Reconstructing a GIS of 19th Century Urban Environmental Conditions

Brian Bettenhausen
Center For Population Economics
University of Chicago

Carlos Villarreal
Center for Population Economics
University of Chicago

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Research Goals

Better Understand the Health and Economic Conditions within 19th Century US Cities

Requires the construction of a GIS to integrate address-level, municipal and federal records
Challenge

Fundamental spatial features, including the paths of streets and rivers, significantly changed within cities during the 20th century.

Modern data are only useful in regions of limited change.
Cincinnati – 2009 Census Tiger Shapefiles
Cincinnati – CPE Historical Reconstruction
Circa 1930
The CPE Urban GIS Project:

1. Reconstruct the historical street layout as a basemap
2. Redraw the administrative boundaries employed by agencies reporting on conditions within cities from 1830-1930
3. Collect, Digitize and Link Data
   - Census Data
     - Ward and Enumeration District-Level
   - Municipal
     - Ward, Assembly, Health and Sanitary District-Level
     - Block-Level
     - Address-Level
Historical Basemap Reconstruction Examples

Cincinnati and Chicago
Cincinnati Closeup
Cincinnati Closeup
Chicago – Full Spatial Extent

1930 Chicago Extent

Current Chicago Extent
Chicago – West Town
Chicago – West Town with 1938 Aerial
Chicago – UIC District – Historically Dense
Chicago – UIC District with 1938 Aerial
Reconstructing Administrative Boundaries

Ward History Example

Boston
Boston Wards 1830
Boston Wards 1835
Boston Wards 1838
Boston Wards 1862
Boston Wards 1866
Boston Wards 1867
Boston Wards 1869
Boston Wards 1878
Boston Wards 1895
Boston Wards 1922-1930
Incorporating Census Data

New York City
• Ward Level Density in 1850 and 1860

Boston
• Ward Level Crude Mortality and Density in 1860

Baltimore
• Ward Level Child Mortality and Density in 1860
• Precinct Level Child Mortality in 1890

Chicago
• Enumeration District Level in 1880
New York City Population Density per Acre in 1850: Population Data from the Federal Census
New York City Population Density per Acre in 1860: Population Data from the Federal Census
Boston Population Density per Acre 1860: Data from the Federal Census
Boston Mortality Distribution 1860:
Data from the Federal Mortality Census
Baltimore Population Density per Acre in 1860:
Population Data from the Federal Census
Baltimore Ward Crude Mortality Rate 1860: 1890 Federal Mortality Census
Baltimore Ward Child Mortality Rate 1860: 1890 Federal Mortality Census
Baltimore Precinct Child Mortality 1890:
1890 Federal Census – Statistics of Cities
Chicago Enumeration District Population Density 1880: Federal Population Census Data

Density Measured as Population per Acre

Density Ranging From 1.53 people per Acre (Blue) To 191.83 people per Acre (Red)
Incorporating Other Data Sources
Homer Hoyt (1933) Land Value Maps

MAP OF CHICAGO
SHOWING
LAND VALUES—1873
AVERAGE VALUES FOR EACH SQUARE MILE IN DOLLARS PER ACRE
SOURCE: ACTUAL SALES

MAP OF CHICAGO
SHOWING
LAND VALUES—1892
AVERAGE VALUES FOR EACH SQUARE MILE AND 960 ACRE TRACTS IN DOLLAR PER ACRE
SOURCE: ACTUAL SALES
Homer Hoyt’s Land Values

1873

1892
Reconstructing Block-Level Data

Chicago Sewerage Installation History
Infrastructure Investment: Chicago Sewers Installed 1873-1899

In investigating the capitalization of Infrastructure investments into local land values, the historical Chicago Sewerage Map dates range from 1873 (Green) to 1899 (Red). White lines indicate streets without installed sewer pipes. Data from the Annual Reports of the Department of Public Works.
Reconstructing Address-Level Data

Residences of Union Army Veterans
1865-1930
Chicago Civil War Veterans

Residential Information - 1865 - 1930

-Medical Records

-Lifetime Economic Outcomes

-Linkable to Environmental exposures across the life-cycle
Chicago: A Closer Look at Bridgeport Residents
Chicago:
Bridgeport Residences with 1938 Aerial
Chicago Union Army Residents
Note: 7 uncodable residences with contemporary data
New York City was the largest city in the United States throughout the study period.

Our Address-level data allow a finer investigation into the influence of highly localized urban conditions on later life health and economic outcomes.
New York City:
Distribution of Residential Data
CPE Map Server Project

• Provides a chloropleth map viewer
• Provides data extracts
• Provides complete citations and notes

http://www.cpe.uchicago.edu
Thank You!!

For further information, please contact us:

Brian Bettenhausen:  
bbett@cpe.uchicago.edu

Carlos Villarreal:  
carlos@cpe.uchicago.edu