

SPACE, TIME, AND ATTRIBUTES

Use of GIS Programs in the Presentation & Extraction of Census Data

Eswaran Selvarajah
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SPACE, TIME, AND ATTRIBUTES

An overview of the use of GIS Software in the extraction of essential data from an otherwise voluminous census data from the US Census Bureau (or any data that have geographic references to identify attributes in relation to territorial space).

Extracted data can go through a visualization process to create maps, charts and illustrations, which are easy to communicate and comprehend, particularly by the public.

PRESENTATION DATA AND SOFTWARE

GIS Programs Used:

MapInfo 6.0 and ArcGIS 9.2

Data Sources:

US Census Data 2000

Claritas Census Updates 2005

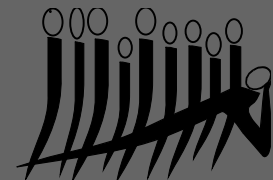
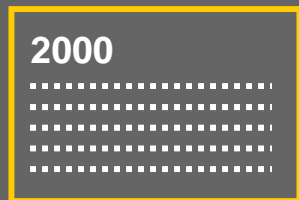
Data Extraction Software for GIS:

PCensus-USA Version 8.6 for ArcView

CONTEXT

US Census Bureau & Census Data

- US Census Bureau compiles information on people living in any **Location** (or territorial **Space**) within the USA.
- Census data relate to a specific point in **Time**, most often corresponding to years ending with a zero. (1980, 1990, 2000, etc.)
- Census data are statistics on a variety of **Attributes** on population & housing.

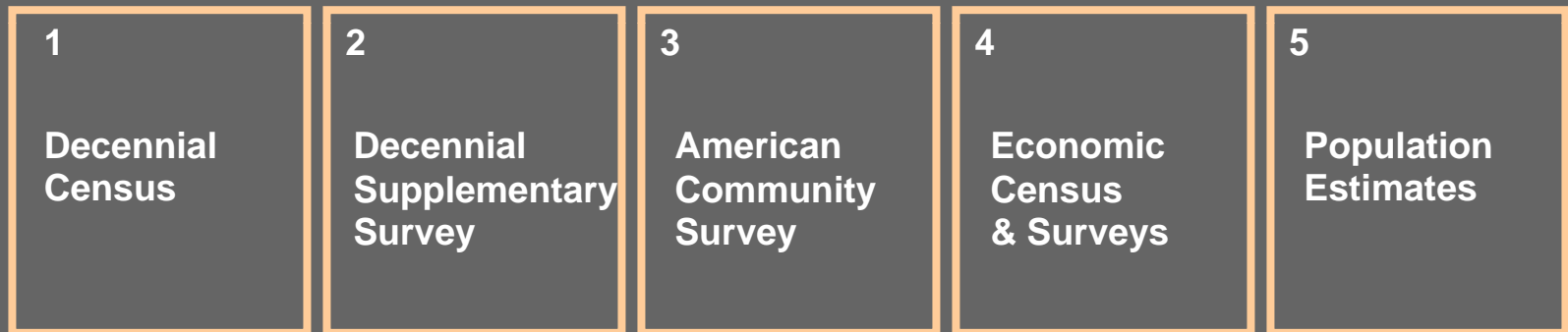


Primary Uses of US Census Data

- **Legislative redistricting of Congressional Districts by US Congress.**
- **Information for Policy formulation and program development by governmental, non-governmental and business entities.**
- **Impact assessment**

Categories of Survey & Studies by US Census Bureau

The US Census Bureau Conducts a Variety of Surveys and Publishes Many Data Files and Reports:



And more



In this presentation our focus is Decennial Census.

Census Geography

- To systematically enumerate and provide data location by location, the US Census Bureau has geographically subdivided the country into parts.
- They are as small as a street **block** to a large land mass such as a **state**.
- A **Block** is the basic unit of land area for the census and aggregated to form larger areas:
 - Wards & Precincts
 - ZIP Codes
 - Census Tracts
 - Cities & Towns
 - Counties
 - Regions
 - States, and many more!
- Not all the information collected for the **Block** are released to the public. Instead they are available at the aggregated larger areas such as **Census Block Group** and **Census Tract**.

Census Geography & Data Sets

Availability of datasets vary with the type of Geography

- Larger the geographic level, the greater the extent of data available.
- For example, a Block provides relatively small amount of data as against a County.

Geographic Information Systems & Census Geography

Because of the systematic compilation of census data conforming to physical, geographic characteristics and administrative boundaries, the census data can be manipulated by Geographic Information Systems for extraction, analysis & presentation.

Examples of Popular Geographic Levels

1. USA



2. Massachusetts



3. Boston



4. Neighborhood



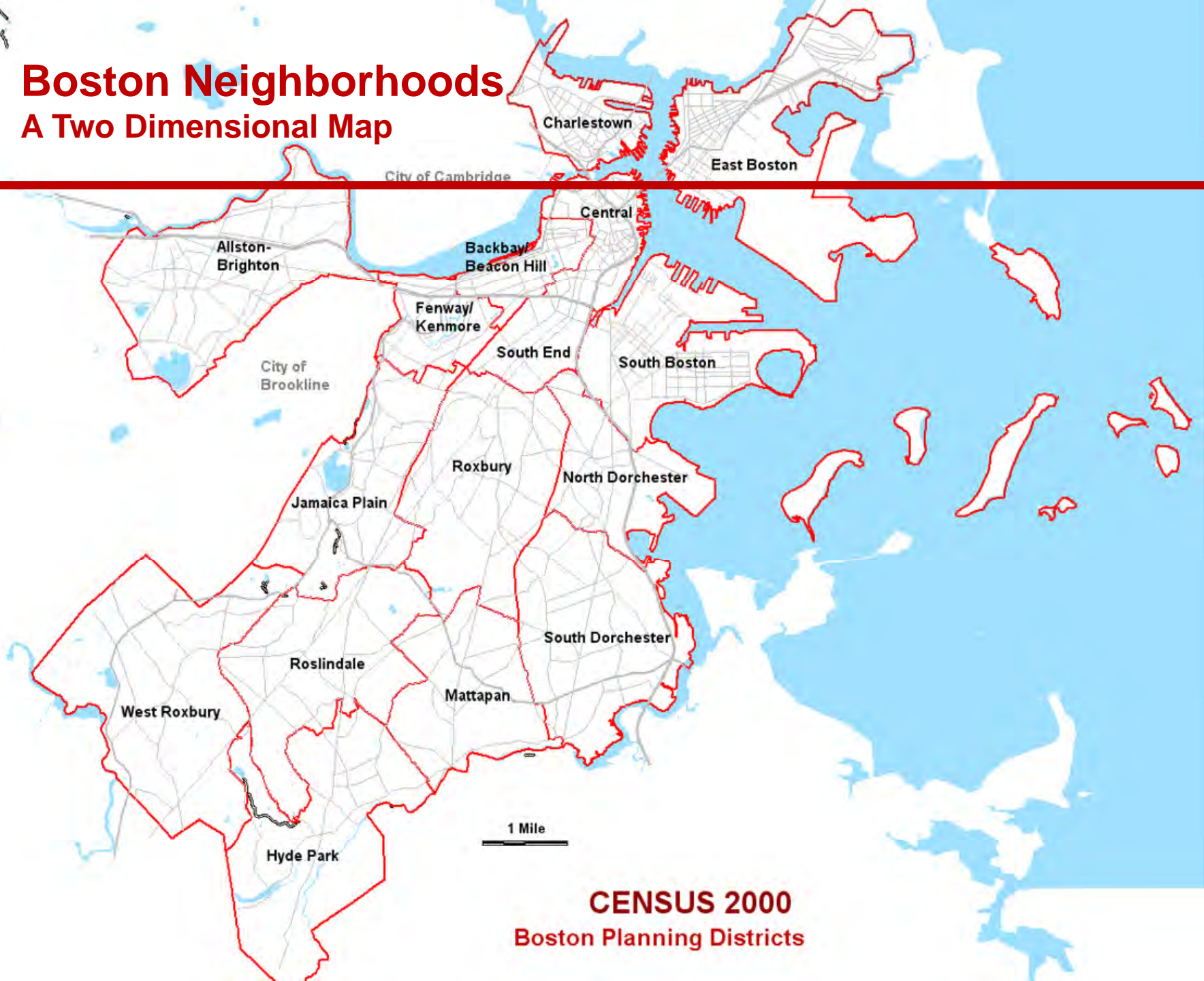
Aerial View of Boston Neighborhoods

Incorporating Census Geography



Boston Neighborhoods

A Two Dimensional Map



Census Geographic Units of Boston

Unlike popular geographic levels, census geography involves a set of hierarchically designed units which are revised every 10 years.

Boston city is divided as follows:

- 157 Census Tracts
- 545 Block Groups
- 5630 Blocks

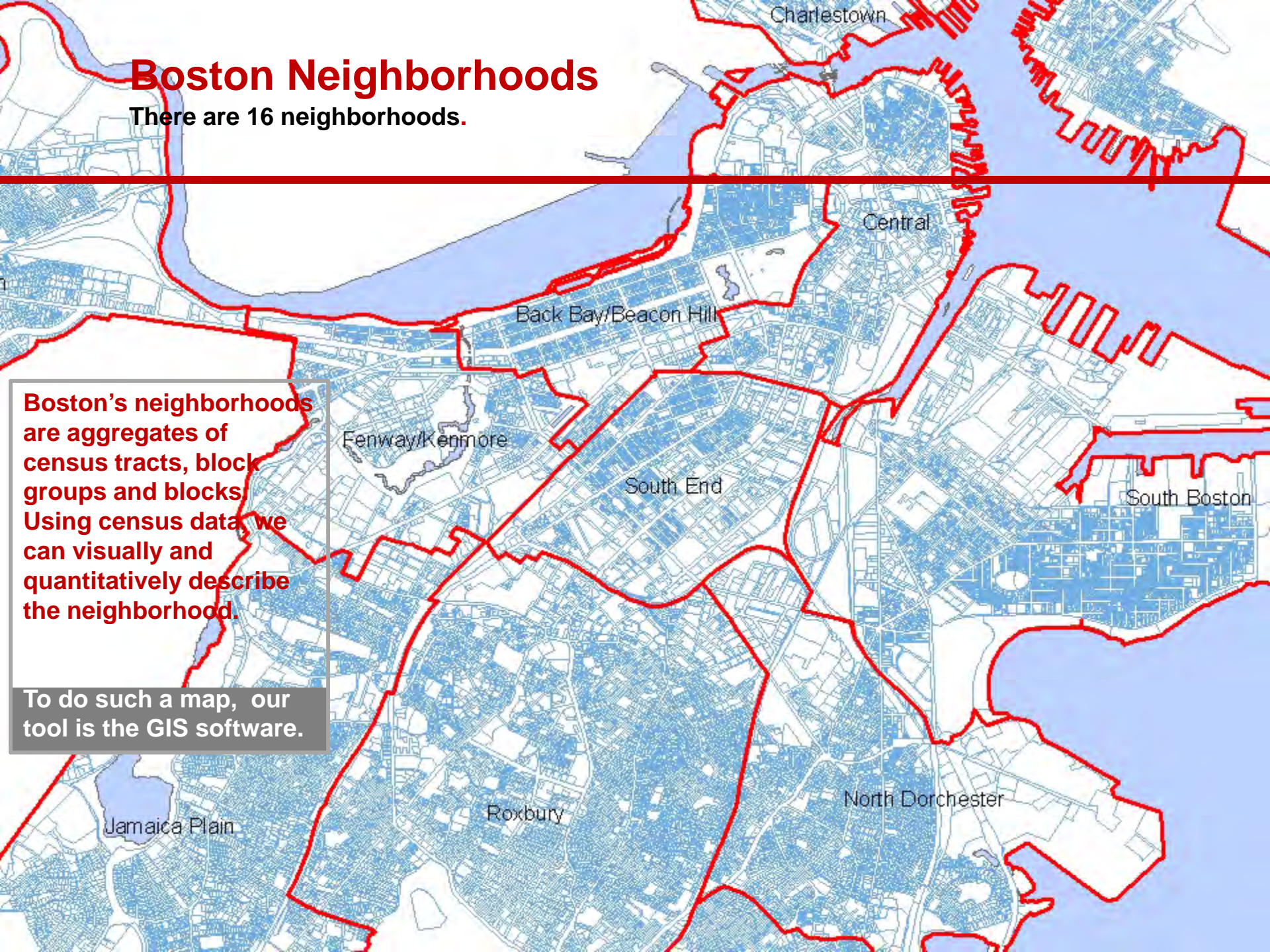


Boston Neighborhoods

There are 16 neighborhoods.

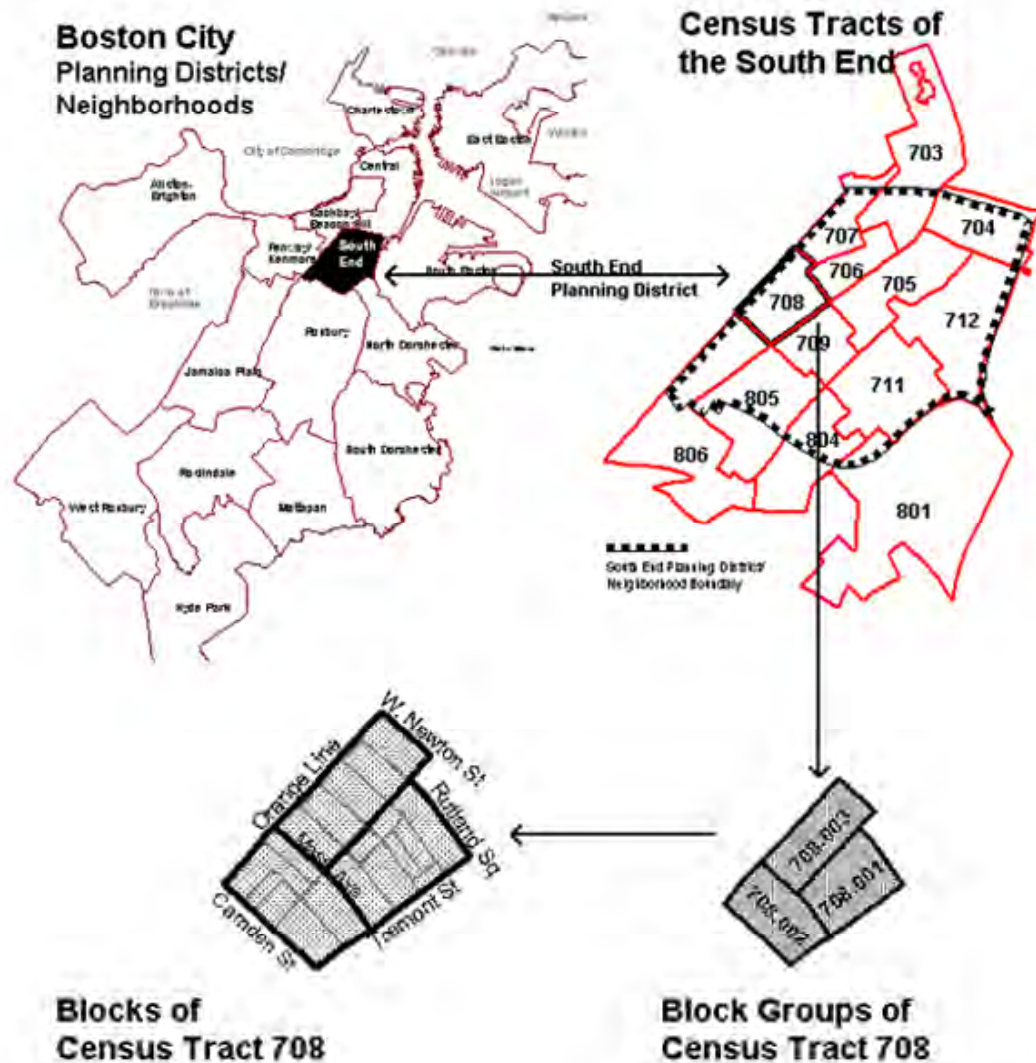
Boston's neighborhoods are aggregates of census tracts, block groups and blocks. Using census data, we can visually and quantitatively describe the neighborhood.

To do such a map, our tool is the GIS software.



Composition of Neighborhood

In terms of Census Tracts, Block Groups & Blocks: the South End



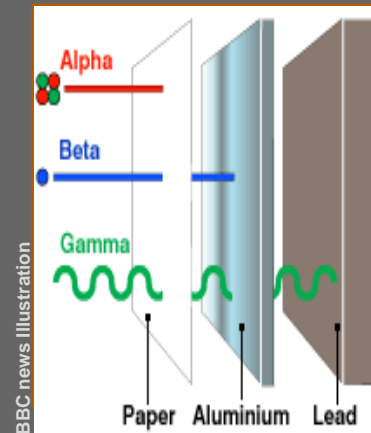
Presentation and Visualization of Data

A Sample of Raw Data

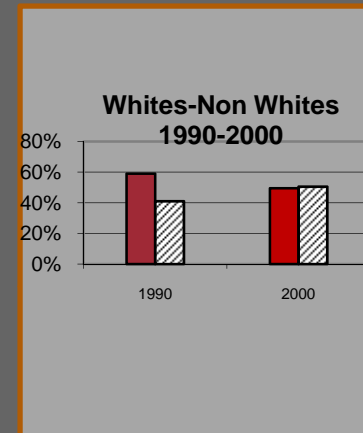
2005 Estmd. Male Pop	278,208	
Age 0 to 4	18,454	6.63%
Age 5 to 9	16,012	5.76%
Age 10 to 14	15,824	5.69%
Age 15 to 17	8,550	3.07%
Age 18 to 20	16,548	5.95%
Age 21 to 24	19,696	7.08%
Age 25 to 34	60,087	21.60%
Age 35 to 44	45,185	16.24%
Age 45 to 49	17,726	6.37%
Age 50 to 54	14,911	5.36%
Age 55 to 59	12,223	4.39%
Age 60 to 64	9,435	3.39%
Age 65 to 74	12,940	4.65%
Age 75 to 84	8,009	2.88%
Age 85 & over	2,608	0.94%
2005 Estmd. Median Age	32.33	
2005 Estmd. Avr. Age	34.37	
2005 Estmd. Female	297,462	
Age 0 to 4	17,373	5.84%
Age 5 to 9	15,121	5.08%
Age 10 to 14	15,296	5.14%
Age 15 to 17	8,275	2.78%
Age 18 to 20	17,787	5.98%
Age 21 to 24	19,984	6.72%
Age 25 to 34	62,018	20.85%
Age 35 to 44	44,607	15.00%
Age 45 to 49	18,340	6.17%
Age 50 to 54	16,399	5.51%
Age 55 to 59	14,075	4.73%
Age 60 to 64	11,073	3.72%
Age 65 to 74	16,992	5.71%
Age 75 to 84	13,605	4.57%
Age 85 & over	6,517	2.19%
2005 Estmd. Median Age	33.85	
2005 Estmd. Avr. Age	36.99	



Illustration



Charts



Thematic Maps

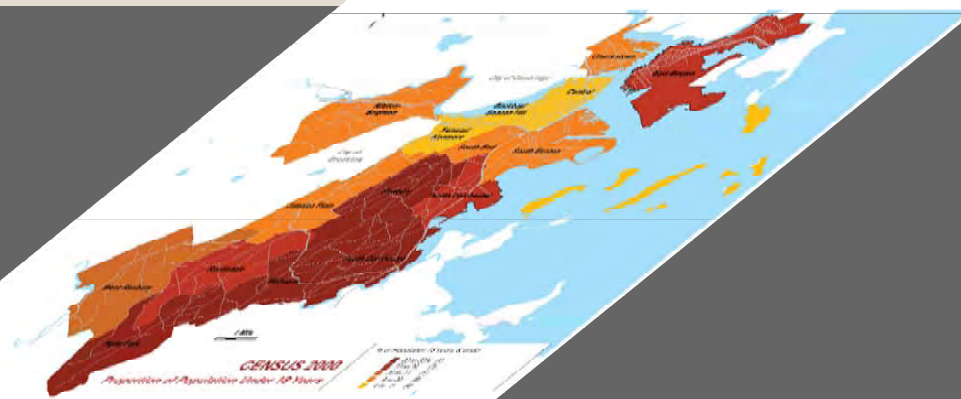


Models

Three Step Transformation of Data

Step 3

Thematic Map (In the GIS)



Step 2

Base Map (In the GIS)



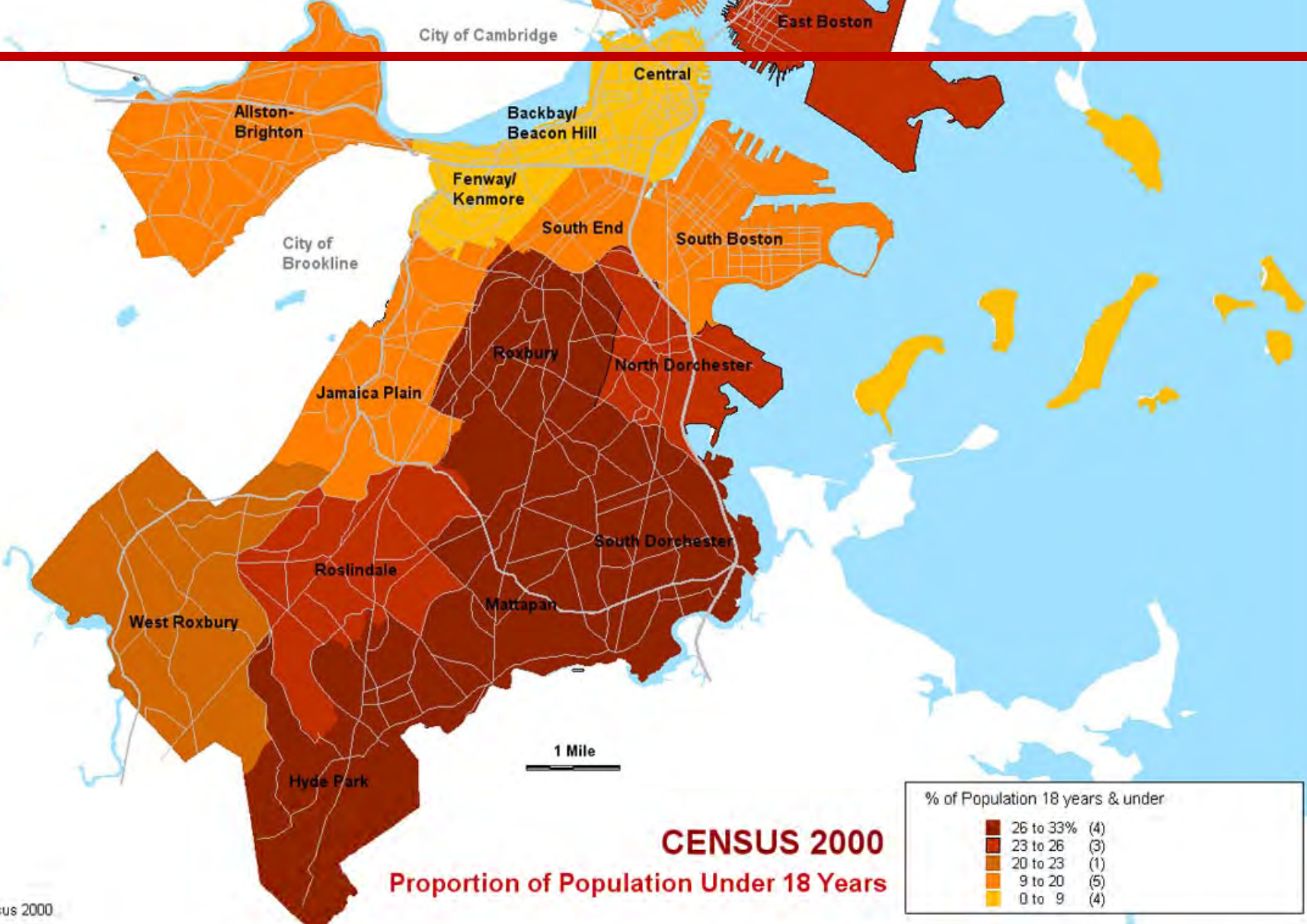
Step 1

Statistical Data on Neighborhood

	South End	East End
Population:	28,100	300,141
Gross Population Density/Sq.mile:	27,300.8	12,172.3
Foreign Born Population	32.0%	32.2%
Race - Assignments: White	12,701	200,873
Hispanic Population	4,570	85,100
Poverty Rate	32.9%	10.9%
Unemployment Rate	6.9%	7.2%
Median Household Income	\$41,800	\$30,800
Housing Units:	15,871	201,831
Occupied Housing Units	32.0%	82.7%
Median Gross Rent	\$797	\$602

Thematic Map of Boston Neighborhoods

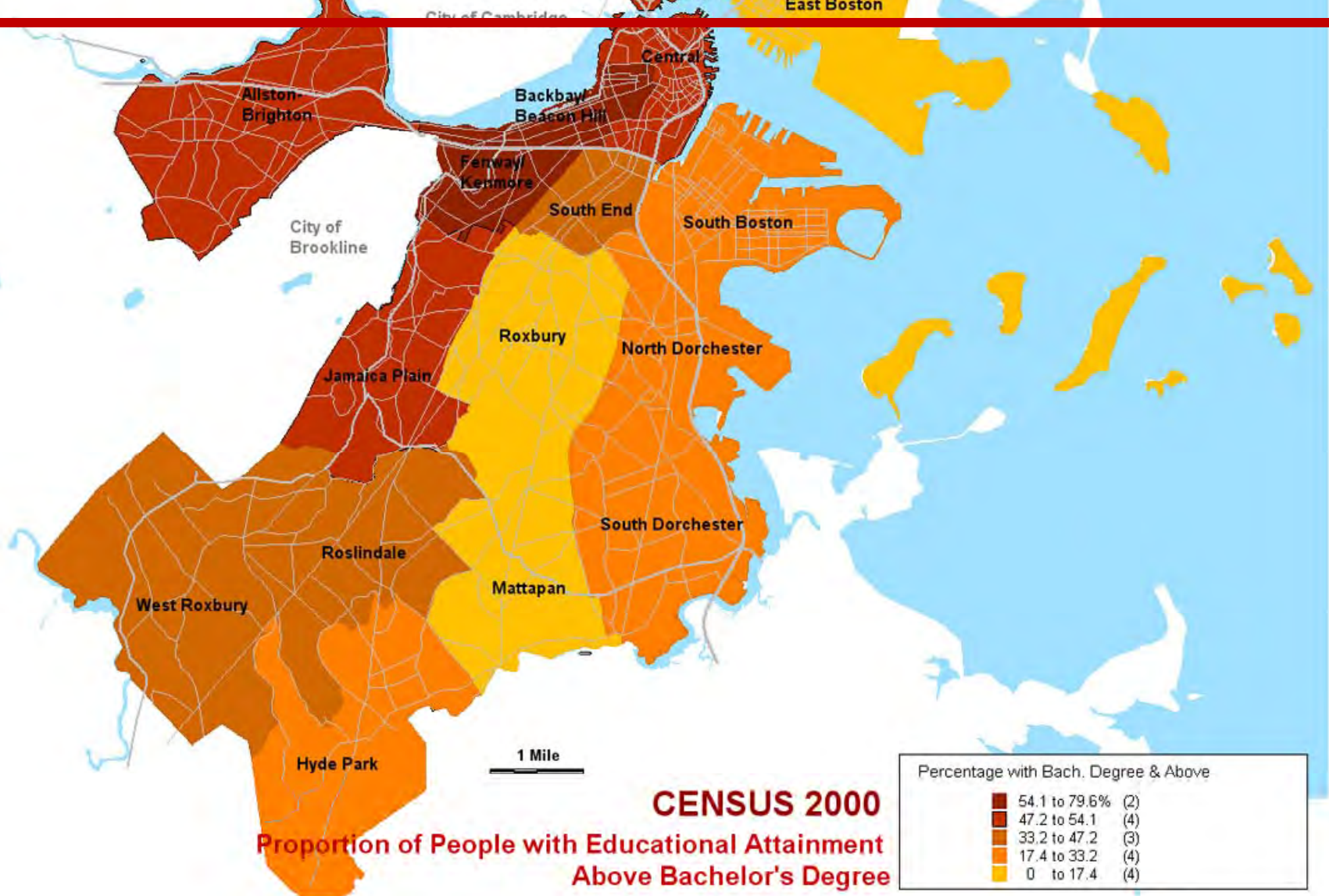
Helps Visually Present A Comparative Overview of 16 Neighborhoods



Data: US Census 2000

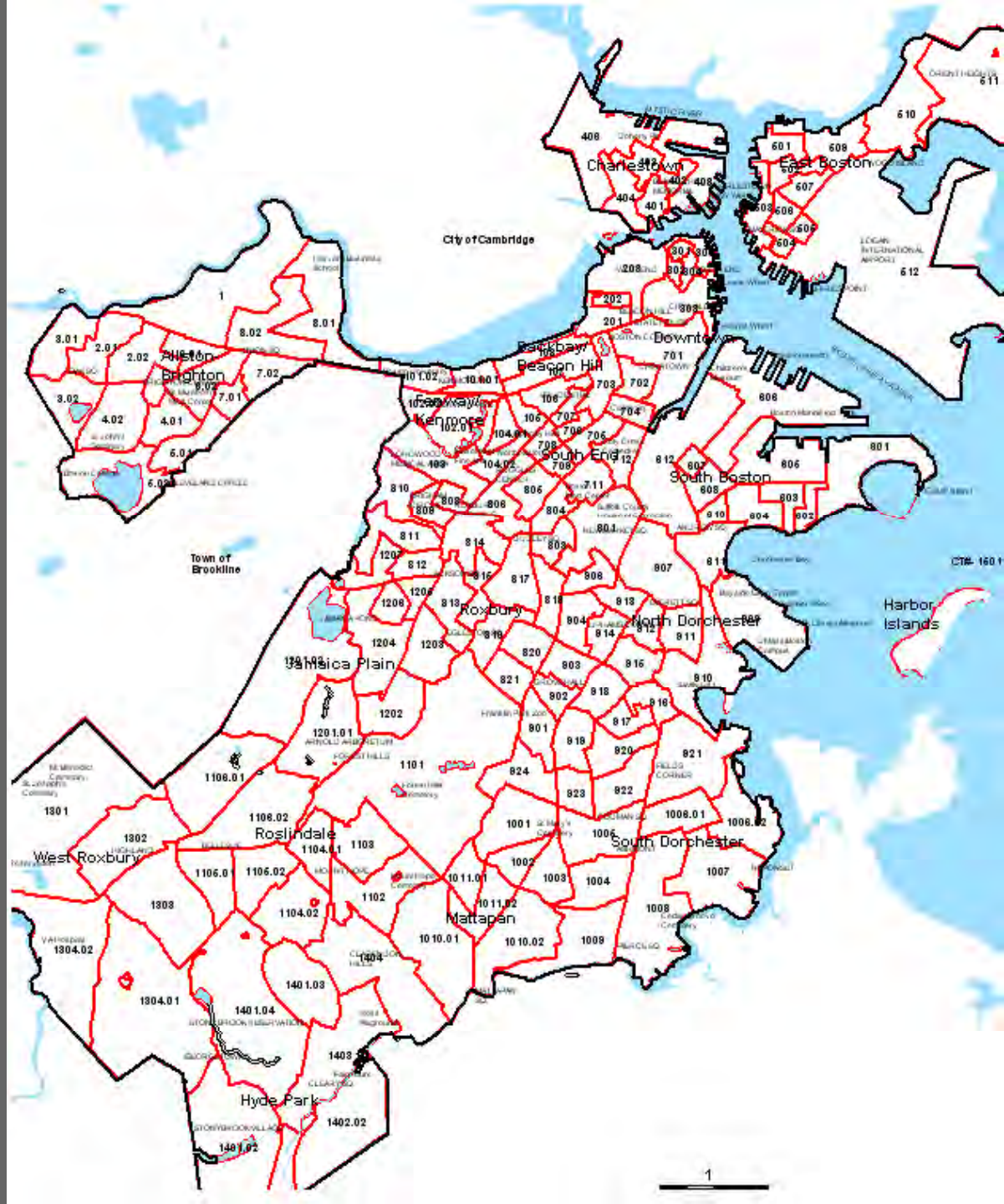
Thematic Map

A Selected Characteristic: Educational Attainment

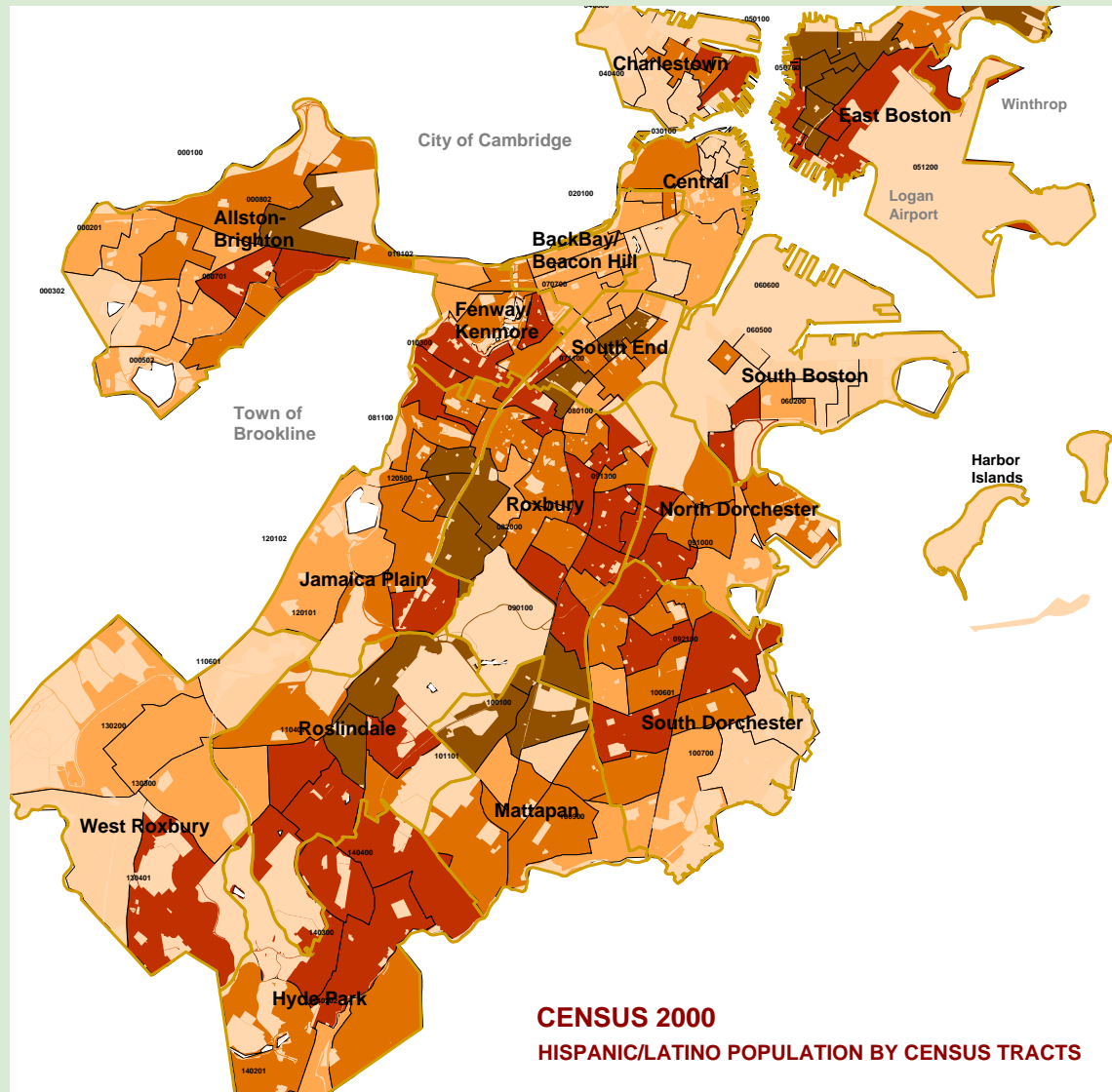


Most Commonly Used Census Geography: Census Tracts

Boston's 157 Census Tracts
are more useful in breaking up
the city into as many parts
that offer much finer
representation of
the neighborhoods:



Thematic Map with Census Tract as Basic Unit

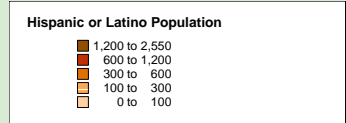


Note:
Numbers within Census Tracts
are Tract ID numbers.

Census Tract
Boundaries

Planning District
Boundaries

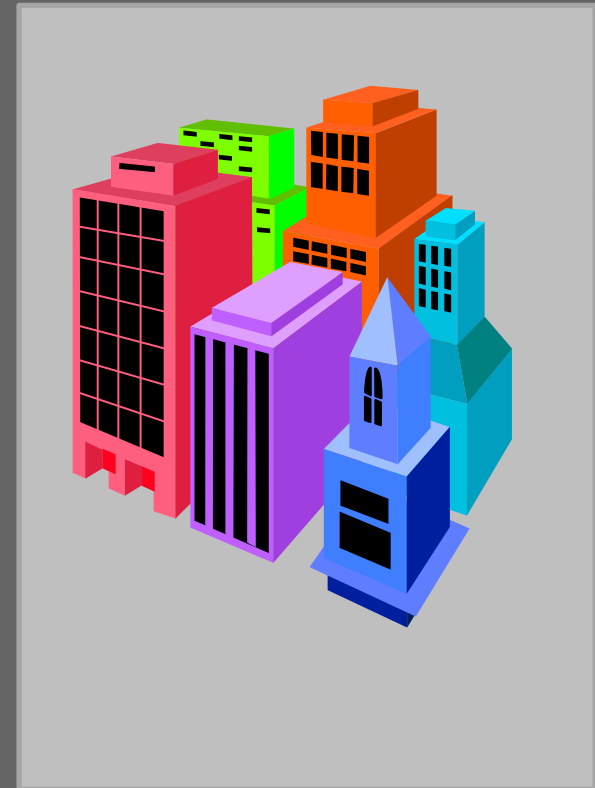
ES MAP 4/05



Relationship of Poverty Rates & Subsidized Housing

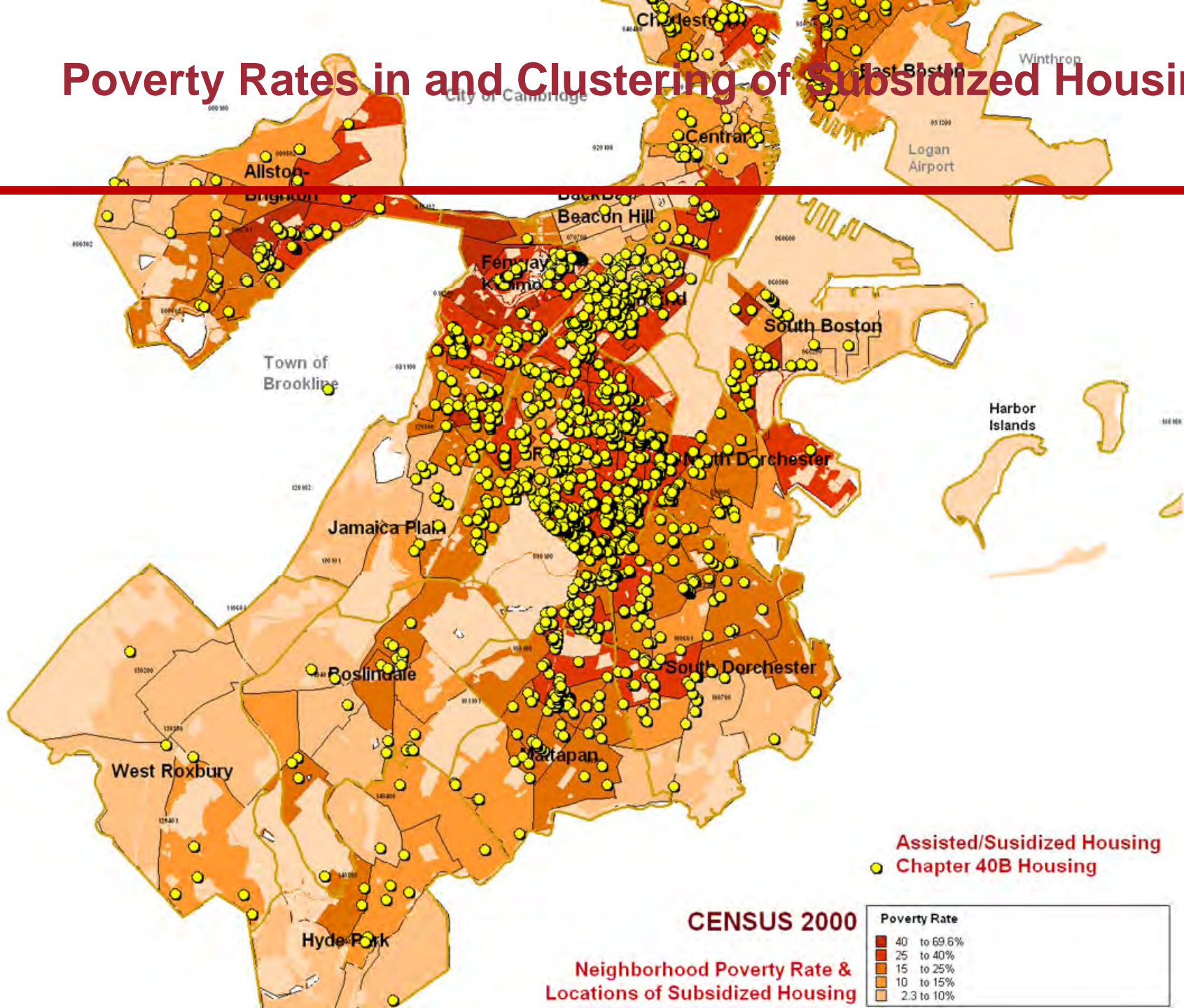
CENSUS TRACT	Total Population	Poverty Rate
1	3,968	13.5
2.01	3,887	8.7
2.02	3,925	12.2
3.01	2,833	9.0
3.02	3,036	5.6
4.01	5,868	21.7
4.02	3,564	20.4
5.01	7,456	23.9
5.02	3,076	23.6
6.01	3,413	15.9
6.02	4,860	43.0
7.01	4,687	26.8
7.02	7,551	32.2
8.01	3,540	26.9
8.02	7,984	32.8

Census Tracts and Poverty Rate



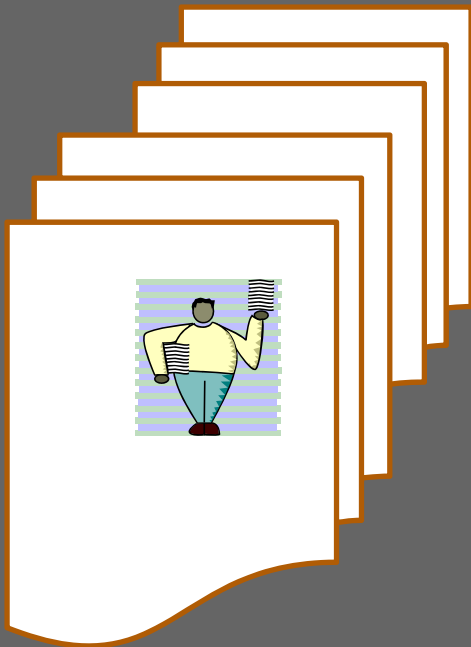
Subsidized Housing Developments

Poverty Rates in and Clustering of Subsidized Housing



Extraction of Data

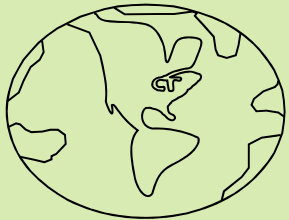
● What to Do with Stacks of Data of Large Geographies?



● Make Use of GIS Program & Data Extraction Modules!

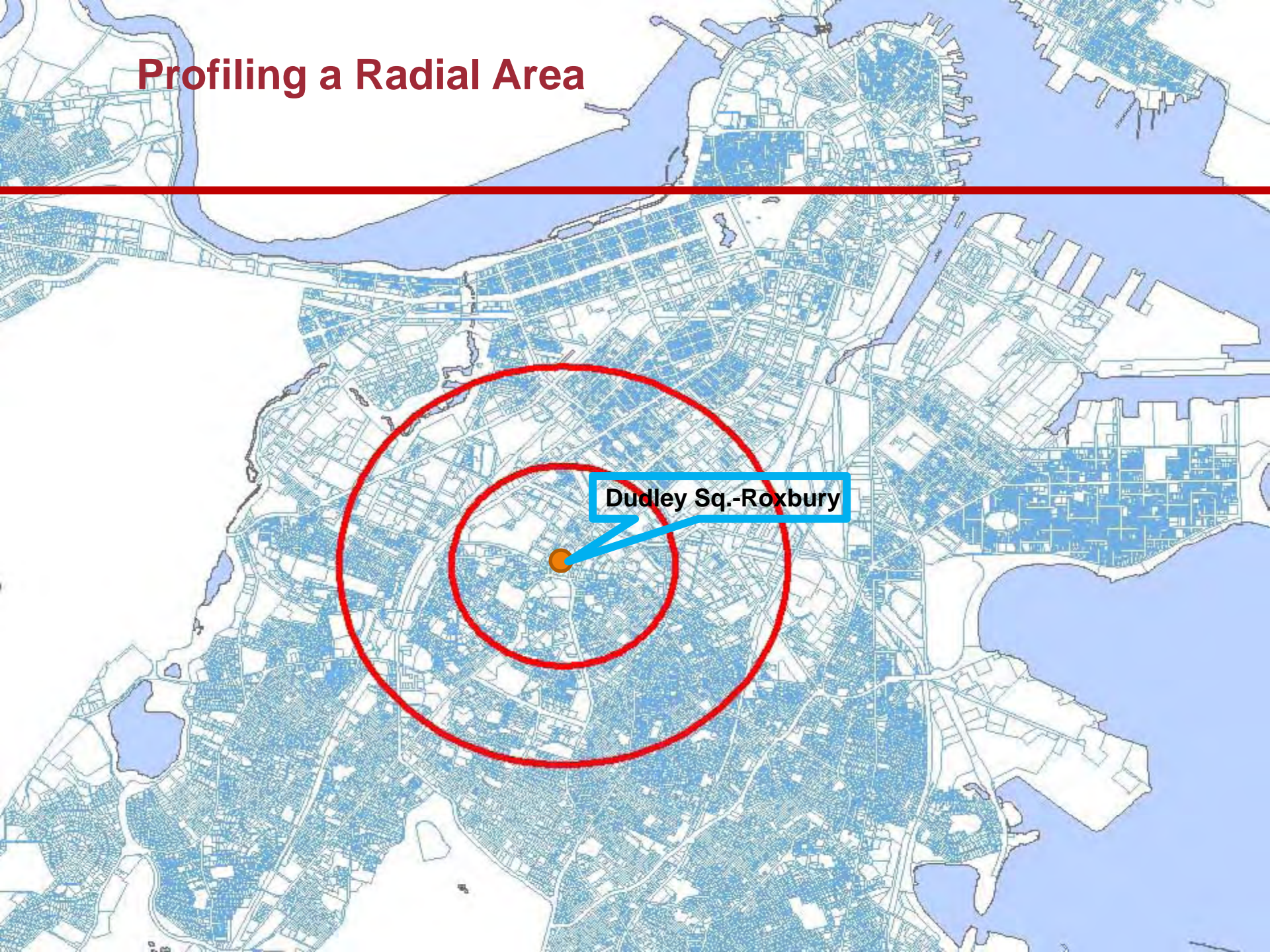


● Decisions are Made Easy with Summary Profiles of User-Specified Geography!



SE-StudyArea	
SUMMARY	
Land area, square miles	0.272
2005 Estmd. Total Population	1,847
2005 Estmd. Group Quarters Population	501
2005 Estmd. Average Household Size	1.79
(See Definition of Group Quarters Population at the end.)	
POPULATION	
2005 Estimate	1,847
2000 Census	1,791
1990 Census	1,653
Growth 1990 - 2000	8.37%
RACIAL COMPOSITION	
2005 Estmd. Population by Single Race Classification	
White	974 52.8%
Black or Afr. Amer.	277 15.0%
Asian & Pacific Islander	465 25.2%
Some Other Race (incl. Nat. Am.)	64 3.5%
Two or More Races	66 3.6%

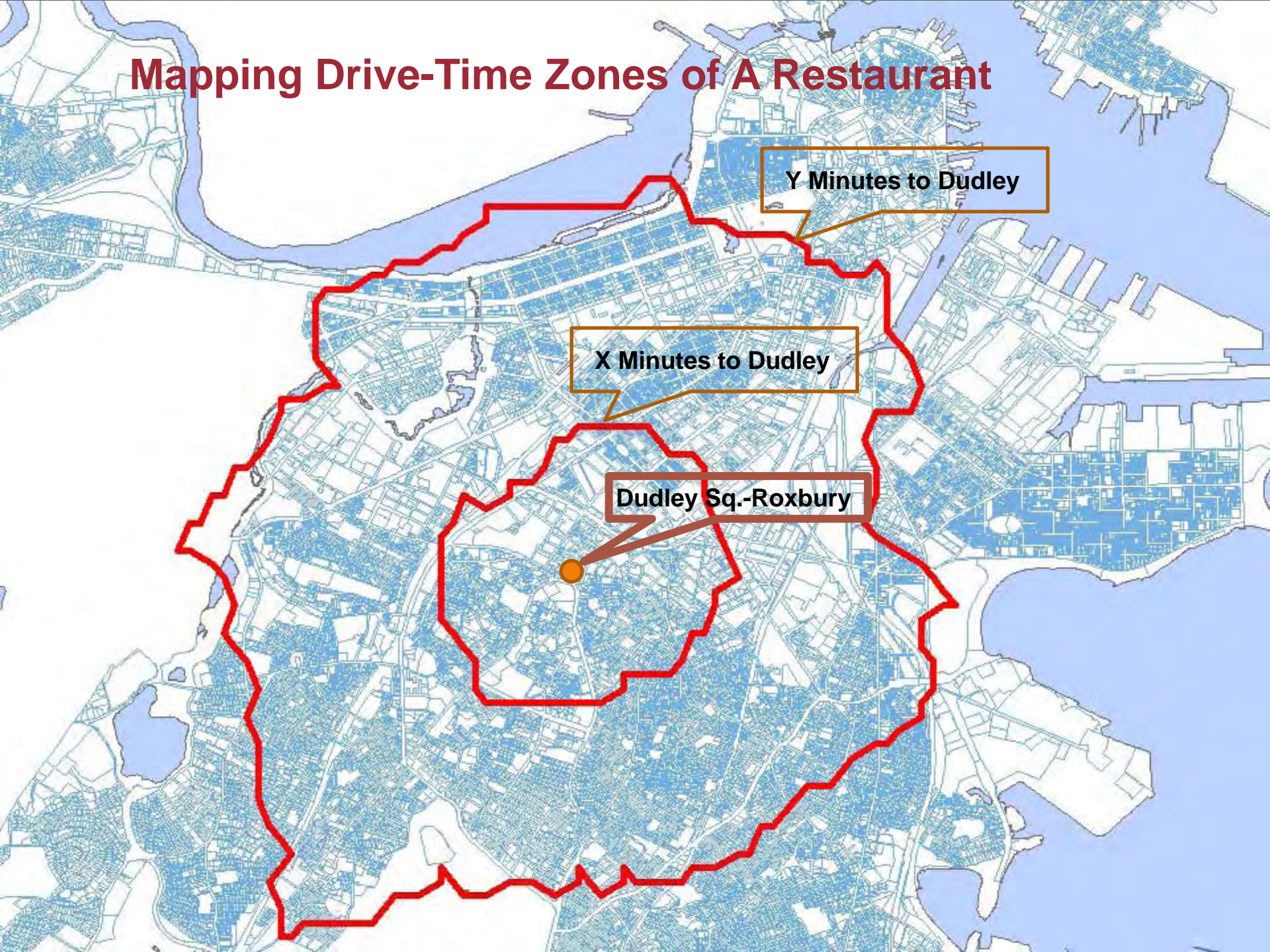
Profiling a Radial Area



Radial Area Profile

Pop Facts: Demographic Quick Facts	Distance from Site 0 - 0.5 mi		Distance from Site 0 - 1 mi	
Population				
2010 Projection	10,832		61,574	
2005 Estimate	10,831		61,318	
2000 Census	10,805		60,709	
1990 Census	12,407		62,025	
Growth 1990 - 2000	-12.91%		-2.12%	
Households				
2010 Projection	4,382		24,694	
2005 Estimate	4,313		24,428	
2000 Census	4,222		23,991	
1990 Census	4,629		23,639	
Growth 1990 - 2000	-8.80%		1.49%	
2005 Estimated Population by Single Race Classification	10,831		61,318	
White Alone	1,308	12.08%	24,402	39.80%
Black or African American Alone	6,876	63.48%	22,202	36.21%
American Indian and Alaska Native Alone	97	0.90%	360	0.59%
Asian Alone	140	1.30%	3,314	5.40%
Native Hawaiian and Other Pacific Islander Alone	4	0.04%	56	0.09%
Some Other Race Alone	1,737	16.03%	7,410	12.09%
Two or More Races	668	6.17%	3,574	5.83%
2005 Estimated Population Hispanic or Latino	10,831		61,318	
Hispanic or Latino	3,007	27.77%	12,328	20.10%
Not Hispanic or Latino	7,824	72.23%	48,990	79.90%
2005 Tenure of Occupied Housing Units	4,313		24,428	
Owner Occupied	699	16.20%	4,601	18.83%
Renter Occupied	3,614	83.80%	19,827	81.17%
2005 Average Household Size	2.45		2.22	
2005 Estimated Households by Household Income	4,313		24,428	
Less than \$15,000	1,419	32.91%	7,055	28.88%
\$15,000 to \$24,999	530	12.30%	2,911	11.92%
\$25,000 to \$34,999	612	14.19%	2,745	11.24%
\$35,000 to \$49,999	602	13.95%	3,263	13.36%
\$50,000 to \$74,999	576	13.35%	3,225	13.20%
\$75,000 to \$99,999	263	6.11%	1,988	8.14%
\$100,000 to \$149,999	185	4.29%	1,881	7.70%
\$150,000 to \$249,999	96	2.21%	874	3.58%
\$250,000 to \$499,999	27	0.63%	330	1.35%
\$500,000 or more	2	0.05%	156	0.64%
2005 Estimated Average Household Income	\$ 40,559		\$ 53,432	
2005 Estimated Median Household Income	\$ 28,375		\$ 33,190	
2005 Estimated Per Capita Income	\$ 16,349		\$ 22,450	

Mapping Drive-Time Zones of A Restaurant



Y Minutes to Dudley

X Minutes to Dudley

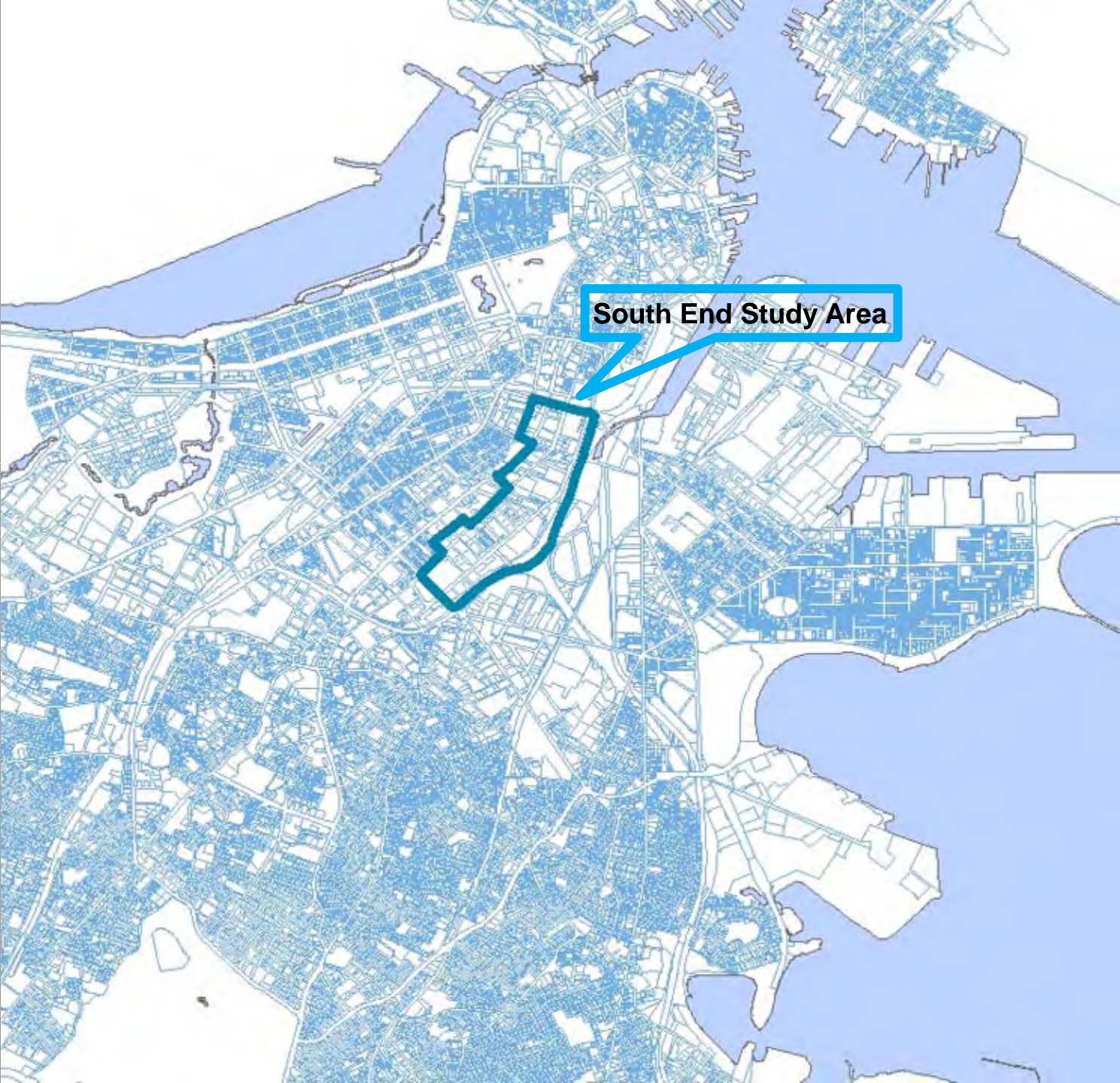
Dudley Sq.-Roxbury

**Dudley Sq. - Drive Time Areas
Profile Report
Claritas 2005: Updates**

**Drive-Time
Profile for
Restaurant**

Selected Data	Drive Time 0 min - 5 min		Drive Time 0 min - 2 min	
Households				
2010 Projection	73,791		10,497	
2005 Estimate	74,145		10,291	
2000 Census	74,085		9,983	
1990 Census	71,090		9,687	
Growth 2005-2010	-0.48%		2.00%	
Growth 2000-2005	0.08%		3.09%	
Growth 1990-2000	4.21%		3.06%	
2005 Estimated Households by Household Type	74,145		10,291	
Family Households	29,823	40.22%	4,881	47.43%
Non-family Households	44,322	59.78%	5,410	52.57%
2005 Estimated Group Quarters Population	22,145		1,168	
2005 Households by Ethnicity: Hispanic or Latino	10,691	14.42%	2,054	19.96%
2005 Estimated Households by Household Income	74,145		10,291	
Less than \$15,000	18,395	24.81%	3,154	30.65%
\$15,000 to \$24,999	7,775	10.49%	1,222	11.87%
\$25,000 to \$34,999	7,671	10.35%	1,228	11.93%
\$35,000 to \$49,999	9,889	13.34%	1,306	12.69%
\$50,000 to \$74,999	10,413	14.04%	1,374	13.36%
\$75,000 to \$99,999	6,743	9.09%	779	7.57%
\$100,000 to \$149,999	7,036	9.49%	758	7.36%
\$150,000 to \$249,999	3,617	4.88%	330	3.21%
\$250,000 to \$499,999	1,611	2.17%	95	0.93%
\$500,000 or more	996	1.34%	45	0.44%
2005 Estimated Average Household Income	\$ 65,423		\$ 49,141	
2005 Estimated Median Household Income	\$ 39,902		\$ 31,270	
2005 Estimated Per Capita Income	\$ 28,232		\$ 22,083	

Profile of
Area Defined
By Users



SOUTH END STUDY AREA - 2005

Summary Profile Report

Claritas 2005: Updates

Selected Data	SouthEnd-StudyArea1		South End - NHood		Boston	
Population						
2010 Projection	1,883		28,848		560,701	
2005 Estimate	1,847		28,632		575,705	
2000 Census	1,791		28,240		589,175	
1990 Census	1,653		28,676		574,316	
Growth 1990 - 2000	8.37%		-1.52%		2.59%	
Households						
2010 Projection	622		15,004		228,646	
2005 Estimate	609		14,710		234,681	
2000 Census	586		14,302		239,543	
1990 Census	482		13,123		228,479	
Growth 1990 - 2000	21.57%		8.98%		4.84%	
2005 Estimated Population by Single Race Classification	1,847		28,632		575,705	
White Alone	974	52.76%	15,845	55.34%	307,824	53.47%
Black or African American Alone	277	15.02%	5,649	19.73%	142,691	24.79%
American Indian and Alaska Native Alone	8	0.45%	149	0.52%	2,414	0.42%
Asian Alone	465	25.18%	3,343	11.68%	46,044	8.00%
Native Hawaiian and Other Pacific Islander Alone	0	0.00%	31	0.11%	416	0.07%
Some Other Race Alone	56	3.03%	2,434	8.50%	48,616	8.44%
Two or More Races	66	3.57%	1,181	4.12%	27,701	4.81%
2005 Estimated Population Hispanic or Latino	1,847		28,632		575,705	
Hispanic or Latino	165	8.96%	4,827	16.86%	90,413	15.70%
Not Hispanic or Latino	1,682	91.04%	23,805	83.14%	485,292	84.30%
2005 Tenure of Occupied Housing Units	609		14,710		234,681	
Owner Occupied	131	21.46%	3,968	26.97%	74,873	31.90%
Renter Occupied	478	78.54%	10,742	73.03%	159,808	68.10%
2005 Average Household Size	1.79		1.85		2.30	

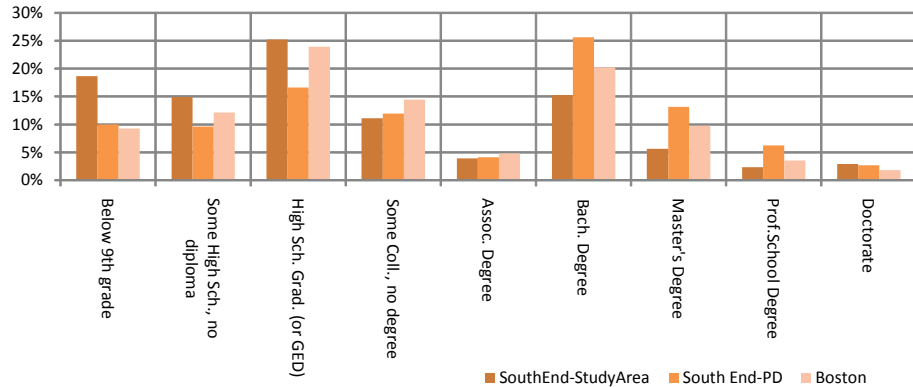
Comparative Profile of South End

	SouthEnd-StudyArea		South End-PD		Boston	
EDUCATIONAL ATTAINMENT						
2005 Estmd. Population Age 25 & Over by	1,535		22,240		386,750	
Below 9th grade	286	18.7%	2,220	10.0%	35,851	9.3%
Some High Sch., no diploma	229	15.0%	2,144	9.6%	46,934	12.1%
High Sch. Grad. (or GED)	387	25.2%	3,694	16.6%	92,500	23.9%
Some Coll., no degree	171	11.1%	2,655	11.9%	55,832	14.4%
Assoc. Degree	60	3.9%	913	4.1%	18,707	4.8%
Bach. Degree	235	15.3%	5,696	25.6%	78,199	20.2%
Master's Degree	87	5.7%	2,928	13.2%	37,824	9.8%
Prof.School Degree	36	2.3%	1,388	6.2%	13,780	3.6%
Doctorate	45	2.9%	601	2.7%	7,123	1.8%

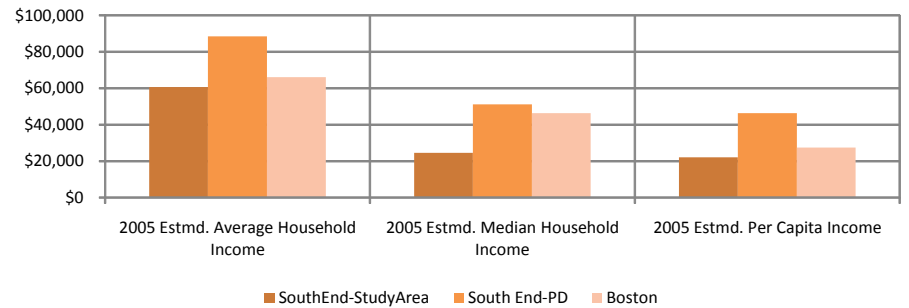
	SouthEnd-StudyArea		South End-PD		Boston	
HOUSEHOLD INCOME						
2005 Estmd. Households by Household Inc	609		14,710		234,665	
Less than \$15,000	226	37.2%	3,186	21.7%	45,362	19.3%
\$15,000 to \$24,999	82	13.4%	1,290	8.8%	23,599	10.1%
\$25,000 to \$34,999	43	7.0%	1,227	8.3%	23,691	10.1%
\$35,000 to \$49,999	47	7.8%	1,567	10.7%	32,582	13.9%
\$50,000 to \$74,999	69	11.3%	1,845	12.5%	40,057	17.1%
\$75,000 to \$99,999	25	4.1%	1,463	10.0%	25,903	11.0%
\$100,000 to \$149,999	43	7.1%	1,898	12.9%	26,312	11.2%
\$150,000 to \$249,999	53	8.7%	1,240	8.4%	11,396	4.9%
\$250,000 to \$499,999	13	2.2%	568	3.9%	3,769	1.6%
\$500,000 or more	7	1.2%	426	2.9%	1,994	0.9%

2005 Estmd. Average Household Income	\$60,698	\$88,393	\$65,992
2005 Estmd. Median Household Income	\$24,544	\$51,153	\$46,362
2005 Estmd. Per Capita Income	\$22,131	\$46,281	\$27,524

Educational Attainment



Income Characteristics



In Conclusion....

US Census Bureau is only one in a hundred sources and the data are only a fraction of thousands of data sets.

The examples of data extraction, however, demonstrate the use of two basic parameters defined by the user:

- a. The geographic boundaries of the place
- b. A dataset of specific subject category and time

Moreover, the potential of generating graphic profiles and visual forms such as charts and maps can also be created for many other data sets that relate to space.

The extraction and visualization of data form a very useful basis to make our decisions and meaningful actions.

THANK YOU