Maps for Census 2000: Directions We Can Take

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Good morning! I am delighted to be here talking about Census 2000 maps.

Will Census 2000 products be depository?

The first question a depository librarian often asks is whether a product like census maps will be depository. Perhaps you have been or will be surprised at the answer: no, paper maps will not be depository, although it is my understanding that GPO expects that CD-ROMs and DVDs will be depository unless they are custom products.

Of course, census tract maps in 1990 were depository, as were census tract and block maps in 1980. For those of us who get a lot of use out of those maps even 20 years and 3 censuses later, it is important to know what our options are for providing access to Census 2000 maps.

Thus, our topic. What are our options for serving users in a world without Census 2000 maps in paper?

On the agenda

I would like to approach the topic of Maps for Census 2000 from the point of view of a librarian concerned with providing access and public service for these products. Thus, I will be primarily concerned with issues of accessibility and usability. For this reason, much of the presentation will be organized not by product, but by medium and format.

I will not provide definitive answers to problems, but I will try to provide the kind of information, evaluation, and techniques that you might need to address the problems and to make decisions in your libraries for how you want to provide public access to and support for census maps.

I have brought some examples of Census 2000 maps. Some of these are maps that we plotted on our plotter. Some of them are customized maps that I created from Census maps using techniques that I will briefly allude to later on. [For illustrations, see <http://www.unc.edu/~leverg/dlcmaps/index.html>.]

At the end of the handout, I have included citations to sources of the information that I present.

In order to understand census maps, it is essential to have a basic understanding of census geography, so we will start with that. I will then present some sample queries that users often ask. I will evaluate the map resources, in part, based on how easily users can get their queries answered. I'll then provide an overview of American FactFinder's capabilities, strengths, and weaknesses. I'll do the same for paper maps, PDF format digital files, commercial GeoLytics products, and some specialized products, TIGER/Line and HP-GL/2 digital files.

One topic that comes up again and again when talking about census maps is the issue of how to print them out. I will focus on the advantages and disadvantages of a color printer and a plotter for this purpose. Finally, I will summarize the options available to us.

Census 2000 geography

In order to understand census maps, it helps to have a basic understanding of the geographical areas represented on census maps.

The somewhat straight line down the middle of the image represents the basic hierarchy of census geographic areas which are represented on census maps and for which you can collect census data. The nation is exhaustively divided into regions, regions into divisions, divisions into states and state-like areas, states into counties and county-like areas, counties into census tracts, tracts into block groups, and block groups into blocks.

The block is the smallest census geographic unit and in urban areas it corresponds fairly closely to what we think of as a two dimensional city block. The block group is simply a collection of blocks. A census tract is another relatively small census geographic area, with a range of 1500-8000 people per tract.

What are users' needs?

For those of you who might be new to documents, new to the census, or new to maps, I'd like to provide you with some typical queries related to census maps that you might encounter. These queries set the stage for one of the ways in which I will evaluate census map resources.

The first type of query that users often ask is what I call "locate." Users often need to locate their census geographic area on a map. For example, "I have collected data for the census tracts with the highest per capita income in several cities in the U.S. I need to locate those census tracts on a map in order to isolate areas where my new franchise restaurants could be located."

Another type of query users often have is "identify" their geographical area in census geographic terms. For example, "our public health group wants statistics on our community. But first we need a map to find out what census blocks best define our community so we can then collect the census data for those areas."

A third type of query is "compare" census geographic areas. For example, "I have census tract data for 1990 and 2000. However, I don't know whether the data are comparable, since tract boundaries can change. I would like to compare maps of 1990 and 2000 census tracts so that I know how much the boundaries have changed." Of course, we seldom get a question asked so clearly and succinctly, but I have tried to boil real questions down to their essence.

Finally, users often want to do thematic mapping, which involves displaying statistical data on a map. For example, "I would like to show, on a map, the distribution of poverty in Fairfax County, Virginia by block group. I want to know whether there is more poverty in certain areas of the county than others."

So, we have four types of queries: locate a census geographic area on a map; identify a geographic area in census geographic terms; compare census geographic areas over time; and thematic mapping.

American FactFinder

Let's take a look at American FactFinder: what it is and what its strengths and weaknesses are.

American FactFinder is a free service of the Census Bureau, providing access to Census 2000 data and maps on the web. It is a wonderful service, providing a number of portals for a variety of needs and levels of expertise. I think we need to thank the Census Bureau for FactFinder's quality and quantity of information and presentation.

American FactFinder has three portals that include mapping capabilities. All three provide access to 1990 and 2000 maps. The Reference Maps portal provides maps only; you cannot use it for thematic mapping. The two other portals, Thematic Maps and Basic Facts-Maps are thematic mapping portals. Basic Facts-Maps is designed for novices and quick and easy questions; Thematic Maps is significantly more full-featured and information-rich.

This is FactFinder's front page. I have circled the portals: at the top right is Basic Facts-Maps; and at the bottom left are Reference Maps and Thematic Maps.

This is an example of a block map of Alexandria, VA, produced using the Reference Maps portal of American FactFinder. The map is so detailed, you can see the street names and the block numbers of each block.

This is an example of a thematic map of Arlington, VA, produced using the Thematic Maps portal. The dark magenta census tracts have a higher percentage of folks 65 and over; the yellow tracts have a lower percentage.

What are American FactFinder's strengths and weaknesses? Both Reference Maps and Thematic Maps are interactive; you can zoom, pan, and search by address to find your area of interest; you can customize the boundaries (such as whether or not to display and label city boundaries); and you can customize other features and the title of the map.

The maps are seamless. Imagine that you are interested in a geographical area that straddles the boundary of two paper sheet maps. You would have to work with two maps and try to match them up. This is not a problem in FactFinder since there are no boundaries, there are no sheet maps.

The maps are color. You can print the maps out or you can save the maps and legends as .gif files.

Finally, and not insignificantly, it is freely available on the web.

On the other hand, FactFinder is not perfect. For instance, the map colors in Reference Maps and Basic Facts-Maps are not customizable and I do not always find them to be the optimal colors. The map size is fixed at about 4"x5". This is very small for many needs, especially if the user needs a map of a large geographical area. Of course, because the maps are color–-a good thing–-you need a color printer to print them out. And finally, both the Internet and FactFinder can be slow, especially when California wakes up.

Given its strengths and weaknesses, FactFinder is especially good for reference questions or a relatively small amount of information. It is best for queries that do not require a large map size. Otherwise, your user will have to print out multiple maps, edge-match them, and tape them together. FactFinder is great for geographical areas which would straddle two or more map sheets. Of course, it is ideal for users who do not want to come in to the library. It is excellent for all four types of queries that we began with: locate, compare, thematic mapping, and even identify for a small geographical area.

"Sheet" map products

Let's move on to what I will call non-interactive "sheet" map products, that is, those map products that display a small subset of the U.S. at a time on a static map. The most familiar sheet map product would be a sheet map in paper, but these paper products have corresponding maps in PDF format via the web or on CD-ROM or DVD.

There are 4 major series of sheet maps: County Block Maps (which include voting districts), Block Maps (which lack voting districts), Census Tract Outline Maps, and the Voting District/State Legislative District Outline Maps.

You see each of the four major map series in the first column of this table. Each of the four major series will be issued in paper, in PDF on the web, and in PDF on CD-ROM or DVD.

The paper maps and PDF maps on the web are all available now, except for the Block maps which should be available by the end of the year. The PDF maps on CD-ROM/DVD should also be available by the end of the year.

Paper maps

The first sheet map product I'd like to look at in detail is paper maps. Paper maps are 36"x33". The scale varies depending on the characteristics of the geographical area represented.

Paper maps are available for purchase from the Census Bureau at $5 per map. They are sold in state or county packages.

However, you might not want to put in an order for the whole set just yet. This is a very large country. To produce maps that display over 8 million blocks at a legible scale requires that there be relatively few blocks per map sheet and thus a relatively large number of maps. How many?

For the whole U.S., there are about 6500 census tract maps and about 100,000 county block maps, for a total of 107,000 maps just for those 2 series. At $5 per map, just these two series will cost you $533,375.

This table provides more detailed information. For Illinois in the county block series in the last column, for example, there are about 3,110 map sheets, enough to require 21 drawers in a map case and to deplete your collection development budget by $15,550.

That said, we are all convinced of the value of paper maps. They are familiar and easy to use. There is usually a relatively good sized geographical area on one sheet, making them convenient to use. The maps are beautiful, high-quality maps. We can add them to our collections, catalog them, and keep them forever.

On the other hand, we will need money, space, and staff to buy, house, and process them. Buying paper maps is a just-in-case solution: we buy them just in case our users will need them. Another potential problem is that the ink on the maps may run when exposed to water. This means that preservation will be an issue.

Given these strengths and weaknesses, paper maps are especially suitable for identifying an area in census geographic terms and comparing geographic areas over time. However, it is usually easier to locate census geographic areas by using American FactFinder than by using paper maps.

Portable Document Format digital files

Let's move on to the second sheet map product, the PDF digital files. PDF, of course, is an acronym for Portable Document Format. Many government documents are available on the web or on CD-ROM in PDF, so we are quite familiar with these files and with the free viewer, Adobe Acrobat Reader. Using Reader, you can display, print, or plot maps in PDF. These PDF map files are provided by the Census Bureau for free on the web and they will be available on CD-ROM or DVD.

This is an example of an entire PDF map. Notice that the census tract and block numbers and the street names are not legible. This illustrates one of the problems with the PDF maps that I will discuss in more detail later on and I will also talk about some solutions to this legibility problem.

This is an example of a subset of a PDF block map I created from a full size PDF map file using techniques I will refer to later on. I have zoomed in on the map enough to make the block numbers and street names legible.

You have already seen this table. It is here only as a reminder that PDF maps are already available on the web. The final block series will be available by the end of the year.

In order to evaluate PDF, I need to briefly provide some terminology for concepts that might be unfamiliar to those of us who are not maps librarians. There are three flexible parameters that are especially important when working with maps in PDF. The first is the size of the map printed out. For instance, at intended size, PDF maps are 36"x33". American FactFinder maps are about 4"x5".

The second parameter is the map extent, or the extent of the area on the ground that is represented on the map. For example, some census tract maps show an entire county. If a county is large or densely populated, just a subset of that county may be represented on a given tract map.

Finally, the third parameter is the display resolution, or the amount that you are zoomed in or out on the printed map. The display resolution,

of course, may determine how much detail you can see in the map.

This slide illustrates these three parameters. The two maps have about the same map size, but they differ in map extent and display resolution. The map extent in the map on the left is larger than that of the map on the right. This might be a good thing, since you can see more blocks in the map on the left. On the other hand, we are zoomed farther out in the map on the left, which might be a bad thing because we are zoomed so far out that we can't see the street names.

With these three flexible parameters in mind, let's talk about strengths and weaknesses of the PDF maps. On the plus side, these three parameters, map size, map extent, and display resolution, are flexible and they are independently controllable when dealing with PDF maps.

Using Reader you can zoom, plan, copy, and even search for text labels such as census tract numbers within a file. The maps are beautiful color maps. They are freely available on the web and they will be available for purchase from the Census Bureau. Finally, the PDF files are a just-in-time solution. You don't have to buy, house, and catalog over half a million dollars worth of Census 2000 maps if the PDF maps will satisfy your users' needs.

It is especially important to ask, then, whether PDF maps *will* satisfy our users' needs. What are some of the weaknesses? First, the PDF maps correspond to the 36"x33" sheet maps, so they are inconvenient for users working with areas that straddle two or more maps.

The PDF files are not customizable, at least not using Reader. The permanent public access issue has not been solved for the PDF format, to my knowledge.

Color usually conveys important or critical information, such as the difference among boundary types. Thus, these maps may not be fully usable when printed on a black and white printer or when photocopied on a black and white photocopier. For instance, streams (in blue) and

the roads which often form block boundaries (in black) are very hard to distinguish in grayscale.

The final problem, legibility, is most serious. For example, when an entire County Block Map is printed out, one can barely see the block numbers, even on 11"x17" paper. When an entire Census Tract Map is printed out, the census tract numbers are legible; however, street names are not visible, even on 11"x17" paper.

However, the legibility problem is one that we have a hope of addressing in our libraries. One solution is to purchase a plotter for over $10,000.

Another option is to consider a color ink-jet printer that prints on up to 11"x17" (tabloid size) paper. Such a printer costs about $500. Because tabloid paper permits a larger map size, you can also have a larger map extent or you can zoom in more. However, as I noted just a minute ago, this alleviates but does not completely solve the legibility problem.

Another partial solution to the legibility problem is to make what I call "fancy maps." You make fancy maps by taking advantage of PDF's flexibility in map size, map extent, and display resolution.
Here are a couple examples of fancy maps. You can print out a fully legible subset of a map across several sheets of paper and then tape the pieces together, making what I call a map quilt. Or, you can print out a subset of a map, forcing it onto one sheet of paper, if that is what you need. Or, you can print out a map at a particular size, say 5"x7" or 20"x30".

How do you do this? The Census Bureau has some excellent basic instructions for working with Reader with the PDF maps. To follow their instructions, you need only a PDF map, a color printer, and Reader.

However, their instructions provide control over only the map extent. They do not describe how to control the map size or the display resolution.

I have worked up some more advanced techniques to have precise control over all three parameters: map size, map extent, and display

resolution, but you can only control two out of the three parameters at a time. So, you can choose the map size and map extent; or you can choose the map extent and display resolution. But, because of the "Laws of Maps," you can not choose the map size and the map extent and the display resolution all at once.

To follow these instructions, you need a PDF map, a color printer, Reader, Paint (which is usually installed as a part of a Windows installation), and Word.

So, assuming that you have a color printer and are able to make fancy maps, PDF maps are great for queries that require fancy maps, for reference questions (because you can display the map on the screen without necessarily having to print it out), for users who do not want to come in to the library, and for the type of query that involves identifying an area in census geographic terms.

GeoLytics products

We will take a short vacation from Census Bureau products to look at commercial products from GeoLytics.

Some of you may have purchased the very popular GeoLytics 1990 Census products. GeoLytics is also offering several Census 2000 products which include data and mapping and which include 1990 variables normalized to 2000 geographies which will be very useful for folks doing time-series work. Their products are licensed on CD-ROM, and they offer a Census 2000 subscription plan. Here are some sample prices just to give you an idea of how much money might be involved.

TIGER/Line and HP-GL/2 format digital files

Let's look at some more specialized Census Bureau products: TIGER/Line and HP-GL/2 digital files.

We are familiar with TIGER/Line – at least by title – from the 1990 Census. Using TIGER/Line, you can display, print, or plot using a GIS (Geographic Information System). These files are very flexible and very powerful. You can combine TIGER/Line with data to do thematic mapping or to do sophisticated spatial analysis. On the other hand, it requires a significant investment in GIS, and to use the files you must first convert and extract them. The private sector also offers modified or enhanced versions of TIGER/Line.

HP-GL/2 files are even more of a niche product. As of a few weeks ago, Census had not yet decided whether to release these files. They are intended to be used with a plotter for high volume or high quality needs.

A printer or a plotter?

I have mentioned printers and plotters several times, so I thought it might be useful to discuss them in a bit of depth. On the left is an image of a inkjet printer capable of printing on tabloid size paper. On the right is a plotter, capable of plotting on 36" wide paper.

As we have seen, a color printer is essential to print out census maps. A tabloid sized printer will provide more flexibility than a letter/legal sized printer.

A plotter is essential for printing out census maps at their full size. It is also good for high quality or high volume.

Here I have given you information about a model for a tabloid sized printer and one for a plotter that you might look at, with the understanding that I neither recommend nor not recommend these particular models. If you are interested in a plotter, you *must* look at the Census Bureau's flyer on specifications for plotters to be used with their maps.

Why might you want to invest in a plotter? To produce maps at their full size, for high volume or high quality, to easily add maps to your collection, to plot on demand, to avoid having to purchase maps, and to use with a GIS.

Why might you *not* want to invest in a plotter? It is very expensive, over $10,000 to begin, plus the cost to plot each map. There are lots of other costs.

There are also lots of service and support issues. Who will provide maintenance and support? Do you want to charge for plotting and if so how will you do it? Do you want to provide remote access to the plotter and if so how you do so? What is your service policy? Can I plot my Jimi Hendrix poster? … a flow chart for my class? … my "Beat Duke" banner?

Summary of options

Let's summarize our options.

At the high end, you could invest in a plotter to plot census maps. You can get involved with TIGER/Line and GIS. If Census makes them available, you can purchase HP-GL/2 files and use them with a plotter.

If you do not want to aim that high, you can begin with American FactFinder's three mapping portals, you can purchase paper maps at $5 per map, you can access PDF maps for free on the web, and you can learn to make fancy maps.

You might also consider purchasing GeoLytics products or a color printer.

I also suggest that you investigate what resources are available in your area. Do any nearby libraries, your State Library, your State Data Center, or your Regional library have full-size paper maps or do they have a plotter? Also watch out for other products to be made available either on the web or CD-ROM.

For more information

Will Census 2000 maps be depository?

- "FW: 2000 Census Tracts & Block Maps," message from Robin Haun-Mohamed to Carlos A. Diaz forwarded to doctech-l listserv by Carlos A. Diaz; April 26, 2001 <http://www.usu.edu/library/GovDocs/doctech2.html#Archives>

Census Bureau

- <http://www.census.gov/>

Census geography

- Hierarchical Relationship of Census Geographic Entities <http://www.census.gov/geo/www/cengeoga.pdf>
- Census 2000 Geographic Definitions <http://www.census.gov/geo/www/geo_defn.html>

- Strength in Numbers: Your Guide to Census 2000 Redistricting Data from the U.S. Census Bureau <http://www.census.gov/clo/www/strength2.pdf>

Users' needs

- Thanks to my colleagues Mimi Curlee, Bob Gaines, Lisa Stimatz, and others for sharing sample queries with me.

American FactFinder

- <http://factfinder.census.gov/>

"Sheet" map products from Census Bureau

- Census 2000 Geographic Product Highlights <http://www.census.gov/geo/www/geo_flyer.pdf>
- Census 2000 Redistricting Data Map Products <http://www.census.gov/geo/www/tiger/rd_2ktiger/pl_maps/pl_maps.html>
- Census Store (Product Catalog) <http://www.census.gov/mp/www/censtore.html>
- Census Maps and Related Product Titles <http://www.census.gov/mp/www/geo/index.html>
- Census 2000 Redistricting Data and Maps <http://www.census.gov/mp/www/geo/c2000/2000pr~1.html>
- Census 2000 Tabulation Geography Tallies <http://www.census.gov/geo/www/tabgeo2k.pdf>

Printing PDF files

- Printing from the PDF Map Files <http://www.census.gov/geo/www/tiger/rd_2ktiger/pl_maps/pdfprint.html>
- How to Print out Census 2000 Maps in PDF Format <http://www.lib.unc.edu/reference/docs/leverg/printpdf.html>

GeoLytics

- <http://www.geolytics.com/>

TIGER/Line

- Downloading Redistricting Census 2000 TIGER/Line Files <http://www.census.gov/geo/www/tiger/rd_2ktiger/tgr2kweb.html>

- Sources of TIGER/Line and TIGER Spatial Data <http://www.lib.unc.edu/reference/gis/tiger.html>

Plotter

- Large-Format Map Products for Census 2000 Guide to Map Plotting Devices <http://www.census.gov/geo/DR/plotter.pdf>

- "Standardized Costs for Census 2000 Plots," Joe Aufmuth, gis4lib listserv, June 16, 2000 <gopher://lists.u.washington.edu:70/0R51847-56132-/public/gis4lib/gis4lib.log200006>

My census website

- <http://www.lib.unc.edu/reference/govinfo/census/index.html>

This presentation is available at

- <http://www.unc.edu/~leverg/dlcmaps/index.html>