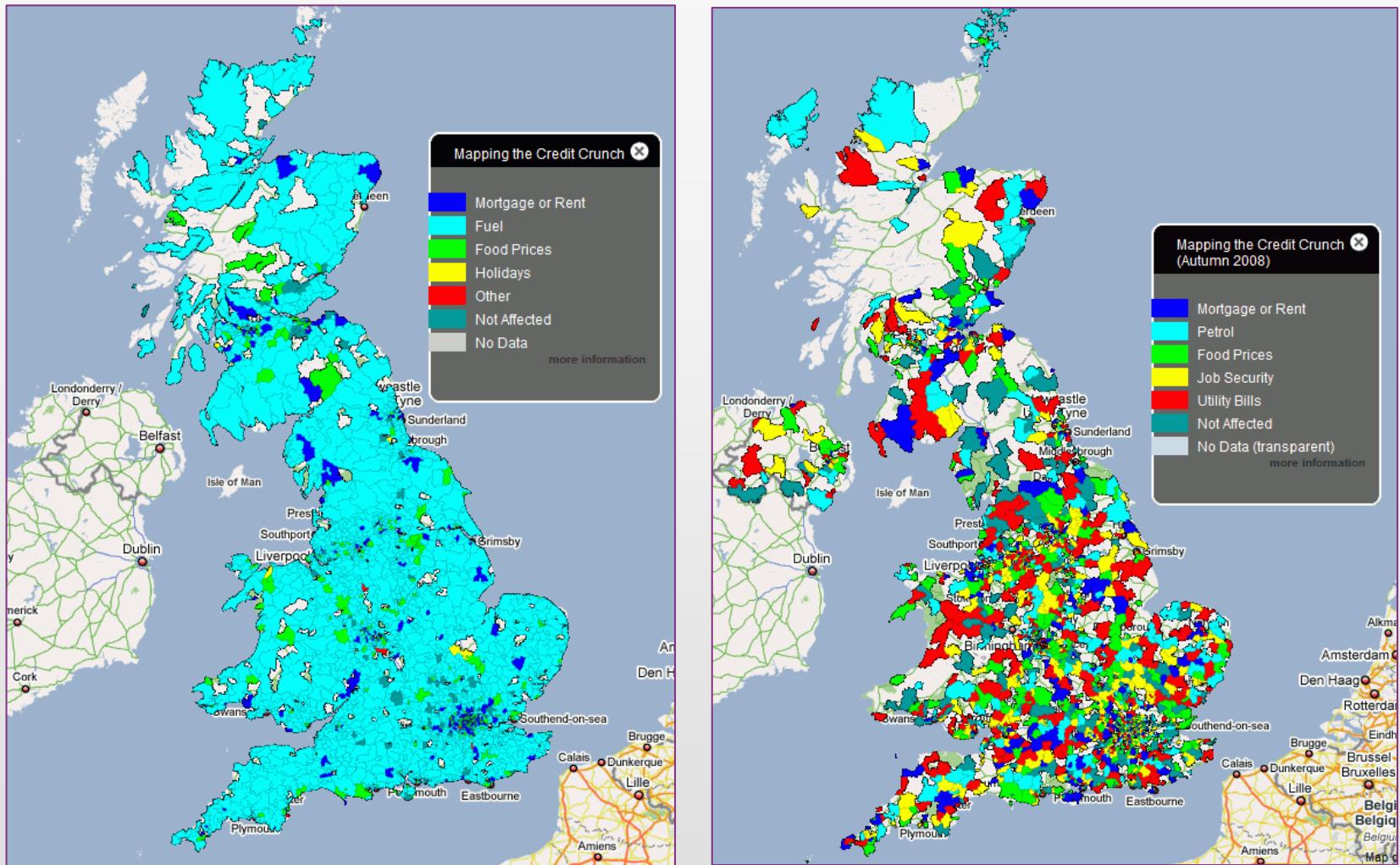
23,475 responses
April, May, June 2008

A new credit crunch survey started in October and currently has 3,802 responses.



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UCL



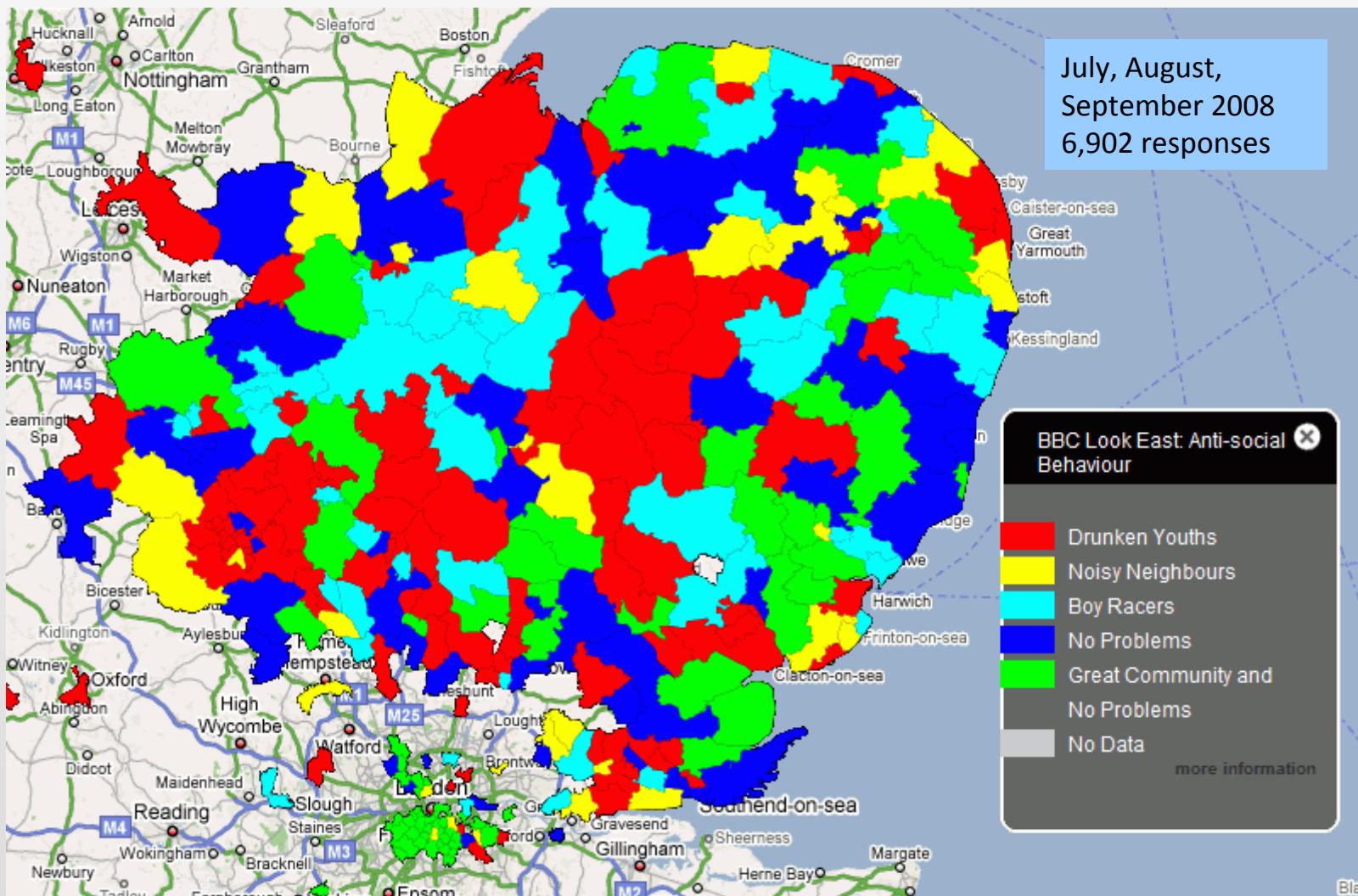
<http://www.maptube.org/creditcrunch/>



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BBC Look East: Anti-Social Behaviour



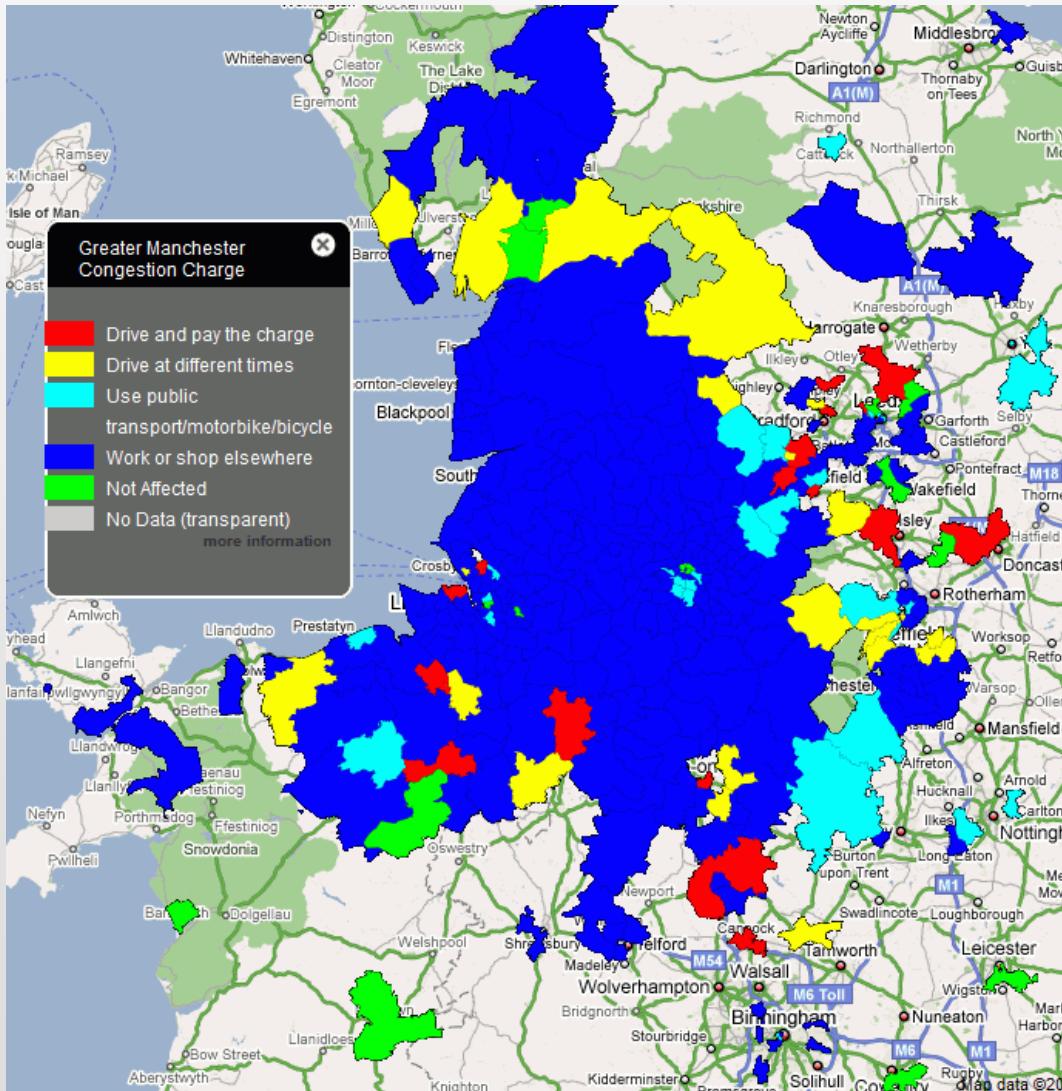
[p://www.maptube.org/lookeast](http://www.maptube.org/lookeast)



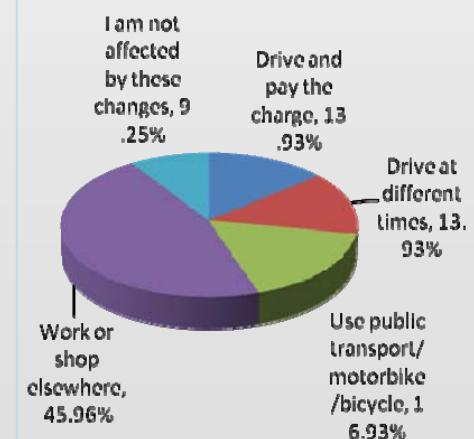
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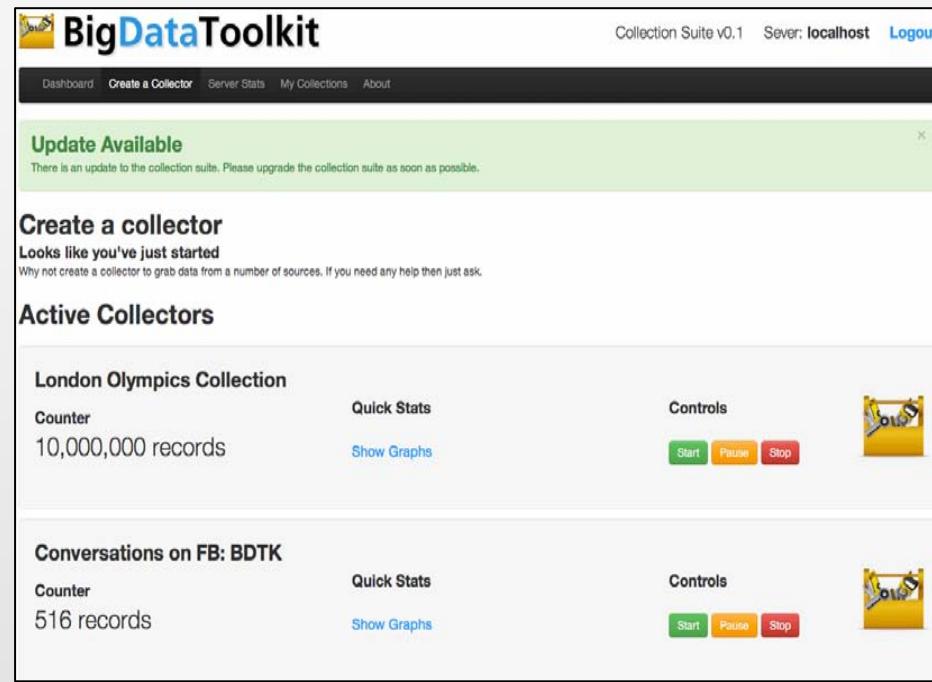
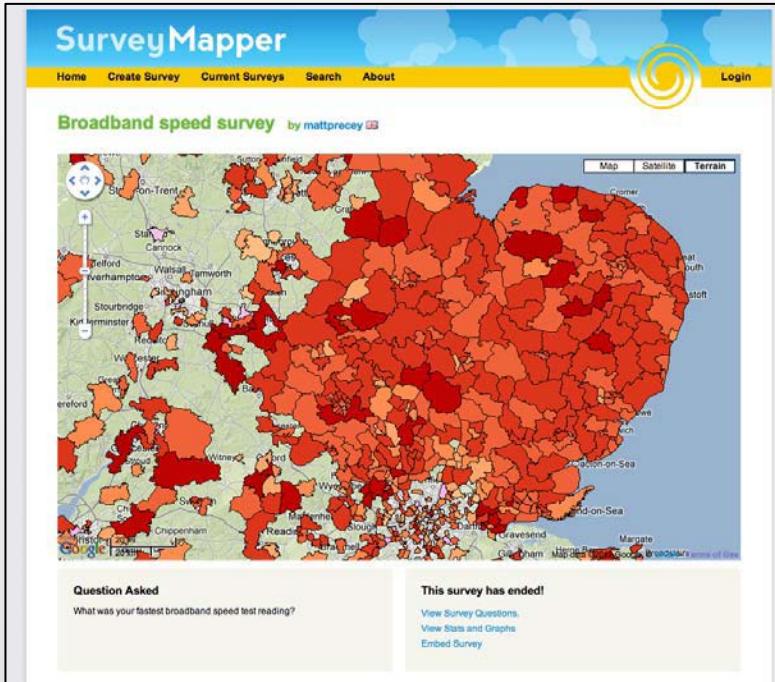
Manchester Congestion Charge



15,902 responses
October to December 2008



Data, Sensing, Capture, Extraction:



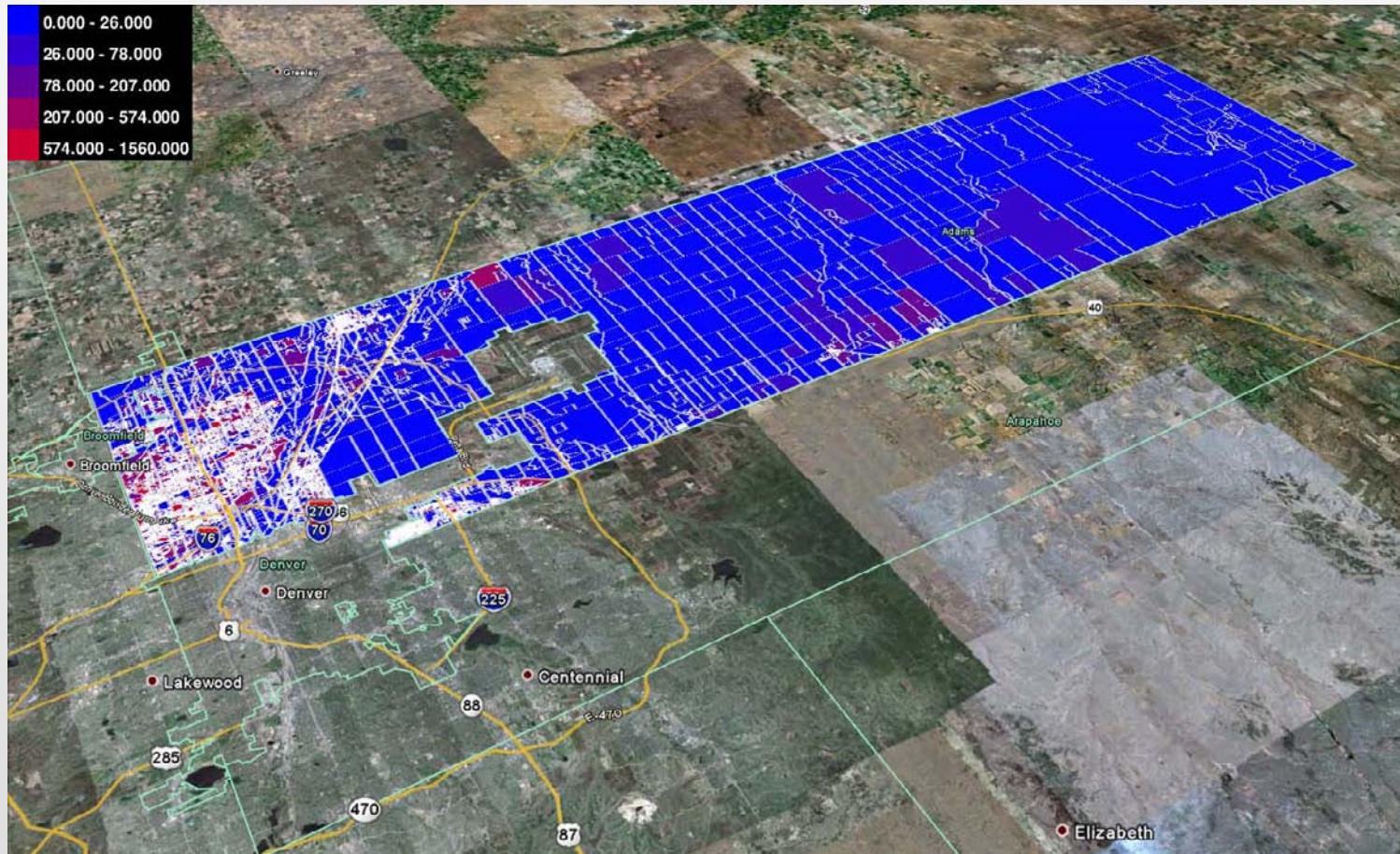
Crowd-Sourcing: Survey Mapper let's you create a survey and mount it on the web; this is part of the BigDataToolkit



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Census Analytics

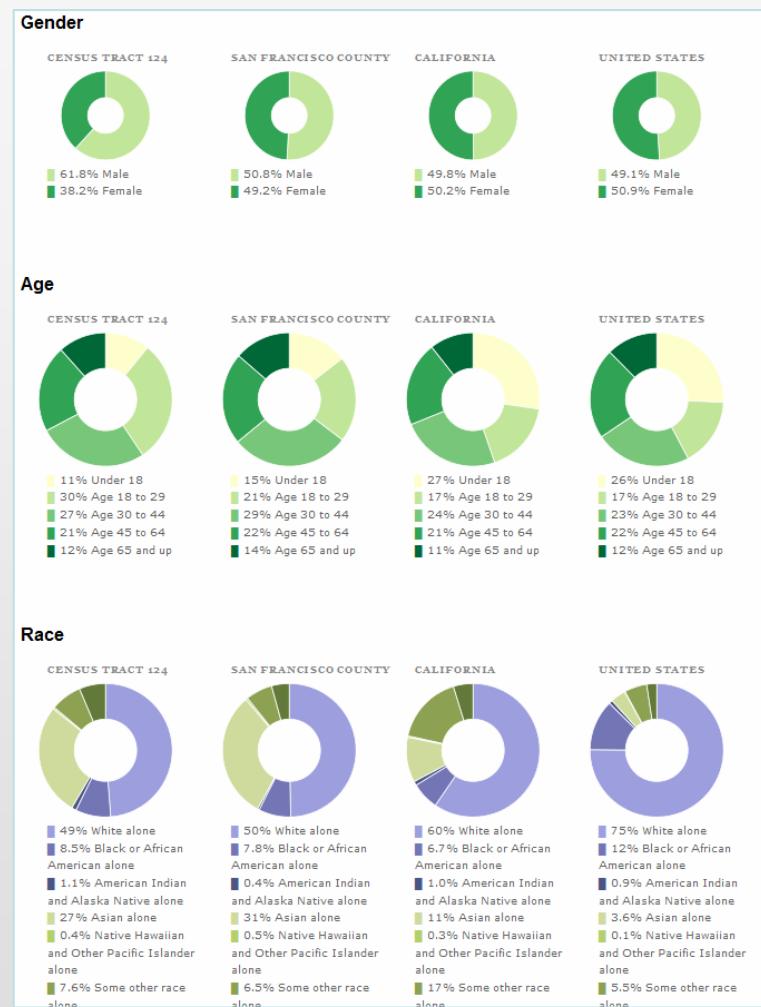
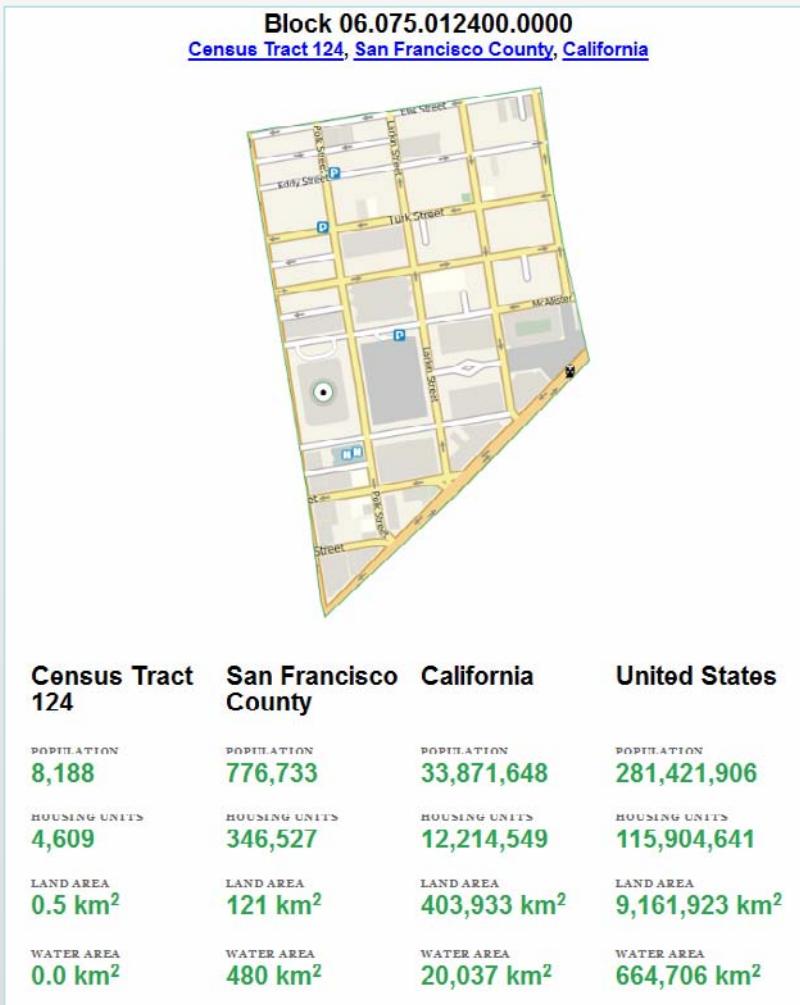


<http://www.gcensus.com/>



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- <http://thistract.com/>
- Built by Michal Migurski of Stamen Design
- Uses geolocation
- On “GitHub”
 - Should be possible to implement it for the 2001 (and 2011) UK census data
 - “This OA”?

migurski / This-Tract

GitHub is more than just a place to share code. It's a place to keep tabs on your favorite developers and projects, easily contribute fixes and new features, and visualize what's going on inside your codebase!

Sign Up Now

FREE FOR OPEN SOURCE

Source Commits Network Pull Requests (0) Issues (2) Graphs Branch: master

Switch Branches (1) Switch Tags (0) Branch List

One U.S. census tract at a time
http://thistract.com

HTTP Git Read Only https://github.com/migurski/This-Tract.git Read Only access

Oops, forgot to credit protovis for the new charts

Michal Migurski (author)
January 03, 2011

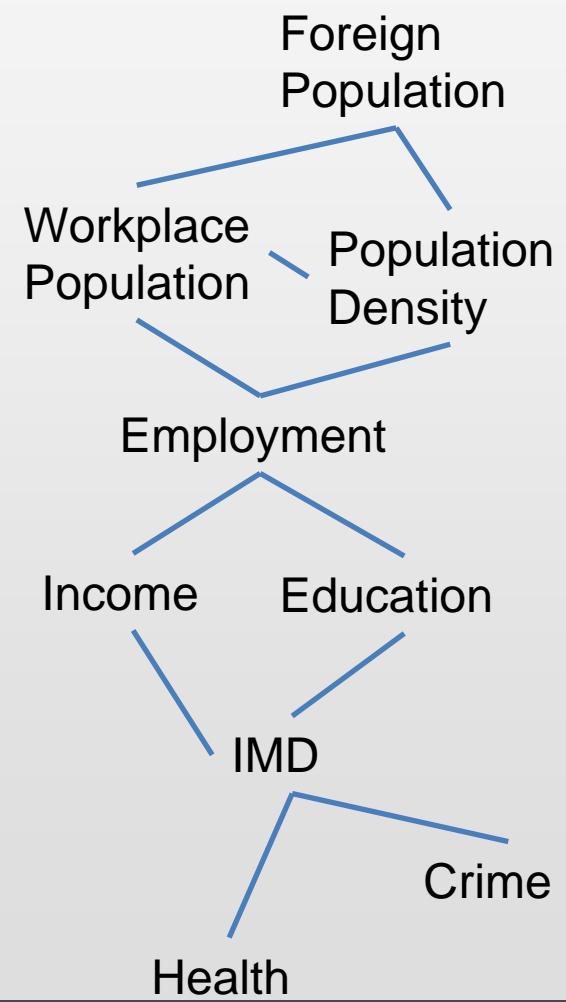
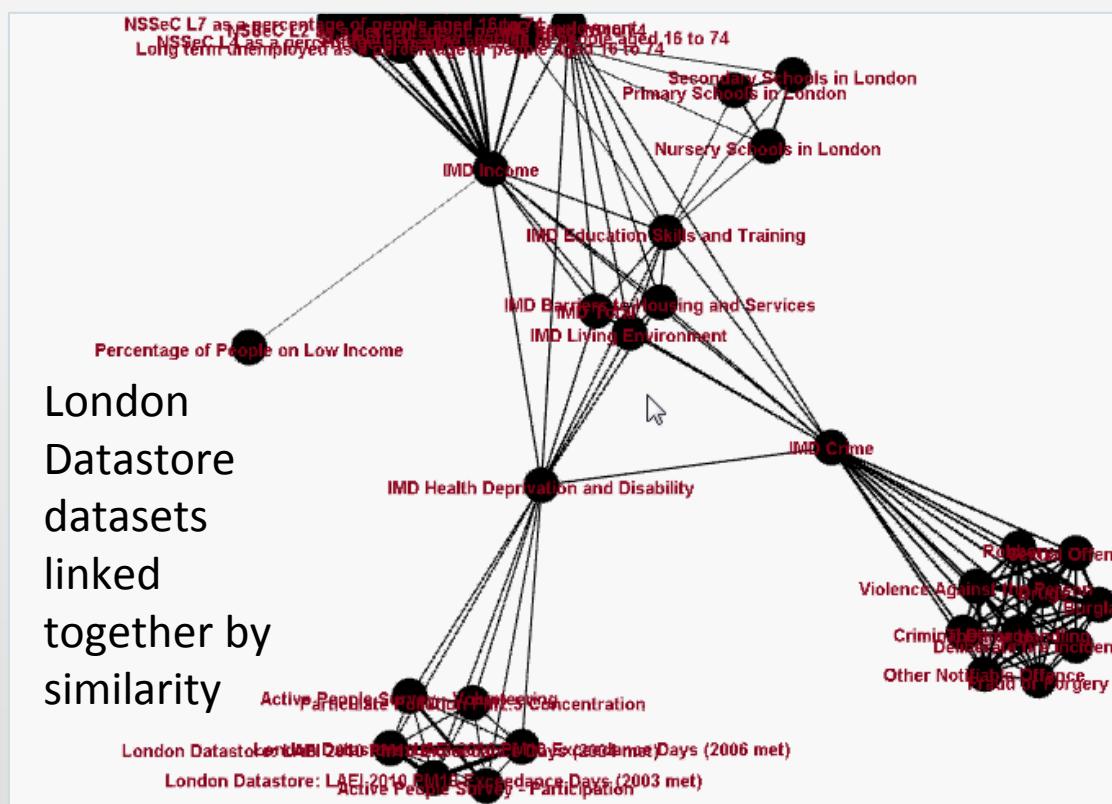
commit e88370e638e008daa877
tree 6d72b6b20327968b6468
parent bbfca7228bb8ea0f0f02f4

This-Tract /

Name	Date	Message	history
data/	December 30, 2010	Noted SF1 and SF3 settings in new readme [Michal Migurski]	
index.html	January 03, 2011	Oops, forgot to credit protovis for the new charts [Michal Migurski]	
layout-default.css	December 31, 2010	Incorporated Craig's substantial design edits [Michal Migurski]	
layout-wider.css	December 31, 2010	Incorporated Craig's substantial design edits [Michal Migurski]	
protovis-r3.2.js	December 26, 2010	Doinking around with pv [Michal Migurski]	
slimjim.php	December 29, 2010	Added some cache headers but not really using them... [Michal Migurski]	
spinner.gif	October 26, 2010	Added loading state for tract, county, state [Michal Migurski]	



Keyword Graphs: How are datasets linked together?



<http://www.gapminder.org/>

Google Data Explorer



<http://www.google.com/publicdata/home>



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Textal: Visualising textual data from Books, Social Media, etc. Drill down into the Analytics



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Census Profiler + Google Earth

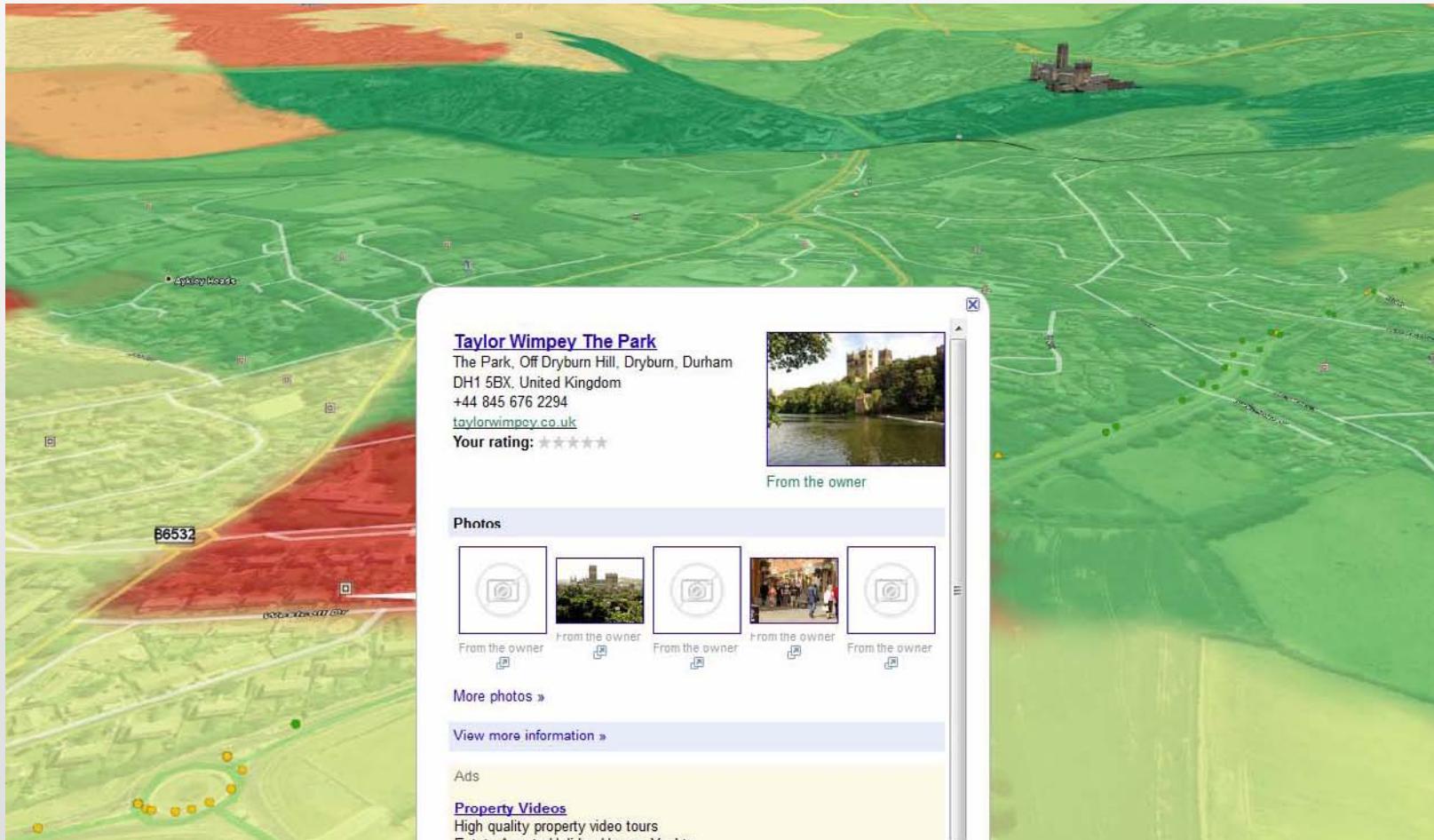


Aerial imagery Copyright Google, Boundary data Crown Copyright, Census data Copyright ONS



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Aerial imagery Copyright Google, Boundary data Crown Copyright, Census data Copyright ONS

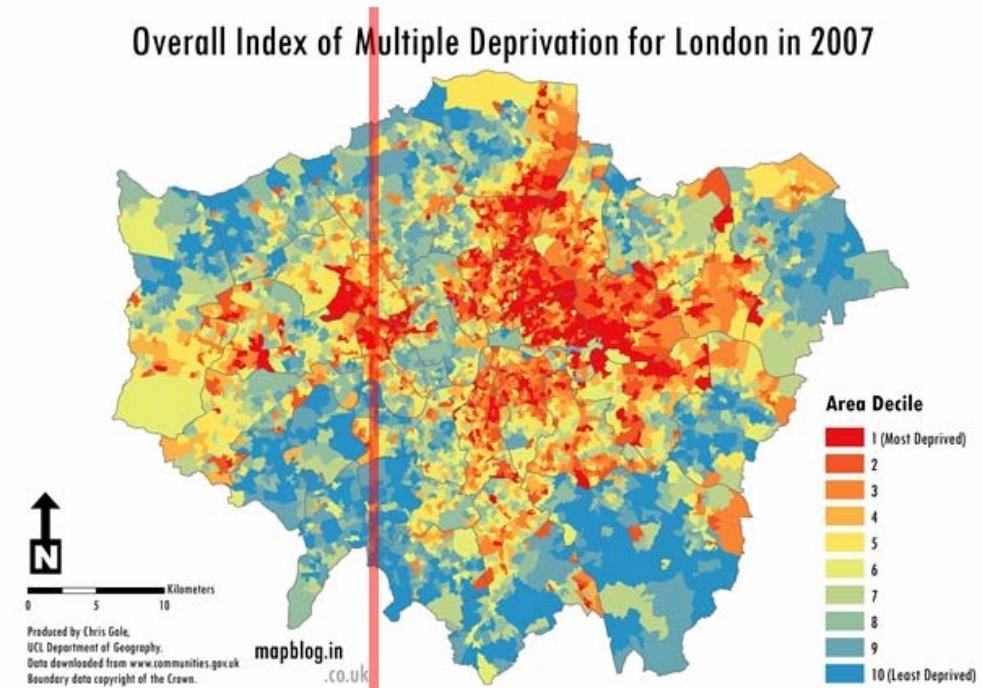
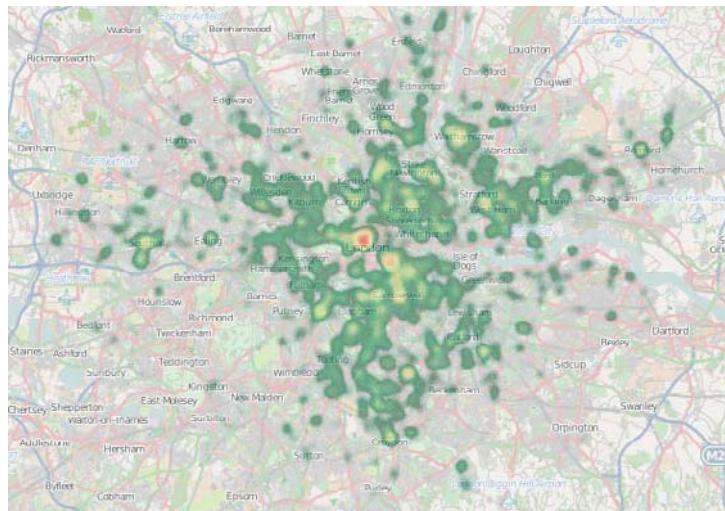


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Next Steps: What Can We Expect?

- Choropleths to show specific value or % differences
- Heatmaps to show general patterns of differences
- Fade between years
- Swipe maps



Swipe map was produced by Chris Gale (UCL Geography)

There are a variety of things that I need to do to fill in detail but next time we will look at visual analytics – particularly modelling – two kinds of modelling

- Geometric modelling and geographic modelling
- 3D modelling which is digital icon modelling or geometric representation
- 2D but more abstract spatial modelling which is mathematical modelling of socio-economic city functioning
- We will then return in the last two lectures to social media and related smart city issues

