



“Semantic pathways for building a spatially-thinking society/ GEOTHNK”
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Educational object

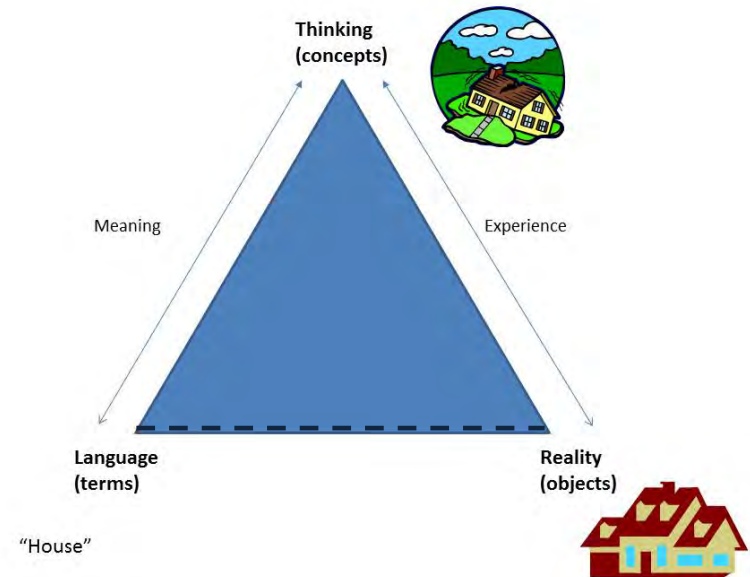
Cartograms : An alternative way to visualize data

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What is a map?

- A map is a symbolic depiction highlighting relationships between elements of some space such as objects, regions, and themes.
- Cartography or map-making is the study practice of crafting representations of the Earth upon a flat surface (see History of cartography) and one who makes maps is called a cartographer.
- General vs. thematic cartography
- General cartography involves those maps that are constructed for a general audience and contain a variety of features.
- Thematic cartography involves maps of specific geographic themes, oriented toward specific audiences.

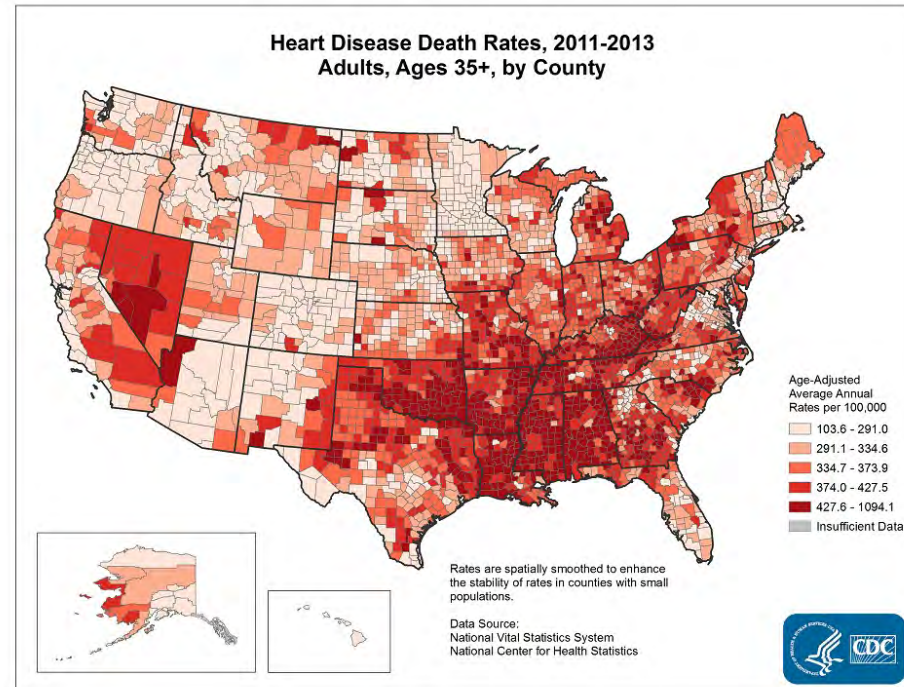


Choropleth Maps

Description: These maps contain areas that are shaded or patterned in proportion to the statistical variable being displayed on the map. Data are aggregated over predefined areal units (politically-defined area or administrative—census or zip).

Optimal uses: Best used when data are standardized (e.g., rates), discrete, and are evenly distributed within well-defined areal units.

Design Considerations: Number of categories should be limited (between 3 and 7).



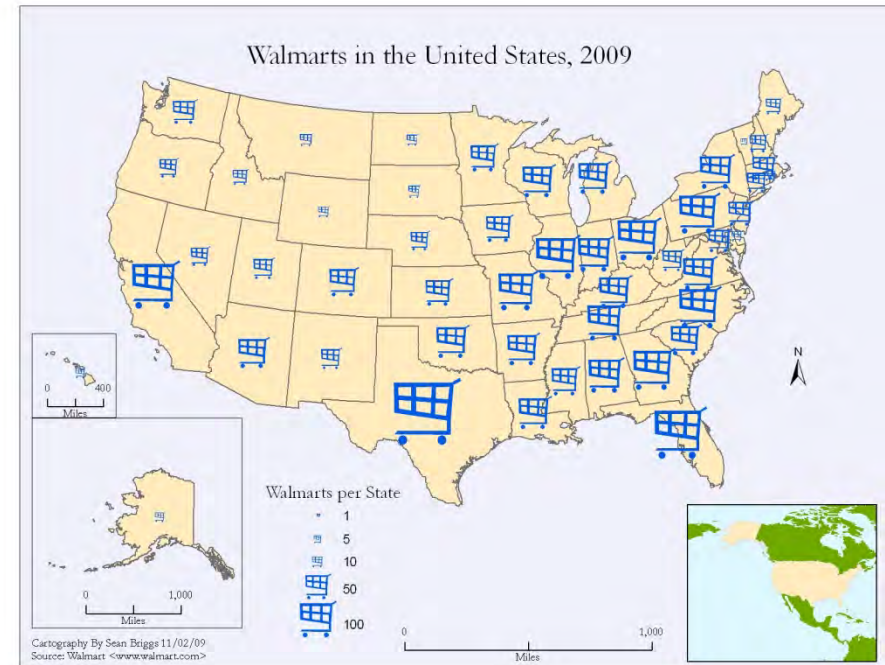
<http://www.cdc.gov/dhdsp/maps/gisx/resources/maps4.html>

Graduated Symbol Map

Description: These maps contain symbols varying in size to show their relative quantitative values; used with point/location data.

Optimal uses: Best used when there is a lot of variation and range in the data; the goal is to show relative magnitudes of phenomena at specific locations. This is also good choice for count data.

Design Considerations: Should not be used for standardized data such as rates or percentages.

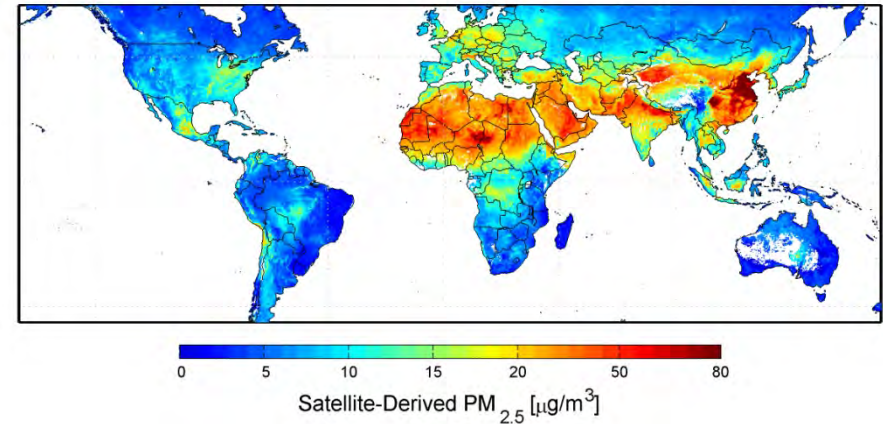


Isopleth Map

Description: A contour map that depicts smooth continuous information (such as weather or pollution data); data are depicted using lines that connect points of equal numerical value.

Optimal uses: Serves as an effective method for highlighting spatial patterns in the data, as opposed to depicting discrete rates per enumeration area.

Design Considerations: Requires understanding of various interpolation techniques..



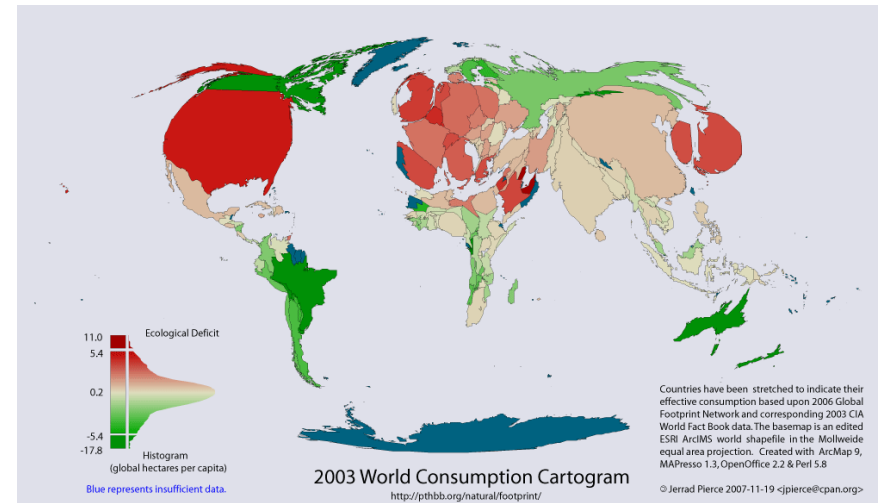
<http://www.cdc.gov/dhbsp/maps/gisx/resources/maps4.html>

Cartogram

Description: The spatial geometry of each mapped area/distance is distorted to depict an attribute other than land area (e.g., population or income)

Optimal uses: Best accompanied by description of mapping techniques; can be constructed manually or digitally.

Design Considerations: Methods are complex and interpretation can be difficult.



Dot Map

Description: Uses dots to show the presence of a feature or occurrence; displays a spatial pattern and relative density. Individual dots can represent single or multiple occurrences.

Optimal uses: Best used for count data; can also show multiple data sets (by using different symbols or colors).

Design Considerations: Requires additional tools (e.g., geocoding) to locate dots on the map; perceptual issues as well as design techniques (e.g., dot size, value, and arrangements) should be considered.

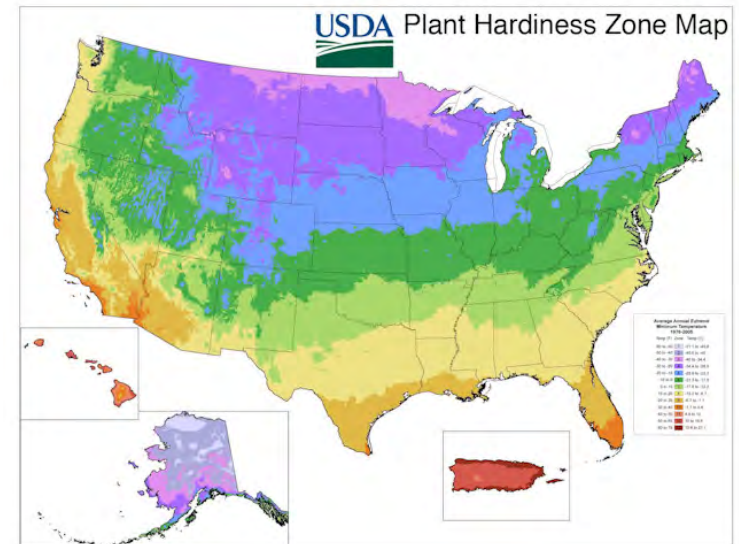


Dasymetric Map

Description: A thematic map that uses symbols to spatially classify volumetric data; serves as an alternative to choropleth maps.

Optimal uses: Most appropriate to use dasymetric maps when the assumption of uniformly distributed phenomena is not met (e.g., population distribution). Interpretation can be facilitated when mapping technique is provided to map users. As with choropleth map, this technique is for depicting standardized data (e.g., rates).

Design Considerations: As with cartograms, this method is quite complex and time-consuming; the extent of the mapped areas rarely correspond to the boundaries of enumeration units.



Discuss Strengths and Weaknesses



(1,4)

- Strengths

Easy to determine qualitatively

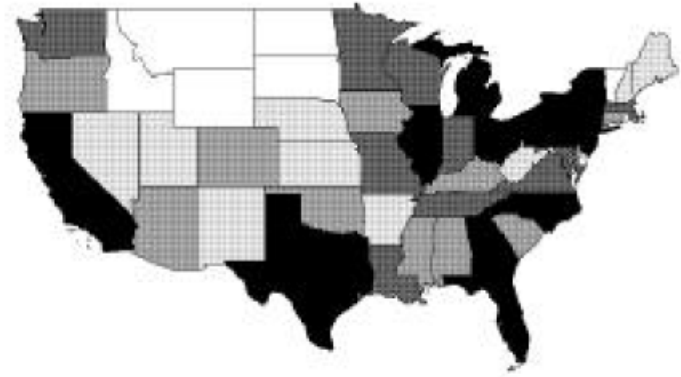
- Weaknesses

but hard to grasp magnitude of population density

Dorling quote: *Maps are designed to show land and to be used for military purposes, seaward navigation and the demarcation of territory... not to allow us to visualize spatial social structure.*

Cartograms

- Cartograms are deliberate exaggerations of a map that communicate information about regions through their spatial dimensions (House)
- Rather than accurately reflect the area and superimpose shading to represent the variable..
- .. Distort the area so as to reflect the variable directly



Types of Cartogram

contiguous or non-contiguous

Contiguous Cartogram



Population of California

Non-Contiguous Cartograms

Overlapping

Non-Overlapping



Population of California

Contiguous and Non-Contiguous Cartograms

- Here is the US population example in both styles...

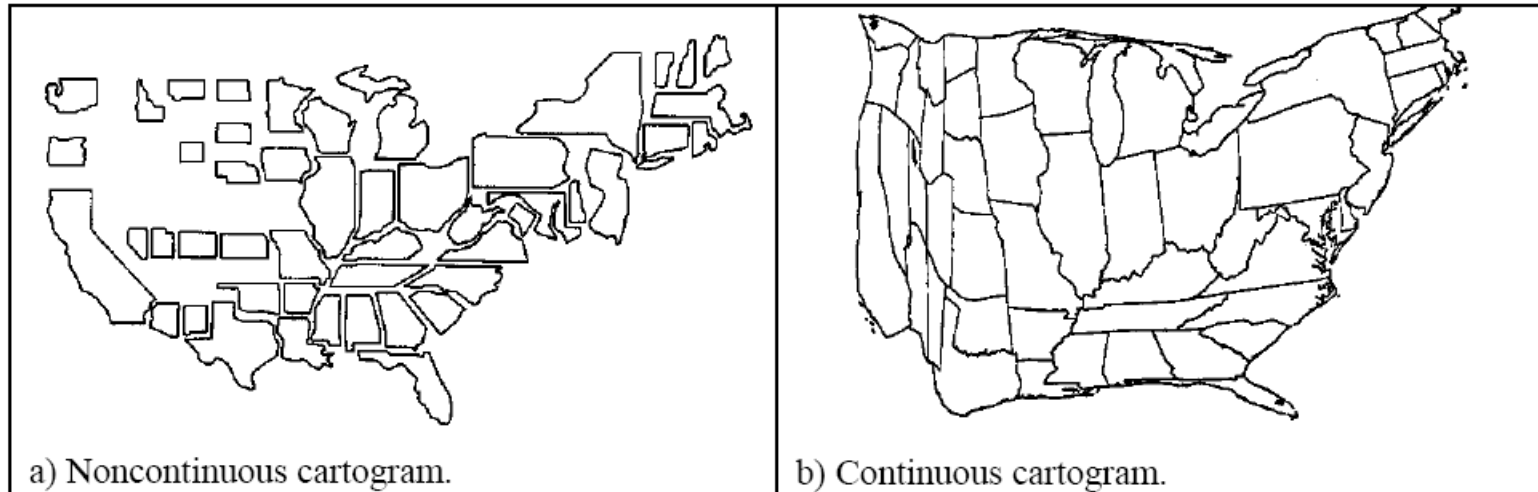


Figure 2.2: Two population cartograms of the U.S. (a: Reproduced with permission from [16], page 163, figure 7.17; b: Reproduced from an uncopyrighted federal government document [24], page 56).

Perimeter-preservation

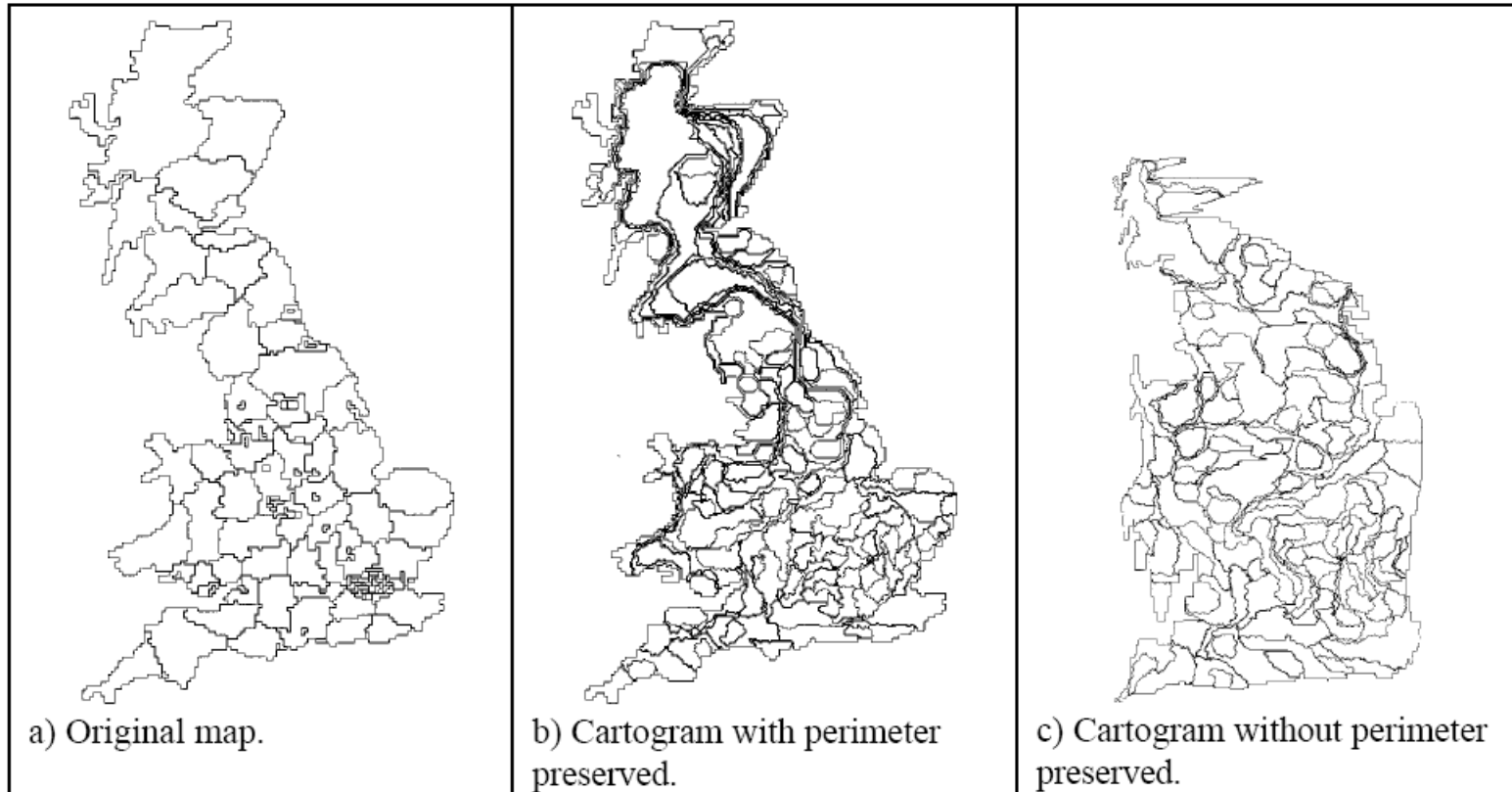
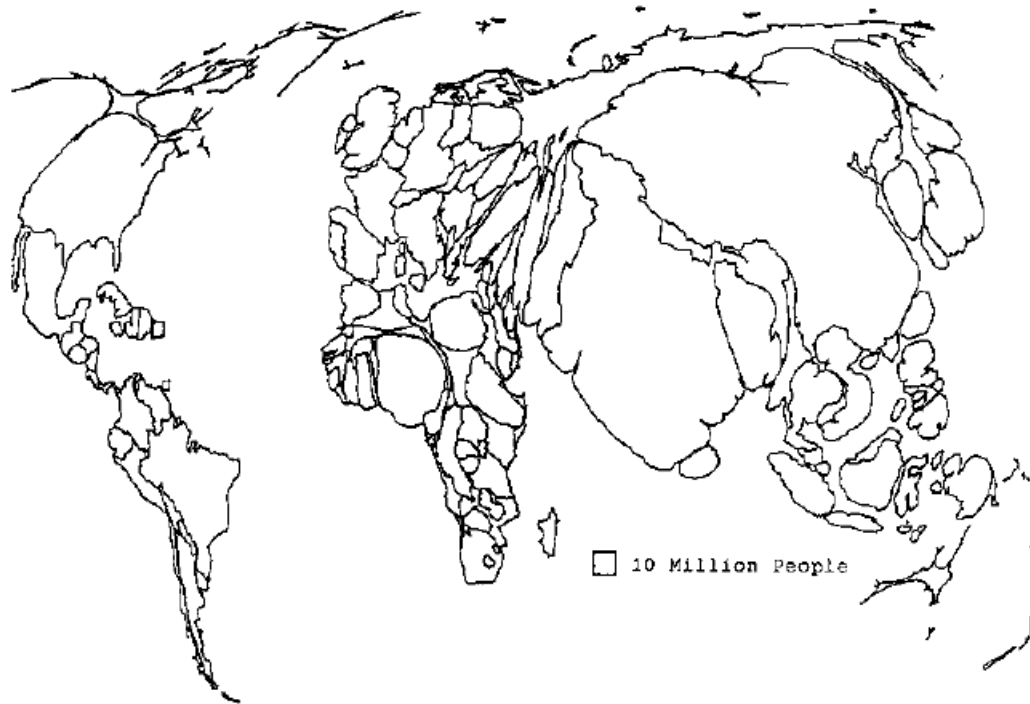


Figure 2.3: Population in British counties and major cities (Reproduced with permission from author [4], pages 20-22, figures 14b, 14c, and 14e).

World Population Cartogram



a) World population cartogram.

Acknowledgement: Examples taken from Web site of Dr Donald House
<http://www-viz.tamu.edu/faculty/house/cartograms>

George Bush – Victory large or small?

Figure1. 2004 Presidential Election Result*



a. By State

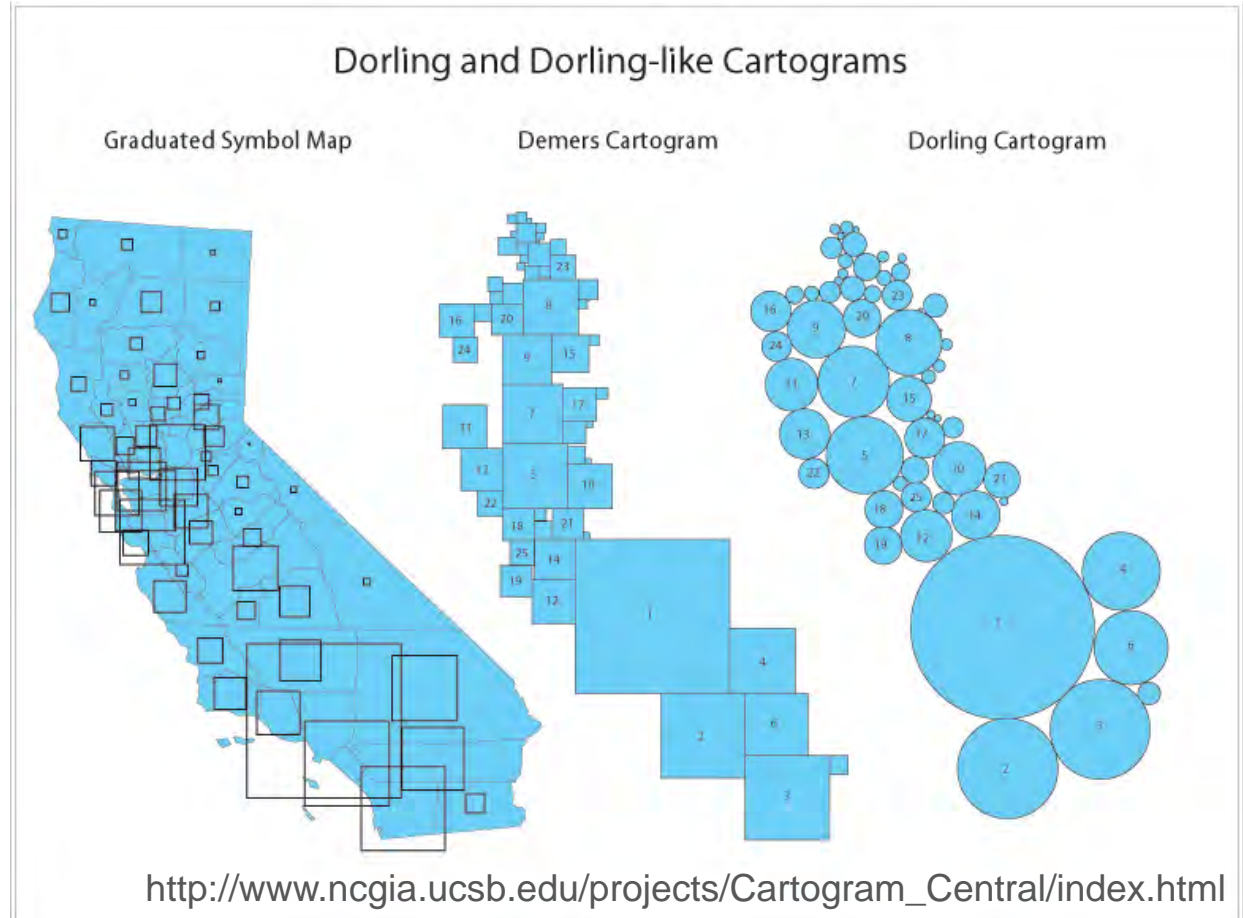


b. On a population cartogram

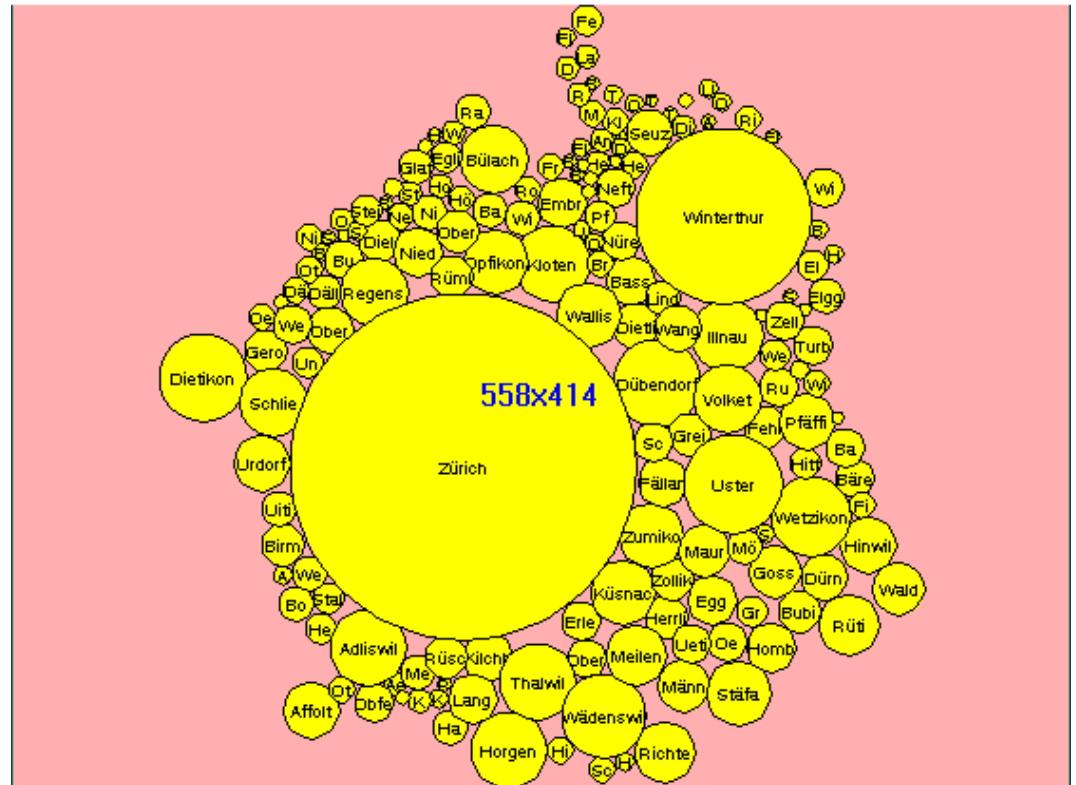
Data resource: Michael Gastner, Cosma Shalizi, and Mark Newman, University of Michigan

Types of Cartogram

- Danny Dorling (recently Professor in Leeds) invented a special type of cartogram using circles of different size



Dorling Cartograms



British county populations evolving...

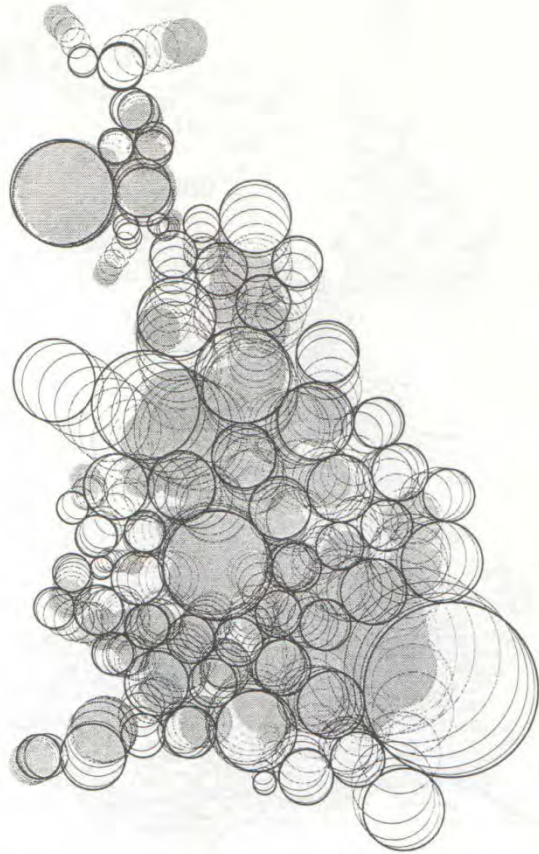


Figure 11.1 Illustration of a cartogram of British county populations evolving



Figure 11.2 Contiguity on the local authority districts population cartogram

Chernoff Face Cartogram!

- Acknowledgement:
 - Last two slides from 'Cartograms for Human Geography', by D. Dorling, in Visualization in Geographical Information Systems, Wiley.

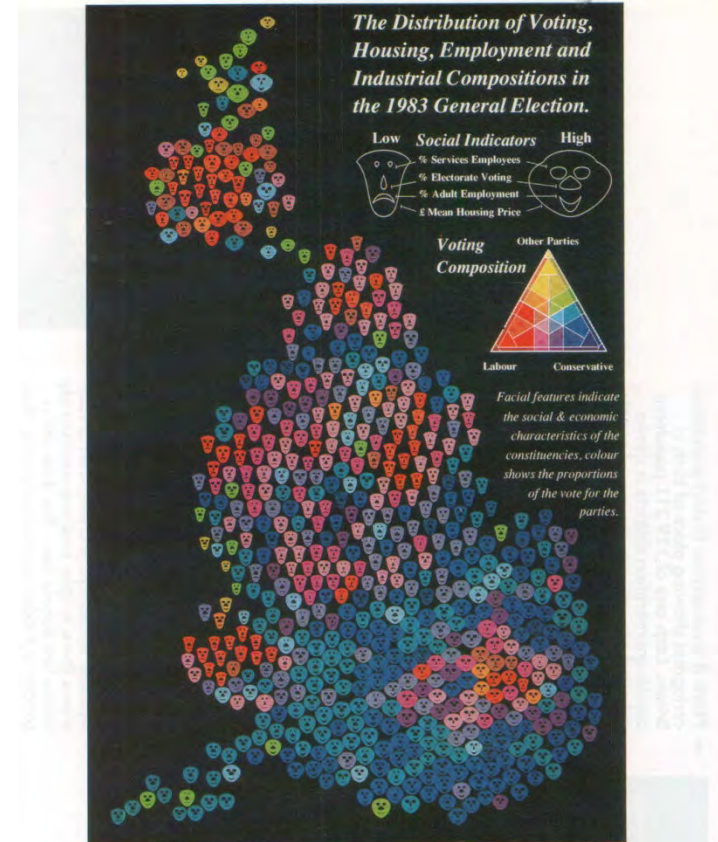


Plate 10 The distributions of voting, housing, employment and industry on a population cartogram. The 633 mainland parliamentary constituencies are each represented by a face whose features express the various variables, and which is coloured by the mix of voting, drawn on an equal electorate cartogram. The patterns in this picture are very interesting and could lead to endless discussion. The 'deaths-heads' inside Glasgow city are solidly red, while the happy-faces around the capital voted strongly for the government of the day. The Welsh may not have had much employment, or expensive housing, but they still turned out to vote in large numbers. This technique is particularly good for identifying exceptions, faces which do not fit in with the crowd

Examples of Cartogram

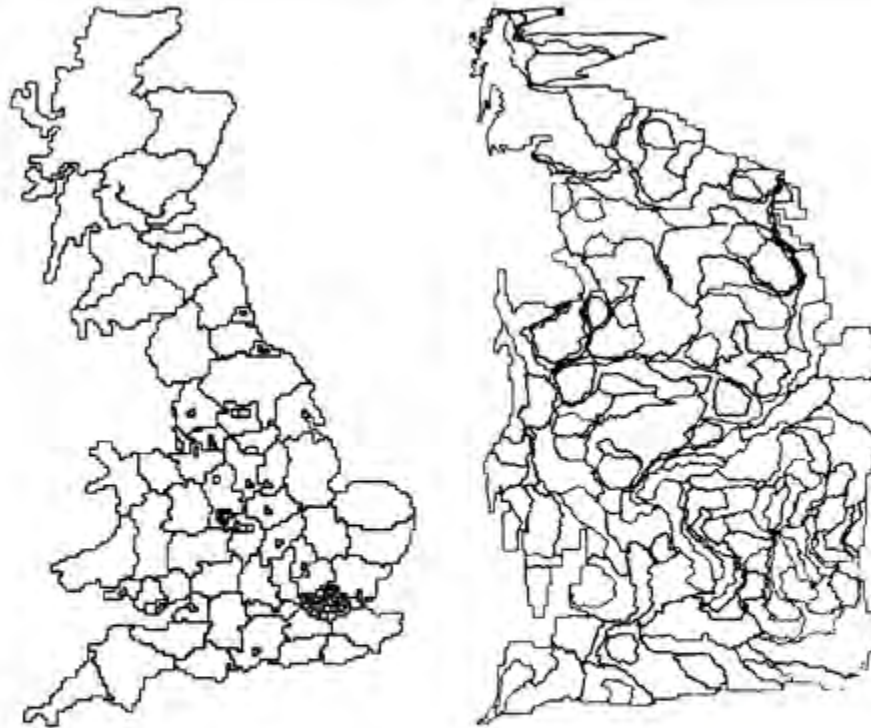


Fig. 2.

Population cartogram of Britain by county. (Left) The original map. (Right) Cartogram generated with the cellular automaton algorithm of Dorling. [Reproduced with permission from Dorling (6) (Copyright 1996, University of East Anglia)].

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Examples of Cartogram

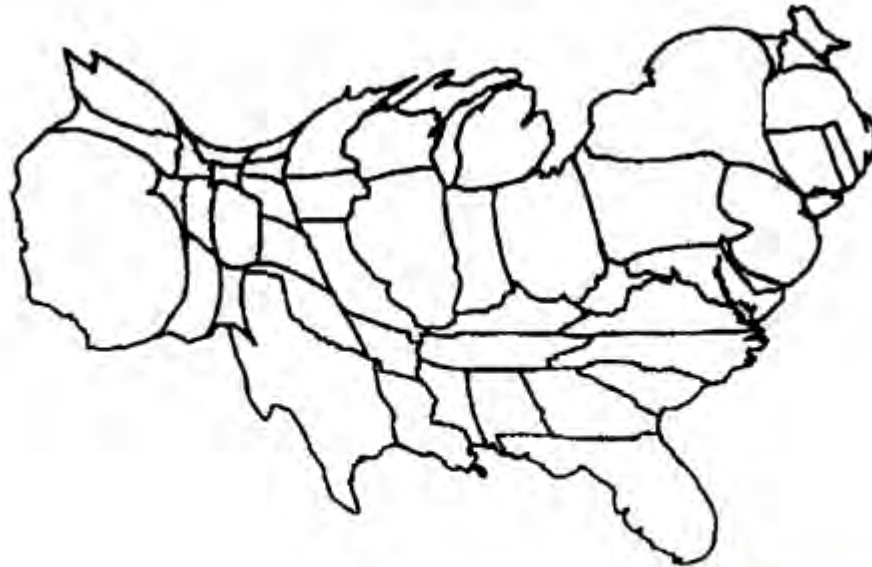
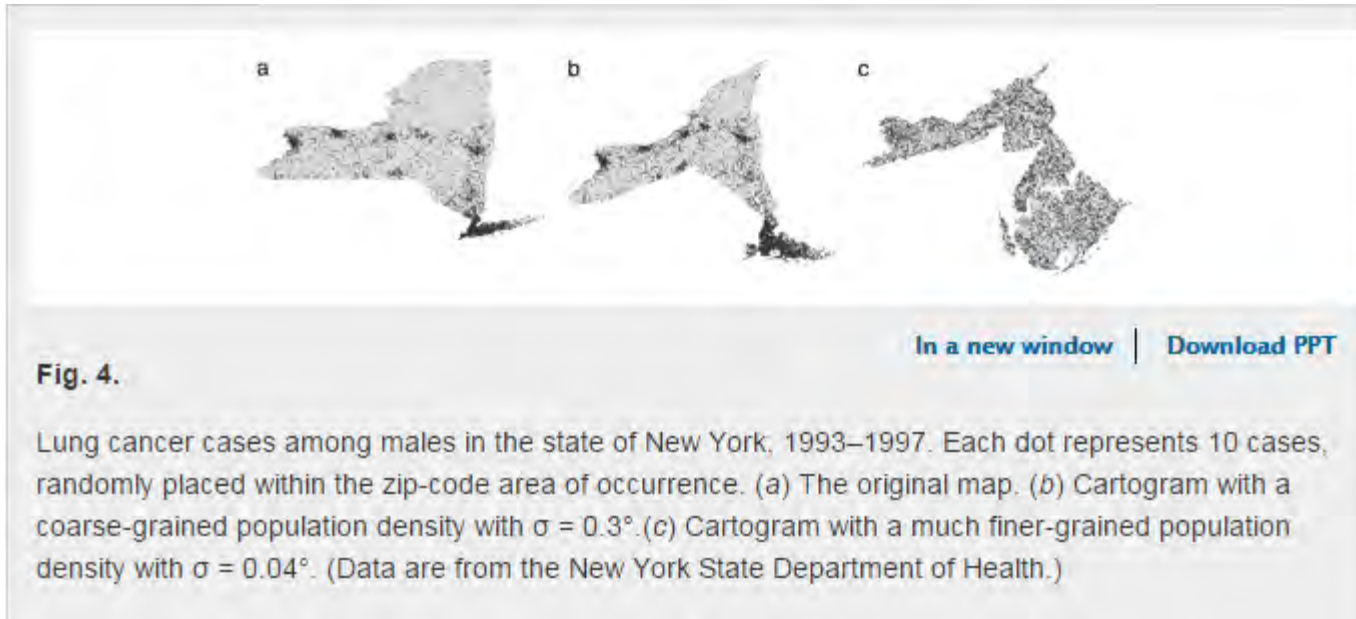


Fig. 1.

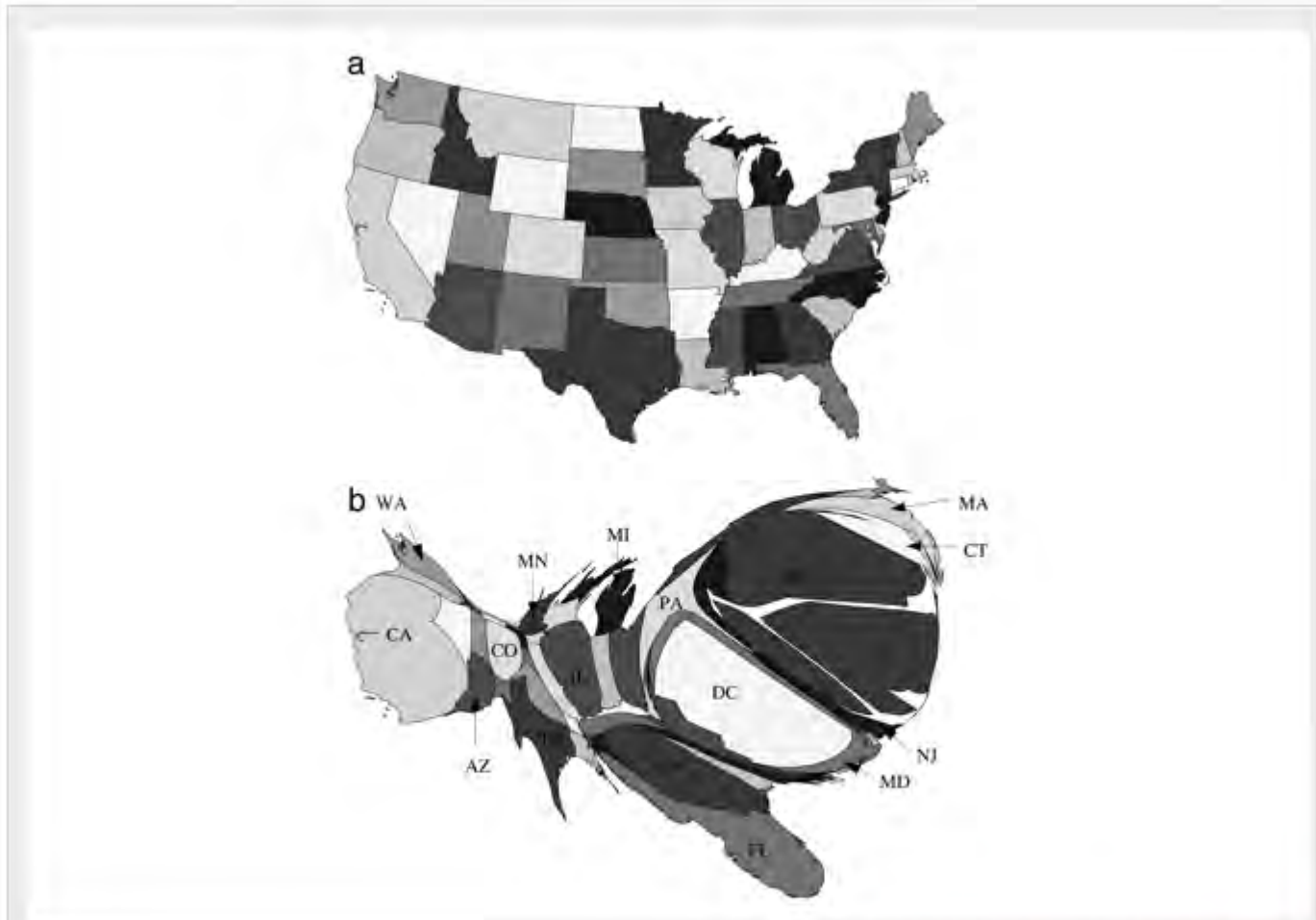
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U.S. population cartogram constructed with the method of Gusein-Zade and Tikunov. [Reproduced with permission from ref. 17 (Copyright 1993, American Congress on Surveying and Mapping)]

Examples of Cartogram



Examples of Cartogram

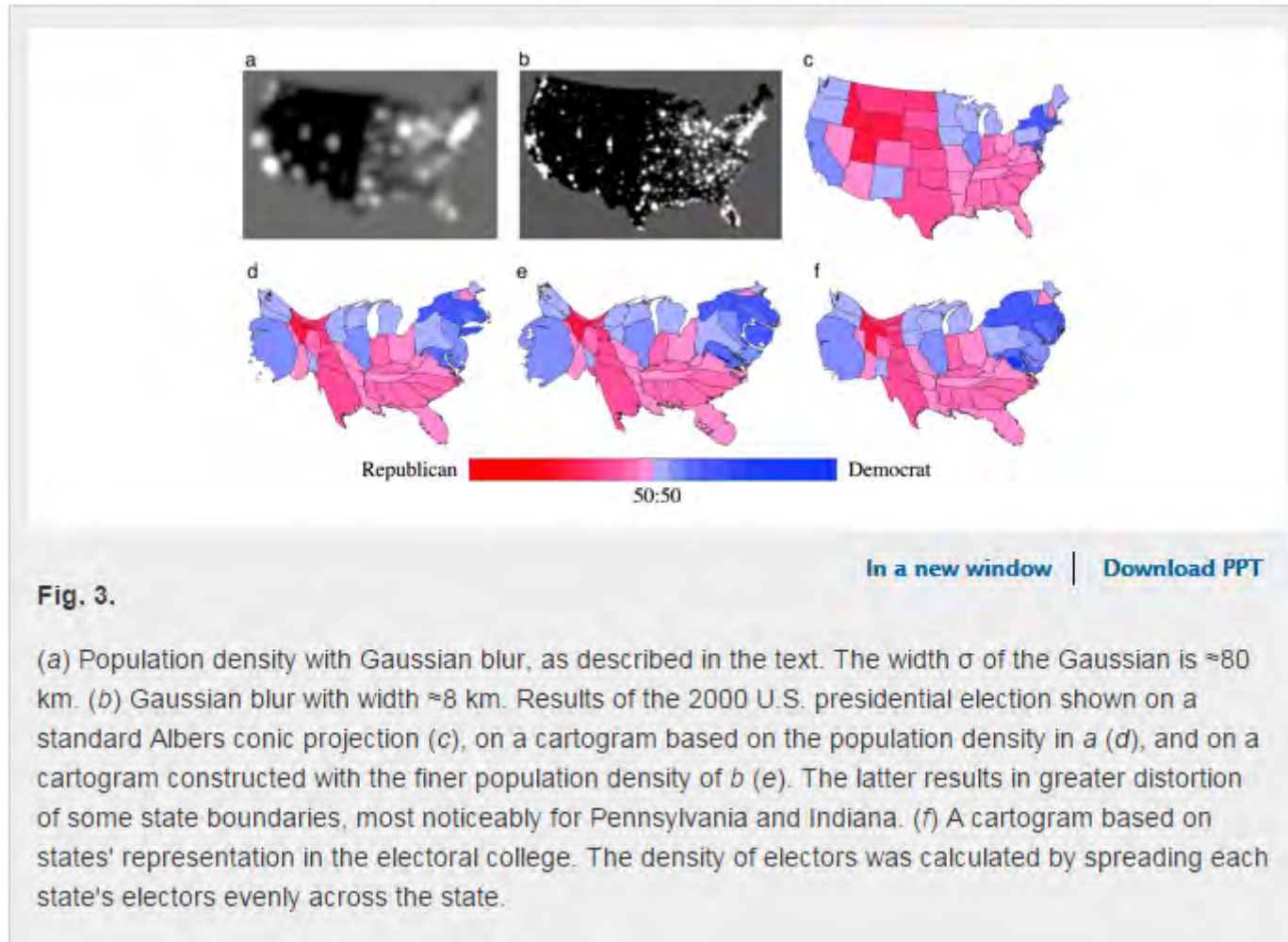


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Fig. 5.

The distribution of news stories by state in the United States. (a) Albers conic projection. (b) Cartogram in which the sizes of states are proportional to the frequency of their appearance in news stories.

Examples of Cartogram



References

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<http://lessonplanspage.com/ssciexploringusaandworldwithcartogramsfromshow912-htm/>

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