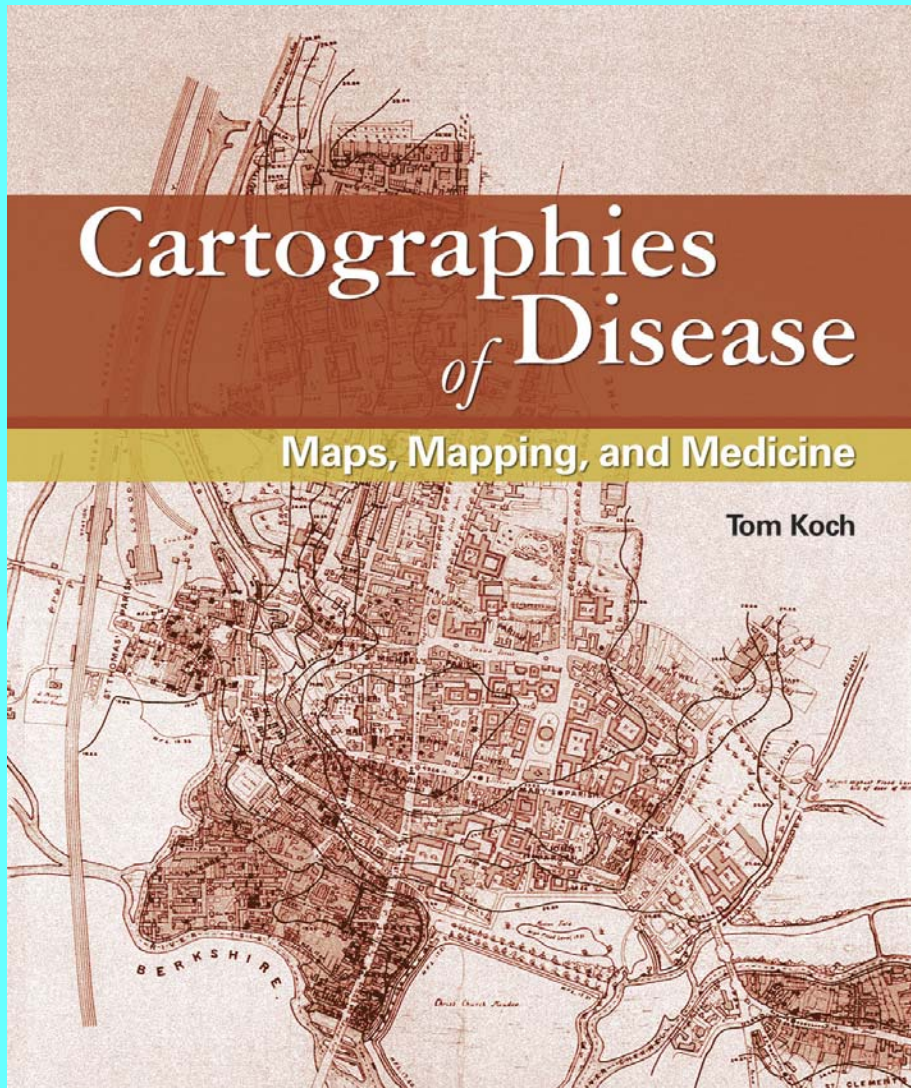


# Cartographies of Disease: Public Safety, Public Health



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# Maps and Medicine

1. What maps are and what they do.
2. What they've always done.
3. How they serve today.
4. Ideas for the future.

# “Representation”

“Maps . . . allow us to *see* a world that is too large and too complex to be seen directly.”

*Well, no.*

“What we see when looking at a map is not the world, but an abstract *representation* that we find convenient to use in place of a world. . . . We are creating it.”

Alan M. MacEachren, *How Maps Work: Representation Visualization, and Design*. NY: Guilford, 1995, 1.

# Representation?

We do not create “the world,” a construct more dense and varied than any map. Instead we *present* a congress of events related in space at a time on the basis of elements we believe define that event. It is not a ‘representation’ but instead a distillation of relations between here and there, this and that.

# Here and there, this and that

Mapping takes a set of spatially located facts and relates them to other sets of facts. “This case relates to that case,” “These cases relate to those locations where a causative fixture resides.”

Mapping places the abstract in the concrete, seeking relations between this and that case, these cases and that cause.

*Krieger and Wood. 2005. Seeing Through Maps, Second edition, Chapter 8.*

# Propositions

This builds testable propositions that:

- link conditions, states, and behaviors
- in territory, in space,
- to anchor scientific and social arguments
- that create territory, and territorial authority.

-Wood, D. and J. Krygier. *The Natures of Maps*. Guilford Press, *In Press*.

-Wood, D. Kaiser, W. L. and B. Abramms. *Seeing through maps: Many ways to see the World, Second Ed*. Amherst: ODT, Inc., 2006.

# Purpose

We do this in health studies for a range of reasons:

- ❖ Describe a health event.
- ❖ Determine its cause by:
- ❖ Generating hypotheses about cause and effect.
- ❖ Then we distill potentially relevant data and
- ❖ test the results to prove or disprove a hypothesis.

The result is fundamentally ecological, and relational. The mapping that results is necessarily statistical and graphic, informing health policy.



The result is an abstraction  
distilling data into information .

“You *reduce* the text to a few elements, and  
*abstract* them from the narrative flow, and  
construct a new, *artificial* object...”

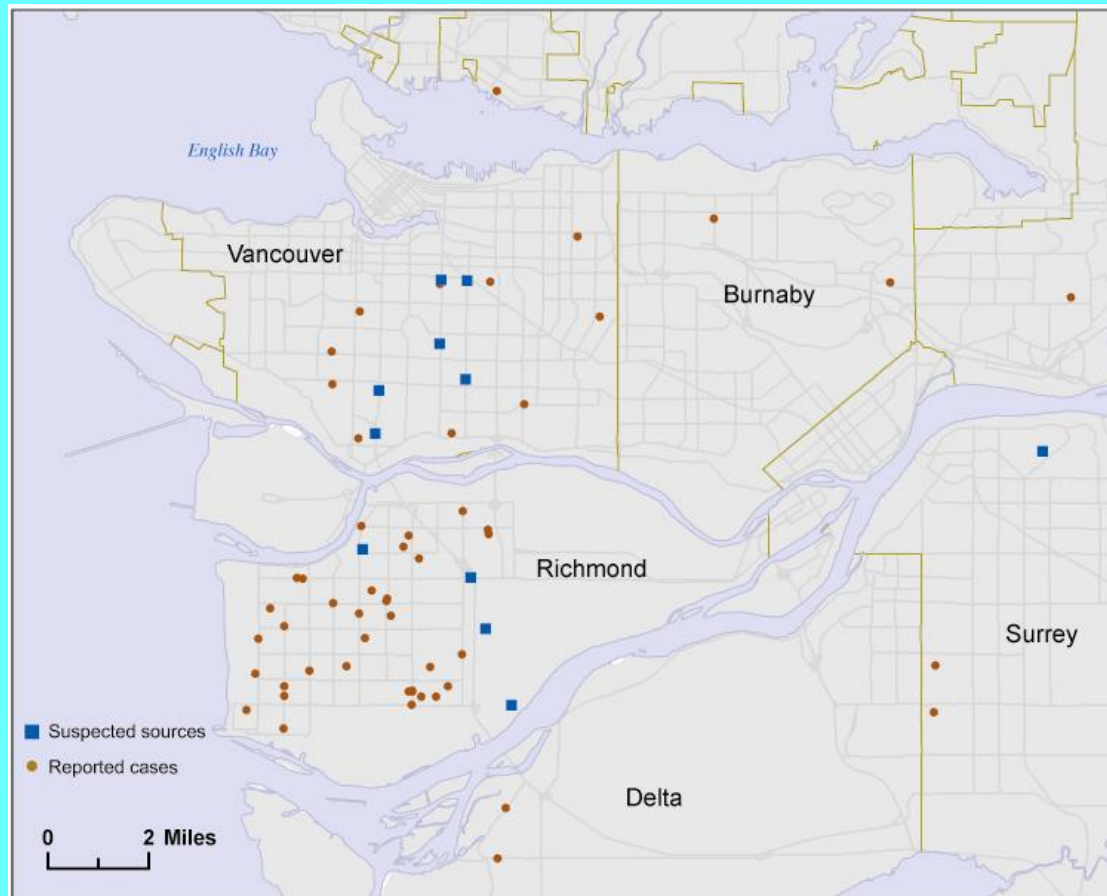
Moretti, F. *Graphs, Maps, Trees: Abstract Model for a  
Literary History*. NY: Verso, 2005, 55.

# That's when the work begins

Mapping it—”is not the conclusion of geographical work; it's the *beginning*. After which begins in fact the most challenging part of the whole enterprise: one looks at the map, *and thinks.*”

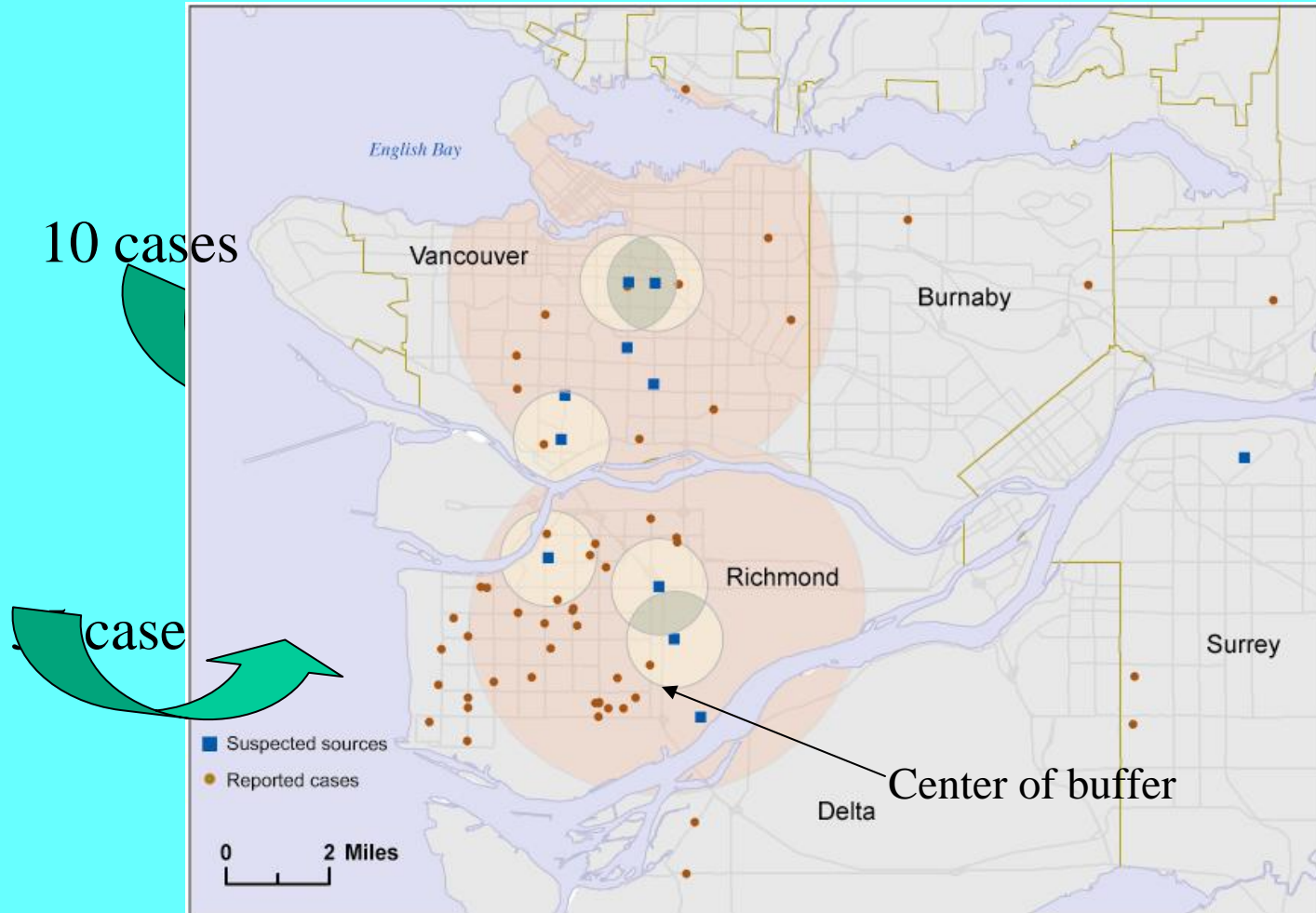
F. Moretti. *Atlas of the European Novel: 1800-1900*. NY: Verso, 1998.

# Here and there



Data courtesy B.C. Centres for Disease Control. Author map from, *Cartographies of Disease* (2005).

# This and that



Data courtesy the B.C. Centre for Disease Control: Author map: *Cartographies of Disease* (2005).

# Bari—1690: Policy mapping

Map withheld for lack of permission. The map is included in Koch, T. *Cartographies of Disease*. Redlands, CA: ESRI Press, 2005.

# Administrative mapping

With this map Arrieta sought to justify to his king the expense of 250 military encampments in a complex system of containment designed to slow or stop the spread of plague through a provincial *cordon sanitaire* that included

- a. An intensive barrier around areas of active plague.
- b. A barrier isolating areas where plague had been recently from those plague-free.
- c. Internal barriers specially protecting plague-free town.

# Arrieta Propositions

## Arrieta assumptions:

- Plague was present in Bari, Italy.
- The disease was dynamic and mobile.
- It could be contained, or at least diminished, by isolating locations without disease activity from those where disease was current.

**Proposition:** Plague can be slowed or halted by isolating sites free of plague from (a) those where plague is active (b) and those where it has recently been active.

# Thinking about disease

Arrieta did not know what caused plague, how it traveled from place to place. Nor did he care. It was enough to propose a system of isolation that might help prevent its spread.

Others have used mapping to consider the causes of disease as a means of stopping them, and to investigate urban policy and practice as generators of disease.



# Chadwick: The City

Edmund Chadwick attempted to map the location of both cholera and respiratory disease and correlate incidence with income levels in the city of Leeds. The result suggests a strong correspondence between disease incidence and intensity and dense areas of urban poverty where sewage and water supply were unsecured. This was the “sanitarian agenda.”

# Leeds: Detail

Map withheld for lack of permission. Chadwick's map is owned by the British Library. It is included in Koch, T. *Cartographies of Disease. Redlands*, CA: ESRI Press, 2005.

Red dots are cholera, black dots are respiratory disease  
Darker areas are less wealthy neighborhoods.

# The Policy Debate

Were people poor and sick because they would not work?

Did illness and poverty make them too weak and sick to work?

The first would result in punitive poor policies. The Second in urban sanitation, education, and health initiatives.

# Mapping numbers

WARDS.	Population.	Population on each Acre.	N <sup>o</sup> . of Streets.		Births to Population.	Deaths to Population.
			Good Streets	Bad Streets.		
N <sup>os</sup> I & II.	28,775	207	64	109	1 in 22	1 in 23
III, IV & V.	23,039	118	60	100	1 in 28	1 in 30
VI, VII & VIII.	30,306	84	120	130	1 in 28	1 in 36



# Mapping disparaged

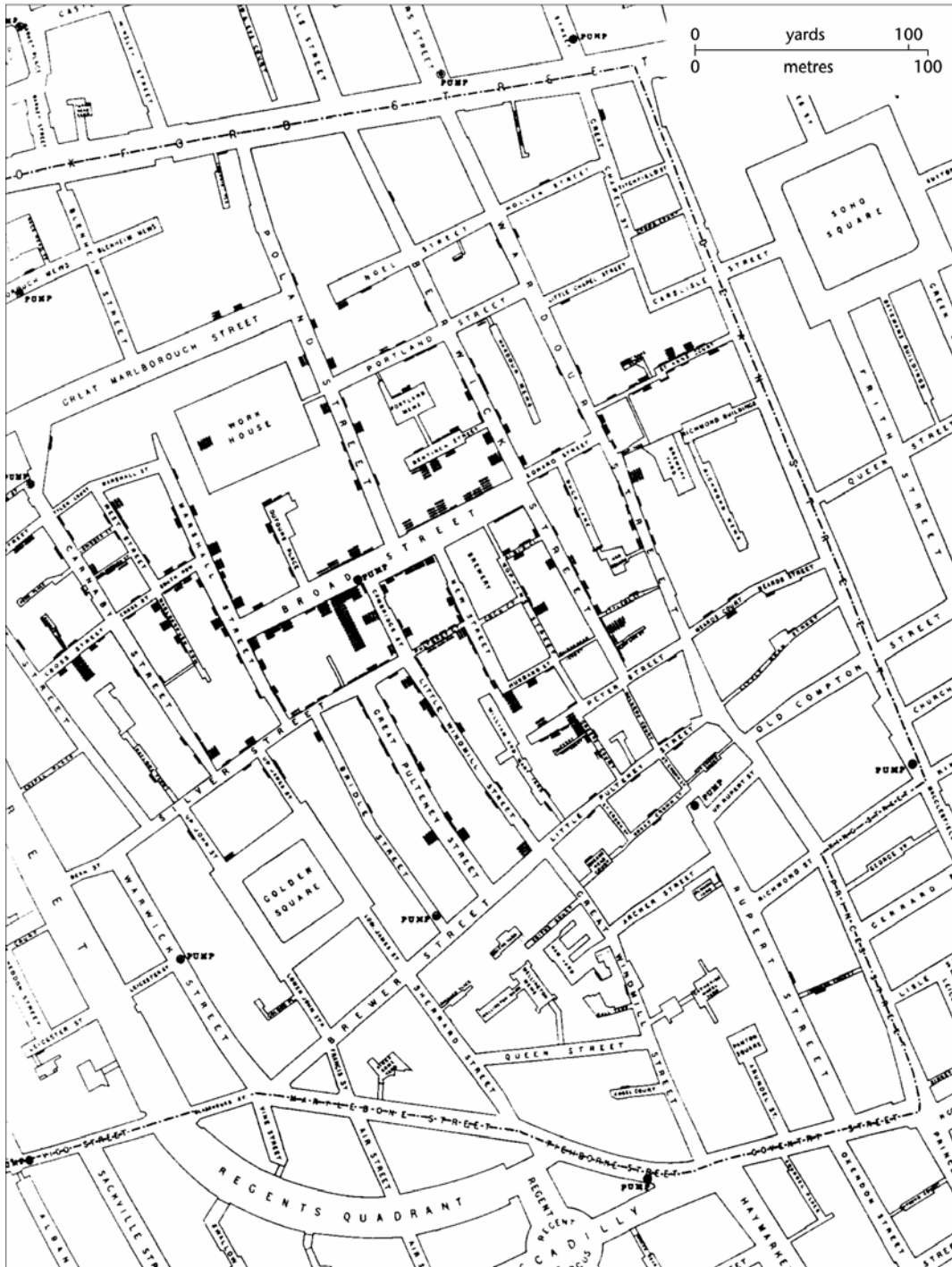
The utility of mapping has in recent decades been disparaged, perhaps because it's still thought of as "representative" of a world in which "real work" goes on. Nowhere is this clearer than in the writing of modern authorities on the John Snow's iconic map of a cholera outbreak in his London neighborhood.

# At issue

At issue in Snow's work was:

- a. The debate over whether cholera was waterborne or airborne.
- b. Disease theory in general and its relation to public policy.

If cholera was waterborne expensive programs of water supply safety would be required. If contamination came from sewage, new sewage policies need to be instituted cholera was airborne there was little to be done.



# John Snow and Cholera 1855



## The Broad Street Outbreak

Source:

<http://www.ph.ucla.edu/epi/snow/highressnowmap.html>

# Snow's map

Snow's map distilled the data he had collected to describe the intensity of the outbreak in relation to the water sources he believed were its source. The result served as evidence for his thesis on the centrality of the Broad Street pump to the outbreak. That centrality grounded his theory on the origin of the outbreak and the nature of the disease.



# The map as proof

“It might be noticed,” Snow wrote, “that the deaths are most numerous near to the pump in Broad Street.”

John Snow. 1855. *On the Mode of Communication of Cholera*, Second Edition.  
Frost, W. Ed. 1936. *Two papers by John Snow*. London: Commonwealth Fund,  
109.

# Data or propaganda

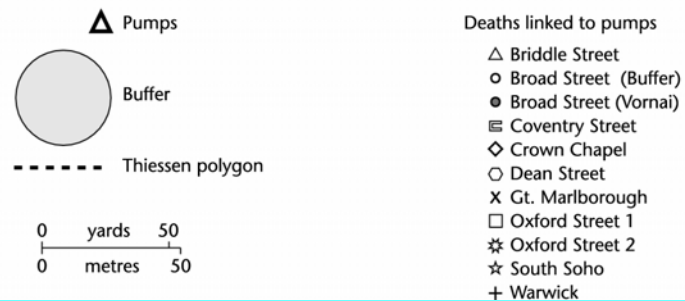
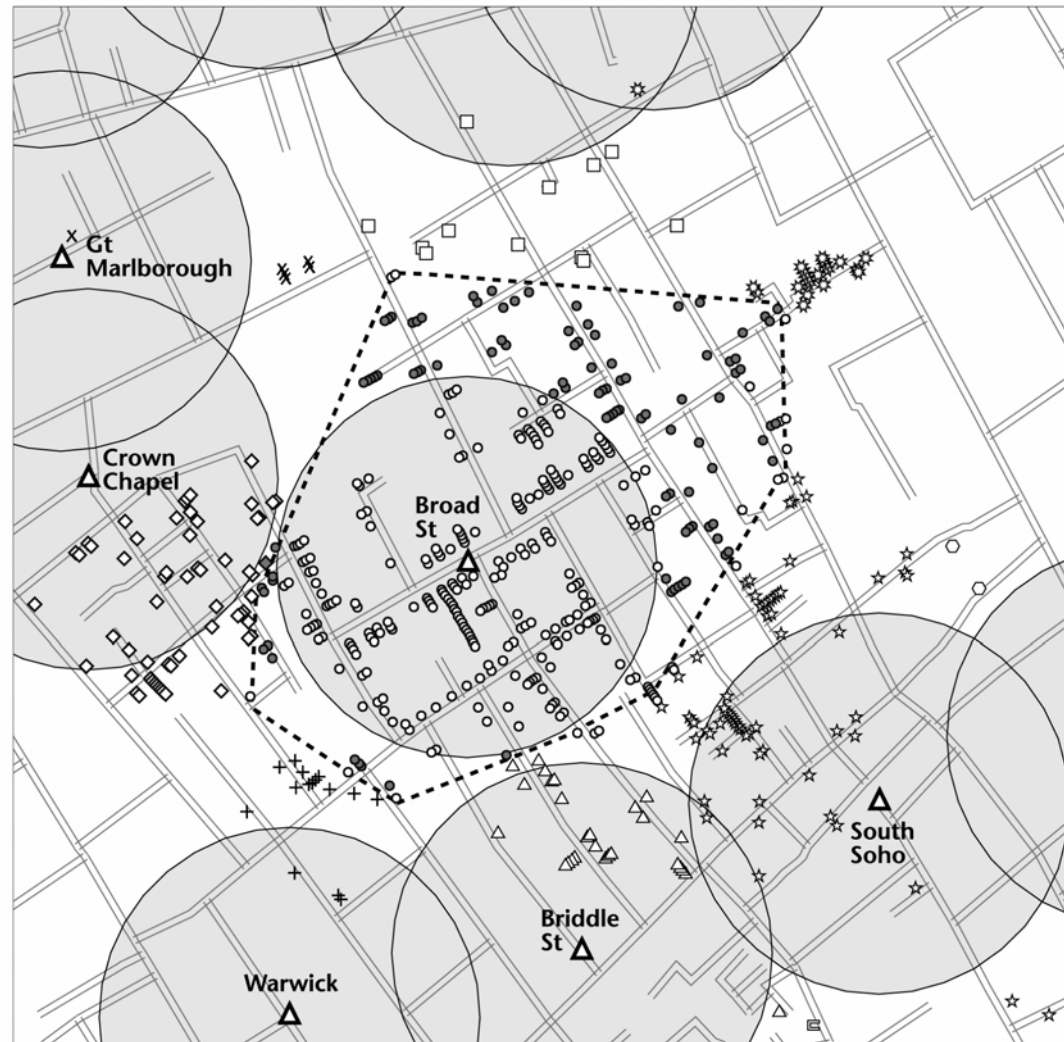
“ . . . neither his [Snow’s] map nor those of his rivals were of any value in generating insightful hypotheses. Snow’s famous cholera map was pure propaganda—and copycat propaganda at that .”

Monmonier, M. 2002. *Spying with Maps: Surveillance Technologies and the Future of Privacy*. Chicago: University of Chicago Press, 155.

Snow’s map didn’t generate hypotheses, it *tested* them. That isn’t “pure propaganda,” but science. The map was an overwhelmingly central exhibit that distilled Snow’s data and supported his argument.

# Snow Updated

Koch, T. and K. Denike.  
 Medical Mapping.  
*Journal of Geography* 103:2,  
 2004.  
 By permission of authors.



# Contemporary mapping

Contemporary computerized mapping presents a potentially new opportunity for mapping in public health and public safety. The GIS medium permits greater sharing of data and a robust environment for the reunification of statistical and graphic techniques of consideration and presentation. It is still about reducing the wealth of data, abstracting from it to present a proposition, however.

# Space & Time

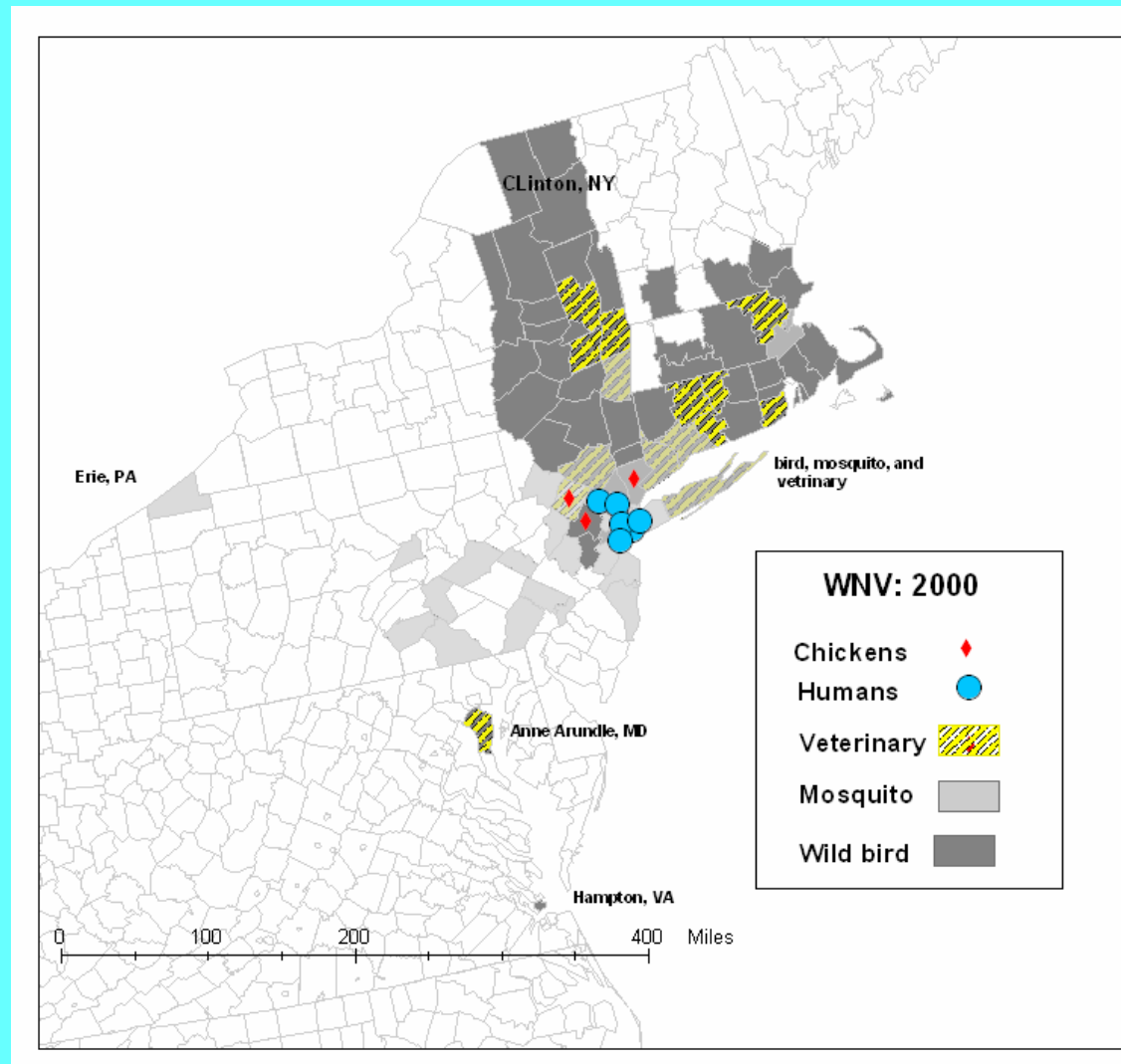
“Professional epidemiologists appear oblivious to where the epidemic is,” geographer Peter Gould would complain, “asking only when numbers will appear along the time horizon” of an epidemic outbreak. Either space or time can be the maps focus.

Gould, P. Kael, P. J., Geoff, W. and Golub, A. 1991. AIDS: Predicting the next map. *Interfaces* 21:3, 80-92.

# Gould\_time series

The Gould time series of maps is included in  
Koch, T. *Cartographies of Disease* (2005)  
By permission of the estate of Peter J. Gould.

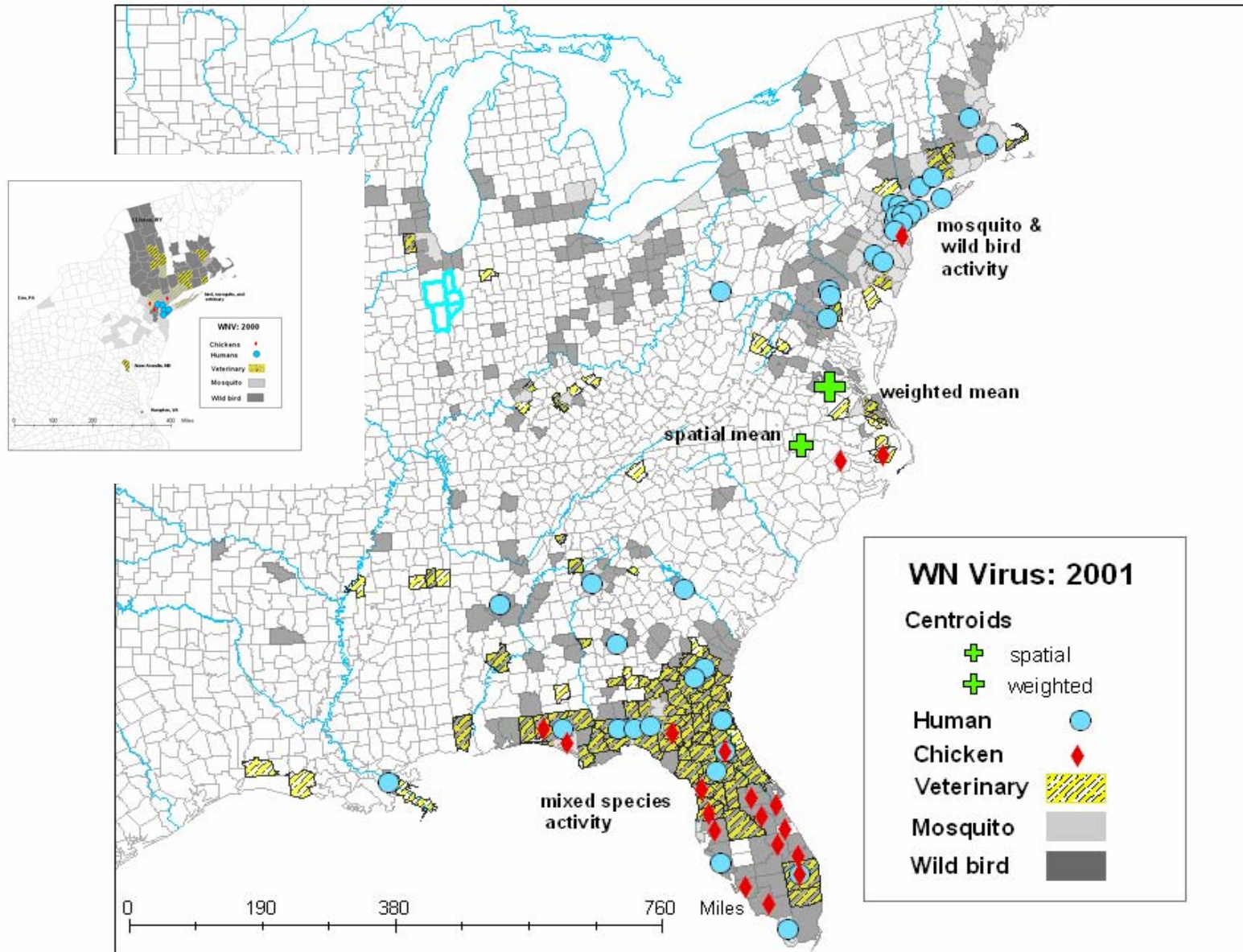
# Current Directions: WNV



Map by author:

Koch, T. and Denike K. Certainty, Uncertainty, and the spatiality of disease. *SERRA*, In press.

# West Nile Virus 2000-2001

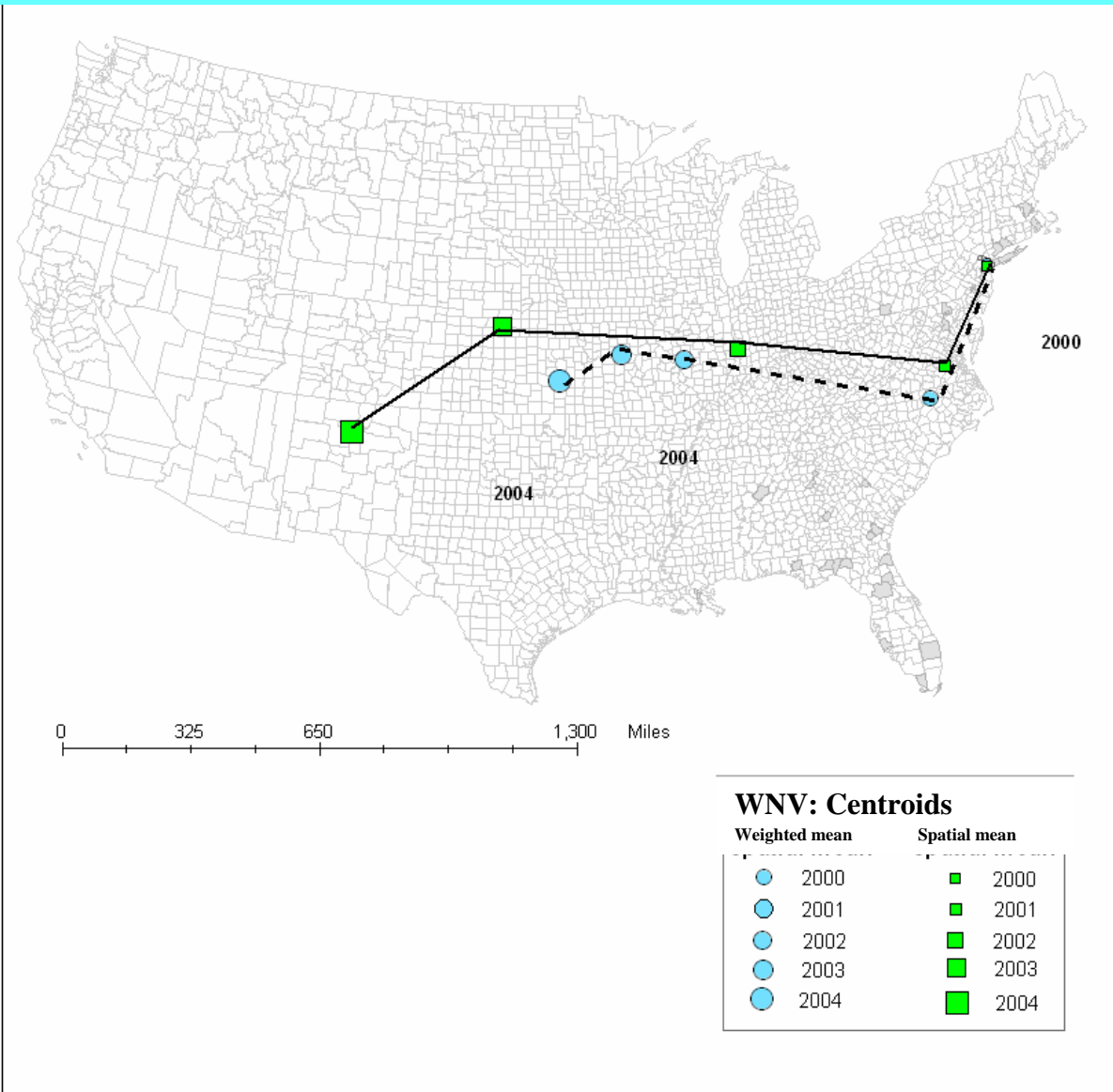


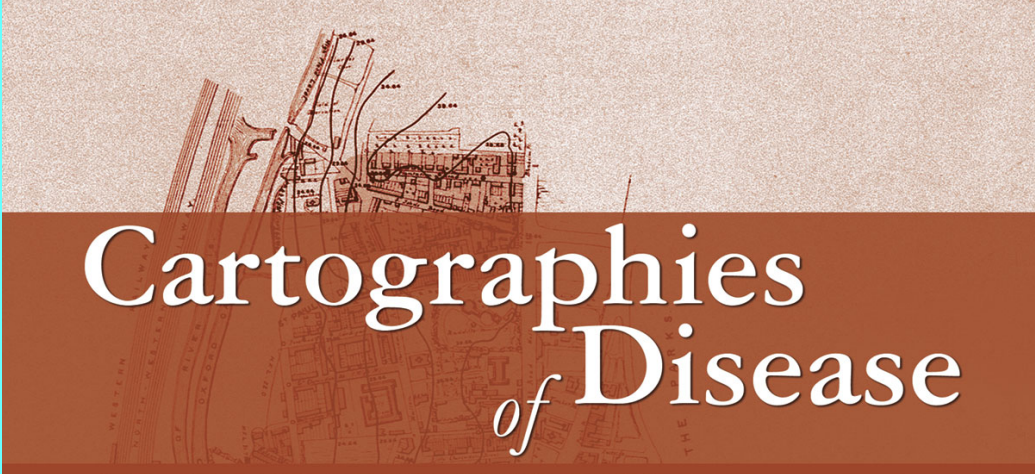
Map by author:

Koch, T. and Denike K. Certainty, Uncertainty, and the spatiality of disease. Serra, In press.



# WNV Centroids





# Cartographies *of* Disease

Maps, Mapping, and Medicine



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**June 5 2006**

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