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Market Area Selection and Data Development for Medicare Fee-for-Service Reform

Final Report

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EXECUTIVE SUMMARY

The purpose of this project was to develop an approach for defining, analyzing, describing, and selecting market areas for selected Medicare fee-for-service (FFS) reform initiatives and to develop and populate a database that would support the identification of specific market areas based on this approach. This final report describes the final database and focuses on how the database we have developed can be applied to answer a range of policy questions.

We first describe the general process for using the database, including the various tools we have included and ways that database users can look up variables by category and perform search queries. We focus specifically on how to use the lookup tables to identify and find specific variables and their values from the database. We then describe more detailed operations, such as how to perform multiple criteria queries on the database. This documentation is intended to supply the Centers for Medicare & Medicaid Services (CMS) with enough information to use this database deliverable independently and effectively.

For much of this report, we concentrate on demonstrating the five-step market area selection approach we described in our interim report (RTI, 2002). Specifically, we demonstrate how the database can be used to identify possible market areas for the implementation of two CMS target reform projects: Medicare Preferred Provider Organizations (PPOs) and Competitive Acquisition for Durable Medical Equipment (DME). We focused on these two projects based on direction from CMS, as these reform initiatives are of most interest to the Agency at this time.

Using this approach, results of our most selective Medicare PPO and DME Competitive Acquisition market selection analyses suggest the following potential markets for these reform initiatives:

- For the Medicare PPO analyses, market selection should consider supply, demand, and market competition factors. In our final ("combined approach") query, we identify a very narrow set of 11 counties in 4 states that satisfy all the criteria. Plotting these on a map, we find that 2 counties are in Illinois, 4 are in Florida, 4 are in New Jersey, and 1 is in Connecticut.

- For the DME Competitive Acquisition analyses, when we considered geographic areas with large, growing, and more costly than average FFS populations, along with areas that appear to favor competition among DME suppliers, we found two MSAs that satisfy both sets of criteria jointly: Austin, Texas, and Indianapolis, Indiana.

In addition to our analyses that yield these very specific markets, we provide information regarding a number of alternatives. Our purpose in these analyses is not to identify the "perfect" markets, since we cannot know the full range of criteria that may be important to CMS, but rather to show how the selection analysis and database work together to provide options to policy makers.

Therefore, the site selection analyses we present for possible Medicare PPO and DME Competitive Acquisition should be understood first and foremost as examples of how to

approach site selection by developing and refining possible important variables, and then using queries to the database to identify geographic areas that meet these conditions.

Although the focus of this project has been to develop a tool to assist CMS in site selection for a range of possible projects, the database has other valuable applications—not because the available data are unique but because the database provides an efficient way to link a wide range of variables from CMS and other data sources. For example, the ability to combine variables from CMS administrative, Area Resource File, and U.S. Census data at the county level is valuable for many of CMS' monitoring and evaluation projects. The ability to make these linkages quickly—through this database—means that these data are more valuable in addressing real-time policy questions.

SECTION 1
INTRODUCTION

1.1 Purpose and Overview

The purpose of this project was to develop an approach for defining, analyzing, describing, and selecting market areas for selected Medicare fee-for-service (FFS) reform initiatives and to develop and populate a database that would support implementation of this approach. It has also been our goal, in developing the database, to provide the Centers for Medicare & Medicaid Services (CMS) with a tool that could be applied to other projects and that could be added to and updated in the future as additional years of data become available. In this way, the products of this contract can support Agency initiatives beyond those related to Medicare FFS reform.

This final report focuses on how the database we have developed can be applied to answer a range of policy questions. First, we describe the general process for using the database, including the various tools we have included and ways that users of the database can look up variables by category and perform search queries. Then, we demonstrate the five-step market area selection approach we described in our interim report (RTI, 2002). Specifically, we demonstrate how the database can be used to identify possible market areas for the implementation of two CMS target reform projects: Medicare Preferred Provider Organizations (PPOs) and Competitive Acquisition for Durable Medical Equipment (DME). We focused on these two projects based on direction from CMS, because these reform initiatives are of most interest to the Agency at this time. We focus on showing how the database and market area selection approach work together to identify possible specific sites for PPOs and DME Competitive Acquisition, but we also describe how this unique database might be used in other policy applications, such as program evaluation and more general market area analyses.

In this report, we also provide detailed documentation on the database we have developed. Per our agreement with CMS, we are delivering a Microsoft Access database. The database documentation included in this report includes the file structure and layout of the database, the source data used to populate the database, the specific variable layout of the database, and instructions for performing queries within the database. We also describe how new data can be imported into the database, as updated information becomes available. Finally, we describe how to link tables to geographic data in a Geographic Information System (GIS).

1.2 Importance of This Work

CMS' original impetus for awarding this contract was to facilitate the selection of appropriate market areas for a range of Medicare FFS reform initiatives. Making these market site selection decisions for this range of possible reform projects can be facilitated by the availability of a centralized database that organizes relevant geographic, provider, and beneficiary/population information. Currently, CMS tends to approach site selection for reform initiatives and demonstrations on a project-by-project basis. Using this ad hoc approach, information collected in previous projects is generally not coordinated; in most cases, this site selection information is restricted to specific criteria set at project onset and therefore has limited application to other efforts. Without a single database populated with many variables and including geographic linking information, CMS is restricted to determining market area selection

criteria using more limited data and/or relying on supplier response rather than doing optimal market analysis in-house. The database we have created in this contract will allow CMS to consider multiple site criteria and perform sensitivity analyses to judge the relative importance of the selection criteria and values. In this way, CMS can consider many possible selection criteria and values and generate a range of possible site selection options quickly and efficiently. The use of this database and the market area selection approach we have defined will facilitate conceptual thinking about what constitutes a "market" for different types of services and providers in a more systematic way. This database and methodology will also allow greater insight during ex post evaluations of projects and analysis of relative successes among industry participants.

Although not specifically envisioned at the time this contract was awarded, this database has uses beyond the prospective identification of sites for specific Medicare reform initiatives and demonstrations. We believe this database will also prove useful to CMS in analyzing a full range of market-related issues. For example, this database is already being proposed for use in the evaluation of CMS initiatives, including the Medicare PPO demonstration. Because the solicitation and selection of PPO sites for this Medicare demonstration is already underway, it is too late to use this database to identify possible sites. However, CMS staff and the evaluator plan to use the information in this database to describe the population and health care market characteristics of the 35 PPO demonstration plans, as well as understanding whether market area factors are related to the PPO interest and beneficiary enrollments observed in this project. Similarly, CMS could use this database to consider the impact of market area characteristics in a number of other program evaluation projects. In this way, the market area database created for this project can be used to conduct retrospective analyses of specific geographic factors, in addition to being used to prospectively identify target sites as projects are under development.

1.3 Review of Our Five-Step Market Area Selection Approach

Our proposed process for market selection is broadly based on both economic theory and applied health services research methods. The first aids in understanding factors within markets that influence how markets *work*, whereas the latter aids in understanding what a health market actually *is*. Economic concepts related to supply and demand are important in understanding the processes and structures that emerge within markets and their impacts on market potential (such as efficiency, price levels, product heterogeneity, quality, and market power). These economic concepts help define the key variables to be considered within market areas when selecting market areas for reform. Therefore, in *Step 1* of the market selection process, we use economic theory to define key variables used to characterize market activity and guide assessment of market potential that are relevant to the specifics of the individual reform project.

In *Step 2* of this selection process, we turn to possible geographic definitions of markets that are most relevant to the specific project. In most cases, these geographic definitions will be geopolitical, although there are alternatives; we propose three geographic market definitions. Like the application of economic concepts, the consideration of geographic factors also highlights important issues. For example, to define the market area itself, it is necessary to consider the geographic concept of the urban–rural continuum. This focus on the urban–rural continuum is an important distinction from the traditional economic concepts of self-contained markets, used in antitrust analysis and in defining cities and urban areas. Regionalization can be

more important than urbanization in health services delivery, as the integration, relationships, and dependencies between urban and rural areas are all components of any health care system.

In *Step 3* of the process, the site selection criteria identified in Step 1 (economic factors) and Step 2 (geographic market definitions) are refined based on real-world constraints, including data availability and administrative and policy considerations. In *Step 4*, possible specific sites are identified for a specific project using a relational query approach. Essentially, in this step, a database is queried to identify specific locations that meet the conditions identified in Steps 1 and 2 and refined in Step 3. In *Step 5*, we take the result of the query performed in Step 4 that identifies possible specific market areas and use sensitivity analysis to refine these results to either expand or contract the recommended list.

Our approach is applied specifically to the selection of Medicare PPO and DME Competitive Acquisition sites. It can be summarized as follows:

1. Perform economic assessment of market conditions:
   - Identify the key demand and supply factors for the project.
   - Identify other key factors that will likely impact the project, such as market power, competition, agglomeration effects, and transaction costs.
2. Identify which commonly used geographic market definition methodology is most appropriate. We discuss the following options:
   - geographic distance,
   - geopolitical boundaries, and
   - patient origin.
3. Identify constraints on the market definition methodology, such as the need for contiguous areas for administrative reasons; pragmatic use of complete geographic regions rather than subregions due to dispersed flows of commerce along an urban–rural continuum or data availability; inclusiveness of all players in a region rather than a specialized subset, for pragmatic or policy reasons; and use of broader geographic regions and associated measures than ideal, due to limited data availability or policy considerations.
4. Use a query-based approach applied to the database to identify feasible sites or market areas.
5. Conduct sensitivity analyses within selected markets to further narrow (or expand) the number of selected sites.

Although other methods for market selection exist, ours is best suited for this project for several reasons. First, it can be applied to a very broad, general database, such as the one we construct here. This allows maximum flexibility in tailoring key variables to specific projects

and allows selection criteria to be project-specific. This is particularly important for public program initiatives, where there can be specific policy considerations that must be accounted for. The selection criteria and key variables can easily be altered to reflect changes in market conditions or to identify fewer or greater numbers of feasible sites. The query-based approach allows for heterogeneity among the key variables and is generally the most useful approach when multiple variables measured in different dimensions are to be considered jointly in market selection. Because the approach is nonparametric, the results are robust to the wide range of statistical distributions exhibited in the heterogeneous key variables. Finally, this approach is extremely useful in identifying a set of feasible regions that broadly satisfy multiple criteria, to be used as a starting point in more detailed, specialized analysis.

1.4 Structure of the Final Report

This report is structured as follows. In Section 2, we describe the variables in the database and provide detailed information on data contents, data organization, and data documentation. In Section 3, we describe how to use the database. Here we describe the various tools we have built into the database, including lookup forms. We also describe how to view a list of variables and their characteristics and how to use queries to find and list data. In Section 4, we describe how to use the database for market selection and analysis. We review here our five-step approach, presented originally in the interim report (see Appendix A for unabridged version of text from interim report). In Section 5, we apply our market area selection approach to two reform initiatives: Medicare PPOs and DME Competitive Acquisition. This section also contains a summary, reiterating general insights gained from this market modeling research that have wider applicability. Section 6 describes more advanced database topics, including database structure, more advanced relational queries that can be used for export of data subsets, and instructions on how to incorporate new data into the database. Appendix A contains the Literature Review and Past Performance sections for PPO and DME market selection from the interim report, Appendix B contains the Beale codes used in describing the urban–rural continuum, Appendix C contains a listing of all CMS variables now included in the database, Appendix D contains a listing of some database components and a selection of variables included in the database, and Appendix E contains maps depicting the results from the site selection analyses performed for the PPO and DME markets. A complete listing of all variables by source or by variable category can be generated by printing the reports (rpt_Variables and rpt_Variables_by_Category) that are provided as programmed reports in the database itself. Having these programmed reports in the database means that when new variables are added to the database, or when variable names are changed, they will automatically be updated and included in these reports.

SECTION 2
DESCRIPTION OF VARIABLES IN THE DATABASE

To make this database as useful as possible for site selection and other market research projects, we included a wide array of variables from a range of data sources. A large number of these variables derive from either the U.S. Census or the Area Resource File (ARF). These data sets contain a rich source of basic demographic and provider-related information. The Census files also supplied the basic geographic crosswalk information, which we supplemented with additional specific files. Another major source of data was the CMS administrative and claims files. We have included variables from both the FFS claims and the managed care administrative files. These data are the primary source of the Medicare-specific variables. To round out the database, we have also included data from some additional sources.

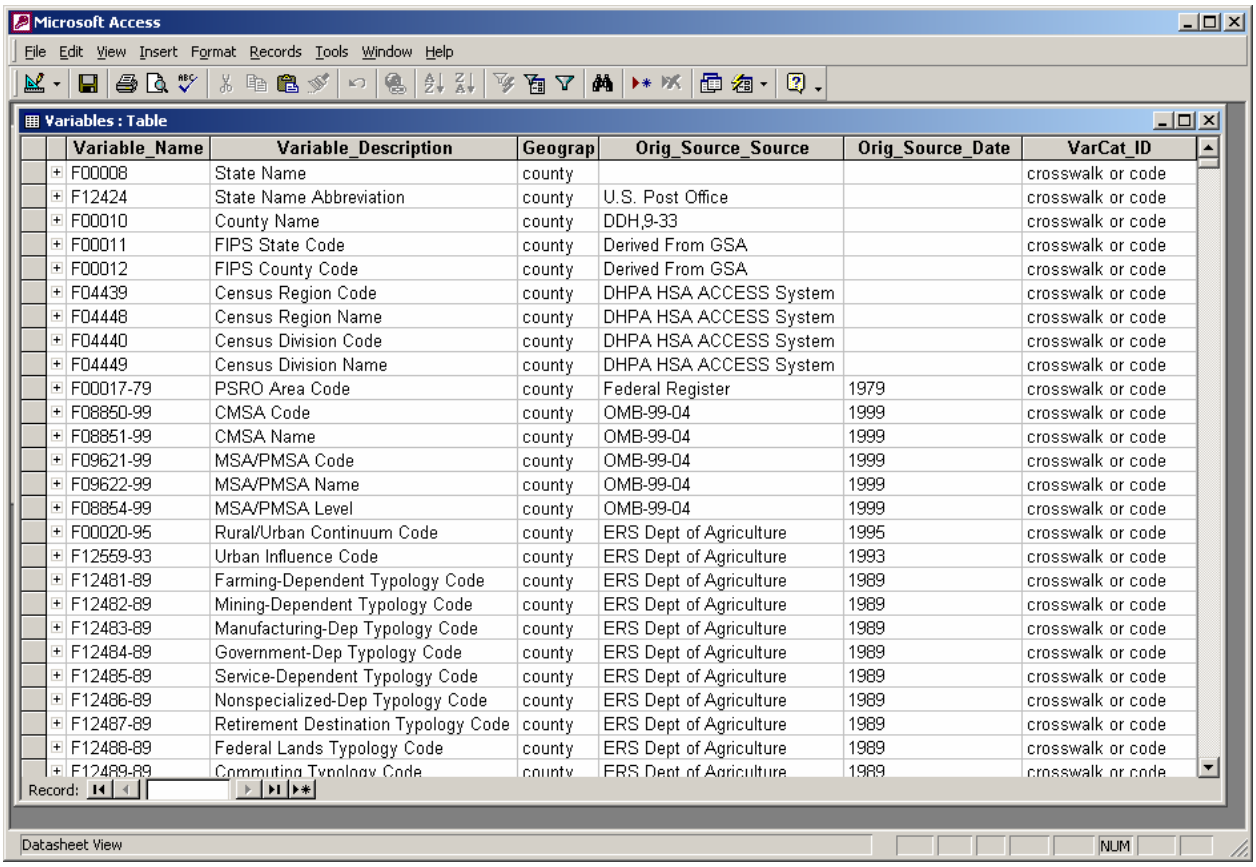
As of December 30, 2002, there are 2,707 variables in the Access 2000 database, named the CMS Market Area Database (MAD). A list of all CMS variables currently in the database is included in Appendix C, which can be updated using the Find_Location_Data form as more data are added to the database. The user-friendly Find_Location_Data form is displayed when the database is first opened, and this form can be used to find information about the data, as described in Section 3.2.1. In the remainder of this section, we describe the basic components and categories of the database and how to use database tools to easily find, list, and export data. Section 6 gives a more technical description of how the database components fit together and describes some more complex functions that the database can perform.

The basic geographic unit of organization in the MAD is the county (2,327 variables). State-level data are also included for 241 of the county-level variables and 86 additional state-level variables (for a total of 327 variables with state-level data). The remaining 48 variables have instances geography (instances are multiple observations within a geographic area and are defined at either the zip code, county, or state level). For example, DME suppliers and hospitals are organized by zip code of business address. The database is relational, which means that these various levels of geography are linked within the database. The main value of the MAD is this relational linkage of data at different geographic levels, from various sources. This database by design can reduce the effort required in constructing multivariate data sets with multiple geographies for research and planning projects.

The most familiar way for most users to see the database contents is to inspect the rows and columns in the Variables table. The Variables table (Figure 1) contains columns including

- variable ID (Variable_ID),
- data set ID (DS_ID),
- variable name (Variable_Name),
- variable description (Variable_Description),
- geography level (Geography_Level),

Figure 1
Variables table



Variable_Name	Variable_Description	Geograp	Orig_Source_Source	Orig_Source_Date	VarCat_ID
F00008	State Name	county			crosswalk or code
F12424	State Name Abbreviation	county	U.S. Post Office		crosswalk or code
F00010	County Name	county	DDH,9-33		crosswalk or code
F00011	FIPS State Code	county	Derived From GSA		crosswalk or code
F00012	FIPS County Code	county	Derived From GSA		crosswalk or code
F04439	Census Region Code	county	DHPA HSA ACCESS System		crosswalk or code
F04448	Census Region Name	county	DHPA HSA ACCESS System		crosswalk or code
F04440	Census Division Code	county	DHPA HSA ACCESS System		crosswalk or code
F04449	Census Division Name	county	DHPA HSA ACCESS System		crosswalk or code
F00017-79	PSRO Area Code	county	Federal Register	1979	crosswalk or code
F08850-99	CMSA Code	county	OMB-99-04	1999	crosswalk or code
F08851-99	CMSA Name	county	OMB-99-04	1999	crosswalk or code
F09621-99	MSA/PMSA Code	county	OMB-99-04	1999	crosswalk or code
F09622-99	MSA/PMSA Name	county	OMB-99-04	1999	crosswalk or code
F08854-99	MSA/PMSA Level	county	OMB-99-04	1999	crosswalk or code
F00020-95	Rural/Urban Continuum Code	county	ERS Dept of Agriculture	1995	crosswalk or code
F12559-93	Urban Influence Code	county	ERS Dept of Agriculture	1993	crosswalk or code
F12481-89	Farming-Dependent Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12482-89	Mining-Dependent Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12483-89	Manufacturing-Dep Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12484-89	Government-Dep Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12485-89	Service-Dependent Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12486-89	Nonspecialized-Dep Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12487-89	Retirement Destination Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12488-89	Federal Lands Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code
F12489-89	Commuting Typology Code	county	ERS Dept of Agriculture	1989	crosswalk or code

- original source (Orig_Source_Source),
- date for data item (Orig_Source_Date),
- comments from the source (Orig_Source_Comment),
- contact person or website for source (Orig_Source_Contact),
- document ID number if additional documentation is available (Document_ID),
- restrictions on distribution code (Dist_Restricted), and
- variable category ID (VarCat_ID).

The variable name may not always be very descriptive from the original source. For example, ARF variable names are numerical strings that do not indicate what the variable captures, and DME fee schedule variables are alpha-numeric strings reflecting the HCPCS codes assigned to them by CMS. We have kept the original variable names from the original source for

ease in updating the database. To give the variable names more context, we have added prefixes to some that help suggest the content. For example, all the DME variables begin with the prefix DME_ followed by the HCPCS code. ARF variables that ultimately derive from CMS sources were recoded as having CMS as the source, and the ARF variable name was either replaced or modified with a prefix to make it fall alphabetically with the CMS data in the same category. For example, ARF data on Medicare+Choice payment rates by county (ABRates) were renamed ABRATE to conform with CMS data on ABRATES in the file. For Medicare+Choice penetration rates from the ARF, the prefix MCPENE was attached to the original ARF variable name. For other CMS variables, such as FFS physician data, data from the Provider of Service Hospital file, or data from various managed care sources, prefixes (FFS, POS, MC) were attached to names to enable useful lists when reported alphabetically by source (see Appendix C for CMS data listing).

The database is so large that working with the Variables table is not an efficient way to find information about the variables. To enhance utility and speed, the data are categorized several ways (by source, by subject, by geography) to enhance filtering (viewing subsets). Filtering by category or data source can be used to shorten the data presented in the Variables table, as described in Section 3.2.5.

As described in Section 3, in addition to the basic structures and data in the database, some additional tables and tools have been added to aid in data review, data imports, and data documentation. A lookup form (Find_Location_Data form) has been created to help find information about variables quickly and to list variables in report format. The database contains some basic queries (County_list, County_names, Zip_list, State_list, Query1, Query1_Crosstab, Beale_Codes, SSA_Codes, Zip_to_County) that can be used to quickly create commonly used crosswalks and to use as a guide in designing data queries for exporting data.

2.1 Data Sources

There are 11 sources of data in the CMS Market Area Database (Table 1). For many variables, only the most current period data available at project completion are included. For others thought to be useful in trend analysis and forecasting, both current and past period data are included. For every variable in the database, the Orig_Source_Date field in the Variables table gives the year in which the data were collected.

2.2 Data Organization

Grouping by source is a natural way to organize the data. The database currently contains the DS_ID field in the Variables table, which designates data source by Source_Number (see Table 1). Variables are also grouped by subject type in the database. The Variables table contains a VarCat_ID field that stores the subject group for each variable. Variables in the Variables table are grouped by the following 21 subject areas or categories:

Table 1
Data sources in the CMS market area database

Source_Number	Source_Name	Number of variables
1	Area Resource File (ARF) 2001 and 2002	1,625
2	U.S. Census 1990 and 2000	705
3	GeoAnalytics, Census CD 1999	15
4	Dartmouth Atlas HRR- and HSA-to-zip code crosswalks	2
5	CMS	282
6	Academy for Health Services Research (AHSR)	12
7	American Association of Retired Persons (AARP)	18
8	Environmental Sciences Research Institute (ESRI) zip code-to-county crosswalk	3
10	National Supplier Clearinghouse	5
11	InterStudy PPO Database 2.0	35
12	Miscellaneous	8

Note: The database also includes contact information for each source and each variable in the database. Any comments from the source about the coding or units of the data are included in a comments column in the Variables table.

- access to care
- birth-death
- crosswalk or code
- disease/disability
- education
- employment/occupation
- hospital-org/mission/type
- hospital-physical plant
- hospital-services
- hospital-staff
- hospital-utilization
- housing
- income
- insurance-Medicare
- insurance-private
- other healthcare provider
- other healthcare services
- physician
- population
- prices
- transportation

Data are also be organized by level of geography—state, county, or instance (state, county, zip code). This is represented in the database by the Geography_Level field in the Variables table.

When data are entered into the database, they do not need to be placed in any particular grouping or order (e.g., by source, by type). They are entered consecutively so that the most recent additions appear at the end of the Variables table if sorted by Variable_ID. The data can be sorted or filtered on any field in the Variables table.

Information in the Variables table can be changed unless it is write-protected (locked in use). Users must understand that any changes made to the database records are effected immediately—the user has no discretion in saving or discarding changes. Therefore, it is important to keep a backup copy of the current version of the database, in case important information is changed or deleted in error or without authorization.

2.3 Data Documentation

In general, data contained in the database are documented using three tables: the Variables table, Data_Sources table, and Documents table. The Variables table contains most of the information about each variable, including original source; original source date; year associated with the actual data collection; and other information useful to the user, such as comments about units of measurement and a full description of each variable. Each variable in the database is also linked to a data source in the Data_Sources table (with contract information) and a subject in the Variable_Categories table.

The Documents table provides a way to insert more extensive documentation associated with certain variables into the database. For example, Document 1 describes the 25 top allowed-charge HCPCS codes for DME, with associated aggregate allowed-charge levels. This document is attached to the state-level DME fee schedule amounts for the top 25 allowed-charge equipment categories included in the database, which are categorized as "prices" in the VarCat_ID codes.

The Documents table contains actual documents stored as Object Linking and Embedding (OLE) objects that are linked to variables in the Variables table. For example, document 2 is attached to the three variables from the 2002 Physician Relative Value (RV) Fee Schedule (WORK, MLPRCTC, PRAC_EXP). Document 2 explains that these three variables are actually the geographic weights for the work, malpractice, and practice expense components used in constructing region-specific fees for thousands of different procedures. Specific numerical data for these thousands of fees for different procedures are not contained in the database. Document 2 describes in detail how to use these geographic weights in conjunction with the RV schedule posted annually on CMS' web site (for 2002, RVU02.EXE) to create region-specific fees for every procedure. Document 3 is linked to the InterStudy PPO data, and it is the complete InterStudy PPO Database 2.0 data documentation.

The document files cannot be opened directly from the Documents table. These linked documents are stored in the Documents table as OLE objects and can only be opened using the Find_Location_Data Documents button or from the Find_Variables report generated from the Find_Location_Data form. Document 9 is not actually linked to any data and can only be

accessed using the Find_Location_Data Documents button. Document 9 contains the Entity Relationship Diagram, which shows how the various components of the database are linked together in the database design (see Section 6.2.1). This diagram is useful to refer to when learning the structure of the database. Additional documents can be added to the database using the Find_Variables report (generated using the Find_Location_Data form), by clicking on the space where the document would be displayed and choosing <Insert> <Object> from the menu.

Some extra tables are contained in the database as additional documentation. Three of these, ARF_Fields_2001, ARF_Fields_2002 and Census_Fields, contain information about the Area Resource File format and Census data format that could be useful for inserting updated data from these data sources into the database. Table MSA_Data contains additional information about MSAs.

SECTION 3
USING THE DATABASE

3.1 Tools Included in the Database

The Access Database contains a number of options, or "Objects," under the main menu:

- Tables—Tables in the usual flat-file format can be included as components in the database under the "Tables" Object. They can be linked on relational fields (geographic codes) or unlinked.

- Queries—Queries are files containing strings of programming code that instruct Access to find and link specific components of the database and to produce specific results in tabular format. In Section 6.3, we describe using queries in some detail, and we include in the database several queries that can be run to produce crosswalks or to replicate some of the market area analysis in Chapter 5. Clicking on the "Query" Object produces a list of these preprogrammed queries, and also brings up the Query Wizard, a Microsoft Access tool to aid in creating new queries.

- Forms—Clicking on the "Forms" Object brings up a list of four RTI-created forms and the Form creation tools provided by Microsoft Access. Lookup forms (Find Forms) provide an easy method for finding specific numerical values, to review data and database contents, and to create "Reports" using specific data items chosen from the database. The Find Form we have created is described in more detail below.

- Report—"Reports" is another Object category in the Microsoft Access menu. For example, the RTI-created Report that appears under the "Reports" Object, rpt_Variables, is a 67-page report that describes each of the variables included in the database by data source, including the variable name, a complete description, category, level of geography, and original source date. Appendix C contains the portion of this list (a 9 page report) that describes CMS variables. There are two more variable reports contained in the database, one that provides all of the information for each of the variables by data source, rpt_Variables_Long, and one similar to rpt_Variables that lists the variable information grouped by category instead of data source, rpt_Variables_by_Category.

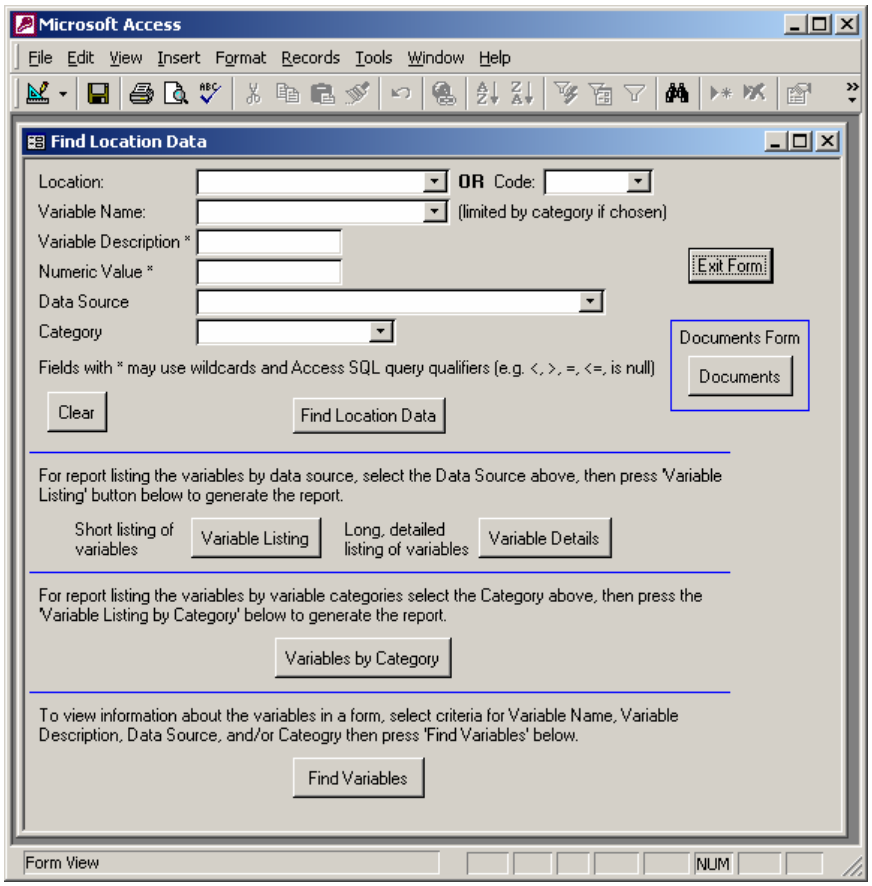
3.2 How to Use Key Features of the Lookup Forms

In this section, we provide more detail and specific examples of how to use a key feature of this database: the lookup form. We describe here a number of ways that CMS can use this feature, along with specific examples.

3.2.1 How to Use Lookup Forms

In using the database, CMS can first employ lookup forms to find out what specific data variables are in the database. Lookup forms (also called Find forms) can be created in Access databases to facilitate user interface. To show how this works, we have created a form called frm_Find_Location_Data (Figure 2). By default, it pops up automatically when the database is

Figure 2
RTI-created find form in database: frm_Find_Location_Data



opened. To access it at other times, the user can click on the Forms menu under the Microsoft Access Objects menu. As shown in Figure 2, the RTI-created frm_Find_Location_Data provides seven buttons to obtain facts, create reports or lists, and view data in the database.

The top portion of the find form contains boxes to enter one or more criteria by which the data or reports will be filtered. The rest of the form contains a collection of buttons, including the "Find Location Data" button to display the location data in a form, the "Variable Listing" button to display a compact report of variables by data source with abbreviated details for each; the "Variable Details" button to display a report of variables by data source (but with more details for each variable, making it a more lengthy list); the "Variables by Category" button to display the compact version of the variables report but grouped by category instead of data source; the "Find Variables" button to display information about the variables in a form; the "Documents" button to view all the documents contained in the database; and the "Clear" button, which will remove all entered criteria from the form.

Both the "Find Location Data" and "Find Variables" buttons can be filtered using multiple criteria by making multiple selections in the boxes at the top of the form. Many of these boxes are drop-down boxes that display all the choices for each selection. One tip in using the drop-

down box is to first click on the down arrow at the right of the box to display the list, then click in the box itself and start typing the first few letters of the selection. The drop-down box will then scroll down to the selections matching the letters that are typed. The Variable Name drop-down box on the form can also be limited to display only those variables for a selected category by selecting the category before clicking on the variable name drop-drown box. The next section contains an example of applying multiple criteria.

3.2.2 How to Find Locations with Variables Having Specific Numerical Values or Ranges of Values

Once CMS has determined what variables they might want to use, analysts may want to select only those places that satisfy a specific range criterion. To select the regions meeting the specific criterion for the variable, begin with the lookup form. Within the lookup form, the first button, "Find Location Data," allows the user to enter criteria on the form and then press the button to view the data fitting those criteria. Because of the large amount of data in the database, the data may take a while to display after this button is pushed. For example, suppose the user wanted to know in which states the average price for MediGap Plan A in 2000 exceeded $900. In the Variable Name box, select PRICE00A; in the Numeric Value box, type >900 (Figure 3). Then push the "Find Location Data" button, and a table is created showing six states that meet this criterion (Price00A > 900) and the numerical value for this price in each of these six states (Figure 4).

3.2.3 How to Create Lists of Contents and Reports for Variables, by Source

Rather than searching for specific variables and variable values, CMS may want to simply review a general listing of the variables and their contents. This can also be done with the lookup forms using a feature that links to a specific report set up by RTI. To do this, there are three different buttons that can be used depending on the desired format. The "Variable Listing" and "Variable Details" buttons allow the user to select a data source and then press the button to view an Access report listing all the variables in the database for the selected data source. The "Variable Listing" report is a compact version of the "Variable Details" report only showing selected information for each variable. If no data source is selected, then all the variables in the database will be displayed in the report. The "Variables by Category" button generates a report similar to the "Variable Listing" report but for a selected category instead of the data source. These buttons correspond to RTI-created reports (rpt_Variables, rpt_Variables_Long, and rpt_Variables_by_Category) in the Report menu. The report can then be printed out to provide a hard copy listing of the variables in the database.

Suppose the user wanted to create a report listing only the CMS data included in the database. In the Data Source box on the form, choose CMS from the drop-down list (Figure 5). Then click the "Variable Listing" button. A report is created showing selected information about each CMS variable in the database (Figure 6). This report is included in Appendix D. By selecting the category, "hospital-staff," and clicking "Variables by Category," a similar report is generated showing only those variables associated with the hospital-staff category (Figure 7).

Figure 3
Example: Using "Find Location Data" to find locations with variables having particular numerical values or ranges of values

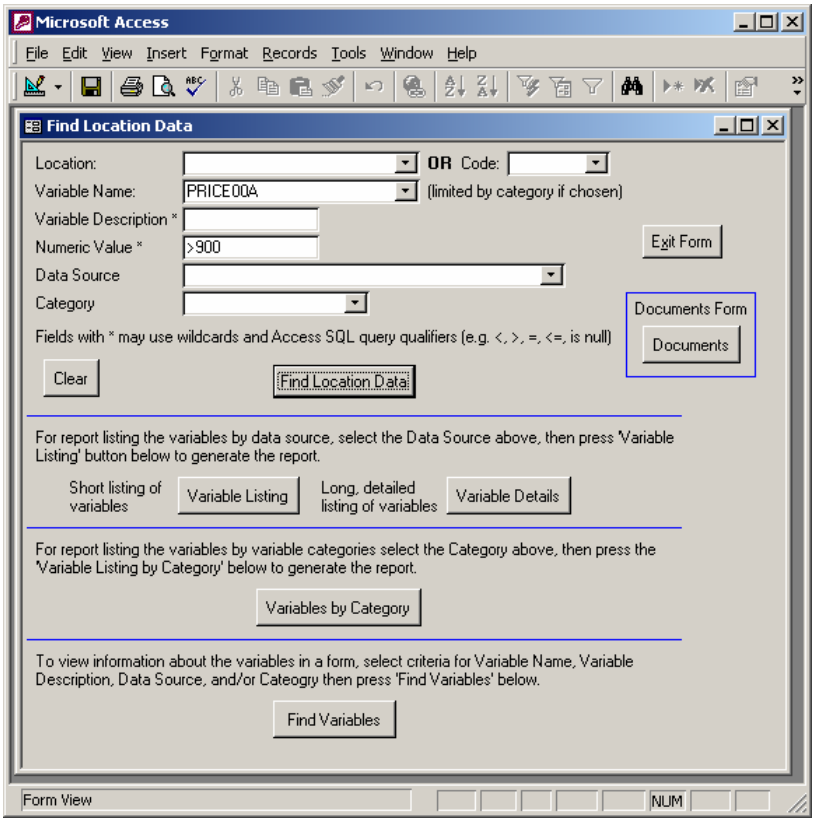


Figure 4
Results of "Find Location Data" query in Figure 3

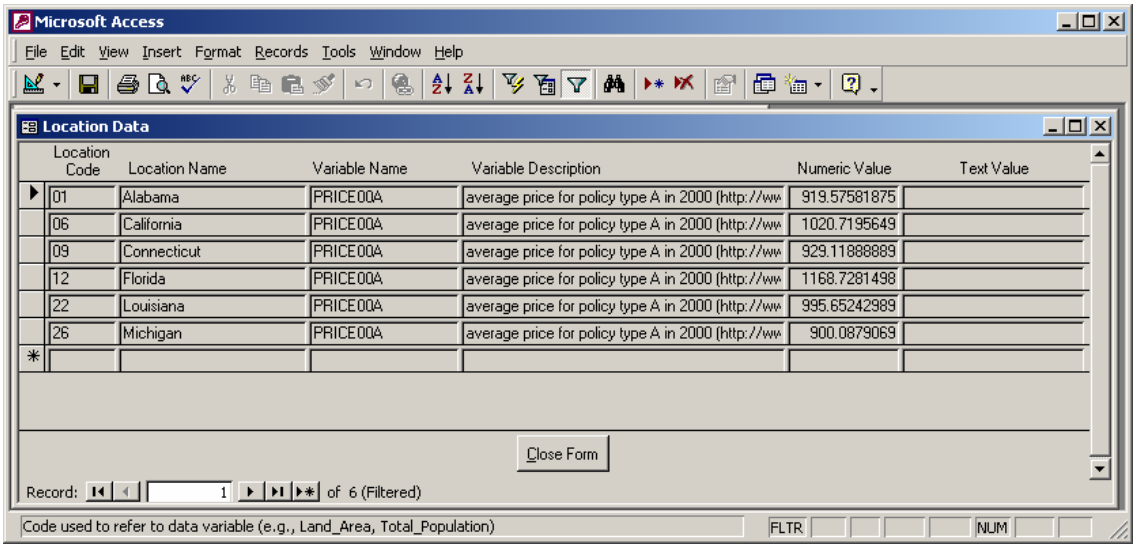


Figure 5
Example: Using "Variable Listing" to generate variable listing by data source

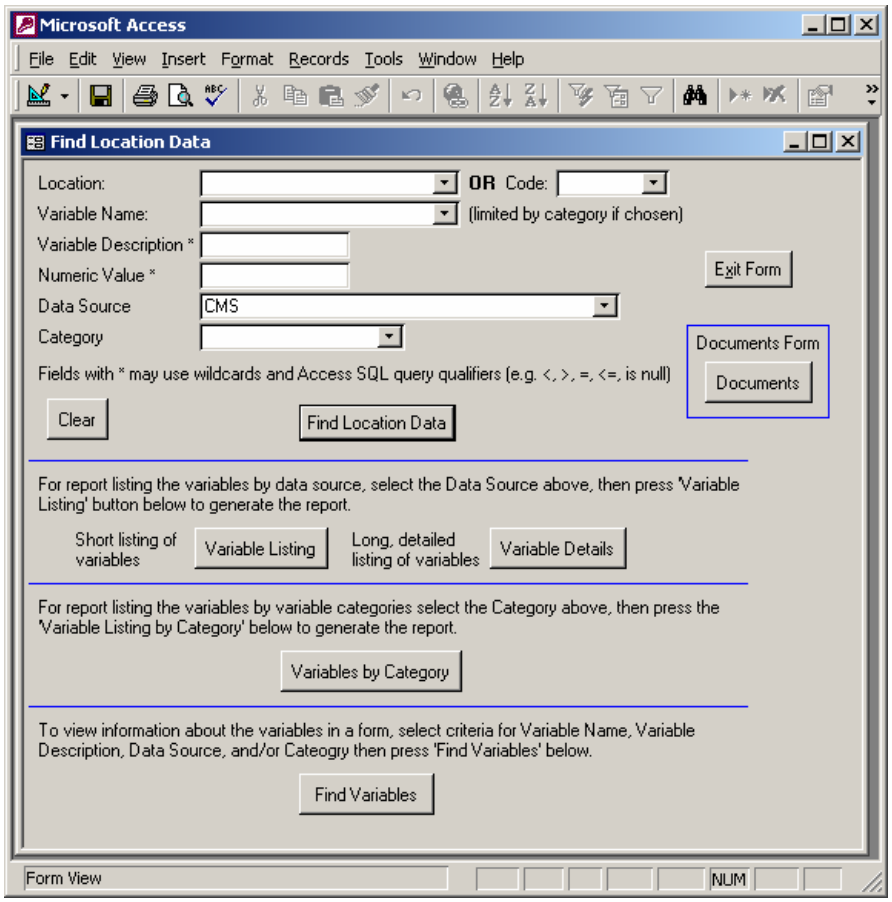
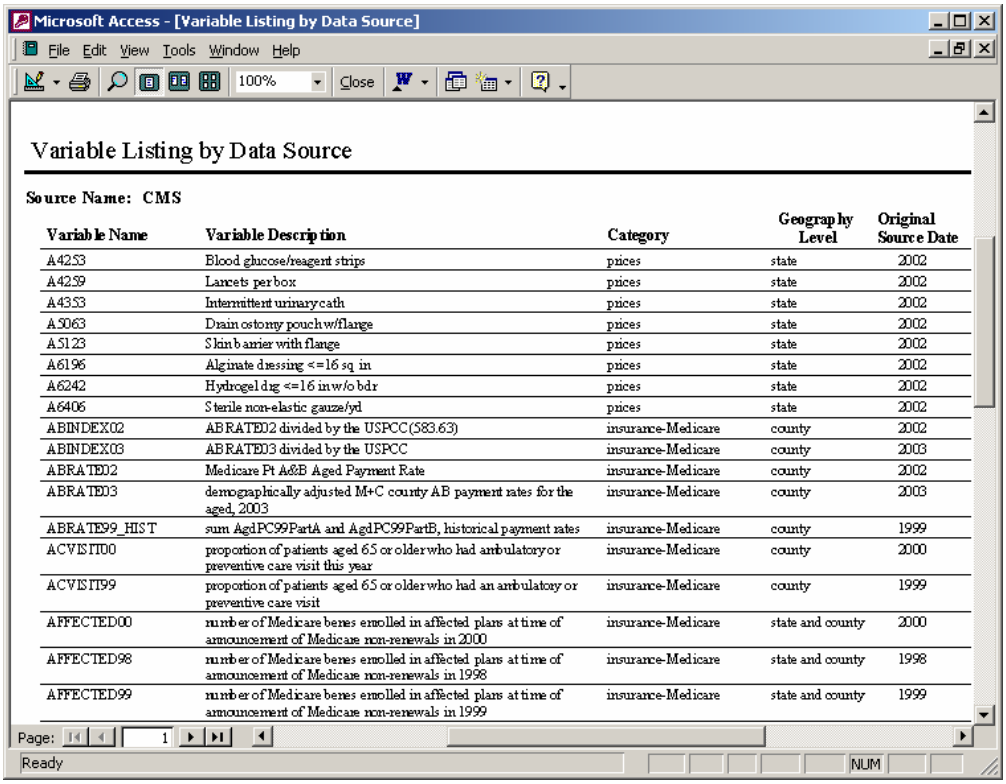
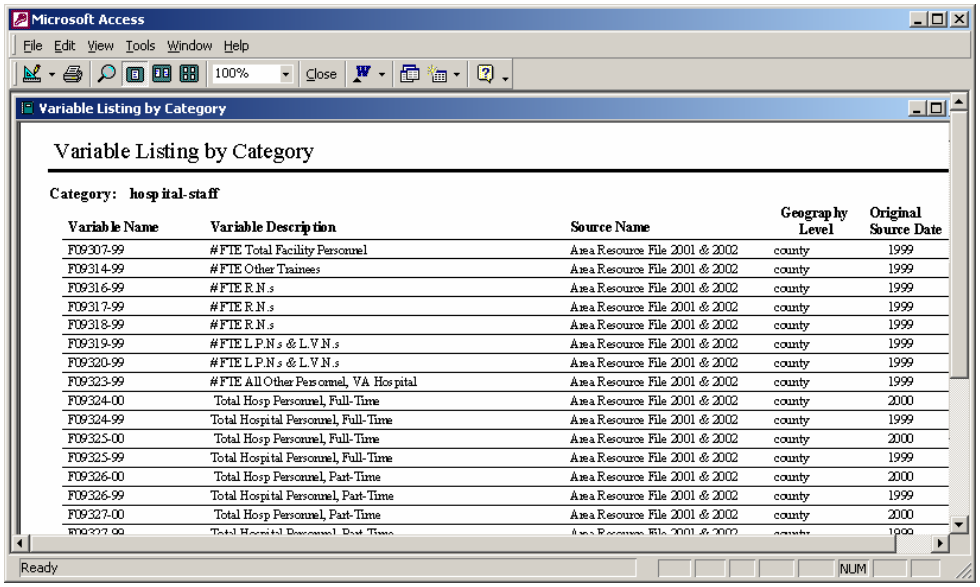


Figure 6
Results of "Variable Listing" query in Figure 5



Variable Name	Variable Description	Category	Geography Level	Original Source Date
A4253	Blood glucose/reagent strips	prices	state	2002
A4259	Lancets per box	prices	state	2002
A4353	Intermittent urinary cath	prices	state	2002
A5063	Drain ostomy pouch w/flange	prices	state	2002
A5123	Skin barrier with flange	prices	state	2002
A6196	Alginate dressing <=16 sq in	prices	state	2002
A6242	Hydrogel dsg <=16 in w/o bdr	prices	state	2002
A6406	Sterile non-elastic gauze/yd	prices	state	2002
ABINDEX02	ABRATED2 divided by the USPCC(583.63)	insurance-Medicare	county	2002
ABINDEX03	ABRATED3 divided by the USPCC	insurance-Medicare	county	2003
ABRATED2	Medicare Pt A&B Aged Payment Rate	insurance-Medicare	county	2002
ABRATED3	demographically adjusted M+C county AB payment rates for the aged, 2003	insurance-Medicare	county	2003
ABRATE99_HIST	sum AgdPC99PartA and AgdPC99PartB, historical payment rates	insurance-Medicare	county	1999
ACVISIT00	proportion of patients aged 65 or older who had ambulatory or preventive care visit this year	insurance-Medicare	county	2000
ACVISIT99	proportion of patients aged 65 or older who had an ambulatory or preventive care visit	insurance-Medicare	county	1999
AFFECTED00	number of Medicare benes enrolled in affected plans at time of announcement of Medicare non-renewals in 2000	insurance-Medicare	state and county	2000
AFFECTED98	number of Medicare benes enrolled in affected plans at time of announcement of Medicare non-renewals in 1998	insurance-Medicare	state and county	1998
AFFECTED99	number of Medicare benes enrolled in affected plans at time of announcement of Medicare non-renewals in 1999	insurance-Medicare	state and county	1999

Figure 7
Results of "Variables by Category" query



Variable Name	Variable Description	Source Name	Geography Level	Original Source Date
F09307-99	#FTE Total Facility Personnel	Area Resource File 2001 & 2002	county	1999
F09314-99	#FTE Other Trainees	Area Resource File 2001 & 2002	county	1999
F09316-99	#FTE R.N.s	Area Resource File 2001 & 2002	county	1999
F09317-99	#FTE R.N.s	Area Resource File 2001 & 2002	county	1999
F09318-99	#FTE R.N.s	Area Resource File 2001 & 2002	county	1999
F09319-99	#FTE L.P.N.s & L.V.N.s	Area Resource File 2001 & 2002	county	1999
F09320-99	#FTE L.P.N.s & L.V.N.s	Area Resource File 2001 & 2002	county	1999
F09323-99	#FTE All Other Personnel, VA Hospital	Area Resource File 2001 & 2002	county	1999
F09324-00	Total Hosp Personnel, Full-Time	Area Resource File 2001 & 2002	county	2000
F09324-99	Total Hospital Personnel, Full-Time	Area Resource File 2001 & 2002	county	1999
F09325-00	Total Hosp Personnel, Full-Time	Area Resource File 2001 & 2002	county	2000
F09325-99	Total Hospital Personnel, Full-Time	Area Resource File 2001 & 2002	county	1999
F09326-00	Total Hosp Personnel, Part-Time	Area Resource File 2001 & 2002	county	2000
F09326-99	Total Hospital Personnel, Part-Time	Area Resource File 2001 & 2002	county	1999
F09327-00	Total Hosp Personnel, Part-Time	Area Resource File 2001 & 2002	county	2000

3.2.4 How to Find Information about Variables, by Source or Keyword

CMS may also want to locate specific variables, once they are familiar with the data set. Also found on the RTI-created Lookup Form (see Figure 2), the third button, "Find Variables," allows the user to select the variable name, variable description, data source and/or category, and then press the button to view the information in the database describing the variables fitting those criteria. Asterisks can be used as wild cards in the Variable Description box when the variable name is not known. Please note that the searches will be slower when wild cards are used. For example, suppose the user wanted to know what hospital data are available in the database from CMS sources. Type *hospital* in the Variable Description box, and choose CMS as the source in the Data Source drop-down list (Figure 8). Then click the "Find Variables" button. A box pops up with record navigation arrows at the bottom left corner that can be used to scroll through the 13 variables found using this request (Figure 9).

Figure 8
Example: Using "Find Variables" to find information on variables, by source and keyword

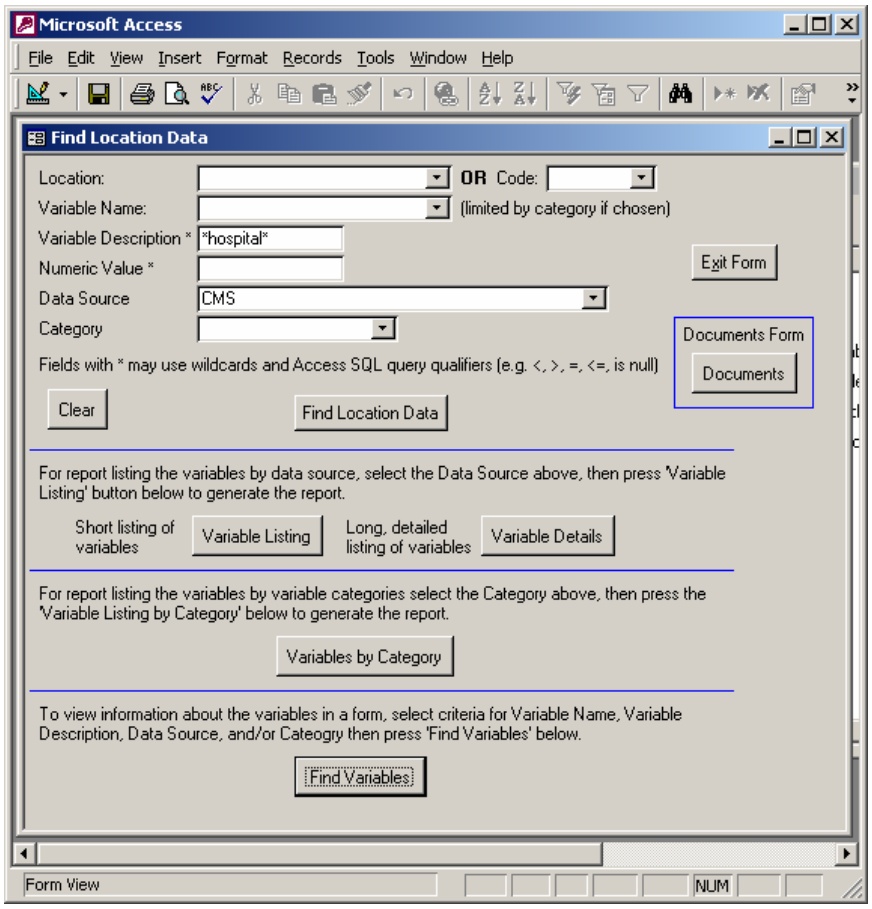
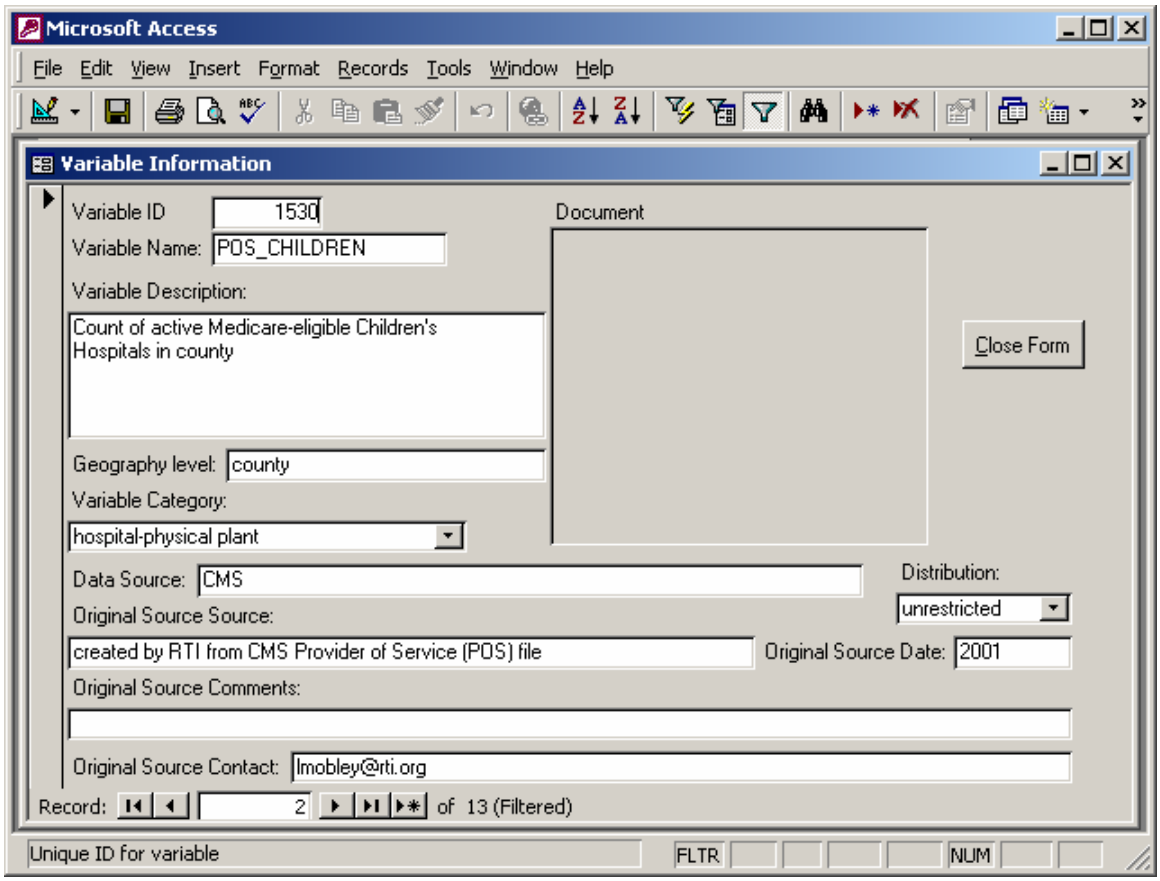


Figure 9
Results of "Find Variables" query in Figure 8



Note: Note the distribution box for each variable indicating any distribution restrictions on the data.

These include variables describing hospital counts by type, Herfindahl indices constructed using Medicare hospital data, and a state-level fee schedule for hospital beds of variable height with mattress. If the user had not chosen a Data Source, all hospital-related variables in the database would be returned, including 43 additional variables from the ARF.

The form opened using the "Find Variables" button will also display any Acrobat documents that are associated with the variable (Figure 10). Here, the Find Form requested information on a specific variable by name, DME_A4253. One record was returned, describing this variable as an item of DME; the attached Acrobat document gives more information about total expenditures for this item (and 24 others) and describes its product category (Figure 11).

Figure 10
Variable information form with associated Acrobat document

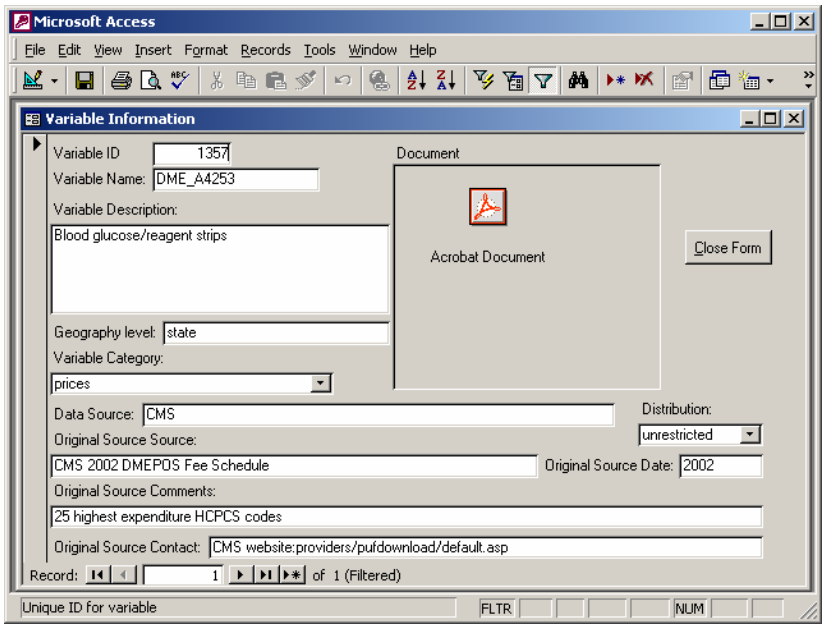
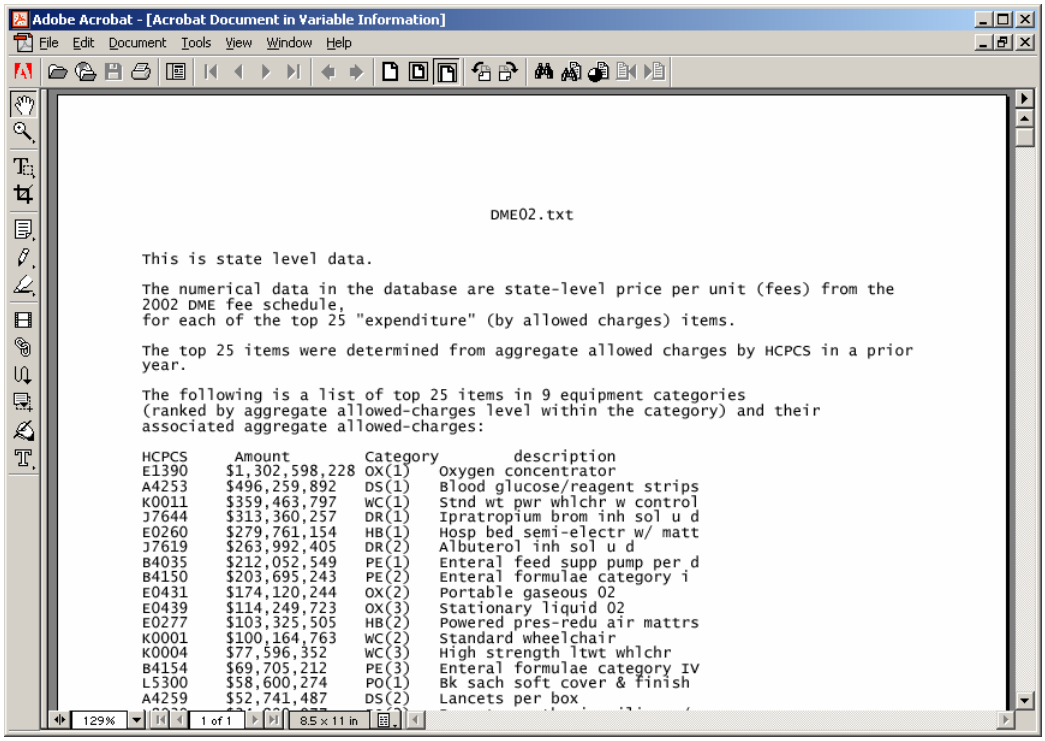


Figure 11
Acrobat document associated with Figure 10



3.2.5 Viewing Compact Lists of Variables and Their Characteristics

An alternative way to view variable names and descriptions by source, in a more compact list (and without using the lookup form), is to open the Variables table, right-click on the DS_ID column, and type the number corresponding to the desired data source in the Filter Form box that pops up (for example, CMS is source 5) (Figure 12). A table (Figure 13) is created that lists only CMS variables, with source documentation and a complete description of each variable.

Figure 12
Selecting a CMS variables listing using "Filter Form"

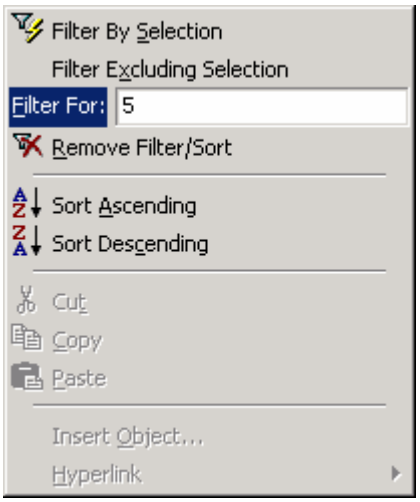
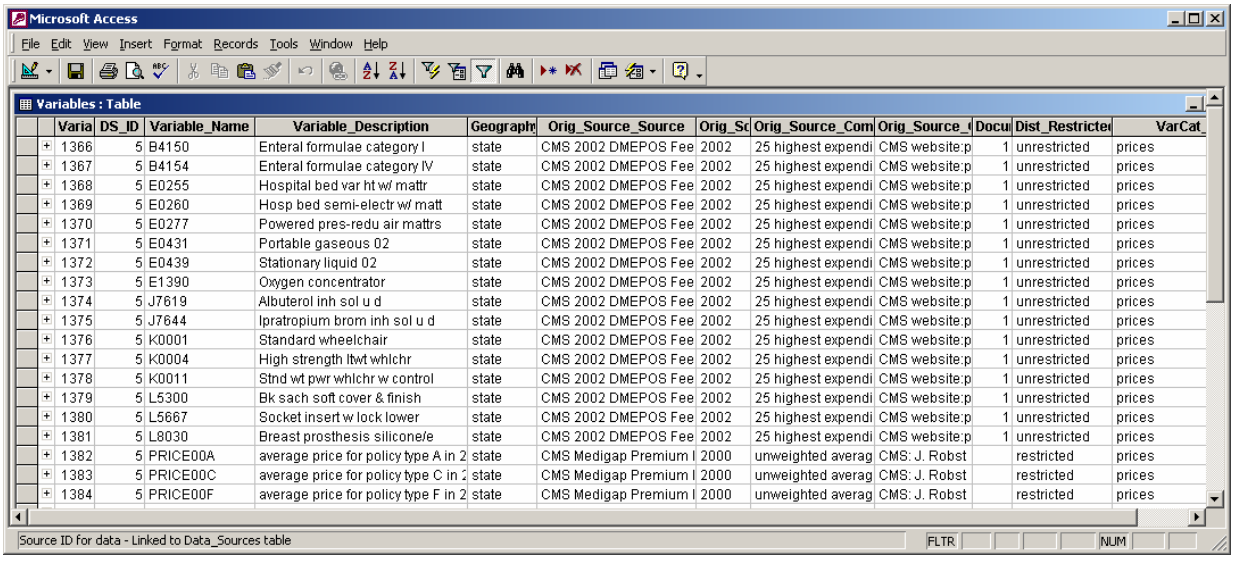


Figure 13
Variables table filtered for DS_ID = 5



Varia	DS_ID	Variable_Name	Variable_Description	Geography	Orig_Source_Source	Orig_Sc	Orig_Source_Com	Orig_Source_(	Docu	Dist_Restricte(	VarCat_
1366	5	B4150	Enteral formulae category I	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1367	5	B4154	Enteral formulae category IV	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1368	5	E0255	Hospital bed var ht w/ mattr	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1369	5	E0260	Hosp bed semi-electr w/ matt	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1370	5	E0277	Powered pres-redu air mattrs	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1371	5	E0431	Portable gaseous 02	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1372	5	E0439	Stationary liquid 02	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1373	5	E1390	Oxygen concentrator	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1374	5	J7619	Albuterol inh sol u d	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1375	5	J7644	Ipratropium brom inh sol u d	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1376	5	K0001	Standard wheelchair	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1377	5	K0004	High strength ltwt whlchr	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1378	5	K0011	Stnd wt pwr whlchr w control	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1379	5	L5300	Bk sach soft cover & finish	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1380	5	L5667	Socket insert w lock lower	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1381	5	L8030	Breast prosthesis silicone/e	state	CMS 2002 DMEPOS Fee	2002	25 highest expendi	CMS website:p	1	unrestricted	prices
1382	5	PRICE00A	average price for policy type A in 2	state	CMS Medigap Premium I	2000	unweighted averag	CMS: J. Robst		restricted	prices
1383	5	PRICE00C	average price for policy type C in 2	state	CMS Medigap Premium I	2000	unweighted averag	CMS: J. Robst		restricted	prices
1384	5	PRICE00F	average price for policy type F in 2	state	CMS Medigap Premium I	2000	unweighted averag	CMS: J. Robst		restricted	prices

SECTION 4
USING THE DATA SET: A GENERAL APPROACH TO MARKET SELECTION

The purpose of our market selection methodology is to design a *process* that is general enough to cover a wide range of innovative projects yet provides enough guidance to identify specific variables that are key to the success of specific projects. A key feature of our approach is its flexibility, because the definition of appropriate market areas will vary with the project. As demonstrated in Section 5, CMS can apply this approach to specific projects using the accompanying data set.

Our approach consists of five steps, which we describe in the remainder of this section:

1. Perform economic assessment of market conditions:
   - Identify the key demand and supply factors for the project.
   - Identify other key factors that will likely impact the project, such as market power, competition, agglomeration effects, and transaction costs.
2. Identify which commonly used geographic market definition methodology is most appropriate. We discuss the following options:
   - geographic distance,
   - geopolitical boundaries, and
   - patient origin.
3. Identify practical constraints on the market definition methodology, such as data availability and the need for contiguous market areas.
4. Use a query-based approach applied to the database to identify feasible sites or market areas.
5. As an additional possible step, we discuss how more specialized analysis within selected markets could be performed, if necessary, to further narrow the number of selected sites.

4.1 Step 1: Economic Assessment of Market Conditions

The economics literature on market area definitions is a useful starting point in identifying possible sites for Medicare reform initiatives. This literature describes the supply and demand factors that affect market outcomes. It also provides information on how factors such as competition, availability of skilled labor and other critical supplies, and the costs of doing business affect the behavior of health care providers within that market. Understanding these economic principles can provide a theoretical basis for identifying one type of market over another.

4.1.1 Supply and Demand Factors

Supply of health professionals is somewhat restricted (inelastic) due to the considerable fixed investments needed in training and education. Demand can increase rather abruptly, but it takes several years before supply can increase. This can lead to spot shortages in health care markets. These spot shortages can become chronic because health care professionals are rather mobile and are able to cluster in the most desirable locations. Clustering of physicians around large hospitals in dense urban areas has led to the emergence of centers for specialized services, whereas shortages of physicians in rural areas have led to access problems.

Supply shortages are expected to develop and/or increase in nursing if current trends persist, with fewer people entering the profession and the general population aging (Heinrich, 2001; Strunk, Ginsburg, and Gabel, 2001). The current and future supply of nurses and physicians (in specialized areas and in general practice) are important components to consider in developing Centers of Excellence, care coordination, and disease management programs. The age distribution of physicians and the number of physicians per capita may impact physicians' willingness to participate in new programs. The extent to which local physicians are organized into group practice arrangements or vertical arrangements with hospitals may impact their willingness to participate in the provider/physician collaboration and/or Centers of Excellence programs. The importance of research and teaching among local physician populations may also indicate physician interest in developing Centers of Excellence and new treatment methodologies, such as coordinated care and disease management programs.

The existing supply of managed care products in the market can help predict whether suppliers are willing to expand their products to include Medicare patients. Administrative, provider network, and marketing efficiencies can be extended with an increase in the volume of patients served, making this more attractive than developing an entirely new product for Medicare.

There are several important demand factors to consider in selecting markets from program modernization initiatives:

- The size of the population determines the size of demand and thus the potential quantity of savings or volume of other intended program impacts that can be achieved; for targeted disease-specific initiatives, a large population with the specific disease would enhance program viability.

- The income distribution of the elderly, because higher income individuals demand higher quality services; also, higher income is generally associated with better education and/or information, which may increase demand for programs that improve health outcomes.

- Change in the size and composition of the Medicare demand, especially change in the income distribution by age. Markets with stable or increasing numbers of younger, wealthier elderly are better candidates for disease management, care coordination, and Centers of Excellence projects.

The type of insurance coverage that prevails in a region can influence demand levels. Consumers covered by the traditional FFS Medicare plan face cost sharing but can avoid this by purchasing supplemental insurance or by participating in an employer-sponsored Medicare wraparound supplemental insurance program. To the extent that supplemental insurance is complete (covers all or most major out-of-pocket costs), the separation of consumer from significant costs leads to an increase in demand—with greater utilization of services than if costs were shared. Regions with more supplemental insurance coverage for the Medicare population thus have higher program costs per capita. These areas are ideal targets for programs that seek to reduce program costs through more efficient utilization by beneficiaries.

The available insurance options and regulatory climate in a market can also impact demand by Medicare beneficiaries for new insurance products. Availability of affordable supplemental insurance, coverage of pharmaceuticals, regulatory environment for grievances and oversight, availability of state assistance programs for pharmaceutical coverage, and the range of benefits and quality of service available in different plans all impact demand. The variety and quality of insurance coverage improves with increased competition in the insurance industry, so demand for new managed care products can be greater in more competitive insurance markets.

4.1.2 Other Factors: Market Power, Agglomeration Effects, and Transaction Costs

Market Power and Market Competition. Potential for entry by new suppliers is an important determinant of market competition. Even in markets with few competing suppliers, if entry is easy, then the existing suppliers will behave more competitively to discourage entrants. The impact of potential competition is important to consider when implementing new programs that require competitive bidding by suppliers to win business in the program.

Market power—the ability to charge higher prices, pay lower input prices, or operate inefficiently without recrimination—is determined by the relative strengths on the supply and demand sides of the market. Generally, the larger the number of competitors in a market, the lower their market power. There are several ways to measure market concentration, but the most widely accepted is the Herfindahl Index. It is constructed by calculating market shares for each firm in a region, squaring these shares, and then summing these squares. A higher number reflects greater concentration and market power (with a monopoly maximum of 1.0). Other measures include the number of suppliers or the market share held by a few of the largest suppliers.

Concentration of power can occur when key input suppliers, such as physicians, join with either the hospital or the insurance sides of the market. Recent evidence suggests that hospital/physician integration that is allowed in order to improve quality and efficiency can increase market power and prices, especially when the hospital industry is itself highly concentrated (Cuellar and Gertler, 2001). This suggests that factors contributing to the market power of alliances—such as high hospital market concentration—should be considered when attempting to implement exclusive physician-hospital alliances to enhance quality and efficiency.

Physicians are attracted to urban areas by urban amenities in both production and consumption. An abundance of physicians is attractive to managed care organizations (MCOs), which must build dense provider networks to meet the market test of convenience coupled with

good quality and low prices for services. The distribution of physicians in urban areas exhibits lower concentration; thus, physicians have lower market power than they would have in rural areas, making urban physicians more likely to join managed care networks and/or to participate in managed care activities, such as disease coordination and continuity of care initiatives.

Agglomeration Effects. Suppliers can induce or enhance demand through their attractive and opportunistic locations near other complementary producers and a good labor supply. This phenomenon is known as an agglomeration effect. With positive agglomeration effects, aggregate behavior is more than the sum of its parts (Krugman, 1991; Fujita and Thisse, 1996). Positive agglomeration effects in hospital markets would mean that hospitals that cluster together near good supplies of nurses and physicians have complementary spillover effects in production among them. This could induce a more stable environment for the development of specialized labor, economies of scale and scope in various dimensions, and an increased medical practice knowledge base and knowledge spillovers, resulting in the emergence of higher quality hospitals and Centers of Excellence (Morrisey and Jensen, 1990).

Transaction Costs. Transaction costs include nonmonetary costs of doing business, such as time spent waiting, searching for products/providers, filling out paperwork and medical forms, and traveling to shop and consume. These costs are very important in health care markets to both consumers and physicians. In emergency and urgent situations, these costs can be a considerable burden, resulting in medical complications and death. Therefore, choosing a suitable location is a very important dimension of market positioning for health care providers. The location of providers is also important in forming managed care networks that meet the market test of convenience, good quality, and low price. Managed care plans that allow out-of-network use of providers (with some cost sharing) are more attractive to consumers who can afford them because they reduce the risk of high transaction costs.

Both HMOs and PPOs locate in urban markets in order to exploit agglomeration and network effects from dense markets in building efficient health care networks. But differences in HMO and PPO plans allow PPOs to thrive where HMOs cannot (Grefer, Mobley, and Frech, 2002). PPOs allow customers to go to providers outside the network at additional cost, whereas traditional HMOs (those without a point of service option) do not. Both forms rely on provider networks, but the PPO is a looser structure than the HMO, more like a traditional indemnity insurer. Because they allow out-of-plan use, PPOs do not need local provider networks to survive; thus, they may have a comparative advantage over HMOs in rural areas.

4.2 Step 2: Geographic Methods for Market Definition

Defining market areas using various geographic boundaries and definitions has a number of practical advantages—primarily that these approaches often are supportable through available data and easily translated into identifiable locations. We elaborate on three separate geographic methods for market definition—the geographic distance method, the geopolitical boundary method, and the patient origin method—noting strengths and weaknesses of each approach.

4.2.1 Geographic Distance Method

The geographic distance method includes in the market area the population that lives and/or works within a specified radial distance of a source of care. This method is based on the assumption that, for a given population, the utility of a provider's services diminishes as the real or perceived transaction costs of accessing the services increases (Morrill and Earickson, 1968). To apply this method, a radial distance is defined for each provider, presumably including geographic origins for the bulk of that provider's constituents.

Strengths of this Approach: Market areas defined in this way are useful for descriptive and planning purposes and have the advantage of defining a specific market for each provider. They provide a good snapshot of actual competitive conditions that exist at a point in time.

Weaknesses of this Approach: Drawbacks include the expense of a literature review and/or actually conducting patient-flow analysis to use as a basis for the radial distance chosen. Without actual analysis of this type, radial definitions assigned to providers are arbitrary and probably will not reflect true market extent. The use of a radial distance defines an artificial areal unit (a circle) that does not account for physical or economic barriers, such as topography or transportation systems, and/or provider-specific or patient-specific factors that would favor a variable-radius approach. Finally, changing market conditions necessitate continuous revision of these estimates. In addition, the appropriate radii may be different for emergency care or specialized services than it is for routine or preventive care.

Most Appropriate Uses: This approach is most appropriate when the purpose is to examine the economic exchange decisions of patients at a point in time, based on proximity of available substitutes, especially for routine, urgent, or emergency care. This approach is also valid when available funding for patient care or financing of specific services is based on a particular provider or location.

Examples of Appropriate Use: Site location for a new routine care service or urgent care center so as to maximize utilization of the service; site selection for launch of a new product or service that has broad appeal; change in site locations for existing products so as to maximize their utilization.

4.2.2 Geopolitical Boundary Method

Geopolitical boundaries are official government or regulatory units, such as counties, states, MSAs, Health Service Areas (HSAs), and Health Facility Planning Areas (HFPAs). Using geopolitical boundaries to define medical markets is one of the oldest and most common methods. The use of specific geopolitical boundaries to define populations is appropriate when the decision maker has responsibility or fiscal authority over populations residing within this specific geographic area. For example, county health departments are concerned with county populations served by them, all of whom reside within the county boundaries. In this case, the county is the natural market definition for the county administrator.

Geopolitical boundaries are often used because an abundance of relevant data are available aggregated to this areal unit. Unfortunately, when markets defined for payment administration do not coincide with relevant economic markets, opportunities may exist to exploit the

differentials. This sort of activity may have occurred in some Medicare+Choice markets (Dutt et al., 2000).

Strengths of this Approach: Areas defined using geopolitical boundaries are readily available and easy to use. An abundance of economic and demographic data are available aggregated to these units.

Weaknesses of this Approach: Drawbacks include errors in the definition of market size and market coverage due to the arbitrary, fixed boundaries; statistical problems, including low power to discriminate among true and false null hypotheses; and inefficiency and bias in parameter estimates.

Most Appropriate Use: This approach is most appropriate when the purpose is to evaluate programs and services that are defined specifically to cover the geographic units.

Examples of Appropriate Use: Examining the impact of a change in public funding on populations or providers within that public domain; evaluating competitive bidding demonstrations that have designated competitors within defined geopolitical boundaries; comparing utilization patterns of publicly-funded individuals across geopolitical units to evaluate whether public funds are distributed equitably across regions; examining the impact of environmental or other regulation that varies across geopolitical units on populations within those units; evaluating the impacts of medical prevention demonstration projects that are implemented in some geopolitical regions and not in others.

4.2.3 Patient Origin Method

Most of the empirical approaches to defining geographic markets have used a shipments approach applied to patient origin data (Morrisey, Sloan, and Valvona, 1988; Garnick et al., 1987). The patient origin method studies actual utilization patterns, or geographical flows, of patients from their homes (origins) to their providers (destinations). These actual flow patterns reflect barriers to care arising from topographical and economic impedance. To define market extent, this method looks at the flows of residents in small geographic areas. Each small area is assigned to a defined market based on the behavior of its residents.

Inclusion criteria are typically based on market shares and can be defined from two different perspectives: from the perspective of a small area neighborhood, or from the perspective of a provider (Griffith, 1972). The relevance index (RI) for hospitals, for example, reflects how important a particular hospital is to a small area/neighborhood. It is calculated as

$$\text{RI} = \frac{\text{\# admissions to hospital x from area y}}{\text{total admissions to any hospital from area y}}.$$

By contrast, the commitment index (CI) reflects how important a particular small area/neighborhood is to a hospital. It is calculated as

$$\text{CI} = \frac{\text{\# admissions to hospital x from area y}}{\text{total admissions to hospital x}}.$$

Strengths of this Approach: The patient origin method can be used to define markets for subgroups of the population (e.g., Medicare) or for specific services (e.g., heart bypass). It naturally picks up the influences of topographic and economic impedance and can be used to examine referral patterns among providers directly.

Weaknesses of this Approach: Drawbacks include the expense of working with large amounts of data and complex data manipulations. The approach assumes that "what was" is equivalent to "what will be" so that the markets defined do not reflect changes in patterns of utilization unless constantly updated. This method is less useful in urban areas where many zip codes send patients to so many hospitals that they do not meet the inclusion criteria in any single market. A similar problem occurs for specialized services market definition where so many zip codes send so few patients to the specialty hospital that none meet the inclusion criteria. Arbitrary changes in inclusion criteria can yield very big changes in market scope.

Most Appropriate Use: This approach is most appropriate for descriptive, evaluative, and (to some extent) planning research; for situations when markets must be defined for subpopulations or special services; and when funding follows the individual.

Examples of Appropriate Use: Describing variation in admission rates across small areas, or urban versus rural areas; evaluating whether a particular provider serves a wide enough geographic market to justify including the provider in a managed care network.

4.3 Step 3: Refining Market Area Selection Criteria Based on Constraints

The market selection methods described in the previous two sections—economic factors and geographic boundaries—are critical steps in defining the criteria that a market area must meet in order to be an appropriate site for policy reform initiatives. However, these criteria must be refined based on practical constraints, the most significant of which are generally data limitations and policy considerations. Such constraints include the following:

1. *Availability of useful data.* As noted above, data availability has made the geopolitical boundaries method the most popular mode of market definition. If the potential problems inherent in using this method are known and accounted for by researchers, there may be little loss from using these convenient geographic units as market boundaries.

2. *Contiguity.* In some cases, ease of program administration may dictate the use of a cluster of contiguous areas, even when some regions in the cluster are not in themselves ideal market sites. An example of this might be the practical and political difficulties of implementing a reform initiative in only a subset of a large urban area.

3. *Including the urban–rural continuum.* Some situations are complicated by the requirement that markets defined must consist of a continuum along urban–rural dimensions. In these cases, both the central region and its peripheral satellites must be chosen simultaneously so as to maximize market potential.

4. *Markets for products that do not yet exist.* Some markets must be defined before they exist—for example, when trying to extend the market for a particular product (private

sector PPO) to include another consumer group (Medicare). In this case, existing (private sector) market share data may be used—with great care—to guide identification of market potential for a different population.

5. *No need to select the "best" candidate market area.* In some situations, all that is needed is a suitable market; there is not enough information to rank markets and choose a best candidate.

4.4 Step 4: Query-Based Site Identification

The first two steps in our proposed market selection process result in a list of important economic factors and a geographic definition that best fit the specific reform project. The third step refines and possibly introduces another set of criteria based on any specific data and policy limitations that apply. In the fourth step, specific sites can be identified merging the criteria developed in the first three steps. This final step is accomplished using relational queries on the database, which can be linked to a GIS to include geographic dimensions, if required.

A relational database contains variables that can be linked on some common field, such as geographic unit (county). The variables "relate" to one another through this key linking variable. A relational query can jointly assess values for several variables regarding whether they satisfy some set of criteria and share the same geography. For example, a query might choose records satisfying some criterion, such as "average county income must be in the upper quartile of the county income distribution." The observations/counties satisfying this criterion are selected from the database. A second query can then be used to identify those counties meeting the first criterion on income and also meeting a second criterion on another variable, such as educational attainment. Imposing the second criterion and requiring that both criteria be met simultaneously will select a subset of the initial group of counties selected (this is an example of set intersection). Queries can be constructed to find the feasible subset for a group of univariate queries simultaneously—rather than in a recursive process. Either set intersection (all criteria must be met in every region) or set union (some or all criteria can be met in every region) can be used in selection. If the relational database is linked to a GIS, the selected counties can be displayed on a map. At any stage in the query process, geographic criteria can be used in the selection process. If these require proximity analysis, linkage to the GIS is crucial. With the GIS, spatial dimensions can be incorporated into the query abstraction process.

4.5 Beyond Step 4: More Specialized Analysis to Further Refine Market Selection

The query-based approach to market selection is fast, flexible, and inexpensive. The result is a robust selection of feasible sites, which can be narrowed further with more detailed, technical analysis. For example, the initial market selection might proceed with readily available county- or state-level data. Once a set of feasible regions has been determined, a more micro-level analysis can be conducted solely on the feasible areas. If an assessment of market competition is needed, then patient flow data (from origin/home to destination/provider) can be used to define submarkets (hospital-specific) and construct concentration measures. Another project may require narrowing down from an inclusive list of all hospitals in an area to those that are most accessible to patients, in order to launch a project aimed at improving routine, urgent, or emergency care. The geographic distance approach can be used to find hospitals with the

densest markets within a specified radius. Measures of accessibility can also be calculated using geographic distance to all residents within a specified region containing the hospital, such as a county. Even more detailed examination of transportation networks and roadways could be undertaken, to further narrow the list of candidates. Another example of more detailed analysis is the siting of hospitals appropriate for Centers of Excellence programs. An initial survey of the region's hospitals may be necessary to gauge the dimensions of existing centers. Patient flow analysis for patients with specific diseases could be conducted for hospitals with existing programs, to see the extent of geographic draw in existing programs. Finally, communities could be mapped by disease incidence, and the radius method (calibrated on the previous analysis of current draw) could be used to select hospitals with sufficient numbers of disease cases within the "normal" travel radius.

SECTION 5
MARKET AREA ANALYSIS FOR THE TWO REFORM INITIATIVES

In this section, we apply this five-step process to the two Medicare FFS reform initiatives of most interest to CMS at this time: Medicare PPOs and DME Competitive Acquisition. As previously stated, the primary usefulness of this analysis is to (1) illustrate the process of developing possible factors important to the goals of the target project, and (2) show how queries applied to the database allow for quick and efficient identification of geographic areas that meet the stated criteria. Because of the efficiency of this method, policy parameters and factors can be refined and modified almost endlessly. Therefore, the reader should focus on the *process* we present here and not only on the resulting site recommendations.

5.1 Background: General Economic Conditions for Both Initiatives

In considering the general economic conditions that would be most preferable for Medicare PPOs and DME Competitive Acquisition, we found many similarities. Therefore, to avoid repetition, we describe these high-level economic conditions here.

There are several important factors that should be considered in the market analysis for the two program modernization initiatives considered here: PPO expansion into Medicare markets and DME Competitive Acquisition. We discussed these factors in considerable detail in the interim report, providing an extensive literature review as a foundation. Pertinent sections of that report are included in Appendix A. Below, we briefly summarize those factors, categorized by supply, demand, and market environment:

Supply Factors:

- Characteristics of the existing supply of managed care products (health plans) in the market can help predict whether existing plans may be willing to expand their products to include Medicare patients. Differences in HMO and PPO plans allow PPOs to thrive where HMOs cannot (Grefer, Mobley, and Frech, 2002). Plans that require network efficiencies (HMOs) are not expected to be willing to extend service into regions without existing networks—regions that often have sparser populations and lower utilization of services. Because PPOs allow out-of-plan use, they do not need local provider networks to survive. They can extend urban networks into rural communities by exploiting the urban–rural continuum and the fact that rural consumers want to shop locally for routine care but are willing to travel long distances to receive highly specialized or technical care. Thus, PPOs are better suited than HMOs to offer plans in rural areas where physicians and hospitals are scarce and where local networks are virtually impossible to construct due to low density and huge geographic distances. PPO plans can be attractive to rural consumers because they allow use of local (out-of-plan) providers for emergency and routine care—their local physicians—and then steer constituents through cost-sharing incentives to use in-plan urban providers for more serious care.

Demand Factors:

- The size of the elderly population determines the size of demand and thus the potential quantity of savings or volume of other intended program impacts that can be achieved.

- Sizes and recent change in subpopulations such as beneficiaries in traditional FFS versus Medicare+Choice plans, including recent disenrollment activity in Medicare+Choice plans, and characteristics of those plans (price package, drug benefits, other benefits) can provide insight regarding heterogeneity in demand and taste for choice among plans. Size of the FFS population helps determine the program savings possible from lower fees for DME through competitive bidding demonstrations.

- Prevalence and price of supplemental insurance (MediGap, other) and availability of state assistance programs for pharmaceuticals can impact demand levels by increasing coverage for what would otherwise be out-of-pocket expenses. When the availability of supplemental insurance allows consumers to decrease their out-of-pocket costs, utilization of services increases.

- The income distribution of the elderly is an important demand determinant, because higher income individuals demand higher quality services. This can be especially important for some DME services. Higher income is generally associated with better education and/or information, which may increase demand for programs or managed care plans that improve health outcomes. Also, markets with stable or increasing numbers of younger, wealthier elderly are better candidates for the introduction of new managed care products.

Market Environment:

- States with more competitive private insurance markets and a regulatory environment permitting oversight and expedited review of grievances against insurance plans are expected to have higher quality insurance products and higher demand by the elderly for new managed care products.

- A transition from administered pricing systems (such as those currently used for DME and clinical laboratory services) to competitive bidding-based pricing systems would require the possibility of competition among suppliers. Generally, the larger the number of competitors in a market, the lower their market power. The number of suppliers currently active in the market can indicate the potential for price competition under a system such as competitive bidding.

- Greater managed care penetration in an area and more choice among managed care plans contribute to a competitive environment for hospitals. On the other hand, regions with few competing hospitals (high hospital concentration) can have high barriers to managed care penetration, because provider market power enables concerted resistance to managed care practices and discounted fees.

- Regions with better educated and wealthier populace have more competitive markets, all else constant, because better use of information enhances market efficiency. Such regions are more conducive to managed care penetration and competition among managed care plans.

5.2 Specific Analysis for the PPO Initiative

The major goal of this initiative, launched formally by CMS last summer in the form of the Medicare PPO demonstrations, is to offer to beneficiaries an alternative to traditional FFS Medicare through a managed care PPO product. The implementation challenge is to identify markets with potential for successful launch of a Medicare PPO, provided by private insurance organizations. We assume that some existing private sector HMO or PPO provider-network infrastructure would facilitate expansion of private plans to Medicare coverage. Our strategy is to identify core markets with some managed care infrastructure and then examine other factors to narrow down the field of possibilities. Success will depend on supply, demand, and market competition characteristics in the core market.

5.2.1 Step 1: Economic Assessment for Medicare PPOs

Based on our insights from the empirical literature and from economic theory, we can describe the conditions under which a PPO could be successful in marketing its plan to Medicare beneficiaries, at cost savings to Medicare. Because we will be using the database to identify possible sites for this initiative, we also describe here specific variables that measure the economic factors we discuss.

If a PPO option was offered to Medicare beneficiaries, allowing freedom of provider choice (with some cost sharing) and additional benefits, including some pharmaceutical coverage, it could potentially succeed in an urban area with high FFS payment rates and the right demographic mix of recipients. A recent study finds that medical care expenditures (using a general patient population) could be the same *or lower* in a point of service (POS) plan than in an HMO plan (Escarce et al., 2001).[1] So the same cost savings may be possible with either a PPO-type plan or an HMO-type plan in urban areas.

In both urban and rural markets, the addition of pharmaceutical benefits to the PPO plan would increase its popularity, but the industry trend is toward a reduction in these benefits, due to escalating pharmaceutical expenditures and a downturn in the underwriting cycle.[2,3]

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[1]The POS and HMO plans in this study used the same network of providers. In a POS plan, beneficiaries can go outside the network at some cost sharing; in the HMO plan, out-of-network utilization is prohibited (requires full cost sharing).

[2]In 2000, 73 percent of Medicare beneficiaries had access to a plan with no-cost sharing on pharmaceutical benefits; in 2001, this had shrunk to less than 50 percent (Health Affairs press release: http://www.healthaffairs.org/press/marapr0102.htm).

[3]Many insurers pulled their managed care plans out of selected markets and increased premiums in 2000–2001 to recoup from underwriting losses experienced during the expansionary period, 1995 to 1998 (Strunk, Ginsburg, and Gabel, 2001).

Marketing a plan with restrictive pharmaceutical benefits would be much easier in states that have pharmaceutical assistance programs for the elderly. In states offering assistance, in theory, beneficiaries with the most significant needs would already have some access to subsidized coverage. States vary widely in the extent and type of assistance offered. At present, 20 states offer subsidized prescription drug coverage to some Medicare beneficiaries, and another 3 are developing coverage programs. Three additional states offer beneficiaries the opportunity to obtain discount drug prices, and two more are working to implement a discount plan. Two other states offer tax credits for prescription drug purchases. So 30 states have some sort of assistance in place or under development. Still, these programs cover only a small proportion of the Medicare population, as many have strict eligibility requirements (low income) and a restricted formulary (Gross, 2001).

A PPO plan might also succeed in a rural area where an HMO could not because of the lack of a large provider base and network economies. This could happen if a substantial portion of specialized inpatient care was shipped out of the rural area to networked, in-plan providers in an adjacent urban area. The consumer could possibly get more benefits at about the same premium as the traditional (supplemented) FFS plan, but Medicare would have more control over the high-cost utilization that occurred in urban hospitals. The cost-spike risk posed to HMOs from enrolling poor rural constituents who under-utilize care under FFS plans (MEDPAC, 2001) could be moderated in PPOs by the cost-sharing requirement for out-of-plan use. This PPO option could thus possibly be (at least) budget-neutral. Implementation of this PPO plan would require rural markets adjacent to urban areas with well-established provider networks. To characterize the urban–rural continuum, we use Beale codes at the county level (see Appendix B). Once the core urban markets are selected, we can further discriminate among them by examining the spatial pattern of urbanness in their surrounding counties.

We thus focus our search for core markets on urban areas with either HMO or PPO private-sector plans in existence and consider states with pharmaceutical subsidies to poor elderly as more favorable places for entry of PPO plans with pharmaceutical benefits. These subsidies for the poor would lessen the risk of excessively high expenditures for drugs under a drug benefit. In addition, prospective plans may seek to enter markets with generally favorable risk and reimbursement environments. To measure these market factors, there are several variables to choose from in each dimension. PPOHMO00 is a variable in the database that can be used to characterize combined market shares of PPO and HMO private-sector plans in the state. (The database does not contain any county-level PPO data—none exist.) RXENROLL01 can be used to characterize the volume of elderly enrollees in state pharmaceutical assistance plans, and PIP_DCG_96 and PYOUNG00 can characterize the degree of cost-risk reflected in the disease array or expected severity of illness in the elderly population in the county. ABRATE02 can be used to characterize the level of generosity in per capita payment to Medicare managed care plans in the county.

Younger, wealthier elderly are more likely to demand PPO-type coverage, especially in states with higher MediGap premiums. Thus, the size of the younger-elderly population, a larger proportion of wealthier persons, and higher local premiums for MediGap coverage would enhance viability of the entering PPO plan. These factors are characterized in the data set by TOTYELD00, PWEALTHY99, and PRICE00A.

With the recent and highly publicized backlash against managed care, and the uncertainty created by the withdrawal of many Medicare+Choice HMO plans in recent years, selling a new PPO option to the Medicare population may not be easy. State-specific information about whether there is state oversight of PPOs (OVERPPO99) and independent or expedited review of grievances may also be important in signaling those states that are perceived less risky by the elderly considering enrollment in a PPO (assuming they are even aware of such regulatory issues). Perhaps more importantly, states with such oversight may also be more attractive to the PPOs themselves, as such oversight could level the playing field across different insurance types, making entry easier and less risky. Similarly, states with a less concentrated private insurance market are more competitive, which could increase the quality of insurance plans and improve the terms of trade between plans and Medicare. In addition, areas with less concentrated hospital markets are more favorable for PPO expansion, because the terms of trade are more favorable to PPOs negotiating with providers. We can characterize these competitive factors using SHRLARGE3, the combined market share held by the largest three private insurers in the state, and HDAYS, the concentration index of Medicare business among county hospitals.

Finally, states with a recent trend toward decreasing Medicare+Choice enrollments due to plan withdrawals could be targeted as places where there has been sufficient interest in managed care among the elderly but dwindling opportunity to obtain it. The variables AFFECTED00 and MCPENE98 can be used to characterize this recent interest in managed care by the elderly.

All of the demand, supply, and competition factors described in this section should be taken into account in doing a comprehensive market analysis. This analysis would help narrow down the field of possibilities to those markets in which the PPO plan(s) for the elderly would most likely succeed. The economic market selection factors that are important for the introduction of a Medicare PPO can be represented in various ways with different sets of variables. In summary, these factors and the database variables we use to characterize them in the following analysis are as follows:

- Regions with a larger number of existing HMOs and PPOs would be more likely to develop efficient, high-quality PPOs available to serve the elderly (PPOHMO00).

- Rural regions with low managed care penetration for the elderly, adjacent to urban areas that are good potential core markets for PPO providers, may enhance geographic spread of managed care among the elderly (BEALE).

- Regions with recent Medicare+Choice disenrollments due to plan withdrawals, where initial Medicare+Choice demand was large, can be used to identify areas with good demand but low supply (AFFECTED00, MCPENE98).

- Regions with the greatest potential for successful entry by PPOs (expansion of existing PPOs) would be those with lower cost-risk due to disease array or potential illness severity in the region (SCORE96, PYOUNG00), state assistance for pharmaceuticals (RXENROLL01), higher reimbursement for managed care enrollees (ABRATE02), and a more competitive market climate (SHRLARGE3, OVERPPO99, HDAYS).

- The relative price of private supplemental coverage (PRICE00A), proportion of the population with higher income (PWEALTHY99), and age distribution of the elderly could also be considered (TOTYELD00).

Table 2 presents descriptions for each of these variables.

5.2.2 Step 2: Geographic Definition

The geopolitical boundary method is chosen for market definition for Medicare PPOs, largely because of the availability of county-level data. This approach would be problematic if the markets for PPOs were smaller than counties. But because PPOs can and most often do function under regional or national organization (they do not require extensive local market networks throughout their service areas), the relevant market for the PPO is larger than the county. We use state-level data for PPO markets because data exist at this level of geography and state regulations vary for PPOs and other managed care entities.

5.2.3 Step 3: Geographic Refinement

Beyond this basic decision to focus on geopolitical boundaries (Step 2), we then turn to refinements of this broad geographic definition (Step 3). For policy reasons, Medicare may wish to give preference to areas where there have been significant plan withdrawals as a way to replace options that beneficiaries have lost. The most important of these areas may be those that have had relatively large numbers of disenrollments and no remaining Medicare+Choice options for some beneficiaries (AFFECTED00, NMCLEFT00).

5.2.4 Step 4: PPO Market Analysis Based on Multiple Criteria

Within states, our aim is to identify local market clusters of counties along an urban–rural continuum that would allow PPOs to exploit their comparative advantage over HMOs. Key selection variables are determined by economic theory. Threshold criteria must be set for the key variables, and areas meeting the criteria are eligible for inclusion among the subset selected from all geographic regions. It is best not to set the threshold criteria too stringently or the end result will be no regions satisfying all criteria. In practice, using the median value for the variable is a good starting point.

The following sections contain four examples of structured query analysis using the database linked to ArcView GIS. Each example begins with a fundamentally different perspective on the market analysis. The four perspectives are (1) Approach 1, from the perspective of the Insurance Industry—Where are the best markets for PPO expansion to cover Medicare?; (2) Approach 2, from CMS' perspective—Where are the markets with demand factors most conducive to successful introduction of a Medicare PPO?; (3) Approach 3, the Combined Approach, where we look for markets that combine the factors from the first two; and (4) Approach 4, the Expanded Approach, where after analysis of the constraints implied by criteria cutoffs in Approach 3, we can loosen constraints to generate a larger set of potential markets.

Table 2
Sample statistics for key variables in two different approach samples

Variable	Variable definition	Summary statistic used in this table	Approach using this selection criterion	Selection criterion	Approach 1 sample	Approach 2 sample
State Level:					n = 6	n = 28
SHRLARGE3	Market share in 1997 of the three largest private group-market insurers	Median	1	<55%	[1]46.5%	54.5%
OVERPPO99	Whether state has oversight of PPOs in 1999	Proportion	1	= 1	[1]1.0	0.68
RXENROLL01	Number of elderly enrolled in 2001 in pharmaceutical assistance programs	Median	1	>0	[1]26,083	0
PRICE00A	Average price for MediGap Plan A	Median	1	>$750	[1]$854	$816
PPOHMO00	Combined market shares of private HMO and PPO plans, 2000	Mean	2	>0.40	0.52	[1]0.54
County Level:					n = 76	n = 139
PIP-DCG_96	PIP-DCG risk score in 1996	Median	1	<1	[1]0.96	0.98
PYOUNG00	Proportion of the elderly aged 65 to 75 in 2000	Median	1	>0.53	[1]0.56	0.53
ABRATE02	Medicare+Choice plan per capita aged reimbursement rate in 2002	Median	1	>500	[1]553	553
AFFECTED00	Number of Medicare beneficiaries involuntarily disenrolled from Medicare+Choice in 2000	Mean	2	>0	4,651	[1]10,152
MCPENE98	Proportion of Medicare beneficiaries in Medicare+Choice plans in 1998	Median	2	>0.005	0.036	[1]0.19
TOTYELD00	Total number of the elderly aged 65 to 75 in 2000	Mean	2	>1,872	13,415	[1]37,234
YOUNGIF	Change in total number of the elderly aged 65 to 75, 1990–2000	Mean	2	>664	6,402	[1]12,380
PWEALTHY99	Proportion of the population with estimated income above $50,000 in 1999	Median	2	>0.234	0.34	[1]0.40
HDAYS	Herfindahl index of hospital concentration of Medicare inpatient days in 2001	Median	2	<0.814	0.56	[1]0.28

[1]Used in selection criteria.

The various perspectives and approaches yield different sets of selected regions, which when compared reveal the power of key variable choice and assumed thresholds in market selection. The key variables chosen and their criteria reflect the intended goals of each approach; thus, we would expect to see different regions selected under different approaches. As a sensitivity analysis, we compare characteristics of regions chosen under different approaches to see if they differ in expected ways. We stress by means of these comparisons that there is no unique, optimal set of key variables and criteria that should necessarily be used in all cases—the intended goals should guide these choices.

The Combined Approach (Approach 3) yields markets that we would describe as being the best places for PPO growth potential among the elderly. These are "best" because our goal in this approach is guided by economic theory, which dictates that we consider demand, supply, and market climate factors jointly in determining optimal regions. The Combined Approach results in a few, very select sites for implementing a PPO aimed at Medicare beneficiaries. We expand this in Approach 4, the Expanded Approach, by loosening our economics-based key variables criteria so that a larger number of areas are selected.

Approach 1: PPO Perspective

This approach takes the perspective of the PPO industry and begins with the question "Where are the ideal markets for launching or expanding PPO products for all populations?" The market climate is "ideal" from the perspective of entering or expanding PPOs: easy entry by new plans, regulatory oversight to even the playing field among plans and provide consumer protection, protection against adverse selection (of very expensive constituents) into new plans, and characterized by high prices for substitutes, affording profitable entry opportunities. We begin the market identification using state-level variables that characterize the competitiveness of the insurance market along these dimensions. Six states are selected that meet all four of the following criteria (see Table 2 for variable description):

- SHRLARGE3 < 55 percent: In 1997, the three largest private group-market insurers have less than 55 percent in combined market share, where 55 percent is the national median value (entry conditions not overly restrictive).

- OVERPPO99 = 1: In 1999, states so designated have, either through statute or regulation, a structure for examining PPOs' network management functions, which may include licensure or certification, solvency requirements, network participation, provider credentialing, quality management, and other functions (ensures level playing field for competition and assures consumers).

- RXENROLL01 > 0: In 2001, the state has some enrollment in state-subsidized benefits, price reductions, buying pools, or tax credits to assist older adults and the disabled in paying for prescription drugs (protects against adverse selection of very costly constituents).

- PRICE00A > $750: The average price in 2000 for a standard MediGap policy in the state is above the national median price (substitute is expensive).

In these six states, we then considered some county-level factors that would promote interest among potential suppliers in offering products in these markets, indicative of more profitable opportunities, including the following (see Table 2 for variable description):

- PIP-DCG_96 < 1: The 1996 PIP-DCG score in the selected counties is less than 1, where 1 represents "average" risk in terms of costliness inherent in county disease array among the elderly.

- PYOUNG00 > 53 percent: In 2000, the elderly population in the county is disproportionately younger than in the median county (younger-elderly are aged 65 to 75).

- ABRATE02 > 500: In 2002, the demographically-adjusted payment rate for Medicare managed care plans in the county is higher than in the median county.

This approach yielded 79 potential counties worthy of even closer scrutiny. The next step is to examine the characteristics of counties nearby to determine which of these 79 are best situated in terms of serving or drawing from adjacent populations, which create additional demand potential. However, because this approach is not targeted specifically to the Medicare population, we turn first to the second approach; after identifying the set of counties with highest potential using this second approach, we join the first and second approaches to find an even smaller set of counties that satisfy both approaches. We then provide the contiguous-populations analysis for these counties.

Approach 2: CMS Perspective on Demand Potential

We begin this analysis by first identifying those states with sufficient private-sector managed care infrastructure to possibly enable expansion to cover some Medicare constituents. We use the following criterion (see Table 2 for variable description):

- PPOHMO00 > 40 percent: In 2000, the combined market shares of PPOs and HMOs in the state exceed 40 percent (median is 44 percent, mean is 42 percent).

This yields 28 states (including Washington, DC). We then turn to county-level criteria for these 28 states, chosen to identify larger Medicare populations with both potential and demonstrated interest in managed care participation (see Table 2 for variable description):

- AFFECTED00 > 0: The county had some Medicare+Choice enrollees who were disenrolled as their chosen Medicare+Choice plan left the market.

- MCPENE98 > 0.005: Medicare+Choice penetration in 1998 exceeded that in the median county (median is 0.005, mean is 0.047).

- TOTYELD00 > 1872: The total number of younger-elderly (aged 65 to 75) in the county exceeds the number in the median county.

- YOUNGDIF > 664: The change from 1990 to 2000 in total number of younger-elderly (aged 65 to 75) in the county exceeds the number in the median county (median is 664, mean is 2144).

- PWEALTHY99 > 0.234: The proportion of the total population with income exceeding $50,000 per year exceeds that in the median county (median is 0.234, mean is 0.265).

- HDAYS < 0.814: In 2002, hospital market concentration in Medicare inpatient days was below the mean (mean is 0.814, median is 1).

This analysis yields 148 counties (including Washington, DC) that satisfy both the state-level and county-level criteria.

As a preliminary sensitivity analysis on the results from the select-by-query methodology, we compare the two sets of regions yielded under the first and second approaches. (A more detailed sensitivity analysis is provided in Section 5.2.5). In addition to variable descriptions, Table 2 displays sample statistics on these key variables when data values are restricted to the set of regions selected. Comparing these statistics across the different sets of selected regions provides insight regarding how much they differ due to the constraints imposed. This is one way to examine how much influence the constraining criteria have on characteristics of selected regions. For example, it is apparent that the selection criteria SHRLARGE3 < 55 percent is quite constraining—the median values in Approach Samples 1 and 2 are very different. Using these sorts of comparisons we can also analyze differences among the two groups of identified sites for greater insight regarding spatial heterogeneity. However, linear statistics cannot reveal spatial heterogeneity as well as maps.

Approach 3: Combined Approach

Ideally, market analysis should consider supply, demand, and market competition factors. If we combine Approaches 1 and 2, this is accomplished. In the Combined Approach query, we identify those states and counties that are common to both subsets identified in Approaches 1 and 2. This very narrow set of eleven counties in four (of five) states satisfies all the criteria for both selection approaches. Plotting these on a map, we find that two counties are in Illinois, four are in Florida, four are in New Jersey, and one is in Connecticut.

Map 1 (Figure E.1) displays the results of this complex query, which shows the eleven initial counties in four states. The Arc Explorer software, which can be downloaded free of charge from ESRI (http://www.esri.com/software/arcexplorer/index.html), contains a simple mapping interface that allows viewing, zooming in, and querying the maps prepared during this analysis (click MAP1.aep included on the project database CD).

5.2.5 Step 5: Special Analysis

In step five of our methodology, we turn to more specialized analysis that can further narrow down the number of selected sites. The final step in market analysis for PPO entry potential is assessment of characteristics in the *regions around* the ideal places identified in the joined queries. Because PPOs are able to operate in markets with a fairly broad geographic extent, the

supply, demand, and market characteristics of these surrounding areas will help us discriminate among these nine selected sites. Examples of some variables to examine in contiguous counties are urban-ness, as represented by Beale codes (see Appendix B), market concentration of Medicare inpatient days among hospitals (HDAYS), change in Medicare+Choice penetration from 1998 to 2000 (PENEDIF), numbers of persons affected by Medicare+Choice withdrawals in 2000 (AFFECTED00), and number left with no HMO plan choice in 2000 (NMCLEFT00).

Rather than present tables with summary statistics for an arbitrarily defined set of contiguous counties, we instead present univariate maps for each of these supplemental variables. The maps are more informative than a table of summary statistics can be, because the spatial variation around the nine key counties cannot be represented quantitatively. Maps for each of these five contiguity-analysis variables are presented in Appendix E (Figures E.2 through E.6) and can be viewed, zoomed, and queried using the Arc Explorer software (click MAP2.aep, click MAP3.aep, and so on, on the project database CD).

As discussed in Section 5.2, rural areas featuring highly concentrated hospital markets adjacent to urban areas are prime locations for attracting rural elderly into PPO plans with a network of urban providers. Due to the sparseness and concentration of hospitals in these rural areas, managed care would have a very difficult time creating networks composed of rural providers. We can examine the regions contiguous to our nine selected (urban) counties to see which are most advantageously situated in terms of expanding coverage to nearby rural populations

First, looking at the urban–rural continuum using a map of the Beale codes (Figure E.2), and cognizant that all the selected sites are in very dense urban areas (Beale codes 0, 1, 2), we see that our 11 counties vary in the urban-ness of their surrounding counties. In Florida, for example, the central county is surrounded by dense urban areas, whereas the northern and southern counties have less urban and rural areas adjacent to them. The two Illinois counties are situated in very heavily urbanized surroundings. The New Jersey counties are almost equally surrounded by mostly urban areas.

Next, looking at hospital concentration in surrounding counties (Figure E.3), we can see how hospital concentration of Medicare inpatient days around the selected counties varies from region to region. Inspection reveals that the selected counties in Florida are more often situated near highly concentrated hospital markets than are selected counties in the other states.

Looking at the variables PENEDIF (change in Medicare+Choice penetration from 1998 to 2000) (Figure E.4), Illinois appears to have seen recent increases in Medicare+Choice penetration (white shading), whereas the other states have seen decreases in Medicare+Choice penetration (darker gray shading), near the selected counties.

Although PENEDIF provides insight regarding early interest in Medicare HMOs, AFFECTED00 and NMCLEFT00 are more enlightening regarding actual numbers of people affected recently by plan withdrawals. Mapping the variables AFFECTED00 (numbers of Medicare+Choice enrollees affected by Medicare+Choice withdrawals in 2000) (Figure E.5), and NMCLEFT00 (number of Medicare+Choice enrollees left with no HMO plan choice in 2000) (Figure E.6), inspection reveals that the largest numbers of people AFFECTED00 and left

stranded (with no plan, NMCLEFT00) are clustered around our selected counties. This is consistent with Figure E.4 showing the change in penetration PENEDIF. In Illinois, for example, inspection reveals that managed care penetration increased in the central areas of Illinois, whereas Figures E.5 and E.6 show that disruptive retraction occurred in more urban areas around our selected counties.

Understanding the spatial heterogeneity in counties adjacent to the key selected counties (the 11 that emerged from combining Approaches 1 and 2) provides insight regarding the potential for success in launching Medicare PPOs in these regions. It may be possible to further narrow down the selected sites based on this information.

On the other hand, CMS may prefer a broader expansion of Medicare managed care, rather than a targeted approach that selects a few sites with greatest potential. Rather than adopt some different approach to market selection, we can continue to consider the joint distributions of supply, demand, and market climate variables and simply relax the constraints implied by the cutoff criteria. Although it may seem that each variable is given equal "weight" in the analysis because we have (largely) used the median values as our cutoff criteria, the weight each variable receives is actually a function of how binding is the constraint implied by its cutoff. By "binding" we mean how powerful the criterion is in terms of eliminating possibilities from consideration. Before doing an expanded market selection analysis through constraint relaxation, we need to know which of our key variable criteria are most binding. Thus, we conduct the following analysis of constraints. An analysis of constraints is an important part of this selection methodology, as it provides sensitivity analysis for the choice process.

Sensitivity Analysis

Analysis of Constraints in State-Level Selection for Combined Approach 3. In analysis of constraints, we take each criterion separately and look at its independent effect in selection (i.e., how many states are removed from the analysis when the criterion is applied, independent of all other criteria). Using this implicit weight, we then rank (sort) these according to degree of stringency imposed. If we select regions using set intersection (joint meeting of all criteria), then it does not matter whether the selection is done sequentially or all at once. The same set of selected regions will emerge in the end, no matter where we start. If we select regions using set union (meeting one, the other, or both criteria), then order of selection may matter. Results of state-level selection using set intersection for all variables are presented in Table 3.

In the absence of other *a priori* beliefs or rules, the logical way to expand the number of sites selected is to relax or eliminate constraints, beginning with those most binding. For example, if we drop the requirement that states have pharmaceutical assistance programs for the elderly (RXENROLL01 > 0), this would add a sixth state to our Combined Approach 3. Relaxing the requirement to SHRLARGE3 from < 55 percent to < 70 percent would result in 11 states in our Combined Approach (Approach 3), whereas eliminating it entirely would result in 14 states. There may be valid *a priori* reasons for dropping or relaxing constraints. For example, we may believe that federal pharmaceutical assistance to the poor elderly is imminent, eliminating the influence of state variation in such assistance. Or, some may believe that more concentrated private insurance markets are actually more conducive to existing PPO product expansion.

Table 3
Results of state-level selection using set intersection

Criterion	Approach	Number of states selected in independent selection	Implicit weight	Number of states selected in sequential, joint selection
None		50		
PRICE00A > $750	1	36	14	36
OVERPPO99 = 1	1	35	15	24
PPOHMO00 > 0.40	2	28	22	14
SHRLARGE3 < 55%	1	22	28	6
RXENROLL01 > 0	1	19	31	5

Analysis of Constraints in County-Level Selection for PPO-Perspective (Approach 1). In Approach 1, we began with six states—CT, FL, IL, NC, NJ, NV—and all 315 counties in them. We then conducted constraint analysis on the county criteria (Table 4).

Table 4
Analysis of constraints in county-level selection (Approach 1)

Criterion	Approach	Number of counties selected, independent selection	Number of counties selected, sequential joint selection
None		315	315
ABRATE02 > 500	1	315	315
PYOUNG00 > 0.53	1	173	173
PIP-DCG_96 < 1	1	152	79

We can see that PIP-DCG_96 < 1 is the most stringent constraint. This requirement rules out all counties with average (1) or above-average (> 1) disease risk, as measured by the PIP-DCG_96 score for counties, 1996. Dropping this requirement would more than double the number of "eligible" counties in sequential selection, from 79 to 173.

Analysis of Constraints in County-Level Selection for CMS-Perspective (Approach 2). In Approach 2, we began with 27 states (AR, AZ, CA, CO, CT, FL, HI, ID, IL, KY, LA, MA, MD, MI, MN, MO, NJ, NM, NV, NY, OH, OR, PA, RI, TN, UT, WI) and the 1,469 counties in them. We then conducted constraint analysis on the county criteria (Table 5).

Table 5
Analysis of constraints in county-level selection (Approach 2)

Criterion	Number counties selected, independent selection	Number counties selected, independent selection, but using the union of sets for {YOUNGDIF OR TOTYELD00} (either, or both)	Number counties selected, sequential joint selection, using set intersection (both)	Number counties selected, sequential joint selection, using set intersection for all except {YOUNGDIF OR TOTYELD00}
None	1,469	1,469	1,469	1,469
MCPENE98 > 0.005	1,009	1,009	1,009	1,009
YOUNGDIF > 664	879	923	677	700
TOTYELD00 > 1872	878		641	
HDAYS < 0.814	511	511	357	374
PWEALTHY99 > 0.234	754	754	302	306
AFFECTED00> 0	273	273	147	147

The requirement that AFFECTED00> 0 is the most stringent criteria in this group. This rules out all counties that did not have any disenrollments from Medicare+Choice as a result of plan withdrawals in 2000. Dropping this requirement would more than double the number of eligible counties in sequential selection, from 147 to more than 300.

If we were concerned that requiring the intersection of YOUNGDIF (growth in younger elderly) and TOTYELD00 (numbers of younger elderly in 2000) in set selection would result in removal of some viable markets with large current numbers of younger elderly but little growth, we could use set union of these two variables' criteria rather than set intersection (columns 3 and 5). Set union would include counties that met either criteria. Set intersection includes only those counties meeting both criteria. As shown in Table 5, this initially increases the total number of counties selected (union is more expansive than intersection). However, in the end result, the total number selected is the same (147). Using set union for these two variables (YOUNGDIF and TOTYELD00) in Combined Approach 3 actually results in the same nine counties in the final selection. With looser criteria set for the most constraining variables, this same set would not likely obtain.

Approach 4: The Expanded Approach. Using the same methodology for identifying key variables as in Approach 3, the Combined Approach, but relaxing some of the most binding constraints, we can expand the number of sites selected while maintaining the integrity of an economics-based methodology. If we drop the state requirement that RXENROLL01 > 0, the number of states considered increases from 5 to 11. If we also relax SHRLARGE3 from < 55 percent to < 70 percent and drop the county requirements that AFFECTED00 > 0 and PIP-DCG_96 < 1, we now have 51 counties in 11 states. These states and counties are listed in Table 6 (the areas selected under the more restrictive Approach 3 are highlighted). (Recall that in Approach 3, with tighter constraints, we had only eleven counties in four states.)

Table 6
Comparison of states and counties selected by Approach 3 (restrictive) and Approach 4 (expansive)

STATE_NAME	CO_NAME	FIPS
California	El Dorado	06017
California	Imperial	06025
California	Kern	06029
California	Kings	06031
California	Lake	06033
California	Los Angeles	06037
California	Merced	06047
California	Monterey	06053
California	Placer	06061
California	San Bernardino	06071
California	Santa Clara	06085
California	Solano	06095
California	Tuolumne	06109
Connecticut	Tolland	09013
Florida	Brevard	12009
Florida	Charlotte	12015
Florida	Clay	12019
Florida	Duval	12031
Florida	Hillsborough	12057
Florida	Lake	12069
Florida	Lee	12071
Florida	Monroe	12087
Florida	Orange	12095
Florida	Polk	12105
Florida	St. Lucie	12111
Illinois	Lake	17097
Illinois	McHenry	17111
Illinois	Will	17197
Kentucky	Jefferson	21111
Michigan	Genesee	26049
Michigan	Livingston	26093
Michigan	Washtenaw	26161
Nevada	Clark	32003
Nevada	Washoe	32031
New Jersey	Burlington	34005
New Jersey	Hudson	34017
New Jersey	Morris	34027
New Jersey	Somerset	34035

(continued)

Table 6 (continued)
Comparison of states and counties selected by Approach 3 (restrictive) and Approach 4 (expansive)

STATE_NAME	CO_NAME	FIPS
New Jersey	Sussex	34037
New Mexico	Santa Fe	35049
Ohio	Butler	39017
Ohio	Franklin	39049
Ohio	Lorain	39093
Ohio	Medina	39103
Ohio	Montgomery	39113
Ohio	Seneca	39147
Ohio	Washington	39167
Ohio	Wayne	39169
Pennsylvania	Bucks	42017
Pennsylvania	Centre	42027
Pennsylvania	Chester	42029

Note: State and counties selected under the more restrictive Approach 3 are highlighted.

Figure E.7 (comparing Approaches 3 and 4) shows the considerable geographic expansion that occurs in the selected sites with this relaxation. The 11 states now included are CA, CT, FL, IL, KY, MI, NV, NJ, NM, OH, and PA. The Arc Explorer software contains a simple mapping interface that allows viewing, zooming in, and querying this map (click MAP7.aep on the project database CD).

5.3 Specific Analysis for the DME Competitive Acquisition Initiative

The major goal of this initiative is to replace administratively-set prices with competitive bidding or pricing, in order to set prices that better reflect market forces. It is hoped that competitive acquisition could lead to lower prices and reduced Medicare expenditures for selected services without an adverse effect on quality of care. Market area selection for competitive acquisition will be very dependent on the characteristics of covered products. Some products (e.g., prescription drugs) could have nationwide market areas, whereas other products (e.g., primary care services) could have very localized markets. Markets for some components of DME (basic hospital supplies) are national, whereas other components (oxygen equipment, prosthetics) are more local because of service required to meet consumer needs. We focus here on DME Competitive Acquisition per CMS' request.

5.3.1 Step 1: Economic Assessment for DME Competitive Acquisition

A number of supply and demand factors should be considered in selecting markets for competitive acquisitions. As in our analysis specific to Medicare PPO markets, we begin here to identify possible variables that would be used to identify a specific market area for this initiative:

- Each market area should be large enough to make competitive bidding worthwhile to suppliers, yet not be too big to administer the demonstration. Also, in larger markets it is less likely that suppliers who do not win will be driven out of business, as there is demand from other population groups besides the elderly. Thus, we should consider the overall size of the MSA in terms of population.

- Each market area should contain enough Medicare FFS beneficiaries so that the potential savings from competitive acquisition exceed the fixed cost of conducting bidding competition for the area. We look initially at markets with both large numbers of FFS enrollees in 2000 (EVERNHMO00) and markets with positive growth in FFS beneficiaries from 1995 to 2000 (FFSGROW).

- Potential savings from competitive acquisitions are likely to be higher in areas with above average Medicare fees (if these fees vary across regions) and in areas with high per capita spending. Thus, we could consider the historical AAPCC rate in the county in 1999 (ABRATE99_HIST) and the fee schedule amounts for big-ticket and high-expenditure items in the Medicare DME fee schedule.

- As its name suggests, competitive acquisition depends on competition between suppliers to set prices as close to costs as possible. It therefore follows that competitive acquisition is most likely to be effective in areas where there are already many competitors, and no supplier has a dominant market share. Thus, we would want to consider the number of DME suppliers per county in 2002, DMESUM.

- Areas with lower to moderate Medicare+Choice penetration in 2002 may also be more costly, as these may exhibit more resistance to managed care or competitive practices.

5.3.2 Step 2: Geographic Definition

Contiguous areas would be easier to administer and would stimulate more competition from local suppliers. A large local demand versus several dispersed smaller demand pockets is more attractive to local suppliers, who can be enticed to participate by the large potential volume of business to be garnered. These pragmatic concerns lead to a market definition based on a cluster of contiguous counties containing a large demand (large Medicare population). Clusters must not be too large, however, or the demonstration becomes difficult to administer.

5.3.3 Step 3: Geographic Refinement

It is unlikely that a successful competitive acquisition initiative can be run with only volunteer providers; bidding must generally be made a condition of participation for all providers in the marketplace. Therefore, the location of volunteers is not a factor. However, areas where there may be lessened provider resistance might be favorable project locations.

5.3.4 Step 4: DME Market Analysis Based on Multiple Criteria

The goal of this analysis is to find geographic regions with the greatest potential savings from DME competitive bidding demonstrations. First, following economic theory, we identify

key product characteristics that are likely to affect the extent of the market. Here we focus on big-ticket items that require service, delivery, and set-up—these items are more likely to have local markets than national ones. Thus, we limit our analysis to local markets.

For illustrative purposes, we employ two different approaches to identify markets, using two different sets of selection criteria. The first approach focuses on potential cost savings, ignoring other market characteristics. The second approach includes both potential for cost savings and other market characteristics, including competitive potential and managed care penetration. Our recommended approach is to combine these, resulting in a few sites with greatest potential for significant savings. In the sensitivity analysis section that follows, we compare the selected regions under the two approaches and analyze the criteria to see which have greatest influence. This analysis is useful to inform analysis in Section 5.3.5, where we wish to employ a more expansive market selection process.

For both approaches, we begin by identifying those states with higher fee schedules for local-market, big-ticket items that are among the top 25 expenditure-generating items in the Medicare budget. The selection criteria are summarized in Table 7.

Table 7
Selection criteria at state level for DME market analysis

HCPCS Code	Allowed-charges[1] amount ($), 2000	Description	Selection criterion: fee schedule amount per Item ($)	Median
E1390	1,302,598,228	Oxygen concentrator	>200	230
K0011	359,463,797	Standard weight power wheelchair with control	>500	527
E0260	279,761,154	Hospital bed semi-electric with mattress	>150	167
E0431	174,120,244	Portable gaseous 02	>30	36
E0439	114,249,723	Stationary liquid 02	>200	230
E0277	103,325,505	Powered pres-redu air mattress	>700	756
K0001	100,164,763	Standard wheelchair (monthly rental rate)	>50	54

[1]The database contains the 2002 fee schedule amounts for the 25 HCPCS codes with highest aggregate allowed charges in 2000.

Using these criteria to select states results in 19 states with above-median expenditures in all seven equipment categories. Next, we find MSAs contained fully within these states with total population between 1 and 2.5 million. The idea here is to select MSAs that are large enough to be attractive to suppliers/bidders but not too large, to allay administrative difficulties. This resulted in 15 MSAs, which have 66 counties centered inside them. Next, using the 66 counties, we do two separate sub-queries: Query A (Costly Markets Approach) and Query B (Costly Markets with Competitive Potential). Although these two queries can be conducted without a

GIS, we find that the GIS facilitates conducting them and also allows mapping the results, which is useful if geographic location of the demonstrations is an important factor.

Query A: Costly Markets Approach

In this approach, we attempted to select market areas with a large and growing FFS population (indicating an expanding market), as well as historically higher than average FFS costs. We believed these factors would generally indicate large, costly markets to the Medicare program. Within the database, the specific selection criteria are as follows (Table 8):

- EVERNHMO00 > 10,000: The FFS enrollment population in the county exceeds the mean in 2000 (median is 3,950, mean is 10,015).
- FFSGROW > 0: There is positive growth in FFS enrollment in the county over the period from 1995 to 2000 (median is 24, mean is –550).
- ABRATE99_HIST > 404: The historical AAPCC rate in the county (1999) exceeds the median (median is 404, mean is 413).

This query yielded four MSAs. Figure E.8 displays the result of this query.

Table 8
Variable descriptions from database

Variable_Name	Variable_Description
EVERNHMO00	Sum by county of the number of FFS beneficiaries who are enrolled for any portion of the year (2000), excluding all beneficiaries who were enrolled in an HMO plan at any time during the year
FFSGROW	EvernHMO00 minus EvernHMO95
ABRATE99_HIST	Sum AgdPC99PartA and AgdPC99PartB, historical payment rates

Query B: Costly Markets with Competitive Potential

We also wanted to identify potential markets with the potential for market competition. Therefore, we wanted to select markets with more than average numbers of Medicare approved DME suppliers, a payment rate exceeding the median for FFS beneficiaries, and a Medicare+Choice penetration rate that was fairly low. Medicare approved suppliers have agreed to accept assignment on all Medicare claims and to maintain certain standards of quality and meet certain protocols in their business dealings with the Medicare population.[4] We felt these

[4]See information at http://www.palmettogba.com/palmetto/Providers.nsf/f45451e08e6ffeda852569ee00005c6d/85256a46005d491a85256b830076c61d?OpenDocument

criteria together would indicate a market that might be very competitive and attractive to DME suppliers. The specific selection criteria for the database are as follows (Table 9):

- DMESUM > 10: The number of Medicare approved DME suppliers in the county in 2002 exceeds the mean and median for counties (median is 3, mean is 9.6).
- Pmt/BENE00 > 600: The payment rate per FFS beneficiary in 2000 exceeds the median for counties (median is 507, mean is 663).
- MCPENE02 < 5 percent: The Medicare+Choice penetration rate in the county in 2002 is fairly low (median is 0 percent, mean is 3.8 percent).

This query yields five MSAs. Figure E.9 displays the result of this query.

Table 9
Variable descriptions from database

Variable_Name	Variable_Description
Pmt/BENE00	PmtAmt divided by EvernHMO: county-average payment per beneficiary for services received by FFS beneficiaries
MCPENE02	Proportion of county Medicare eligibles enrolled in a Medicare+Choice plan
DMESUM	RTI created from supplier listing: number of DME suppliers in each county

When we combine Query A and Query B, we find that two MSAs satisfy both sets of criteria jointly: Austin, Texas, and Indianapolis, Indiana. These are the only two MSAs in the country containing counties that jointly satisfy all the criteria in both the Query A (Costly Markets) and Query B (Costly Markets with Competitive Potential) approaches. This combined approach using the selection criteria in Table 10 is the most restrictive combined approach we employ, resulting in selection of only two MSAs. Next, we relax the most binding constraints and conduct a more expansive Combined Approach, yielding 14 selected MSAs.

5.3.5 Step 5: Special Analysis

In this sensitivity analysis, we examine which criteria used in market selection have the greatest impact in terms of removing areas from the final set of selected areas. Apparently FFSGROW > 0 (growth in the number of FFS beneficiaries from 1995 to 2000) and MCPENE02 < 0.05 (Medicare+Choice penetration rates low to moderate) are the most binding constraints. If we eliminate both of these entirely and use a combined approach including all of the remaining criteria, we employ a more expansive combined approach. Using this expansive combined approach, we end up with 14 MSAs. The only MSA from our initial list of 15 to drop out is Salt

Table 10
Analysis of constraints for two DME approaches

Criteria	Query A: Costly markets		Query B: Costly markets with competitive potential	
	Number counties selected in independent selection	Number counties selected in sequential selection	Number counties selected in independent selection	Number counties selected in sequential selection
Initial Number Counties	66		66	
ABRATE99_HIST > $404	54	54		
Pmt/BENE00 > $600			51	51
DMESUM > 10			42	40
EVERNHMO00 > 10,000	41	33		
MCPENE02 < 0.05			24	12
FFSGROW > 0	20	6		

Lake City, where the historical FFS rates (ABRATE99_HIST) are lower than the threshold value. Both of the MSAs in the very restrictive combined approach (Austin, Indianapolis) are included among the 14 MSAs in the more expansive set. See Table 10 for analysis of constraints and Table 11 for a listing of the MSAs and their counties in various Approaches. The restrictive and expansive sets are mapped together in Figure E.10. The two MSAs in the most restrictive combined Approach and the 14 MSAs in the more expansive combined Approach are mapped together in Figure E.10.

5.4 Summary: Additional Insights Gained and Additional Uses for the Database

5.4.1 Additional Insights Gained

Perhaps the most important of the insights gained was the knowledge that analysis of constraints (sensitivity analysis) can be very helpful in understanding differences across sites. It is also important to note that selection can be applied sequentially in accord with beliefs regarding the relative importance of constraints. When constraints are applied sequentially in order of importance, analysis of the reduction that occurs at each stage can help guide in setting the cutoff criteria.

In general, if set intersection is used, the same group of regions will be selected no matter what the order of selection. But set union can also be used, and this can yield different results according to when it is applied in the sequence of selection. Set union can be applied to some groups of variables and set intersection to others.

Table 11
Fourteen MSAs selected for DME sites using expanded combined approach

[1,2]0640	Austin-San Marcos, TX
1280	Buffalo-Niagara Falls, NY
1680	Cleveland-Lorain-Elyria, OH
[1]1840	Columbus, OH
2800	Fort Worth-Arlington, TX
[1,2]3480	Indianapolis, IN
5080	Milwaukee-Waukesha, WI
5560	New Orleans, LA
5775	Oakland, CA
6840	Rochester, NY
6920	Sacramento, CA
[1]7240	San Antonio, TX
7360	San Francisco, CA
7400	San Jose, CA

[1]Selected using more restrictive "costly markets" approach (A).

[2]Selected using the most restrictive combined (A and B) approach.

Set union can be applied when the researcher is not sure whether either of a pair of variables measuring the same market climate factor is sufficient if used alone or whether one is better than another. Set union of several similar variables can produce expansive sets that are sure to include every region meeting some general market climate condition.

5.4.2 Additional Uses for the Database

In addition to site selection, which has been our focus in this report, the database can be used for many other purposes, including the following:

- Market characterization. For example, perhaps CMS would like to know where Medicare+Choice penetration has never been successful and the other characteristics of those markets.

- Prospective evaluation. For example, perhaps CMS would like to evaluate characteristics of sites where demonstration projects have already been implemented or chosen for implementation. Comparison of various features of these sites can aid

understanding of why projects fare better in some sites than others or to predict where special resources may need to be expended to facilitate program success.

- Sensitivity analysis. Perhaps CMS would like to know how use of a specific variable and cutoff criteria affects sample selection, as compared with other variables.

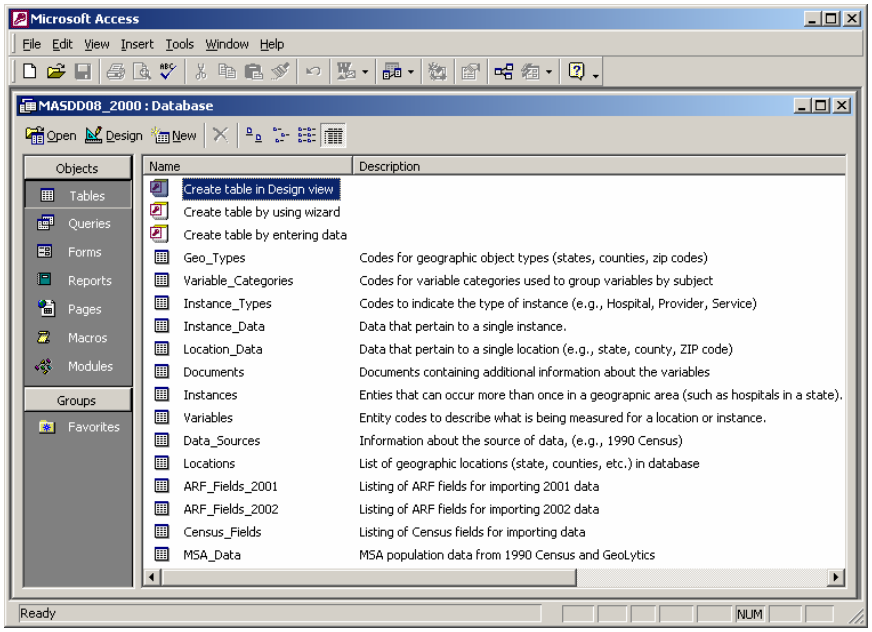
- Site comparison. Perhaps CMS would like to know how a currently proposed group of sites compares with other groups of sites, in various market dimensions.

SECTION 6
MORE ADVANCED DATABASE TOPICS

6.1 Technical Description of the Database

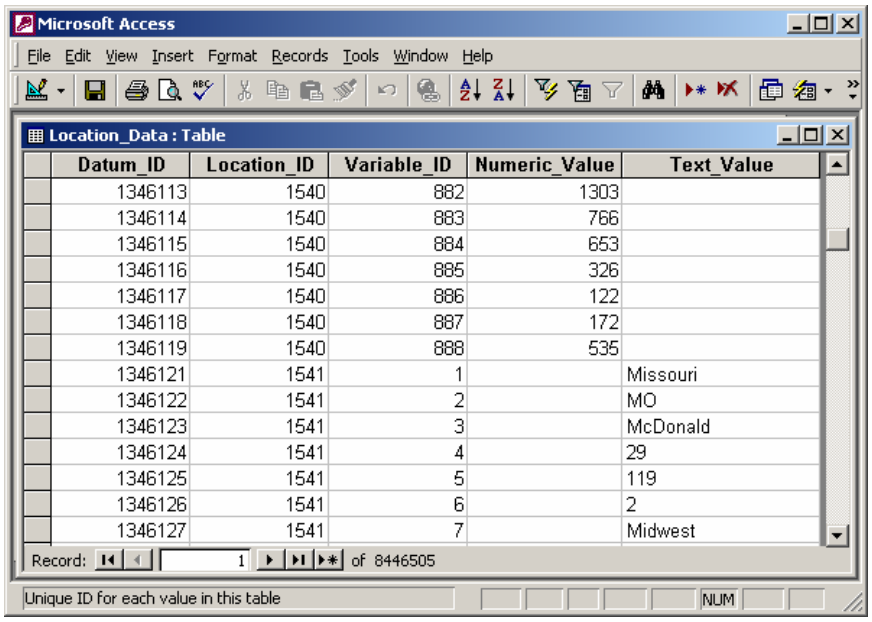
CMS market area data are housed in a PC-based Microsoft Access 2000 database. The traditional, and somewhat broad, definition of a database is "a collection of related data items stored in an organized manner" (Jennings, 1999, p. 128). Microsoft Access uses an all-encompassing database file structure that includes many elements (e.g., tables, queries, forms, indexes). Figure 14 provides an example. Although these elements are widely understood by experienced Access users, they can be confusing to people who have worked with other database and statistical analysis software, such as SAS.

Figure 14
Microsoft Access database file structure—tables



The core of an Access database is a table, or series of tables, where data items are stored in a row-column format that is similar to that used by spreadsheet applications. Figure 15 provides an example of an Access table. Access is a desktop application with a user-friendly interface, so these tables can be viewed easily, like spreadsheets in Microsoft's Excel. In Microsoft Access, it is critical to store the data efficiently (i.e., reduce redundancy) and to define the relationships that exist among tables. The Access database design employed here accomplishes both of those requirements.

Figure 15
Example of Access table



The market area selection data are stored in 10 tables. These data must be stored in a manner that will allow them to be mapped and queried using GIS software. Additionally, the tables must be designed to provide the flexibility to add or update data, including new geographic units, without significantly changing the original structure.

To a non-Access user, what might appear to make the most sense is to have one table for each level of geography. In other words, one table could house all the county-level data (with county FIPS codes and a large number of variables representing county data), another could hold zip code level data, and so on. Each of these tables could then be linked to the appropriate map layer in the GIS system. However, if new fields or variables needed to be added at a later date, the actual structure of the table would need to be changed (i.e., field name, length, type [text, numeric]) and description would need to be added. If data became available for a new geographic unit (e.g., HSA), an entirely new table, with concomitant structure definitions, would need to be created to house these data. This is not the most efficient way to set up the market area selection database.

Access (and other relational database) users use a process called "normalization" to achieve maximum efficiency by (1) eliminating duplicate information in tables, (2) providing the flexibility to accommodate future changes and additions to the database, and (3) minimizing the impact of database changes and additions on user applications (such as GIS) that access the data. This results in a series of tables that are set up using "normalization rules" and that are related to each other using common identifiers.

The market area selection database consists of 10 tables that have been set up using the normalization process. These 10 tables are all interconnected by a series of established

relationships that use unique identifiers. Actual data values (such as a disease rate, per capita income, or hospital capacity) are stored in the Location_Data and Instance_Data tables, but associated information (such as variable name and geographic identifiers) is stored in other tables. As a result, adding a new variable or even an entire new unit of geography (such as HSA) involves merely adding records to existing tables, rather than changing the table structure.

Elements of an Access database include queries as well as tables. Standard data queries can be set up and saved, to be run again and again. Section 3 described simple queries that can be performed using the Find Form in the database. If the structure of the database remains constant, the queries need only be set up once. Following is a detailed description of the database structure with examples of how the tables might be populated with data and queried to create subsets of the data for export to other applications.

6.2 Database Design: File Structure and Relationships

The data collected and processed from CMS, Census, Area Resource File, and other sources are contained in a series of 10 tables (Table 12). These data are normalized (i.e., grouped into tables in a formalized procedure) to eliminate duplication of information and provide flexibility in table structure for future additions or changes. In Section 6.2.1, we discuss an Entity Relationship Diagram, which shows the relational structures between the several database components. In Section 6.2.2, we describe the components in some detail. In Sections 6.3 through 6.5, we provide examples of how data are stored, queried, exported, and deleted from the database

6.2.1 Entity Relationship Diagram

The Entity Relationship Diagram (Figure 16) shows the relationships between the various tables listed in Table 12 that make up the Market Area Selection and Data Development database. Each box represents a separate table, with the title at the top. Table field (column) names are listed within each box, with key fields separated at the top. (Key fields connect tables in the overall database structure.) Key fields are used in the Queries, so the Entity Relationship Diagram (Document 9, can be printed from the Find_Location_Data form) should be referred to when constructing queries.

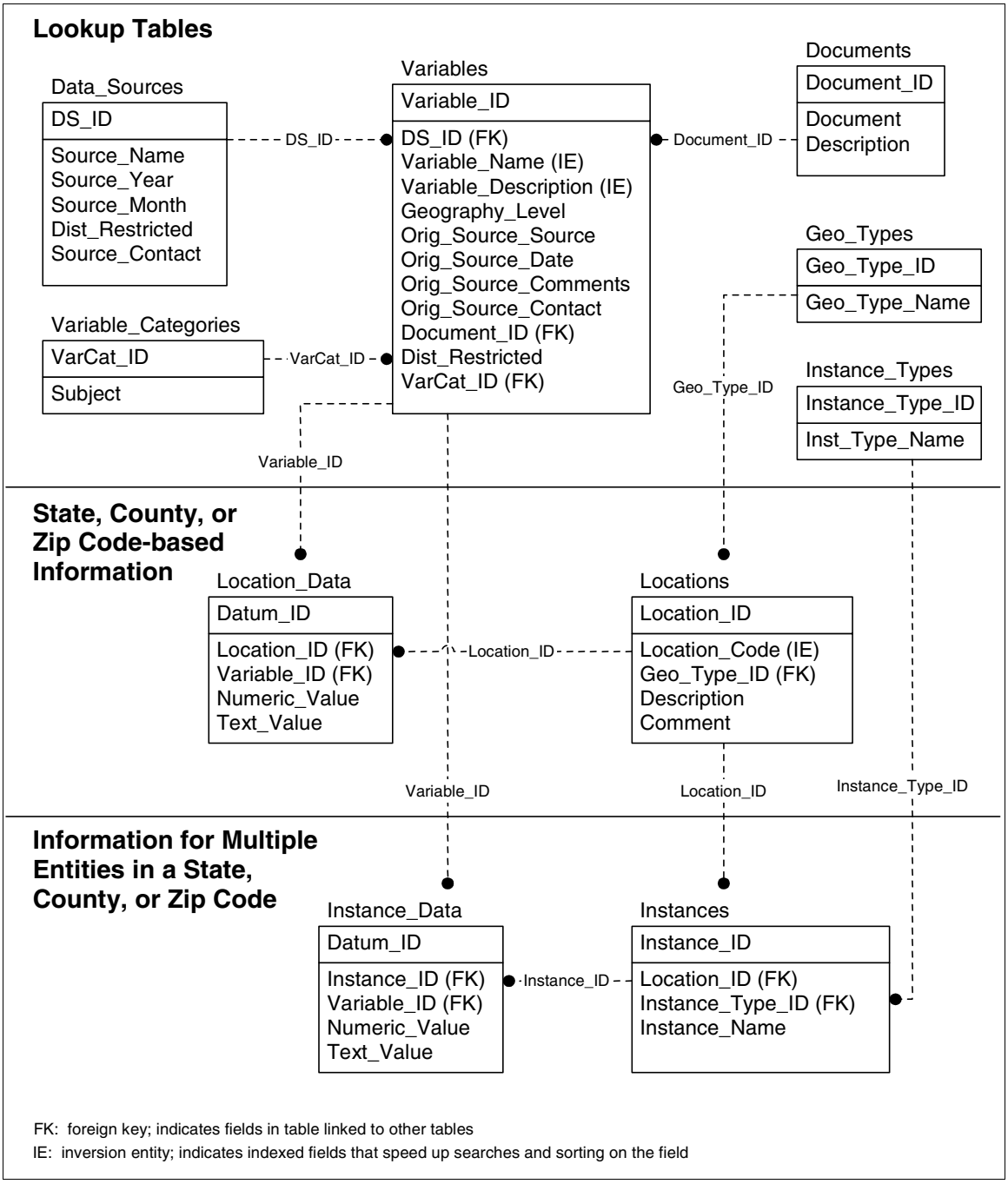
In the diagram, tables are connected with lines to show relationships. The field names that link the two tables are indicated on the connecting lines. Lines that end with a round bullet show where one record in the parent table is related to several records in the child table (one-to-many relationships).

The Entity Relationship Diagram is followed by a Database Dictionary, which provides information for each database table listed above and shown in the Entity Relationship Diagram. These are grouped into three sections corresponding to the diagram. The first group (top segment of Figure 16) are Lookup Tables. The second group (middle tier of Figure 16) contains information at the state, county, or zip code level. The third group (bottom tier of Figure 16) contains information from multiple entitles within a state, county, or zip code.

Table 12
Database component tables: names and descriptions

Table Name	Description	Type
Data_Sources	Information about the source of the data, including time of release and whether release of data are restricted by confidentiality or licensing agreement	Lookup table
Variable_Categories	Codes for variable categories used to group variables by subject	Lookup table
Variables	Entity codes to describe what is being measured	Lookup table
Documents	Documents associated with variables; pdf documents stored as OLE objects in the database table	Lookup table
Geo_Types	Codes for geographic unit types (e.g., county, zip code); these is used to determine which GIS map layer is linked with the data	Lookup table
Instance_Types	Codes to indicate the type of instance, where more than one "instance" can occur in a given geographic unit; examples of instances are hospital, provider, and service	Lookup table
Locations	List of geographic locations in the database, using standardized location codes (i.e., FIPS) when applicable	State, county, or zip code based information
Location_Data	Data that pertain to a single location (e.g., state, county, zip code); this table will contain most data values (e.g., county disease rates, population over age 65, etc.)	State, county, or zip code based information
Instances	Entities that can occur more than once in a geographic area (such as individual hospitals in a given county)	Information for multiple entities in a state, county, or zip code
Instance_Data	Data that pertain to a single instance (e.g., bed capacity of a single hospital)	Information for multiple entities in a state, county, or zip code

Figure 16
Market area database entity relationship diagram



FK: foreign key; indicates fields in table linked to other tables
IE: inversion entity; indicates indexed fields that speed up searches and sorting on the field

6.2.2 Database Dictionary

The design of the 10 component tables in the Access database is described in Tables 13 through 22. The header in each table contains the table's name, followed by a caption that describes the table contents. The columns within the table identify

- Field name;
- Data type (Type): Text, Long Integer (whole number), Boolean (yes/no), Double (floating point number);
- Size (bytes); and
- Description: Begins with a description of the data in the field and, for standardized locations or data types, ends with the link to the appropriate lookup table.

Tables 13 through 22 correspond directly to the table components depicted in Figure 16.

Table 13
Lookup tables: Data_Sources
Information about the source of data (e.g., 1990 Census).

Field Name	Type	Size	Description
DS_ID	Long Integer	4	Unique ID for source of data
Source_Name	Text	125	Name of data source (e.g., Census Data 1990)
Source_Year	Text	12	Year of release (e.g., 1990)
Source_Month	Text	2	Month of release, if applicable, as 2 character text (e.g., 01 for January)
Dist_Restricted	Text	50	Distribution information for data; one of unrestricted, requires data user agreement, or restricted
Source_Contact	Text	255	Data source contact information

Table 14
Lookup tables: Variable_Categories
Codes for variable categories used to group variables by subject.

Field Name	Type	Size	Description
VarCat_ID	Long Integer	4	Unique ID for variable category
Subject	Text	255	Subject/category description

Table 15
Lookup tables: Variables

Entity codes to describe what is being measured for a location or instance.

Field Name	Type	Size	Description
Variable_ID	Long Integer	4	Unique ID for variable
DS_ID	Long Integer	4	Unique ID for source of data; linked to Data_Sources table
Variable_Name	Text	25	Code used to refer to data variable (e.g., Land_Area, Total_Population)
Variable_Description	Text	255	Longer description of variable
Geography_Level	Text	100	Geography level for variable data (e.g., state, county, zip)
Orig_Source_Source	Text	255	Source name given in original source
Orig_Source_Date	Text	50	Date given by original source
Orig_Source_Comments	Text	255	Comments in original source
Orig_Source_Contact	Text	50	Website, agency, or person to contact for additional information
Document_ID	Long Integer	4	ID of associated document if applicable ; linked to Documents table
Dist_Restricted	Text	50	Distribution information for data; one of unrestricted, requires data user agreement, or restricted
VarCat_ID	Long Integer	255	Variable category—linked to Variable_Categories Table

Table 16
Lookup tables: Documents

Documents containing additional information about the variables.

Field Name	Type	Size	Description
Document_ID	Long Integer	4	Document ID
Document	OLE object	0	Document about variables in database
Description	Text	255	Description of document

Table 17
Lookup tables: Geo_Types

Codes for geographic object types (states, counties, zip codes).

Field Name	Type	Size	Description
Geo_Type_ID	Long Integer	4	Unique ID for type of geography
Geo_Type_Name	Text	10	Name of geography type (one of "Nation," "State," "County," "Zip Code")

Table 18
Lookup tables: Instance_Types

Codes to indicate the type of instance (e.g., Provider, Hospital, Service).

Field Name	Type	Size	Description
Instance_Type_ID	Long Integer	4	Unique ID for each Instance Type
Inst_Type_Name	Text	50	Name of the Instance (e.g., Provider, Hospital, Physician, Service)

Table 19
Information for state, county, or zip code: Locations

List of geographic locations (e.g., state, counties) in database.

Field Name	Type	Size	Description
Location_ID	Long Integer	4	Unique ID for each location (state, county, zip code, etc.)
Location_Code	Text	15	Code used to identify location (typically FIPS code)
Geo_Type_ID	Long Integer	4	Unique ID for type of geography; linked to Geo_Types table
Description	Text	255	Description of location
Comment	Text	255	Comment

Table 20
Information for state, county, or zip code: Location_Data
Data that pertain to a single location (e.g., state, county, zip code).

Field Name	Type	Size	Description
Datum_ID	Long Integer	4	Unique ID for each value in the table
Location_ID	Long Integer	4	Location ID of the location that this value pertains to; linked to Locations table
Variable_ID	Long Integer	4	Unique ID for variable; linked to Variables table
Numeric_Value	Double	8	Only filled if variable is a numeric quantity (e.g., Number of Physicians in county)
Text_Value	Text	50	Only filled if variable is a text value (e.g., Urban, Rural)

Table 21
Information for multiple entities within a state, county, or zip code: Instances
Entities that can occur more than once in a geographic area (such as hospitals in a state).

Field Name	Type	Size	Description
Instance_ID	Long Integer	4	Unique ID for each Entity in geographic area
Location_ID	Long Integer	4	Location ID that indicates where the entity is; linked to Locations table
Instance_Type_ID	Long Integer	4	Code to indicate type of entity; linked to Instance_Types table
Instance_Name	Text	255	Name of instance (e.g., “Memorial Hospital”)

Table 22
Information for multiple entities within a state, county, or zip code: Instance_Data
Data that pertain to a single instance.

Field Name	Type	Size	Description
Datum_ID	Long Integer	4	Unique ID for each value in the table
Instance_ID	Long Integer	4	The unique instance that this value applies to; linked to Instances table
Variable_ID	Long Integer	4	Unique ID for variable; linked to Variables table
Numeric_Value	Double	8	Filled for numeric data only
Text_Value	Text	100	Filled for text data only

6.3 Performing More Advanced Queries

Some simple queries (listed in Section 3) are included in the database to quickly create crosswalks and lists of variables and codes that are commonly used in research. One of the most important capabilities of this database is the ability to perform relational queries. Using this query function, CMS can search the database for data that meet criteria set by the user. In many cases, the database will be used to locate geographic areas that meet specific, multiple conditions. We will describe next how this works.

6.3.1 Using Queries to Find and List Data and Create Data Sets for Export

Following are examples that demonstrate how the tables in the Market Area Selection database can be populated and queried. Although location codes and variable names in these tables are accurate, data values themselves have been generated for demonstration purposes only. We begin by describing how the data are populated in the database and then move more specifically to queries.

6.3.2 Data Queries

To get data back out of the database for analysis purposes, queries are performed on the database tables. This can be done using different types of Access queries, but an easy one-step method is to use a crosstab query. This type of query is often used for grouping records by a common key field. Microsoft Access provides a Crosstab Query Wizard, which will walk through the steps in creating a crosstab query, or the query can be created without the wizard in design view.

Figure 17 shows the Access Query Design Window for the crosstab query. In this case, numeric values are obtained from the Location_Data table and linked with the Locations and Variables tables to produce a table that displays the two variables, PIP-DCG_96 and MCPENE02, with their county codes and descriptions (Table 23).

Figure 17
Query design window for crosstab query

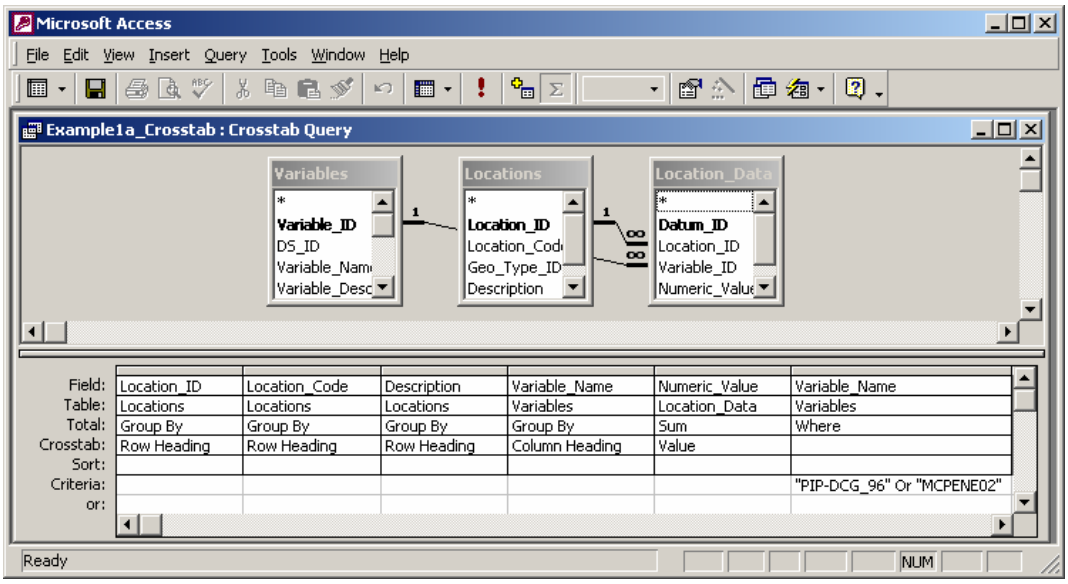


Table 23
Partial Results of crosstab query on Location_Data_Crosstab table

Location_ID	Location_Code	Description	MCPENE02	PIP-DCG_96
1	01001	AL—Autauga	0	1.0049
2	01003	AL—Baldwin	0.0034156	0.9803
3	01005	AL—Barbour	0	1.1491
4	01007	AL—Bibb	0.02297496	1.075
5	01009	AL—Blount	0.1186276	1.0748
6	01011	AL—Bullock	0	1.2127
7	01013	AL—Butler	0	1.1667

A crosstab query can also be created to query text values from the Location_Data table by using the Text_Value field as the Value. Figure 18 is an example of a crosstab query to obtain the state abbreviation (F12424) and the SSA code (SSAcode_FIPS) for each FIPS code. This time, instead of using the variable name to select the values of interest, the variable ID is used (the SSA code has variable_ID=1491; the state abbreviation has variable_ID = 2). Because the variable ID is a primary key, the query will run slightly faster than using the variable name. Table 24 shows the first few records resulting from the query.

Figure 18
Query design window for text crosstab query

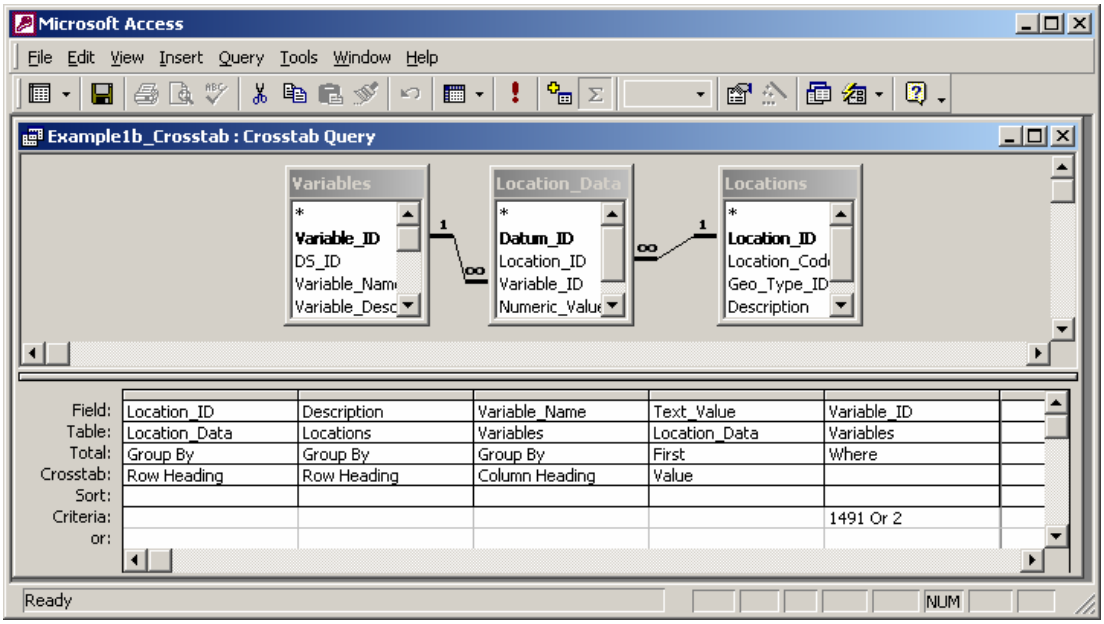


Table 24
Partial results of text crosstab query

Location_ID	Description	F12424	SSAcode_FIPS
1	AL—Autauga	AL	01000
2	AL—Baldwin	AL	01010
3	AL—Barbour	AL	01020
4	AL—Bibb	AL	01030
5	AL—Blount	AL	01040
6	AL—Bullock	AL	01050
7	AL—Butler	AL	01060

Because a crosstab query can only use one value field, numeric values and text values must be queried separately. To combine the numeric and text values, a third select query must be performed to link the location Ids from the two crosstab queries. Figure 19 shows how the first two crosstab queries are linked to combine both numeric and text values by FIPs code. The first few results are shown in Table 25.

Figure 19
Query design for select query to combine numeric and text values

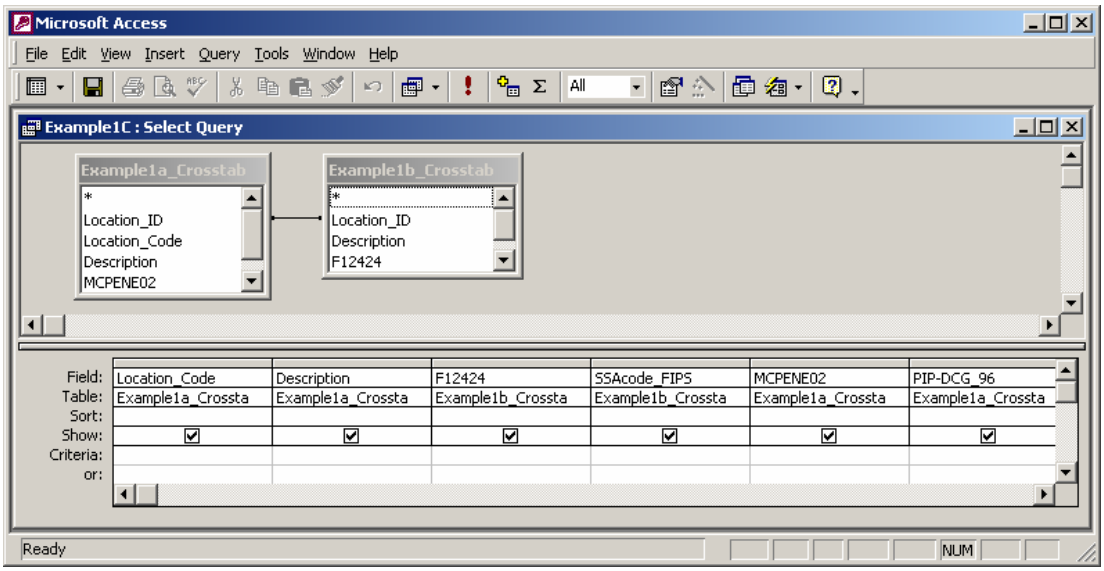


Table 25
Partial results of select query in Figure 19

Location_Code	Description	F12424	SSAcode_FIPS	MCPENE02	PIP-DCG_96
01001	AL—Autauga	AL	01000	0	1.0049
01003	AL—Baldwin	AL	01010	0.0034156	0.9803
01005	AL—Barbour	AL	01020	0	1.1491
01007	AL—Bibb	AL	01030	0.02297496	1.075
01009	AL—Blount	AL	01040	0.1186276	1.0748
01011	AL—Bullock	AL	01050	0	1.2127
01013	AL—Butler	AL	01060	0	1.1667

The previous examples all show queries on county-level variables. The same queries can be performed on state-level variables that can then be combined with the county-level data, repeating the state-level data for each county in the state. First, a select query is performed to select the state-level data of interest (Figure 20). Table 26 shows the first few results. Note that for the state-level FIPS code, the Comment field contains the state abbreviation.

Figure 20
Query design window for select query of state-level data

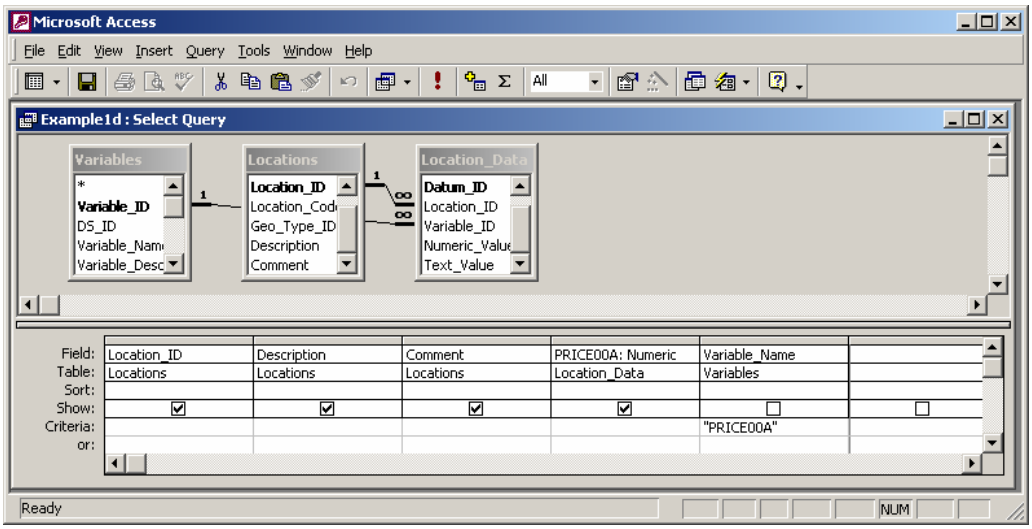


Table 26
Partial results of Figure 20 select query of state-level data

Location_ID	Description	Comment	PRICE00A	Location_ID	Description
3229	Alabama	AL	919.57581875	3229	Alabama
3230	Alaska	AK	840.503571428571	3230	Alaska
3232	Arizona	AZ	899.782429376923	3232	Arizona
3233	Arkansas	AR	796.703710231818	3233	Arkansas
3234	California	CA	1020.71956491304	3234	California
3236	Colorado	CO	748.198882140426	3236	Colorado
3237	Connecticut	CT	929.118888888889	3237	Connecticut

To join the state-level data for variable PRICE00A to the county-level data, a select query joining the F12424 state abbreviation text values from the county-level select query (Figure 19) and the Comment state abbreviations from the state-level select query (Figure 20) can be performed (Figure 21). The resulting records, shown in Table 27, repeat the state-level data for each county in the state. This could be useful in applying criteria on both county- and state-level data simultaneously.

Figure 21
Query design window for combining county- and state-level data

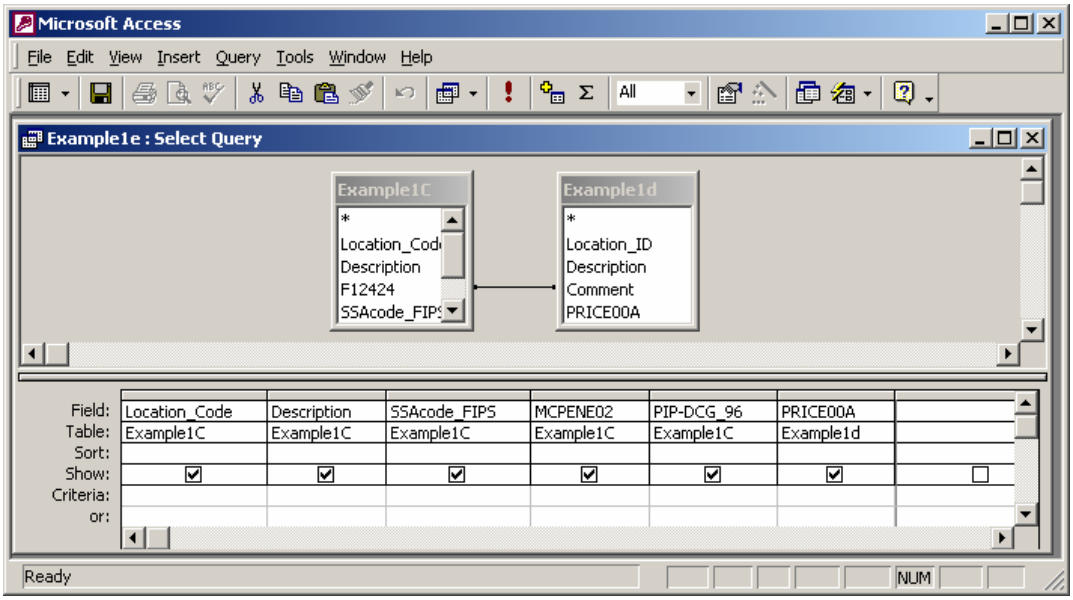


Table 27
Partial results of Figure 21 select query to combine county- and state-level data

Location_Code	Description	SSAcode_FIPS	MCPENE02	PIP-DCG_96	PRICE00A
01001	AL—Autauga	01000	0	1.0049	919.5758
01003	AL—Baldwin	01010	0.0034156	0.9803	919.5758
01005	AL—Barbour	01020	0	1.1491	919.5758
01007	AL—Bibb	01030	0.02297496	1.075	919.5758
01009	AL—Blount	01040	0.1186276	1.0748	919.5758
01011	AL—Bullock	01050	0	1.2127	919.5758
01013	AL—Butler	01060	0	1.1667	919.5758

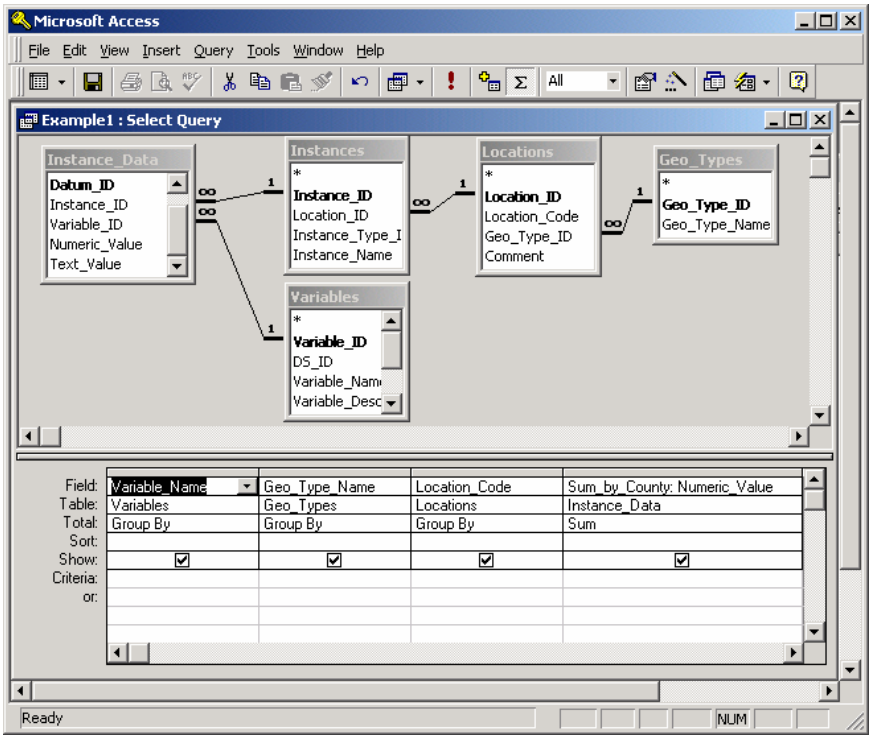
Table 28, the Instance_Data table, contains numeric data on the capacity of individual hospitals. If the instance data need to be aggregated by county for an analysis, a select query can be performed.

Table 28
Results of select query on Instance_Data table

Variable_Name	Geo_Type_Name	Location_Code	Sum_by_County
Hospital capacity by number of patient beds	County	37063	1683
Hospital capacity by number of patient beds	County	37077	500
Hospital capacity by number of patient beds	County	37183	1408

Figure 22 shows the design of a select query using the Access Query Design Window. In this query, the data in the Numeric_Value field of the Instance_Data table are summed, by county, to determine total capacity (i.e., number of hospital beds) for each county. Figure 22 shows the relationship among the five tables involved. Results of this query are shown in Table 28. The aggregated results can be joined by the location code to other county-level data.

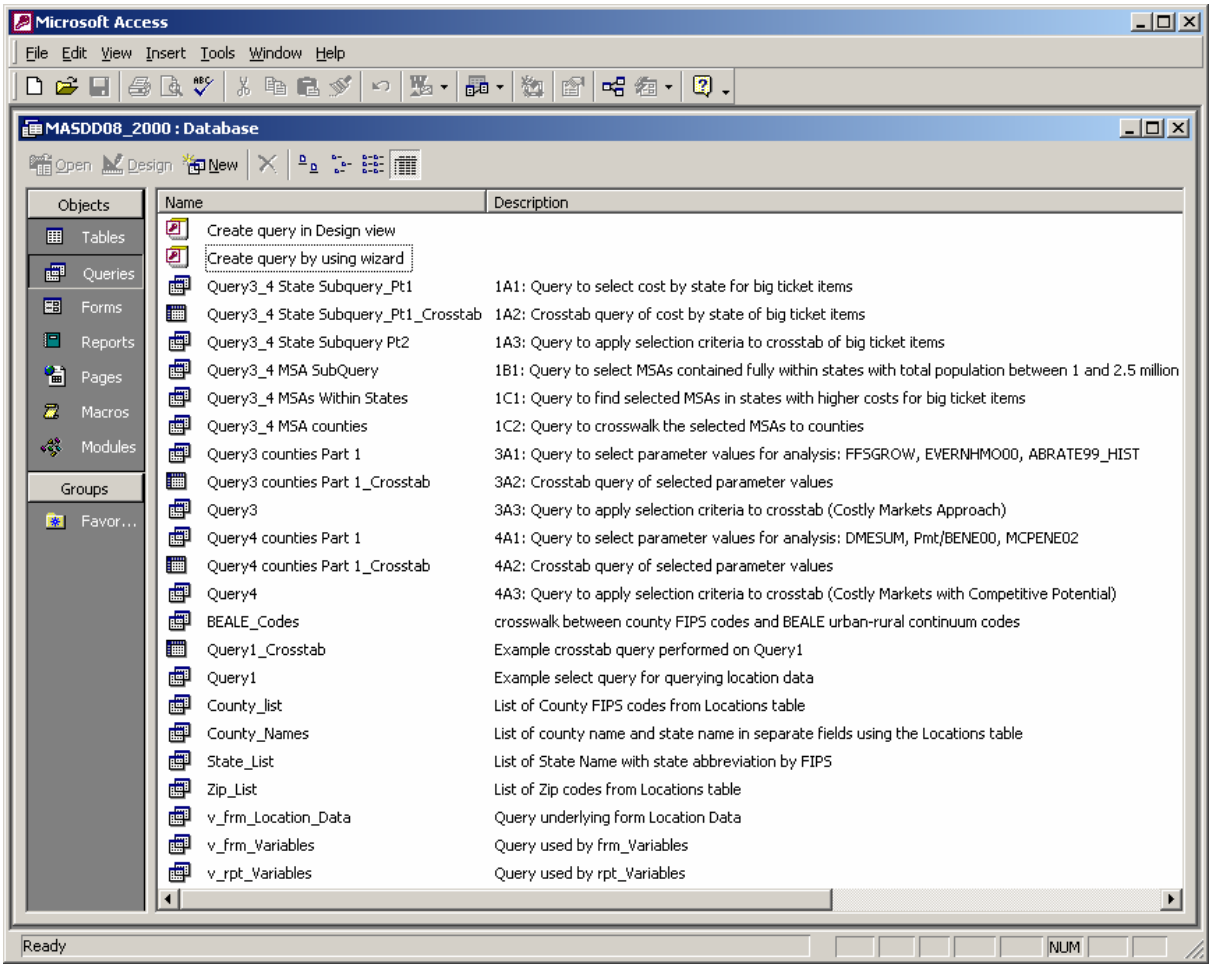
Figure 22
Query design for select query on Instance_Data table



After building an Access query, it can be saved by choosing File—Save on the menu, by clicking on the floppy disk icon on the toolbar, or the program will prompt to save the query, if it has not yet been saved, when the query is closed. After a query is saved, it can be exported to Excel by clicking on the closed query and choosing File—Export from the menu or by right clicking on the closed query and choosing export. An export window will then appear, and Excel can be chosen in the "save as type" box in the lower left of the window. A file name and location are also required when exporting the results of a query to a file. Query results can also be copied and pasted from Access into Excel, but caution should be used to make sure that all desired results are highlighted when being copied.

A series of standardized queries have been developed and stored in the Market Area Selection Database (Figure 23). These can be used over and over again to produce data tables, even after new data are added to the database. In addition, any number of other queries can be created to ask questions of the data or to create tables for export to other file formats.

Figure 23
Example list of queries under the Queries object



Descriptions of each query are provided in the database. If the descriptions are not visible, select View—Details from the menu. Because many queries use other queries as components, especially crosstab queries, the queries will run slowly. Query1 and Query1_Crosstab allow variables to be selected in Query1 and run as a crosstab query in Query1_Crosstab. The County_List, County_Names, State_List, and Zip_List queries all list location codes and descriptions by geography type. These queries can be useful when importing new data. The BEALE_Codes query is a handy crosswalk query between county FIPS codes and BEALE urban–rural continuum codes. The queries v_frm_Location_Data, v_frm_Variables, and v_rpt_Variables are all used by the forms and reports provided in the database. Changes made to these queries may result in the forms and reports not working.

6.3.3 Adding Data to the Database

The following is an example of how parameters from the Area Resource File and the Census 1990 STF3A file would be populated in the database. Table 29 contains records from the Area Resource File for six counties. Table 30 contains poverty data from the 1990 Census for the same counties. Two data records are created to store the data source information in the Data_Sources table (Table 31).

Table 29
Raw data from area resource file

[1]f00010	[2]f12424	[3]f00011	[4]f00012	[5]f1193696
Baltimore City	MD	24	510	138
Howard	MD	24	027	210
Prince Georges	MD	24	033	174
Durham	NC	37	063	198
Granville	NC	37	077	187
Wake	NC	37	183	217

[1]f00010 is the county name.

[2]f12424 is the state name abbreviation.

[3]f00011 is the FIPS state code.

[4]f00012 is the FIPS county code.

[5]f1193696 is the 3-year average (1996 through 1998) number of deaths by chronic obstructive pulmonary disease.

Table 30
Raw data from STF3A, 1990 census

Area name	[1]State (FIPS)	[2]County	[3]P1170022
Baltimore (City) County, MD	24	510	32,154
Howard County, MD	24	027	4,566
Prince Georges County, MD	24	033	16,798
Durham County, NC	37	063	12,492
Granville County, NC	37	077	2,312
Wake County, NC	37	183	9,013

[1]State (FIPS) is the FIPS state code.

[2]County is the FIPS county code.

[3]P1170022 is the population aged 60 to 64 living below the poverty level.

Table 31
Data_Sources table

DS_ID	Source_Name	Source_Year	Source_Month	Dist_Restricted	Source_Contact
1	Area Resource File	2001		unrestricted	Example only
2	STF3A	1990		unrestricted	Example only

Two variables, “F11936-96” and “P1170022” are created to represent the Area Resource File and Census STF3A variables, f1193696 and P1170022 (Table 32). These are stored in the Variables table with unique Variable_IDs and data source IDs of DS_ID = 1 and DS_ID = 2, respectively. The DS_ID values link back to the Data_Sources table.

Six records are created in the Locations table (Table 33). A unique ID, Location_ID, is assigned to each record. These Location_ID numbers do not correspond to geography. These records also contain the location codes for the data (Location_Code)—in this case, the county FIPS. These location codes are geocodes and will ultimately link to geographic units in the GIS map layers. Note in Table 33 that the value in the Location_Code column is the state FIPS combined with the county FIPS. This is required because the three-digit (i.e., county) FIPS codes are not unique across states.

Table 32
Variables table

Variable_ID	DS_ID	Variable_Name	Variable_Description	Orig_Source_ Source	Dist_Restricted	Comment
1	1	F11936-96	Chronic obstructive pulmonary disease deaths (3-year average)	NCHS Mortality Tape	unrestricted	Example only
2	2	P1170022	Number of persons aged 60 to 64 living below poverty level	1990 Census STF3	unrestricted	Example only

Table 33
Locations table

Location_ID	Location_Code	Geo_Type_ID
108	24510	3
510	24027	3
514	24033	3
872	37183	3
927	37063	3
1032	37077	3

The Geo_Type_ID in the Locations table is linked to the Geo_Types table (Table 34). This table is used to identify which geographic map layer is used to map data and display query results. It is necessary because different map layers exist for different geographic units (e.g., counties, states).

The values for the two new variables, "F11936-96" and "P1170022," are filled in the Location_Data table (Table 35). The Datum_ID is a unique ID for each record in this table, and the Location_ID and Variable_ID are filled using the Locations table and the Variables table, respectively. The numeric values for Variable_ID 1 are chronic obstructive pulmonary disease (COPD) deaths. Those for Variable_ID 2 represent the number of persons aged 60 to 64 living below the poverty threshold.

Table 34
Geo_Types table

Geo_Type_ID	Geo_Type_Name
1	Nation
2	State
3	County
4	Zip code

Table 35
Location_Data table

Datum_ID	Location_ID	Variable_ID	Numeric_Value	Text_Value
101	108	1	138	
610	510	1	210	
672	514	1	174	
791	872	1	217	
1222	927	1	198	
1587	1032	1	187	
1673	108	2	32154	
1849	510	2	4566	
2012	514	2	16798	
2223	872	2	9013	
2987	927	2	12492	
3029	1032	2	2312	

Data that occur more than once in a geographic area would be stored in the Instances and Instance_Data tables. Table 36 is an example of how this type of data would be stored. Table 36 contains data on the number of patient beds by hospital with multiple hospitals per FIPS county code.

Table 36
Raw data from census TIGER/Line file (landmarks)

Name	FIPS	Capacity
Dorothea Dix State Hospital	37183	625
Duke Hospital	37063	1,235
Murdoch Center	37077	500
Wake Memorial Hospital	37183	783
Watts Hospital	37063	448

As in the first example, a new data source would be added to the Data_Sources table (Table 37), and a new variable would be added to the Variables table (Table 38). A new instance type would then be added to the Instance_Types table (Table 39). The Instance_Type ID is a unique ID assigned to each different type of instance. Examples of other instance types might be Physicians or Outpatient Surgery Centers.

Table 37
Data_Sources table

DS_ID	Source_Name	Source_Year	Source_Month	Dist_Restricted	Source_Contact
1	Area Resource File	2001		unrestricted	Example only
2	STF3A	1990		unrestricted	Example only
3	Hospital Example Source	2001	01	unrestricted	Example only

Table 38
Variables table

Variable_ ID	DS_ID	Variable_Name	Variable_Description	Orig_Source_ Source	Dist_Restricted	Comment
1	1	F11936-96	Chronic obstructive pulmonary disease deaths (3-year average)	NCHS Mortality Tape	unrestricted	Example only
2	2	P1170022	Number of persons aged 60 to 64 living below poverty level	1990 Census STF3	unrestricted	Example only
3	3	Hosp_Capacity	Hospital capacity by number of patient beds	ABC file	unrestricted	Example only

Table 39
Instance_Types table

Instance_Type_ID	Inst_Type_Name
1	Hospital

Now the instance of each hospital can be added to the Instances table (Table 40). Each record is assigned a unique Instance_ID. The Location_IDs for the counties that these hospitals are in already exist in the Locations table, so no new locations need to be added. For example, Watts Hospital is in Durham County, North Carolina. Its Location_ID is 927. This corresponds with a county FIPS code of 37063 in the Locations table.

Table 40
Instances table

Instance_ID	Location_ID	Instance_Type_ID	Instance_Name
1	927	1	Watts Hospital
2	927	1	Duke Hospital
3	1032	1	Murdoch Center
4	872	1	Wake Memorial Hospital
5	872	1	Dorothea Dix State Hospital

The data for each instance can now be added to the Instance_Data table (Table 41). Each record in this table is assigned a unique Instance_ID. The information for Variable_ID 3, hospital capacity, is contained in the Numeric_Value field. These data are all linked to a geographic location via the Instance_ID, which links to the Instances table. That table contains a Location_ID that links back to the Locations table. Through these linkages, or "relations" that have been set up among tables, queries can be generated and results can be mapped and analyzed.

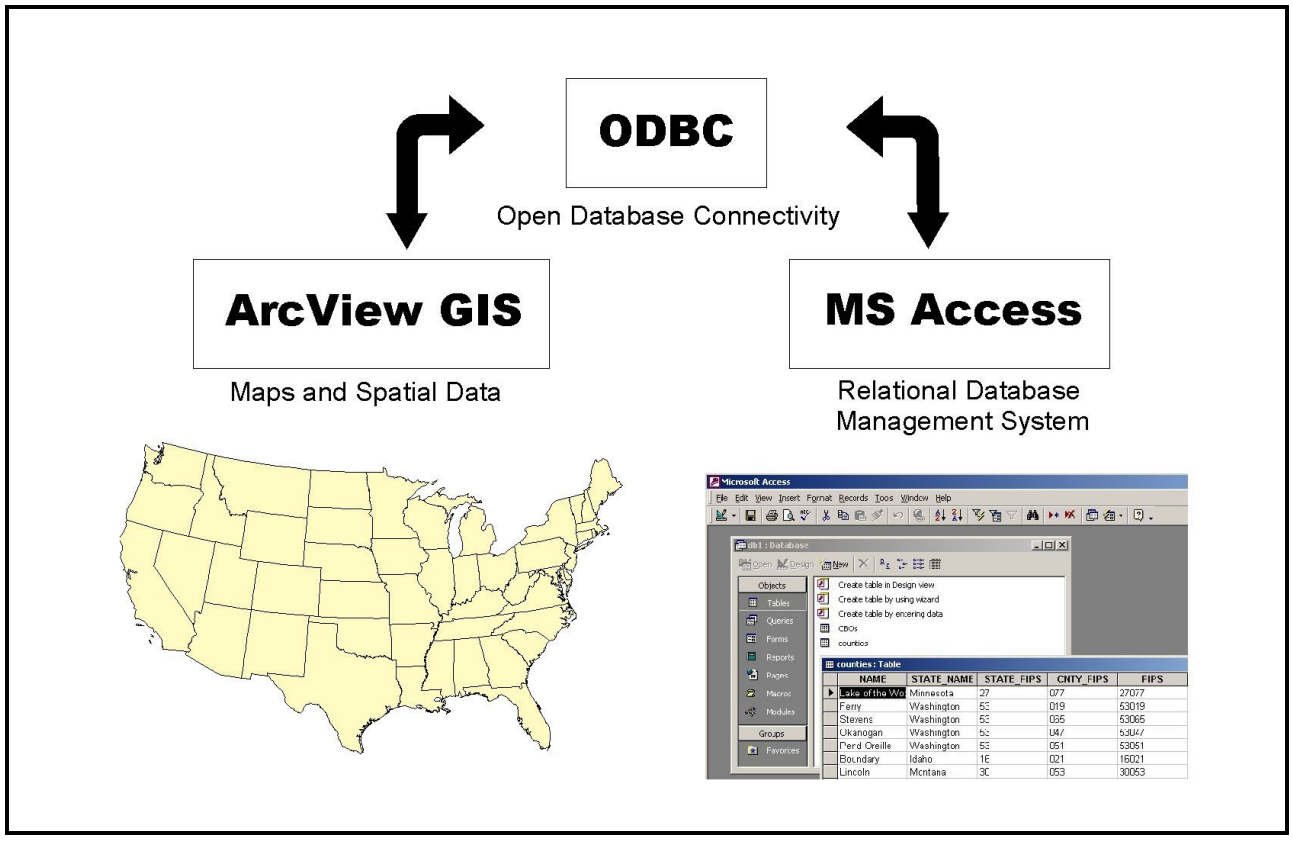
6.4 Linking Tables and Queries to Geographic Data in a GIS

Linkages between the Access tables and queries and ArcView map layers can be facilitated through the use of ArcView's Database Access extension and Microsoft's Open Database Connectivity (ODBC) standard (Figure 24). Records accessed in this manner can be represented in ArcView as a table that is linked by geographic codes (e.g., FIPS codes) to a digital cartographic database (also known as a "map layer"), or shapefile. This allows records in the table to be mapped, queried, and analyzed. It should be noted that the ODBC standard can be used with many of the ESRI GIS software products, including ArcView 3.2a, ArcView 3.3, ArcView 8.x, and ArcMap.

Table 41
Instance_Data table

Datum_ID	Instance_ID	Variable_ID	Numeric_Value	Text_Value
1	5	3	625	
2	2	3	1235	
3	3	3	500	
4	4	3	783	
5	1	3	448	

Figure 24
Conceptual diagram of open database connectivity



The most commonly used boundary files are U.S. states and counties. These files have been derived from U.S. Census TIGER/Line files and other sources and are stored in RTI's national geo-database.

6.5 Importing New Data into the Database and Deleting Data from the Database

6.5.1 Importing New Data

Many of the details for adding new data to the database are described in Section 6.3.3. For data by location, first the variables and the associated information must be entered into the database, then the data to be imported must be linked to the locations in the locations table to get the location IDs, and finally the data can be added to the Location_Data table. To add instance data to the database, first the variables and instance type must be entered, then the instances must be linked to a location and added to the Instances table, and finally the data can be added to the Instance_Data table. In general, the easiest way to add imported data files to the database is to use an Append Query.

Figure 25 is an example of the design window for an Append Query used to add data to the Locations table for variable ID 1592, NUMPPO00. After the electronic file has been imported into the database and the variables added, the imported table can be joined to the Locations table using the appropriate geographic entity, and the data can be appended to the Location_Data table for each variable ID. Similarly, instance data can be added with the instances added first to the Instances table by location, then the data for each instance added to the Instance data table by linking on the Instances table. One important note in adding data from imported electronic files to the database is to make sure that the data to be added are by the appropriate geographic codes (e.g., state FIPS codes for state-based data, county FIPS codes for county-based data). For electronic files that are not in a format readily imported into the database, programs can be written in the Access database to manipulate the data into a more easily handled file format.

6.5.2 Data Removal: The Delete Query

To remove data for a given variable from the database, a delete query is used to first delete all the data for the variable from either the Location_Data or Instance_Data table. Figure 26 shows a delete query to delete all the data for variable ID 3 from the Location_Data table. To create a delete query, first design a select query to select the data that you want to delete, then choose Query—Delete Query from the menu. Running the query will delete all the selected records. To make sure that only the desired data are deleted, run the select query first to view the data to be deleted before running the delete query. After the data for a given variable have been deleted from the database, the variable information in the Variables table can then be deleted.

The user should at all times be aware that adding or removing data or changing any of the text fields in the database will permanently and immediately change the database. No SAVE step is required to make most changes permanent. This unforgiving property of the software is different from what most users may be accustomed to with other Microsoft products. A backup copy of the database should be kept at all times, and the database should remain locked except when being modified by the database administrator.

Figure 25
Query design window for append query

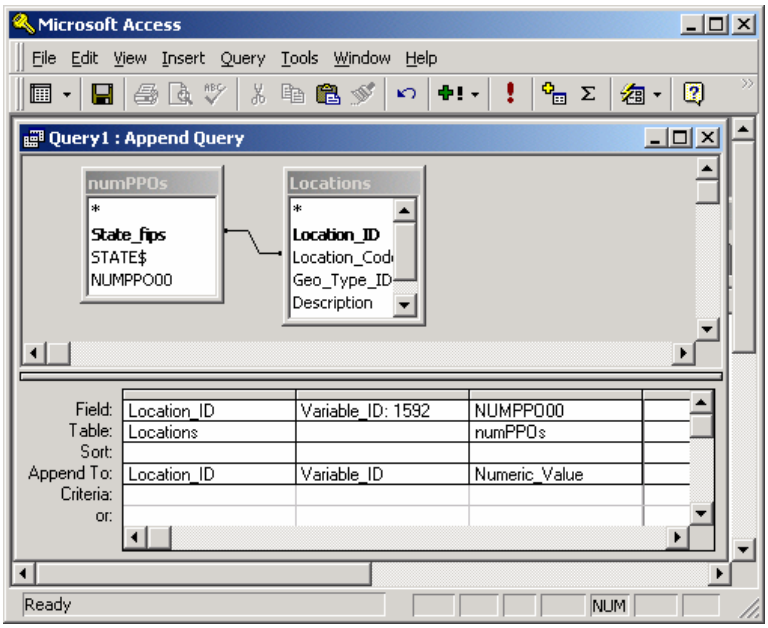
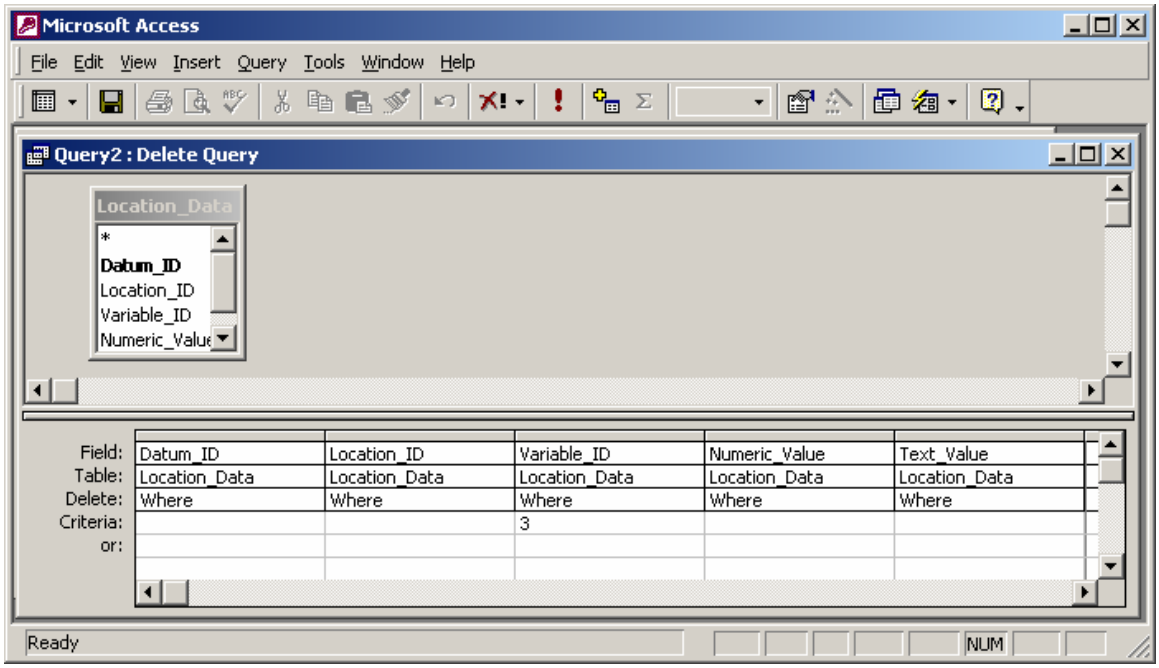


Figure 26
The delete query used to remove data from the database



The database will be delivered in READ ONLY format. The database administrator will need to turn off this attribute before any changes can be made to the database. At other times, the database should remain locked. To be sure the database is locked, find the database while in Windows Explorer, and right-click with the mouse. Choose PROPERTIES, then under the General tab, be sure the READ ONLY attribute is checked. Check it, and then click OK to effect the write protection attribute.

REFERENCES

Cawley, J., Chernew, M., and McLaughlin, C.: HMO Participation in Medicare Managed Care. Working paper presented at the 12th annual Health Economics Conference co-sponsored by Duke, UNC, and the Management Science Group at the Department of Veterans Affairs. Contact: jcawley@umich.edu, April 2001.

Cuellar, A., and Gertler, P.: Strategic Integration of Hospitals and Physicians. Working paper presented at the 12th annual Health Economics Conference co-sponsored by Duke, UNC, and the Management Science Group at the Department of Veterans Affairs. Contact: acuellar@pobox.com, April 2001. .

Dowd, B., Coulam, R., and Feldman, R.: A tale of four cities: Medicare reform and competitive pricing. Health Affairs 19(5):9-29, 2000.

Dutt, H., Freeland, M., Smith, J., and Zezza, M.: A Sensitivity Analysis of the County, MSA, and Empirical Market Area as Medicare HMO Payment Areas. Paper presented at the 2000 AEA/ASSA meetings, New Orleans, LA, 2000.

Escarce, J., Kapur, K., Joyce, G., and Van Vorst, K.: Medical care expenditures under gatekeeper and point-of-service arrangements. Health Services Research 36(6):1037-1057, 2001.

Fujita, M., and Thisse, J.: Economics of agglomeration." Journal of the Japanese and International Economies 10:339-378, 1996.

Garnick, D.W., Luft, H.S., Robinson, J.C., and Tetreault, J.: Appropriate measures of hospital market areas. Health Services Research 22(1):69-89, 1987.

Grefer, J., Mobley, L., and Frech III, H.E.: Where do HMOs and PPOs locate? debunking an urban myth. One of three papers in J. Grefer's Ph.D. dissertation, University of California at Santa Barbara, 2002.

Griffith, J.R.: Determining population service areas and calculating use rates, In: Quantitative Techniques for Hospital Planning and Control. Lexington, MA: Lexington Books, 1972.

Gross, D.: Trends in the Costs, Coverage, and Use of Prescription Drugs by Medicare Beneficiaries. AARP Public Policy Institute <http://research.aarp.org/health/dd63_trends.html>, July 2001.

Health Affairs Press Release: <http://www.healthaffairs.org/press/marapr0102.htm>.

Heinrich, J.: Nursing Workforce: Multiple Factors Create Nurse Recruitment and Retention Problems. GAO Report, GAO-01-912-T, June 27, 2001.

Hoerger, T.J., Lindrooth, R.C., and Sfekas, A.: Site selection analyses. Memorandum to the Health Care Financing Administration, 1999.

InterStudy: County HMO enrollment trends. InterStudy Publications' Quarterly Newsletter 3(1, Spring):1-2, 2002.

Jennings, R.: Special Edition Using Microsoft Access 2000. Indianapolis: Que Publishing, 1999.

Krugman, P.: Increasing returns and economic geography. Journal of Political Economy 99(3):483-499, 1991.

Medicare Payment Advisory Commission (MEDPAC): Report to the Congress: Medicare in Rural America. June 2001.

Morrill, R.L., and Earickson, R.: Hospital variation and patient travel distances. Inquiry 5(4):26-34, 1968.

Morrisey, M., and Jensen, G.: Hospital demand for physicians. The Quarterly Review of Economics and Business 30(1):16-39, 1990.

Morrisey, M.: Competition in hospital and health insurance markets: a review and research agenda. Health Services Research 36(1):191-221, April 2001.

Morrisey, M.A., Sloan, F.A., and Valvona, J.: Defining geographic markets for hospital care. Law and Contemporary Problems 51(2):165-194, 1988.

Nichols, L.M., and Reischauer, R.D.: Who really wants price competition in Medicare managed care? Health Affairs 19(5):30-43, 2000.

Penrod, J., McBride, T., and Mueller, K.: Geographic variation in the determinants of Medicare managed care enrollment. Health Services Research 36(4):733-750, 2001.

RTI: Market Area Selection and Data Development for Medicare Fee-for-Service Reform. Interim report prepared for the Centers for Medicare & Medicaid Services. Research Triangle Park, NC: RTI International, 2002.

Strunk, B., Ginsburg, P., and Gabel, J.: Web Exclusive: Tracking Health Care Costs. <http://www.healthaffairs. org/Strunk_Web_Excl_92601.htm>. Health Affairs, 2001.

APPENDIX A:
LITERATURE REVIEW AND PAST PERFORMANCE
FROM INTERIM REPORT

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A.1 PREFERRED PARTICIPANTS/PREFERRED PROVIDER ORGANIZATIONS

The major goal of this initiative is to offer to beneficiaries an alternative to traditional FFS Medicare through a managed care PPO product. The implementation challenge is to identify markets with potential for successful launch of a Medicare PPO, provided by private insurance organizations. Success will depend on both supply and demand characteristics in the market. We review the literature next to see what factors are important. We then use economic theory to identify the most important factors. Finally, we consider the appropriate market definition to employ, obtain data at the market level, and describe the GIS relational database method that will exploit information from key variables and geography, to discover a set of markets with good potential for success.

A.1.1 Literature/Past Performance Review

The availability of choice among plans is an important benefit to consumers. Medicare currently offers the elderly and disabled a traditional FFS plan, which they can supplement with private insurance to reduce out-of-pocket costs and/or provide additional benefits (like outpatient pharmaceutical coverage). In some areas, the elderly can opt for a Medicare+Choice plan, which can provide the same or better set of services as FFS plus MediGap, generally at a reduced total premium to beneficiaries. Plans that can accomplish this do so through a mix of favorably negotiated provider arrangements, review of service utilization, and the financial benefits of enrolling healthier than average Medicare beneficiaries. These plans compete by increasing benefits and/or reducing premiums as compared to traditional FFS plans (Penrod, McBride, and Mueller, 2001). However, in the past few years, the number of Medicare+Choices plans offering significant extra benefits, particularly prescription drugs, has markedly declined. In order for the managed care plan to succeed in attracting beneficiaries, the additional benefits it provides must be perceived as having at least as much value as the alternative—FFS coverage with the option for supplemental coverage, and complete freedom to choose providers.[5]

The PPO option must be offered at a price/benefit package that makes it attractive to beneficiaries, particularly those who lack retiree coverage and who cannot afford and/or get issued MediGap policies. Managed care of any type, including PPOs, is more likely to succeed in urban markets where provider competition allows efficient network formation and other market-size related efficiencies, so that costs savings can be partially passed on to consumers, leaving them better off and still permitting some profit margin for the MCO. MCOs experience greater efficiencies from agglomeration and dense networks in urban areas, and scale economies can be realized by extending these networks to include Medicare constituents. MCOs with established urban market presence in the private sector are more likely to offer Medicare+Choice plans (Penrod, McBride, and Mueller, 2001).

There are other reasons (besides the lack of dense market efficiencies) that Medicare+Choice arrangements have been less successful getting established in rural areas. Monopoly providers in rural markets have little incentive to negotiate discounted rates with

[5]Enrollees are not free to use providers outside of the network in HMOs; they are able to go outside the network in PPOs, with some cost-sharing.

MCOs, because they can instead receive the higher FFS rates.[6] But raising payment rates for MCOs in rural areas may not be sufficient to support managed care. Under the current Medicare+Choice payment system, base county payment rates in rural areas have been lifted to an artificial minimum level, or "floor," on the theory that higher payments would support managed care options in these areas. In general, however, this has not occurred. Another reason that Medicare MCOs have not entered rural markets is that rural elderly are often poor and do not use health care services at above average rates. Thus there are few service provision efficiency gains to be had from managed care. In fact, among the very poor, there has been under-utilization of care, which could spike up to a permanently higher level with availability of a MCO plan. The MCO would not be able to cover health care under these conditions at any cost savings to Medicare (MEDPAC, 2001). Finally, given the relatively sparse population in rural areas, it may be difficult to enroll enough beneficiaries in any managed care product to justify the costs associated with marketing and other fixed administrative functions.

A recent study by Penrod, McBride, and Mueller (2001) uses data on all U.S. counties to estimate the impacts of various factors affecting both the entry of MCOs into the Medicare+Choice market and the expected enrollment by beneficiaries in these plans. Similarly, Cawley, Chernew, and McLaughlin (2001) used ordered probit regression to estimate the predicted number of HMOs offering Medicare+Choice plans in a county based on entry conditions and beneficiary characteristics, using a time series from 1994 to 2000. Factors with the largest (and statistically significant) impacts on enrollment were the proportion of younger-elderly in the county, and the existence of a higher market share for private-sector HMOs. Factors with the largest (and statistically significant) positive impacts on HMO entry were urban-ness, elderly population in urban area and adjacent counties, growth in elderly population, and higher FFS payment rates. Income, education, and provider supply factors had mixed effects across these two studies, and neither controlled for market concentration in insurance or in hospitals. These concentration measures are important signals about the competitive conditions in markets.

Trend analysis of the relationship between Medicare HMO enrollments and Medicare+Choice reimbursement rates, by county, has been conducted for 1999–2001 (InterStudy, 2002). This analysis finds a strong positive correlation between penetration and reimbursement rates. Counties that increased enrollments in Medicare HMOs the most over time also saw large increases in reimbursement rates over time.

The literature to date has focused on the HMO Medicare+Choice plans. The health services and health economics literature more generally have also focused on HMOs, with the assumption that HMOs were a good proxy for all MCOs. Recently, it has been shown that HMOs and PPOs have different impacts, which is partly due to their different incentive structures, their location in different markets, and/or their marketing to different market niches (Morrisey, 2001; Grefer, Mobley, and Frech, 2002). The difference between HMO and PPO organizations and their locations was discussed in Section 2.1. HMOs have met moderate success in attracting enrollees in urban areas, but few are operational in rural areas (MEDPAC, 2001).

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[6]To illustrate this point, in 1999, private payments to rural hospitals were 34 percent above costs, while payments to urban hospitals were only 13 percent above costs (MEDPAC, 2001).

CMS has some history in pilot-testing new managed care products that attempted to mirror options available in the private sector, such as PPOs. Between 1997 and 1998, the agency initiated a series of demonstrations called "Medicare Choices." Initially solicited in eight target geographic areas with relatively high managed care payment rates, but low historic Medicare managed care penetration, the purpose of the project was to test the receptivity of Medicare beneficiaries to the broader options of managed care delivery systems. The original solicitation, which encouraged PPO and provider sponsored networks, featured options for alternative payment mechanisms, including risk sharing, and was widely received. Almost 400 applications for potential sites were received and reviewed. Eventually, 25 applications were selected for implementation, although not all actually became operational for various practical and financial reasons. CMS eventually implemented 11 sites.

A.1.2 Step One: Market Conditions and Key Factors

Based on our insights from the empirical literature and from economic theory, we can describe the conditions under which a PPO could be successful in marketing its plan to Medicare beneficiaries, at cost savings to Medicare. If a PPO option was offered to Medicare beneficiaries, allowing freedom of provider choice (with some cost sharing) and additional benefits, including some pharmaceutical coverage, it could potentially succeed in an urban area with high FFS rates and the right demographic mix of recipients. A recent study finds that medical care expenditures (using a general patient population) could be the same *or lower* in a point of service (POS) plan than in an HMO plan (Escarce et al., 2001).[7] So the same cost savings may be possible with either a PPO-type plan or an HMO-type plan, in urban areas.

A PPO plan might also succeed in a rural area where an HMO could not because of the lack of a large provider base and network economies. This could happen if a substantial portion of specialized inpatient care was shipped out to networked, in-plan providers in an adjacent urban area. The consumer could possibly get more benefits at about the same premium as the traditional (supplemented) FFS plan, but Medicare would have more control over the high-cost utilization that occurred in urban hospitals. This PPO option could thus possibly be (at least) budget-neutral. Implementation of this PPO plan would require rural markets adjacent to urban areas with well-established provider networks. The presence of growth potential in the younger-elderly population, high local premiums for MediGap coverage, high local FFS rates, and perhaps state programs offering assistance for pharmaceutical products, would enhance viability of the plan. The cost-spike risk posed to HMOs from enrolling poor rural constituents who under-utilize care under FFS plans would be moderated in PPOs by the cost-sharing requirement for out-of-plan use.

In both urban and rural markets, the addition of pharmaceutical benefits to the PPO plan would increase its popularity, but the industry trend is toward a reduction in these benefits, due

[7]The POS and HMO plans in this study utilized the same network of providers. In a POS plan, beneficiaries can go outside the network at some cost sharing; in the HMO plan, out-of-network utilization is prohibited (requires full cost sharing).

to escalating pharmaceutical expenditures and a downturn in the underwriting cycle.[8, 9] Marketing a plan with restrictive pharmaceutical benefits would be much easier in states that have pharmaceutical assistance programs for the elderly. States vary widely in the extent and type of assistance offered. At present, 20 states offer subsidized prescription drug coverage to some Medicare beneficiaries, and another 3 are developing coverage programs. Three additional states offer beneficiaries the opportunity to obtain discount drug prices, and two more are working to implement a discount plan. Two other states offer tax credits for prescription drug purchases. So 30 states have some sort of assistance in place or under development. Still, these programs cover only a small proportion of the Medicare population, as many have strict eligibility requirements (low income) and a restricted formulary (Gross, 2001).

With the recent and highly publicized backlash against managed care, and the uncertainty created by the withdrawal of many Medicare+Choice HMO plans in recent years, selling a new PPO option to the Medicare population may not be easy. One facet that may help in this endeavor is careful screening of plans that wish to participate, using existing quality measures such as Health Plan Employer Data and Information Set (HEDIS) measures or other survey information (e.g., Consumer Assessment of Health Plan Study [CHAPS]). InterStudy's PPO database contains information about the market influence of the top PPOs in each state. Influence is determined by six factors: primary care physician network, specialty physician network, covered lives, employer contracts, claims processed, and the dependent multiplier. The market influence index indicates which PPOs have the most active and influential business in the state. PPOs within a state can also be ranked by total network size, which is based on the number of primary and/or specialty care physicians in its network. All else equal, a PPO with a larger network will be more attractive to consumers. State-specific information about whether there is state oversight of PPOs, and independent or expedited review of grievances, may also be important in signaling those states that are perceived less risky by the elderly considering enrollment in a PPO. Finally, states with a recent trend toward decreasing Medicare+Choice enrollments due to plan withdrawals could be targeted as places where there has been sufficient interest in managed care among the elderly but dwindling opportunity to obtain it.

Table A.1 lists the economic market selection factors that are important for the introduction of a Medicare PPO, in either an urban or a rural area. These factors include the following:

- Regions with a larger number of existing HMOs and PPOs and a competitive private insurance market structure would be likely to develop efficient, high-quality PPOs available to serve the elderly.

[8]In 2000, 73 percent of Medicare beneficiaries had access to a plan with no-cost sharing on pharmaceutical benefits; in 2001, this had shrunk to less than 50 percent (Health Affairs press release: http://www.healthaffairs.org/press/marapr0102.htm).

[9]Many insurers pulled their managed care plans out of selected markets and increased premiums in 2000–2001 to recoup from underwriting losses experienced during the expansionary period, 1995 to 1998 (Strunk, Ginsburg, and Gabel, 2001).

Table A.1
Market selection criteria for introducing Medicare PPOs: Urban regions and adjacent rural regions

	Selection variables for urban regions	Selection variables for adjacent rural regions	Reason		Source
1	High HMO (and other managed care plan types) market shares in the Medicare sector in 1998	High HMO market shares in the Medicare sector in 1998 and in the adjacent urban region	Proxy for sufficient existing network infrastructure, measured in the peak enrollment year		CMS Managed Care Market Penetration
2	Change over time in the number of Medicare HMO (and other managed care) plans and Medicare HMO enrollments/ market share	Change over time in the number of Medicare HMO plans and Medicare HMO enrollments/market share in the adjacent urban region	Changes in climate or popularity of Medicare HMOs and other managed care products over time		CMS Managed Care Market Penetration
3	High PPO share in state		Availability of existing networked providers; persuasion factor		InterStudy
4	Lower private insurance market concentration (state)		More competitive industry; more efficient, higher quality		AHSR
5	Lower hospital market concentration (county), with higher concentration in adjacent regions	Higher hospital market concentration (county), with lower concentration in the adjacent urban region	Low concentration—more competitive industry; more efficient and more willing to bargain	High concentration—less competitive local market, greater cost savings potential from shipping out to adjacent urban area	CMS Hospital Service Area file
6	High proportion of younger-elderly, and larger growth rate in proportion over time,[1] in this and adjacent areas	High proportion of younger-elderly, and larger growth rate in proportion over time	Proxy for better health and less aversion to MCOs		U.S. Census
7	Availability and type of state prescription assistance for elderly		Persuasion factor		AARP
8	MediGap rates by product type		Assess coverage gaps to see PPO niche potential		CMS/Weiss
9	Higher private supplemental coverage		Greater taste for excessive utilization among the target population group		AARP
10	Higher income among the younger-elderly				Census
11	Higher FFS per capita costs in this and adjacent area	Higher FFS per capita costs	Potential cost savings on supply side from bargaining with providers, and on demand side from switch to cost-sharing incentives		CMS: Historical FFS rates
12	Countywide relative health status for Medicare beneficiaries		Potential for greater program savings from improved disease management—these scores indicate financial risk due to costliness of disease array in Medicare population		CMS: PIP-DCG risk scores

[1]Change over time cannot be calculated until the release of Census 2000 SF3 Component, in late 2002.

Note: AHSR = Academy for Health Services Research and Health Policy; ARF = Area Resource File.

- The recent trend in the number of Medicare+Choice plans available and trends in Medicare+Choice enrollments in a region can help identify areas with good demand but low supply.

- Regions with the greatest potential for programmatic savings would be those with higher average county FFS per capita costs and higher FFS fee schedules for physicians and diagnostic related groups (DRGs).

- The presence of private supplemental coverage and age distribution of the elderly should also be considered.

The criteria would differ somewhat for urban versus rural markets because of different market dynamics and cognizance that the urban–rural continuum is important. Urban regions' potential should be assessed with the awareness of potential inflow from adjacent rural area Medicare PPO constituents. Rural regions' potential should be assessed with awareness of adjacent urban capacity for servicing their Medicare PPO constituents' outflow to them. All of these demand, supply, and competition factors would need to be taken into account to do a competitive market analysis. This analysis would help narrow down the field of possibilities to those markets in which the PPO plan(s) for the elderly would most likely succeed.

A.2 COMPETITIVE ACQUISITION

Competitive acquisition is another reform approach that continues to be attractive to CMS. This project was ranked as second in priority by CMS among the six included in this work. The major goal of this initiative is to replace administratively-set prices with competitive bidding or pricing, in order to set prices that better reflect market forces. It is hoped that competitive acquisition could lead to lower prices and reduced Medicare expenditures for selected services without an adverse effect on quality of care.

A.2.1 Literature/Past Performance Review

In the past, Medicare has planned competitive acquisition demonstration projects for Medicare managed care, clinical laboratory services, and durable medical equipment and prosthetics, orthotics, and supplies (DMEPOS). Only the competitive bidding demonstration for DMEPOS has been implemented.

Although the Medicare competitive pricing demonstration focused on managed care, its site selection process addressed many of the issues that need to be considered in selecting sites for FFS initiatives. Sites for the demonstration were selected three times, but each time the demonstration was halted because of provider and Congressional opposition (see Dowd, Coulam, and Feldman, 2000; Nichols and Reischauer, 2000). Site selection criteria differed somewhat during the three demonstration attempts but usually included the following factors:

- High adjusted average per capita costs (AAPCCs), the key variable determining Medicare managed care payments. The high AAPCCs suggested that competitive pricing might reduce payments.

- Several managed care plans serving the market.
- Moderate to high managed care penetration.
- No other Medicare demonstration projects in the market.

Site selection for the last demonstration attempt was the most systematic, with supply and demand data for all 319 MSAs used to narrow the list of candidate sites to nine, before two sites were selected.

For a laboratory competitive bidding demonstration, Hoerger, Lindrooth, and Sfekas (1999) identified site selection criteria and candidate sites, but CMS chose not to proceed with formal site selection. Site selection criteria and their rationale were as follows:

- Must be an MSA because the enacting legislation for the demonstration required that the site be all or part of an MSA.
- Must be a single-state MSA because Medicare carriers generally do not cross state barriers.
- Must have population greater than 1 million and less than 2.5 million so that significant cost savings are possible but the initial population to be covered is not too large to pose major implementation problems.
- Must have Medicare managed care penetration less than 25 percent because the demonstration only covered Medicare FFS beneficiaries.

Based on these criteria, 11 MSAs were selected for more detailed analyses. Detailed analyses of Medicare Part B laboratory claims processed by Medicare carriers and fiscal intermediaries were conducted to form measures of laboratory concentration in each of the 11 remaining eligible MSAs. MSAs were ranked by order of concentration.

The DMEPOS competitive bidding demonstration has been implemented in two sites—Polk County, Florida, and San Antonio, Texas. Polk County was chosen as the first site based on the following criteria:

- Located in the region served by the Durable Medical Equipment Regional Carrier that was the demonstration contractor.
- Located in a single county MSA with a high but not too high number of Medicare FFS beneficiaries.
- Relatively high per capita DME expenditures.
- Numerous DME suppliers.

San Antonio was chosen as the second site for similar reasons, except that it was purposely selected as a larger site to test whether competitive bidding could be implemented in a larger market.

A.2.2 Step One: Market Conditions and Key Factors

A number of supply and demand factors should be considered in selecting markets for competitive acquisitions (Table A.2). Separate parts of the table list economic factors for DME and clinical laboratory services, two potential candidates for competitive acquisitions:

- Each market area should contain enough Medicare FFS beneficiaries so that the potential savings from competitive acquisition exceed the fixed cost of conducting bidding competition for the area.

Table A.2
Market selection criteria for siting competitive acquisition

DME Selection Variables		Reason	Source
1	Large and growing FFS Medicare population	Potential volume attractive to suppliers; potential savings more likely to exceed fixed costs of conducting bidding demonstration	Census, CMS
2	Dense urban county with adjacent less-urban counties	Lower transportation costs	ARF
3	Number of DME suppliers to CMS in county	Measure of market size and potential competition	CMS: Part B DME listing
4	Location of suppliers and beneficiaries, by zip code/address[1]	Flow analysis for market definition, measuring market concentration[1]	CMS: Part B DME listing; EDB[1]
5	High regional average price for selected items in DME schedule	Greater potential savings	CMS: DMEPOS fee schedule
Laboratory Testing Selection Variables			
1	Large and growing FFS Medicare population	Potential volume attractive to suppliers; potential savings more likely to exceed fixed costs of conducting bidding demonstration	Census, CMS
2	Location of laboratories and beneficiaries, by zip code/address[1]	Flow analysis for market definition, measuring market concentration[1]	CMS: EDB[1]; POS file[1] (from OSCAR database)
3	Higher per capita spending in the region	Greater potential savings	CMS: Historical FFS rates
4	Number of certified laboratories in region (there are some 200,000 certified labs in the nation)[1]	Measure of market size and potential competition	CMS: POS file[1] (from OSCAR database)

[1]More specialized database files and analyses that could be included/conducted by CMS in the future.

APPENDIX B:
BEALE CODES

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BEALE CODES
SOURCE: AREA RESOURCE FILE

The **1995 Rural/Urban Continuum Codes** are from *Rural-Urban Continuum Codes for Metro and Nonmetro Counties*, U.S. Department of Agriculture. The codes form a classification scheme that distinguishes metropolitan counties by size and nonmetropolitan counties by degree of urbanization or proximity to metropolitan areas. All U.S. counties and county equivalents are grouped according to the official metropolitan status announced by the Office of Management and Budget in June 1993, when the current population and commuting criteria were first applied to results of the 1990 Census of Population. The 1995 codes are a revised version of the 1993 Rural/Urban Continuum Codes and are defined as follows:

CODE	METROPOLITAN COUNTIES (0-3)
00	Central counties of metropolitan areas of 1 million population or more
01	Fringe counties of metropolitan areas of 1 million population or more
02	Counties in metropolitan areas of 250,000 – 1,000,000 population
03	Counties in metropolitan areas of less than 250,000 population
	NONMETROPOLITAN COUNTIES (4-9)
04	Urban population of 20,000 or more, adjacent to a metropolitan area
05	Urban population of 20,000 or more, not adjacent to a metropolitan area
06	Urban population of 2,500 – 19,999, adjacent to a metropolitan area
07	Urban population of 2,500 – 19,999, not adjacent to a metropolitan area
08	Completely rural (no places with a population of 2,500 or more) adjacent to a metropolitan area
09	Completely rural (no places with a population of 2,500 or more) not adjacent to a metropolitan area

APPENDIX C:
LIST OF VARIABLES BY SOURCE: CMS

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VARIABLE LISTING BY DATA SOURCE

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
ABINDEX_D_02	ABRATE_D_02 divided by the USPCC	insurance-Medicare	county	2002
ABINDEX_D_03	ABRATE_D_03 divided by the USPCC	insurance-Medicare	county	2003
ABINDEX02	ABRATE02 divided by the USPCC	insurance-Medicare	county	2002
ABINDEX03	ABRATE03 divided by the USPCC	insurance-Medicare	county	2003
ABRATE_D_00	Medicare Pt A&B Disabled Payment Rate	insurance-Medicare	county	2000
ABRATE_D_01	Medicare Pt A&B Disabled Payment Rate	insurance-Medicare	county	2001
ABRATE_D_02	demographically adjusted M+C county AB payment rates for the disabled, 2002	insurance-Medicare	county	2002
ABRATE_D_03	demographically adjusted M+C county AB payment rates for the disabled, 2003	insurance-Medicare	county	2003
ABRATE_D_98	Medicare Pt A&B Disabled Payment Rate	insurance-Medicare	county	1998
ABRATE00	Medicare Pt A&B Aged Payment Rate	prices	county	2000
ABRATE01	Medicare Pt A&B Aged Pymnt Rate	insurance-Medicare	county	2001
ABRATE02	Medicare Pt A&B Aged Payment Rate	insurance-Medicare	county	2002
ABRATE03	demographically adjusted M+C county AB payment rates for the aged, 2003	insurance-Medicare	county	2003
ABRATE97	Medicare Pt A&B Aged Payment Rate	prices	county	1997
ABRATE98	Medicare Pt A&B Aged Payment Rate	prices	county	1998
ABRATE99	Medicare Pt A&B Aged Payment Rate	prices	county	1999
ABRATE99_HIST	sum AgdPC99PartA and AgdPC99PartB, historical payment	insurance-Medicare	county	1999
ARATE_D_99_HIST_	Part A reimbursement per capita for the disabled, with IME/DSH/GME	prices	county	1999
ARATE_D_99_HIST_	Part A reimbursement per capita for the disabled, without IME/DSH/GME	prices	county	1999
ARATE00	Medicare Pt A Aged Payment Rate	prices	county	2000
ARATE01	Medicare Pt A Aged Payment Rate	insurance-Medicare	county	2001
ARATE97	Medicare Pt A Aged Payment Rate	prices	county	1997
ARATE98	Medicare Pt A Aged Payment Rate	prices	county	1998
ARATE99	Medicare Pt A Aged Payment Rate	prices	county	1999
ARATE99_HIST-W	Part A reimbursement per capita for the aged, with	prices	county	1999
ARATE99_HIST-W/O	Part A reimbursement per capita for the aged, without IME/DSH/GME	prices	county	1999
BRATE_D_99_HIST	Part B reimbursement per capita for the disabled	prices	county	1999
BRATE00	Medicare Pt B Aged Payment Rate	prices	county	2000
BRATE97	Medicare Pt B Aged Payment Rate	prices	county	1997
BRATE98	Medicare Pt B Aged Payment Rate	prices	county	1998
BRATE99	Medicare Pt B Aged Payment Rate	prices	county	1999
BRATE99_HIST	Part B reimbursement per capita for the aged	prices	county	1999
DME_A4253	Blood glucose/reagent strips	prices	state	2002
DME_A4259	Lancets per box	prices	state	2002
DME_A4353	Intermittent urinary cath	prices	state	2002
DME_A5063	Drain ostomy pouch w/flange	prices	state	2002
DME_A5123	Skin barrier with flange	prices	state	2002
DME_A6196	Alginate dressing <=16 sq in	prices	state	2002
DME_A6242	Hydrogel drg <=16 in w/o bdr	prices	state	2002
DME_A6406	Sterile non-elastic gauze/yd	prices	state	2002
DME_B4035	Enteral feed supp pump per d	prices	state	2002
DME_B4150	Enteral formulae category I	prices	state	2002

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
DME_B4154	Enteral formulae category IV	prices	state	2002
DME_E0255	Hospital bed var ht w/ mattr	prices	state	2002
DME_E0260	Hosp bed semi-electr w/ matt	prices	state	2002
DME_E0277	Powered pres-redu air mattrs	prices	state	2002
DME_E0431	Portable gaseous 02	prices	state	2002
DME_E0439	Stationary liquid 02	prices	state	2002
DME_E1390	Oxygen concentrator	prices	state	2002
DME_J7619	Albuterol inh sol u d	prices	state	2002
DME_J7644	Ipratropium brom inh sol u d	prices	state	2002
DME_K0001	Standard wheelchair	prices	state	2002
DME_K0004	High strength ltwt whlchr	prices	state	2002
DME_K0011	Stnd wt pwr whlchr w control	prices	state	2002
DME_L5300	Bk sach soft cover & finish	prices	state	2002
DME_L5667	Socket insert w lock lower	prices	state	2002
DME_L8030	Breast prosthesis silicone/e	prices	state	2002
F10511-84	Prev Chg Index, Spec + GP	prices	county	1984
F10512-84	Prev Chg Index, Specialty	prices	county	1984
F10513-84	Prev Chg Index, Gen Practice	prices	county	1984
FFS_EvernHMO00	sum by county of the number of FFS beneficiaries who are enrolled for any portion of the year (2000), excluding all beneficiaries who were enrolled in an HMO plan at any time during the year.	physician	state and county	2000
FFS_EvernHMO95	sum by county of the number of FFS beneficiaries who are enrolled for any portion of the year (1995), excluding all beneficiaries who were enrolled in an HMO plan at any time during the year.	physician	state and county	1995
FFS_EvernHMO96	sum by county of the number of FFS beneficiaries who are enrolled for any portion of the year (1996), excluding all beneficiaries who were enrolled in an HMO plan at any time during the year.	physician	state and county	1996
FFS_EvernHMO97	sum by county of the number of FFS beneficiaries who are enrolled for any portion of the year (1997), excluding all beneficiaries who were enrolled in an HMO plan at any time during the year.	physician	state and county	1997
FFS_EvernHMO98	sum by county of the number of FFS beneficiaries who are enrolled for any portion of the year (1998), excluding all beneficiaries who were enrolled in an HMO plan at any time during the year.	physician	state and county	1998
FFS_EvernHMO99	sum by county of the number of FFS beneficiaries who are enrolled for any portion of the year (1999), excluding all beneficiaries who were enrolled in an HMO plan at any time during the year.	physician	state and county	1999
FFS_Pats/UPIN00	TotPats divided by UPINS: a county-average physician FFS caseload measure.	physician	state and county	2000
FFS_Pats/UPIN95	TotPats divided by UPINS: a county-average physician FFS caseload measure.	physician	state and county	1995
FFS_Pats/UPIN96	TotPats divided by UPINS: a county-average physician FFS caseload measure.	physician	state and county	1996
FFS_Pats/UPIN97	TotPats divided by UPINS: a county-average physician FFS caseload measure.	physician	state and county	1997
FFS_Pats/UPIN98	TotPats divided by UPINS: a county-average physician FFS caseload measure.	physician	state and county	1998
FFS_Pats/UPIN99	TotPats divided by UPINS: a county-average physician FFS caseload measure.	physician	state and county	1999
FFS_PBENEDIF	Pmt/BENE00 minus Pmt/BENE95	physician	county	1995, 2000
FFS_Pmt/BENE00	PmtAmt divided by EvernHMO: county-average payment per beneficiary for services received by FFS beneficiaries.	physician	state and county	2000
FFS_Pmt/BENE95	PmtAmt divided by EvernHMO: county-average payment per beneficiary for services received by FFS beneficiaries.	physician	state and county	1995

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
FFS_Pmt/BENE96	PmtAmt divided by EvernHMO: county-average payment per beneficiary for services received by FFS beneficiaries.	physician	state and county	1996
FFS_Pmt/BENE97	PmtAmt divided by EvernHMO: county-average payment per beneficiary for services received by FFS beneficiaries.	physician	state and county	1997
FFS_Pmt/BENE98	PmtAmt divided by EvernHMO: county-average payment per beneficiary for services received by FFS beneficiaries.	physician	state and county	1998
FFS_Pmt/BENE99	PmtAmt divided by EvernHMO: county-average payment per beneficiary for services received by FFS beneficiaries.	physician	state and county	1999
FFS_Pmt/UPIN00	PmtAmt divided by UPINS: county-average payment per active physician for service to FFS beneficiaries.	physician	state and county	2000
FFS_Pmt/UPIN95	PmtAmt divided by UPINS: county-average payment per active physician for service to FFS beneficiaries.	physician	state and county	1995
FFS_Pmt/UPIN96	PmtAmt divided by UPINS: county-average payment per active physician for service to FFS beneficiaries.	physician	state and county	1996
FFS_Pmt/UPIN97	PmtAmt divided by UPINS: county-average payment per active physician for service to FFS beneficiaries.	physician	state and county	1997
FFS_Pmt/UPIN98	PmtAmt divided by UPINS: county-average payment per active physician for service to FFS beneficiaries.	physician	state and county	1998
FFS_Pmt/UPIN99	PmtAmt divided by UPINS: county-average payment per active physician for service to FFS beneficiaries.	physician	state and county	1999
FFS_PmtAmt00	sum by county of total payments made to each UPIN in that year (2000).	physician	state and county	2000
FFS_PmtAmt95	sum by county of total payments made to each UPIN in that year (1995).	physician	state and county	1995
FFS_PmtAmt96	sum by county of total payments made to each UPIN in that year (1996).	physician	state and county	1996
FFS_PmtAmt97	sum by county of total payments made to each UPIN in that year (1997).	physician	state and county	1997
FFS_PmtAmt98	sum by county of total payments made to each UPIN in that year (1998).	physician	state and county	1998
FFS_PmtAmt99	sum by county of total payments made to each UPIN in that year (1999).	physician	state and county	1999
FFS_PUPINDIF	Pmt/UPIN00 minus Pmt/UPIN95	physician	county	1995, 2000
FFS_TotPats00	sum by county of the number of unique FFS beneficiaries seen by each active upin in the year (2000).	physician	state and county	2000
FFS_TotPats95	sum by county of the number of unique FFS beneficiaries seen by each active upin in the year (1995).	physician	state and county	1995
FFS_TotPats96	sum by county of the number of unique FFS beneficiaries seen by each active upin in the year (1996).	physician	state and county	1996
FFS_TotPats97	sum by county of the number of unique FFS beneficiaries seen by each active upin in the year (1997).	physician	state and county	1997
FFS_TotPats98	sum by county of the number of unique FFS beneficiaries seen by each active upin in the year (1998).	physician	state and county	1998
FFS_TotPats99	sum by county of the number of unique FFS beneficiaries seen by each active upin in the year (1999).	physician	state and county	1999
FFS_UBENDIF	UPINS/BENE00 minus UPINS/BENE95	physician	county	1995, 2000
FFS_UPINS/BENE00	UPINS divided by EvernHMO, times 1000: county proportion of active upins per 1000 beneficiaries: the physician-to-population ratio.	physician	state and county	2000
FFS_UPINS/BENE95	UPINS divided by EvernHMO, times 1000: county proportion of active upins per 1000 beneficiaries: the physician-to-population ratio.	physician	state and county	1995
FFS_UPINS/BENE96	UPINS divided by EvernHMO, times 1000: county proportion of active upins per 1000 beneficiaries: the physician-to-population ratio.	physician	state and county	1996

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
FFS_UPINS/BENE97	UPINS divided by EvernHMO, times 1000: county proportion of active upins per 1000 beneficiaries: the physician-to-population ratio.	physician	state and county	1997
FFS_UPINS/BENE98	UPINS divided by EvernHMO, times 1000: county proportion of active upins per 1000 beneficiaries: the physician-to-population ratio.	physician	state and county	1998
FFS_UPINS/BENE99	UPINS divided by EvernHMO, times 1000: county proportion of active upins per 1000 beneficiaries: the physician-to-population ratio.	physician	state and county	1999
FFS_UPINS00	sum by county of the number of active upins (physicians with a Medicare provider ID number who submitted any FFS claim(s) in the year (2000)).	physician	state and county	2000
FFS_UPINS95	sum by county of the number of active upins (physicians with a Medicare provider ID number who submitted any FFS claim(s) in the year (1995)).	physician	state and county	1995
FFS_UPINS96	sum by county of the number of active upins (physicians with a Medicare provider ID number who submitted any FFS claim(s) in the year (1996)).	physician	state and county	1996
FFS_UPINS97	sum by county of the number of active upins (physicians with a Medicare provider ID number who submitted any FFS claim(s) in the year (1997)).	physician	state and county	1997
FFS_UPINS98	sum by county of the number of active upins (physicians with a Medicare provider ID number who submitted any FFS claim(s) in the year (1998)).	physician	state and county	1998
FFS_UPINS99	sum by county of the number of active upins (physicians with a Medicare provider ID number who submitted any FFS claim(s) in the year (1999)).	physician	state and county	1999
FFSgrow	EvernHMO00 minus EvernHMO95	physician	county	1995, 2000
HED_ACVISIT00	proportion of patients aged 65 or older who had ambulatory or preventive care visit this year	insurance-Medicare	county	2000
HED_ACVISIT99	proportion of patients aged 65 or older who had an ambulatory or preventive care visit	insurance-Medicare	county	1999
HED_AOC201-0030-00	proportion of patients aged 65 or older who had an ambulatory or preventive care visit this year	insurance-Medicare	instance - county	2000
HED_AOC201-0030-99	proportion of patients aged 65 or older who had an ambulatory or preventive care visit this year	insurance-Medicare	instance - county	1999
HED_BCSCREEN00	proportion of women aged 52 to 69 who received breast cancer screening by mammogram during this year or previous year	insurance-Medicare	county	2000
HED_BCSCREEN99	proportion of women aged 52 to 69 who received breast cancer screening by mammogram during this year or previous year	insurance-Medicare	county	1999
HED_BETABLOK00	proportion of patients diagnosed with AMI given beta blocker drugs prescription at discharge	insurance-Medicare	county	2000
HED_BETABLOK99	proportion of patients diagnosed with AMI given beta blocker drugs prescription at discharge	insurance-Medicare	county	1999
HED_BLOODPRS00	proportion of patients diagnosed as hypertensive with effective hypertension control	insurance-Medicare	county	2000
HED_BLOODPRS99	proportion of patients diagnosed as hypertensive with effective hypertension control	insurance-Medicare	county	1999
HED_DOCTURN00	primary care physician turnover rate	insurance-Medicare	county	2000
HED_DOCTURN99	primary care physician turnover rate	insurance-Medicare	county	1999
HED_ENROLL00	number of M+C benes enrolled in reporting plans in 2000	insurance-Medicare	county	2000
HED_EOC003-0010-00	proportion of women aged 52 to 69 who received breast cancer screening by mammogram during this year or previous year	insurance-Medicare	instance - county	2000
HED_EOC003-0010-99	proportion of women aged 52 to 69 who received breast cancer screening by mammogram during this year or previous year	insurance-Medicare	instance - county	1999

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
HED_EOC008-0010-00	percentage of patiants diagnosed with AMI given beta blocker drugs prescription at discharge	insurance-Medicare	instance - county	2000
HED_EOC008-0010-99	percentage of patiants diagnosed with AMI given beta blocker drugs prescription at discharge	insurance-Medicare	instance - county	1999
HED_EOC020-0040-00	proportion of diabetic patients with poor HbAlc control	insurance-Medicare	instance - county	2000
HED_EOC020-0040-99	proportion of diabetic patients with poor HbAlc control	insurance-Medicare	instance - county	1999
HED_EOC020-0070-00	proportion of diabetic patients given eye exam	insurance-Medicare	instance - county	2000
HED_EOC020-0070-99	proportion of diabetic patients given eye exam	insurance-Medicare	instance - county	1999
HED_EOC020-0160-00	proportion of diabetic patients given nepropathy monitor for kidney disease	insurance-Medicare	instance - county	2000
HED_EOC020-0160-99	proportion of diabetic patients given nepropathy monitor for kidney disease	insurance-Medicare	instance - county	1999
HED_EOC035-0010-00	proportion of patients diagnosed as hypertensive with effective hypertension control	insurance-Medicare	instance - county	2000
HED_EOC035-0010-99	proportion of patients diagnosed as hypertensive with effective hypertension control	insurance-Medicare	instance - county	1999
HED_EYEEXAM00	proportion of diabetic patients given eye exam	insurance-Medicare	county	2000
HED_EYEEXAM99	proportion of diabetic patients given eye exam	insurance-Medicare	county	1999
HED_GENERAL0050-	plan enrollment	insurance-Medicare	instance - county	2000
HED_GENERAL0050-	plan enrollment	insurance-Medicare	instance - county	1999
HED_HPS402-0010-00	primary care physician turnover rate	insurance-Medicare	instance - county	2000
HED_HPS402-0010-99	primary care physician turnover rate	insurance-Medicare	instance - county	1999
HED_NEPMONIT00	proportion of diabetic patients given nepropathy monitoring for kidney disease	insurance-Medicare	county	2000
HED_NEPMONIT99	proportion of diabetic patients given nepropathy monitoring for kidney disease	insurance-Medicare	county	1999
HED_NUMREPT00	number of plans reporting data to HEDIS in the county in 2000	insurance-Medicare	county	2000
HED_NUMREPT99	number of plans reporting data to HEDIS in the county in 1999	insurance-Medicare	county	1999
HED_POORHBAL00	proportion of diabetic patients with poor HbAlc control	insurance-Medicare	county	2000
HED_POORHBAL99	proportion of diabetic patients with poor HbAlc control	insurance-Medicare	county	1999
HED_WACVISIT00	proportion of patients aged 65 or older who had an ambulatory or preventive care	insurance-Medicare	county	2000
HED_WBCSCREEN00	proportion of women aged 52 to 69 who received breast cancer screening by mammogram during this year or previous year	insurance-Medicare	county	2000
HED_WBETABLOK00	percentage of patients diagnosed with AMI given beta blocker drugs prescription at discharge	insurance-Medicare	county	2000
HED_WBLOODPRS00	proportion of patients diagnosed as hypertensive with effective hypertension control	insurance-Medicare	county	2000
HED_WDOCTURN00	primary care physician turnover rate	insurance-Medicare	county	2000
HED_WEYEEXAM00	proportion of diabetic patients given eye exam	insurance-Medicare	county	2000
HED_WNEPMONIT00	proportion of diabetic patients given nepropathy monitoring for kidney disease	insurance-Medicare	county	2000
HED_WPOORHBAL00	proportion of diabetic patients with poor HbAlc control	insurance-Medicare	county	2000
MBENE00	number of Medicare eligibles in 2000 in M+C counties	insurance-Medicare	state and county	2000
MBENE00_F13191-00	Number Medicare Beneficiaries in M+C counties	insurance-Medicare	county	Dec 2000
MBENE01_AGD&DIS	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_AGED&DI	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_AGED&DI	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_AGED_HI	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_AGED_SMI	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_AGED_TO	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_DISABLED	Medicare County Enrollment	insurance-Medicare	state and county	2001

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
MBENE01_DISABLED	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_DISABLED	Medicare County Enrollment	insurance-Medicare	state and county	2001
MBENE01_F13191-01	# Eligible for Medcre Mangd Care in M+C counties	insurance-Medicare	county	Dec 2001
MBENE97_F13191-97	Number Medicare Beneficiaries in M+C counties	insurance-Medicare	county	Dec 1997
MBENE98	number of Medicare eligibles in 1998 in M+C counties	insurance-Medicare	state and county	1998
MBENE98_F13191-98	Number Medicare Beneficiaries in M+C counties	insurance-Medicare	county	Dec 1998
MBENE98_F13249-98	Medicare Enrollment, Aged Tot	insurance-Medicare	county	Jul 1998
MBENE98_F13250-98	Medicare Enrollment, Aged HI	insurance-Medicare	county	Jul 1998
MBENE98_F13251-98	Medicare Enrollment, Aged SMI	insurance-Medicare	county	Jul 1998
MBENE98_F13252-98	Medicare Enrollment, Disabled HI	insurance-Medicare	county	Jul 1998
MBENE98_F13253-98	Medicare Enrollment, Disabled SMI	insurance-Medicare	county	Jul 1998
MBENE98_F13254-98	Medicare Enrllmnt, Aged & Dsbld Tot	insurance-Medicare	county	Jul 1998
MBENE98_F13255-98	Medicare Enrllmnt, Aged & Dsbld HI	insurance-Medicare	county	Jul 1998
MBENE98_F13256-98	Medicare Enrllmnt, Aged & Dsbld SMI	insurance-Medicare	county	Jul 1998
MBENE99	number of Medicare eligibles in 1999 in M+C counties	insurance-Medicare	state and county	1999
MBENE99_F13191-99	Number Medicare Beneficiaries	insurance-Medicare	county	Dec 1999
MBENE99_F13249-99	Medicare Enrollment, Aged Tot	insurance-Medicare	county	Jul 1999
MBENE99_F13250-99	Medicare Enrollment, Aged HI	insurance-Medicare	county	Jul 1999
MBENE99_F13251-99	Medicare Enrollment, Aged SMI	insurance-Medicare	county	Jul 1999
MBENE99_F13252-99	Medicare Enrollment, Disabled HI	insurance-Medicare	county	Jul 1999
MBENE99_F13253-99	Medicare Enrollment, Disabled SMI	insurance-Medicare	county	Jul 1999
MBENE99_F13254-99	Medicare Enrllmnt, Aged & Dsbld Tot	insurance-Medicare	county	Jul 1999
MBENE99_F13255-99	Medicare Enrllmnt, Aged & Dsbld HI	insurance-Medicare	county	Jul 1999
MBENE99_F13256-99	Medicare Enrllmnt, Aged & Dsbld SMI	insurance-Medicare	county	Jul 1999
MBENE99_F13324-99	Medicare Enrollment, Disabled Tot	insurance-Medicare	county	Jul 1999
MC_AFFECTED00	number of Medicare benes enrolled in affected plans at time of announcement of Medicare non-renewals in 2000	insurance-Medicare	state and county	2000
MC_AFFECTED98	number of Medicare benes enrolled in affected plans at time of announcement of Medicare non-renewals in 1998	insurance-Medicare	state and county	1998
MC_AFFECTED99	number of Medicare benes enrolled in affected plans at time of announcement of Medicare non-renewals in 1999	insurance-Medicare	state and county	1999
MC_BENE00	number of Medicare M+C benes in 2000	insurance-Medicare	state and county	2000
MC_HERF00	Herfindahl concentration index of M+Choice enrollments among HMOs in the county (maximum=1, missing value means no plans enrolled benes in the county).	insurance-Medicare	county	March 2000
MC_HERF01	Herfindahl concentration index of M+Choice enrollments among HMOs in the county (maximum=1, missing value means no plans enrolled benes in the county).	insurance-Medicare	county	March 2001
MC_HERF02	Herfindahl concentration index of M+Choice enrollments among HMOs in the county (maximum=1, missing value means no plans enrolled benes in the county).	insurance-Medicare	county	March 2002
MC_HERF98	Herfindahl concentration index of M+Choice enrollments among HMOs in the county (maximum=1, missing value means no plans enrolled benes in the county).	insurance-Medicare	county	March 1998
MC_HERF99	Herfindahl concentration index of M+Choice enrollments among HMOs in the county (maximum=1, missing value means no plans enrolled benes in the county).	insurance-Medicare	county	March 1999
MC_HERFDIF	HERF02 minus HERF98	insurance-Medicare	county	1998, 2002
MC_HMOREMAIN00	number of M+C HMO plans remaining available in 2000	insurance-Medicare	state and county	2000
MC_NMCLEFT00	number of Medicare benes involuntarily disenrolled by M+C plans with no alternative HMO plans to join	insurance-Medicare	state and county	2000
MC_PENEDIF	MCPENE02 minus MCPENE98	insurance-Medicare	county	1998, 2002

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
MC_PLANREMAIN00	number of M+C HMO and private FFS plans remaining available in 2000	insurance-Medicare	state and county	2000
MC_PLANREMAIN98	number of M+C plans remaining available in 1998	insurance-Medicare	state and county	1998
MC_PLANREMAIN99	number of M+C plans remaining available in 1999	insurance-Medicare	state and county	1999
MC_PLANSAFFECTD98	number of M+C plans not renewing in 1998	insurance-Medicare	state and county	1998
MC_PVTREMAIN00	number of M+C private FFS plans remaining available in 2000	insurance-Medicare	state and county	2000
MCBENE00_F13192-	# Medicare Mangd Care Enrollees	insurance-Medicare	county	Dec 2000
MCBENE01_F13192-	# Medicare Mangd Care Enrollees	insurance-Medicare	county	Dec 2001
MCBENE97_F13192-	# Medicare Mangd Care Enrollees	insurance-Medicare	county	Dec 1997
MCBENE98_F13192-	# Medicare Mangd Care Enrollees	insurance-Medicare	county	Dec 1998
MCBENE99_F13192-	# Medicare Mangd Care Enrollees	insurance-Medicare	county	Dec 1999
MCPENE00	proportion of county Medicare eligibles enrolled in a M+Choice	insurance-Medicare	county	March 2000
MCPENE00_F13193-	% Medicare Mangd Care Penetration	insurance-Medicare	county	Dec 2000
MCPENE01	proportion of county Medicare eligibles enrolled in a M+Choice	insurance-Medicare	county	March 2001
MCPENE01_F13193-	% Medcre Mangd Care Penetration	insurance-Medicare	county	Dec 2001
MCPENE02	proportion of county Medicare eligibles enrolled in a M+Choice	insurance-Medicare	county	March 2002
MCPENE97_F13193-	% Medicare Managed Care Penetration	insurance-Medicare	county	Dec 1997
MCPENE98	proportion of county Medicare eligibles enrolled in a M+Choice	insurance-Medicare	county	March 1998
MCPENE98_F13193-	% Medicare Mangd Care Penetration	insurance-Medicare	county	Dec 1998
MCPENE99	proportion of county Medicare eligibles enrolled in a M+Choice	insurance-Medicare	county	March 1999
MCPENE99_F13193-	% Medicare Mangd Care Penetration	insurance-Medicare	county	Dec 1999
NUM_M+C_00	number of M+C plans available in the county	insurance-Medicare	county	9-11-2000
NUM_M+C_01	number of M+C plans available in the county	insurance-Medicare	county	10-23-2001
NUM_M+C_02	number of M+C plans available in the county	insurance-Medicare	county	9-3-2002
NUM_M+C_98	number of M+C plans offered in the county	insurance-Medicare	county	1998
PIP-DCG_96	PIP-DCG Average County Risk Factor	insurance-Medicare	county	1996
POS_CHILDREN	Count of active Medicare-eligible Children's Hospitals in county	hospital-physical plant	county	2001
POS_CNTYproviders	count of hospital providers of service by fips county code using crosswalk between zip code and county fips	other healthcare services	county	2001
POS_CRITACC	Count of active Medicare-eligible Critical Access Hospitals in county	hospital-physical plant	county	2001
POS_F13211-94	# Skilled Nursing Facilities	other healthcare services	county	1994
POS_F13211-99	# Skilled Nursing Facilities	other healthcare services	county	1999
POS_F13212-94	Skilled Nurs Fac Total Beds	other healthcare services	county	1994
POS_F13212-99	Skilled Nursing Facilities Total Beds	other healthcare services	county	1999
POS_F13213-94	Skilled Nurs Fac Certified Beds	other healthcare services	county	1994
POS_F13213-99	Skilled Nursing Facilities Certified Beds	other healthcare services	county	1999
POS_F13214-94	# Home Health Agencies	other healthcare services	county	1994
POS_F13214-99	# Home Health Agencies	other healthcare services	county	1999
POS_F13215-94	# Nursing Facilities	other healthcare services	county	1994
POS_F13215-99	# Nursing Facilities	other healthcare services	county	1999
POS_F13216-94	Nursing Facilities Total Beds	other healthcare services	county	1994
POS_F13216-99	Nursing Facilities Total Beds	other healthcare services	county	1999
POS_F13217-94	Nursing Facilities Cert Beds	other healthcare services	county	1994
POS_F13217-99	Nursing Facilities Certified Beds	other healthcare services	county	1999
POS_F13218-94	# Rural Health Clinics	other healthcare services	county	1994
POS_F13218-99	# Rural Health Clinics	other healthcare services	county	1999
POS_F13219-94	# Ambulatory Surgery Centers	other healthcare services	county	1994
POS_F13219-99	# Ambulatory Surgery Centers	other healthcare services	county	1999

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
POS_F13220-94	# Hospices	other healthcare services	county	1994
POS_F13220-99	# Hospices	other healthcare services	county	1999
POS_F13221-94	# Community Mental Health Ctrs	other healthcare services	county	1994
POS_F13221-99	# Community Mental Health Centers	other healthcare services	county	1999
POS_F13222-94	# Screeng Mammgrphy for SNF/Hsp	other healthcare services	county	1994
POS_F13320-99	# Fed Qualified Health Centers	other healthcare services	county	1999
POS_HCOUNT	Number of short-term general and critical access hospitals included in calculation of Herfindahl indices	hospital-physical plant	county	2001
POS_HDAYS	Herfindahl index based on Patient Days in short-term general and critical access hospitals, by county	hospital-utilization	county	2001
POS_HDISCH	Herfindahl index based on discharges in short-term general and critical access hospitals, by county	hospital-utilization	county	2001
POS_listing	list of multiple hospital Providers of Service per zip code	other healthcare services	instance - zip code	2001
POS_LTERM	Count of active Medicare-eligible Long Term Stay Hospitals in county	hospital-physical plant	county	2001
POS_PSYCH	Count of active Medicare-eligible Psychiatric Hospitals in	hospital-physical plant	county	2001
POS_REHAB	Count of active Medicare-eligible Rehabilitation Hospitals in	hospital-physical plant	county	2001
POS_RELIG	Count of active Medicare-eligible Religious Non-Medical Health Care Institutions in county	hospital-physical plant	county	2001
POS_STERM	Count of active Medicare-eligible Short Term Stay Hospitals in county	hospital-physical plant	county	2001
POS_TOTAL	Count of all active Medicare-eligible All Provider Types (Hospitals and Institutions) in county	hospital-physical plant	county	2001
PRICE00A	average price for policy type A in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	2000
PRICE00C	average price for policy type C in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	2000
PRICE00F	average price for policy type F in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	2000
PRICE00I	average price for policy type I in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	2000
PRICE98A	average price for policy type A in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1998
PRICE98C	average price for policy type C in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1998
PRICE98F	average price for policy type F in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1998
PRICE98I	average price for policy type I in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1998
PRICE99A	average price for policy type A in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1999
PRICE99C	average price for policy type C in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1999

Source Name: CMS

Variable Name	Variable Description	Category	Geography Level	Original Source Date
PRICE99F	average price for policy type F in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1999
PRICE99I	average price for policy type I in 2000 (http://www.medicare.gov/mgcompare/Search/StandardizedPlans/TenStandardPlans.asp)	prices	state	1999
RV_MLPRCTC	geographic practice cost index (GPCI) for the malpractice component of a procedure	prices	county	2002
RV_PRAC_EXP	geographic practice cost index (GPCI) for the practice expense component of a procedure	prices	county	2002
RV_WORK	geographic practice cost index (GPCI) for the work component of a procedure	prices	county	2002
SSAcode	SSA code from the CMS website	crosswalk or code	state and county	2002

APPENDIX D:
DATABASE COMPONENTS AND EXAMPLE VARIABLES IN CMS MARKET AREA DATABASE

LIST OF TABLES IN APPENDIX D

Table D.1
Database components and example variables in CMS market area database

Price/Fee Level and Demand Variables (CMS Expenditure Drivers)		
Source/Date	General Description	Example Variables, Using Names in Database
CMS 2002	DME price schedule by state for 25 top expenditure items. The linked Acrobat document DME02.txt lists product descriptions, product categories, and total expenditures per product.	By HCPCS Code, with prefix DME_: E1390, A4253, K0011, J7644, E0260, J7619, B4035, B4150, E0431, E0439, E0277, K0001, K0004, B4154, L5300, A4259, L8030, L5667, A5123, A4353, E0255, A5063, A6242, A6406, A6196
CMS 1997-2003	County-level base monthly payment rates to Medicare+Choice plans on behalf of beneficiaries (aged, disabled) according to their county of residence, with demographic adjustment, and USPCC rates for constructing a ratio of county to national average	ABRATE#, ABRATE_D_#, ARATE#, BRATE#
CMS 2000	County historical FFS payment per capita in 1999.	ABRATE99_HIST
CMS; Weiss rates database 1998, 1999, 2000	Statewide average (across plans) of MediGap premiums in four different plans with varied copays, deductibles, and coverage. Types C and F are the most popular plans; A is the basic plan required to be offered by all sellers of MediGap plans; plan I has basic coverage for prescription drugs.	PRICE98A, PRICE98C, PRICE98F, PRICE98I PRICE99A, PRICE99C, PRICE99F, PRICE99I PRICE00A, PRICE00C, PRICE00F, PRICE00I
CMS 1996	PIP-DCG county-level risk scores, indicator of costliness of care based on disease array	PIP-DCG_96
ARF 3-year average 1996–98	From NCHS Mortality Tape: county-wide mortality rates by disease, for the entire population, including: AIDS, infectious and parasitic disease, malignant neoplasms, cerebrovascular disease, ischemic heart disease, other cardiovascular disease, COPD, chronic liver disease and cirrhosis, diabetes, influenza and pneumonia	F11930–96, F11931–96, F11932–96, F11933–96, F11935–96, F11936–96, F11937–96, F13164–96, F13165–96, F13169–96

(continued)

Table D.1
Database components and example variables in CMS market area database (continued)

Price/Fee Level and Demand Variables (CMS Expenditure Drivers)		
Source/Date	General Description	Example Variables, Using Names in Database
AARP 1997–99, 2001	(State-level data): supplemental insurance held by the elderly, 1997–99; availability of state-subsidized Rx programs, 2001 (year enacted and enrollment)	EmployerCov97–99, IndInsur97–99, RxProgram01, RxEnroll01
CMS 2002	Physician RVS-weights file by county: file can be used to convert any of the 8000+ items in the *National Physician Fee Schedule Relative Value File* into county-specific payment rates for each procedure, with instructions in database.	WORK, PRAC_EXP, MLPRCTC
ARF and CMS 1997-2001 ; CMS 1995–2000	Number of Medicare beneficiaries(MBENE) by county (1997-2001), number of Medicare managed care enrollees (MCBENE) by county(1997-2001); number of FFS enrollees (EvernHMO, 1995-2000)	MBENE#; MCBENE#; FFS_EvernHMO#,
Insurance Market Competition/Managed Care (Market Climate)		
Source/Date	Description	Example Variables, Using Names in Database
CMS 1998–2002	Medicare+Choice penetration files: includes Medicare+Choice penetration (MCPENE) and RTI-created annual Herfindahl concentration indices for Medicare business among active HMOs within counties (HERF). HERFs indicate choice availability. NHMO is the count of all HMOs (unique plan Hnumbers) and CMS, by county.	MCPENE#, HERF#, NHMO# Note: missing values are recorded in counties with no Medicare+Choice penetration.
ARF 1998	ARF: InterStudy County Surveyor data on private market HMO penetration and HMO Index of Competition, enrollment, and numbers of HMOs, by HMO type	F13287–98, F13288–98, F13289–98, F13290–98, F13291–98, F13292–98, F13293–98, F13294–98, F13295–98, F13296–98, F13297–98, F13298–98, F13299–98, F13300–98, F13301–98, F13302–98, F13303–98, F13304–98, F13305–98, F13306–98, F13307–98, F13308–98

(continued)

Table D.1
Database components and example variables in CMS market area database (continued)

Insurance Market Competition/Managed Care (Market Climate)		
Source/Date	Description	Example Variables, Using Names in Database
CMS 2000 (1999) 2001 (2000)	CMS HEDIS data, 2000 (1999) and 2001 (2000): HEDIS scores for Medicare managed care plans, in several dimensions, and plan enrollments, by plan. Plans are included in the database as instances so that the user can pull up by county all plans operating there and their HEDIS scores.	All have the prefix HED_: AOC201–0030–99, EOC003–0010–99, HPS402–0010–99, EOC020–0040–99, EOC020–0070–99, EOC020–0160–99,EOC035–0010–99, EOC008–0010–99, GENERAL0050–00, AOC201–0030–00, EOC003–0010–00, HPS402–0010–00, EOC020–0040–00, EOC020–0070–00, EOC020–0160–00, EOC035–0010–00, EOC008–0010–00
RTI/InterStudy 1994, 2000, 2001	Files created by RTI from InterStudy and HIAA data: state-level data on PPO markets, including PPO and HMO market shares in 1994, PPO and HMO enrollments in 1994, HMO market share in 1994, 1997, 1998, 2000 and 2001, number of generalist and specialist physicians in PPOs (may be double-counted unless there are exclusivity arrangements) and number of covered lives in PPOs (an estimate of enrollments), Herfindahl indices of concentration of physicians and covered lives among PPO plans within a state (an indicator of choice availability within the state), summed PPO and HMO market shares in 2000, and number of PPOs operating in the state in 2000.	XPPO94, XPPO00, XHMO94, XHMO97, XHMO98, XHMO00, XHMO01, STATE, ALLPHYS, COVFAM, COVNUM, HHICOV, HHIDOCS, PPOHMO00, NUMPPO00, PENR94, HENR94 Note: PPO-level data, including contact information and ranking relative to other PPOs in the state, are owned by CMS in both hard copy and electronic form. Due to a single-license user agreement, these PPO-level data are not included in this database. Instances (placeholders) for importing these data are included.
AHSR 1997	AHSR data on private group health insurance competition by state: market shares and size distribution among private and HMO plans	NumComm, ShrComm, NumHMO, ShrHMO, NumBCBS, ShrBCBS, IncPerCap, NumGrp, ShrLarge1, ShrLarge3, ShrSmall
AARP 1999, 2000	AARP (state level data): percent of counties in state with minimum Medicare+Choice payment rates, 2000; state oversight of PPOs, 1999; independent review of insurance-related grievances, 1999; expedited review of insurance-related grievances, 1999	M+CpayLOW00, overPPO99, IRgrieve99, ERgrieve99

(continued)

Table D.1
Database components and example variables in CMS market area database (continued)

Provider Supply Variables		
Source/Date	Description	Example Variables, Using Names in Database
CMS 2001	RTI-created county-level Herfindahl indices for Medicare hospital discharges and inpatient days, in short-term general hospitals, from the CMS hospital service area file (SAF) linked to provider of service (POS) listing with address of location. Counts of active Medicare-approved hospitals of all types, and by type, in each county. Note: agrees with ARF counts.	POS_HCOUNT, POS_HDAYS, POS_HDISCH
ARF/CMS 1994, 1999	CMS Provider of Service file data: numbers of SNFs, nursing facilities, home health agencies, rural clinics, ambulatory surgery centers, hospices, community mental health centers, federally qualified health centers, and beds for these entities	POS_F13211–99–POS_F13221–99; POS_F13320–99
National Supplier Clearinghouse 2002	Part B DME Suppliers Listing can be used to locate suppliers by zip code and to calculate counts of active suppliers of DME in each county	DMESUM
AARP *Reforming the Healthcare System: State Profiles 2001*	State-level percent population underserved by primary care physician in 1991, 1999, 2001; percent of providers accepting Medicare fee as total billable amount	MDshort91, MDshort99, MDshort01, assignmnt01
ARF 1998, 2000, 2001	BPHC data: HPSA shortage area codes for primary care, dentists, mental health, in whole or part of county	F09787–00, F09792–00, F12492–00
ARF 1995, 1999, 2000 (MDs); 1996, 1998, 2001 (DOs)	AMA physician Master File and American Osteopathic Association (AOA) data on physician supply (by age, gender, specialty in some years)	see ARF_FIELDS table in database for complete listing
ARF 1998- 2000	County Hospital File data with numbers of facilities by type and by service	see ARF_FIELDS table in database for complete listing

(continued)

Table D.1
Database components and example variables in CMS market area database (continued)

Provider Supply Variables		
Source/Date	Description	Example Variables, Using Names in Database
CMS 1995–2000	CMS physician data (R. Mentnech) with numbers of FFS physicians, FFS physician density and caseload, and average FFS payment per beneficiary and payment per physician, and number of FFS beneficiaries, by county	all with prefix FFS_: UPINS95–UPINS00; UPINS/BENE95–UPINS/BENE00; Pats/UPIN95—Pats/UPIN00; Pmt/BENE95–Pmt/BENE00; Pmt/UPIN95—Pmt/UPIN00; EvernHMO95–EvernHMO00
ARF 1996, 1999, 2000	County Hospital File data with FTE RNs and LPN/LVNs, in nursing homes, short-term general, short-term special, and long-term hospitals	F09316–# to F09320–#; F12647to #–F12650–#; F12655–# to F12658–#
ARF (Census 1990, EEO File)	RNs, LPNs, PAs, nurse and health Aides and Orderlies, therapists, health technicians	F08619–90, F08631–90, F13228–99, F08634–90, F08635–90, F08617–90; F08620–90–F08625–90; F08627–90, F08629–90, F08630–90, F08632–90, F08636–90

APPENDIX E:
MAPS

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Figure E.1
Map 1: Combined supply and demand approach yields eleven counties in four states

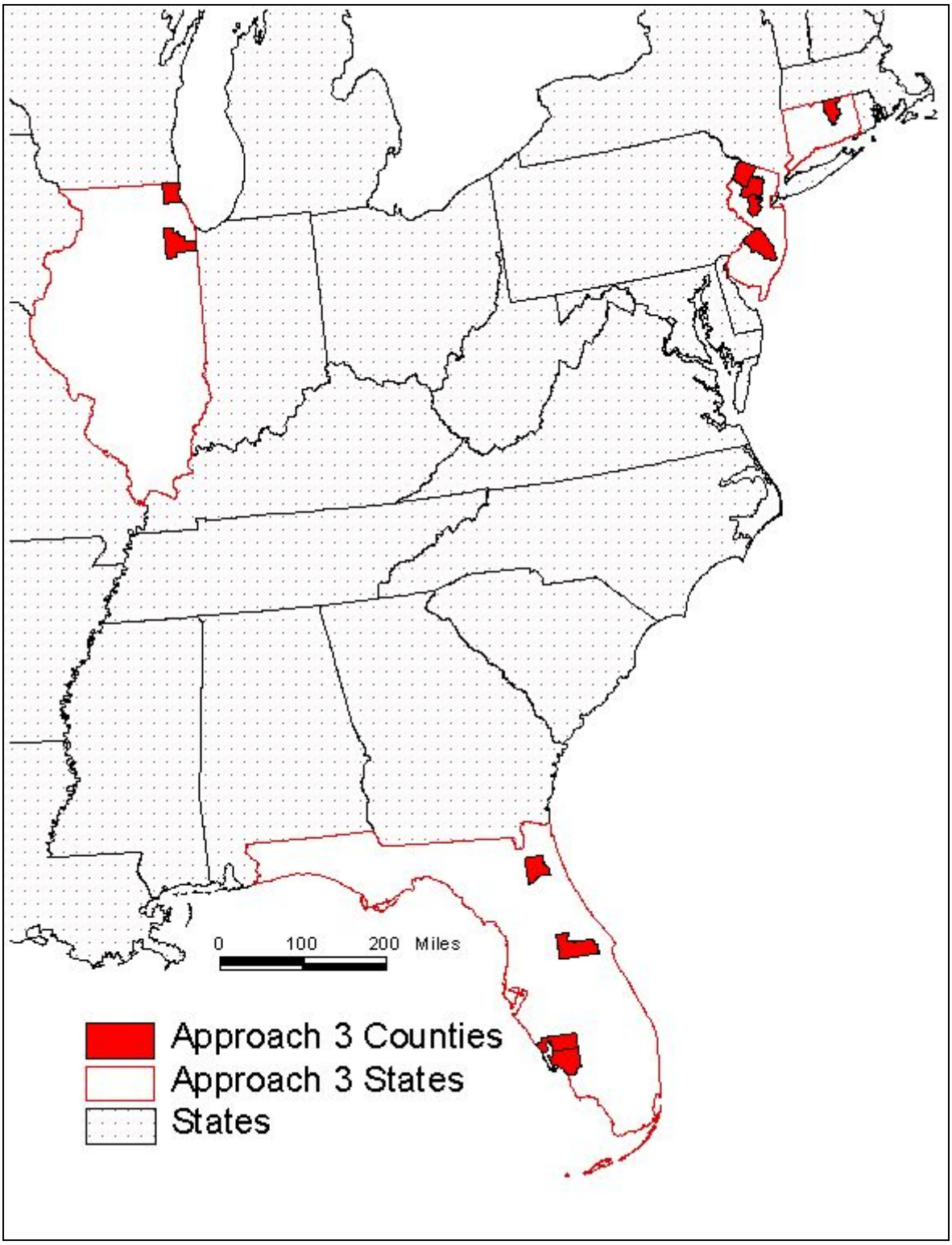

Figure E.2
Map 2: Extent of urban intensity in areas surrounding selected counties

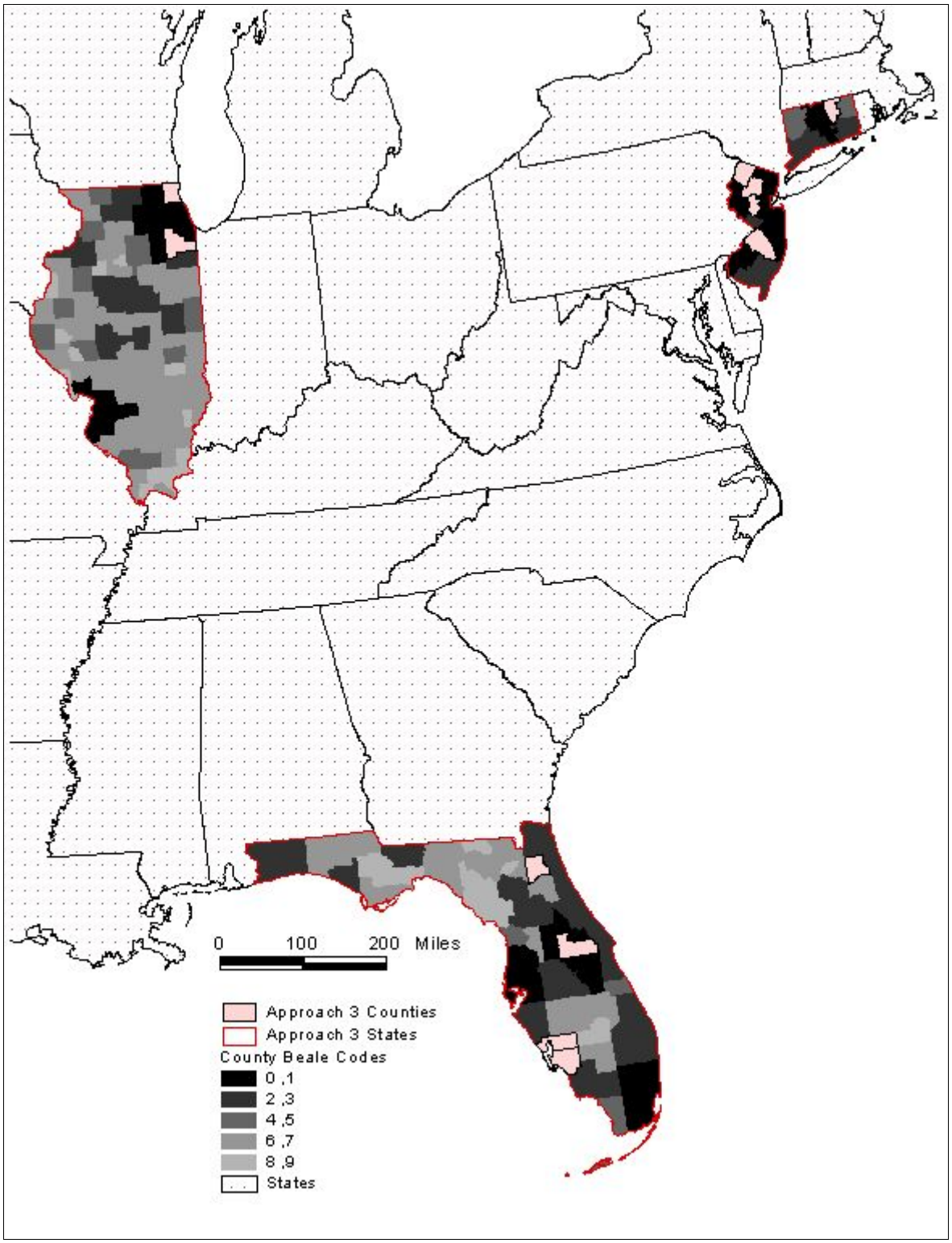

Figure E.3
Map 3: Hospital concentration in Medicare patient days in areas surrounding selected counties

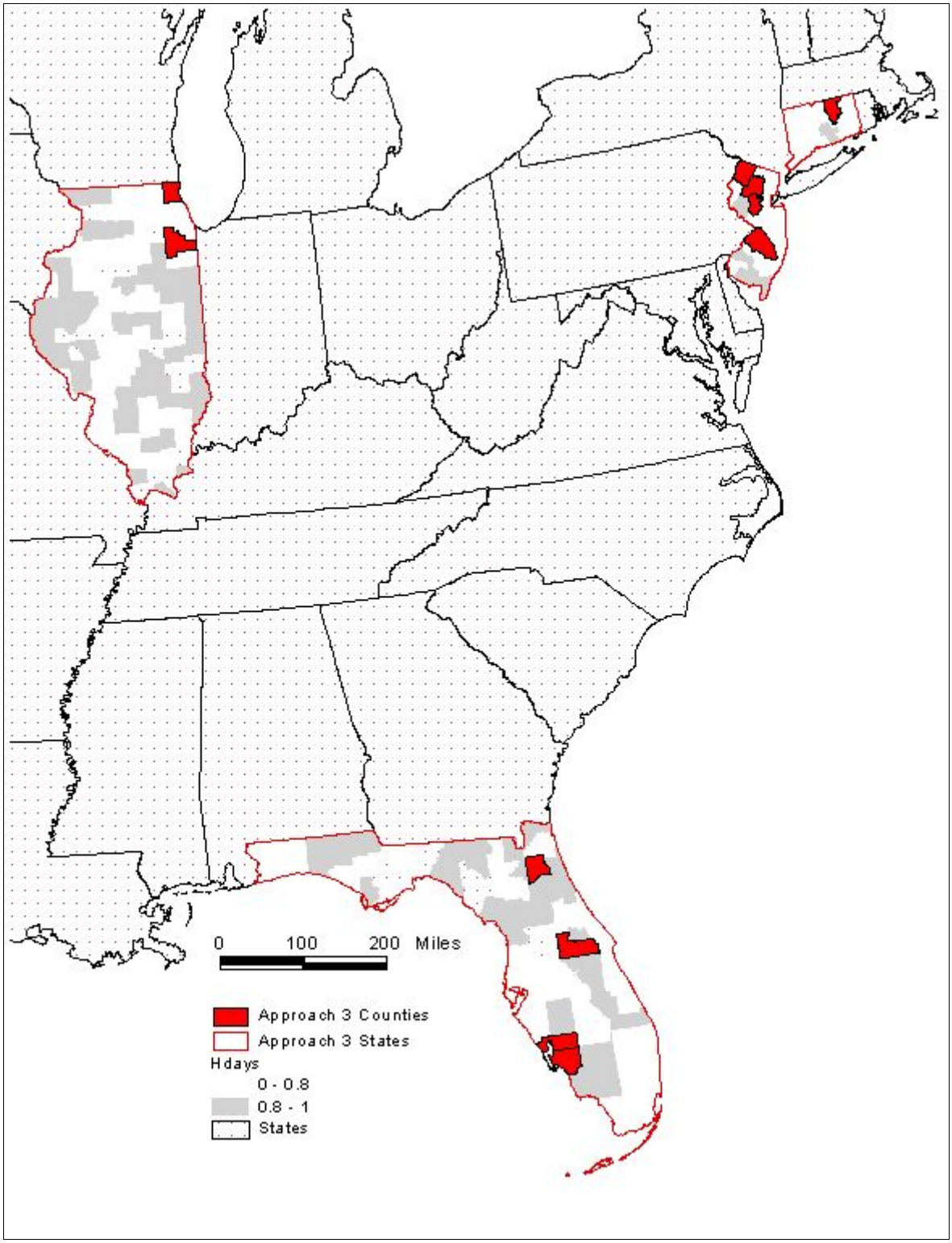

Figure E.4
Map 4: Increases and decreases in Medicare+Choice penetration in areas surrounding selected counties

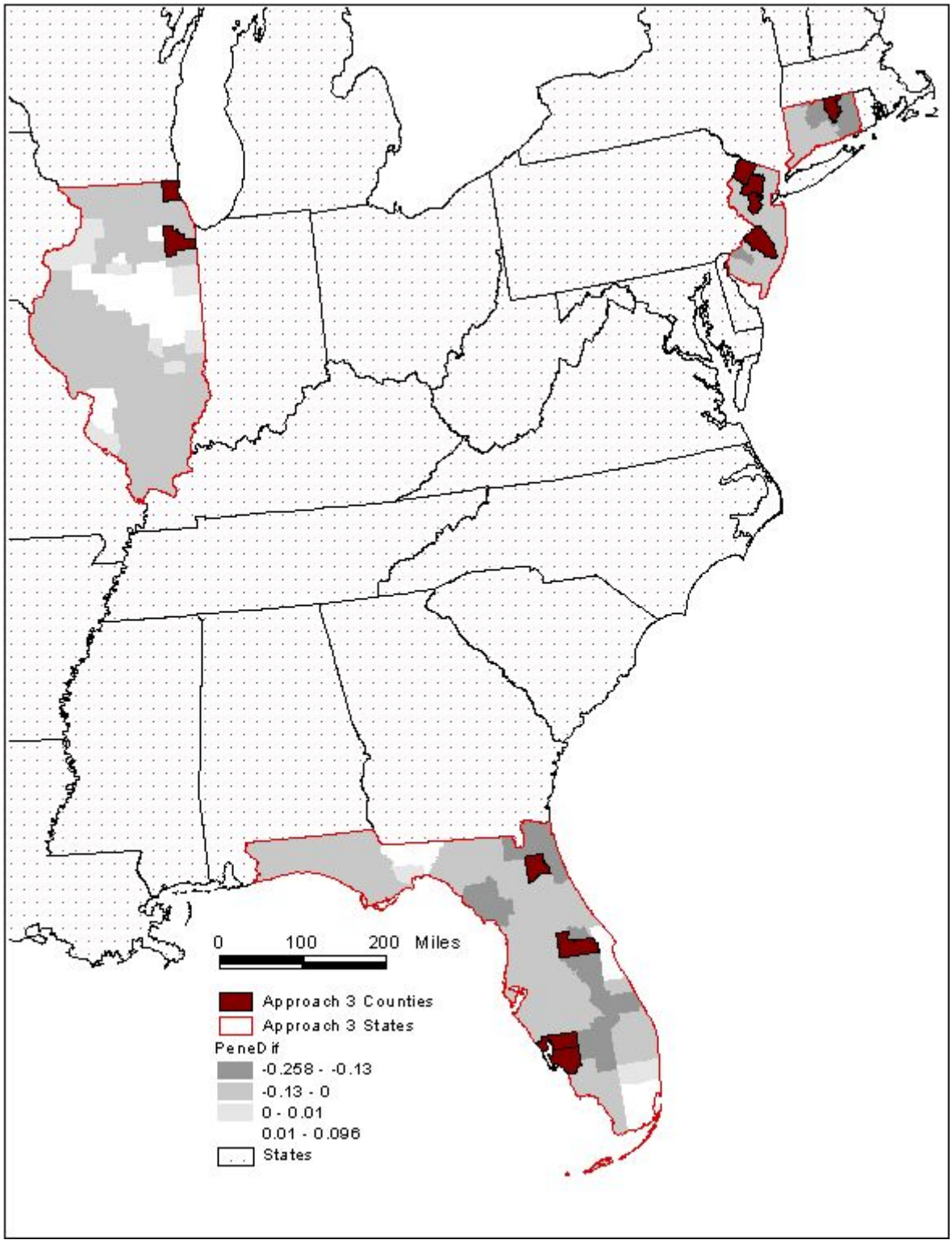

Figure E.5
Map 5: Numbers of Medicare+Choice enrollees affected by plan withdrawals in areas surrounding selected counties

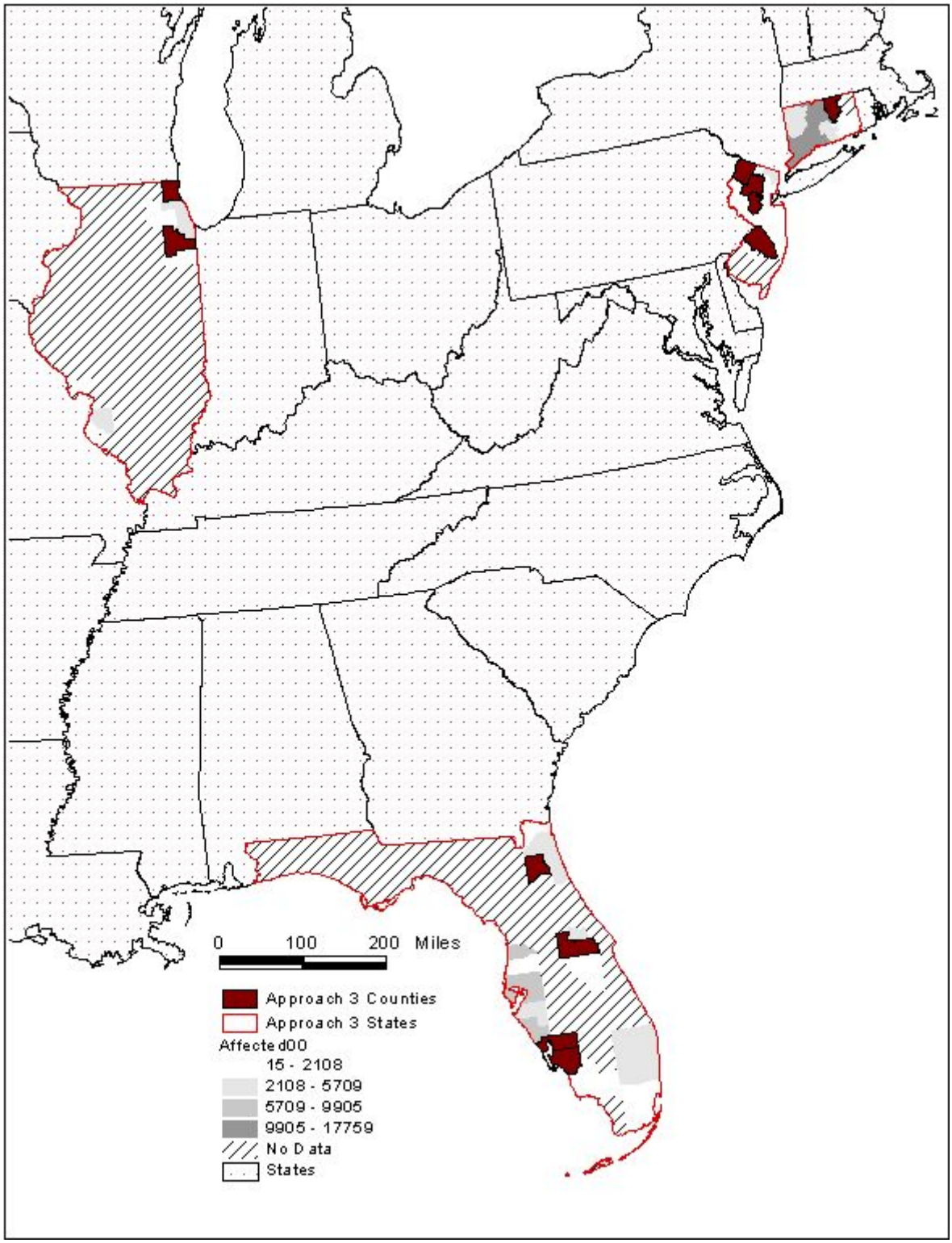

Figure E.6
Map 6: Numbers of Medicare+Choice enrollees left with no managed care plan choice in areas surrounding selected counties

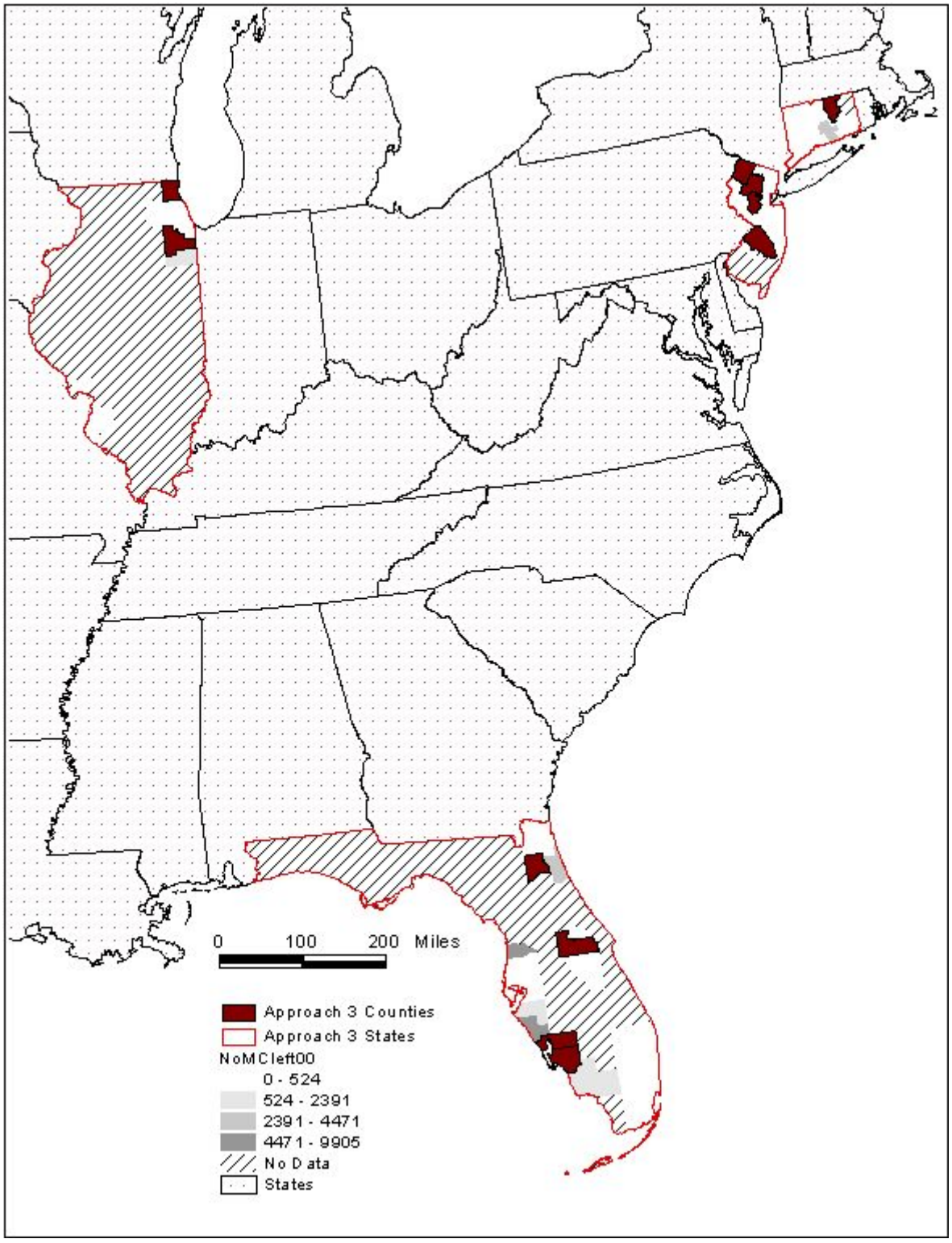

Figure E.7
Map 7: Expanding number of selected markets by relaxing the most binding selection constraints

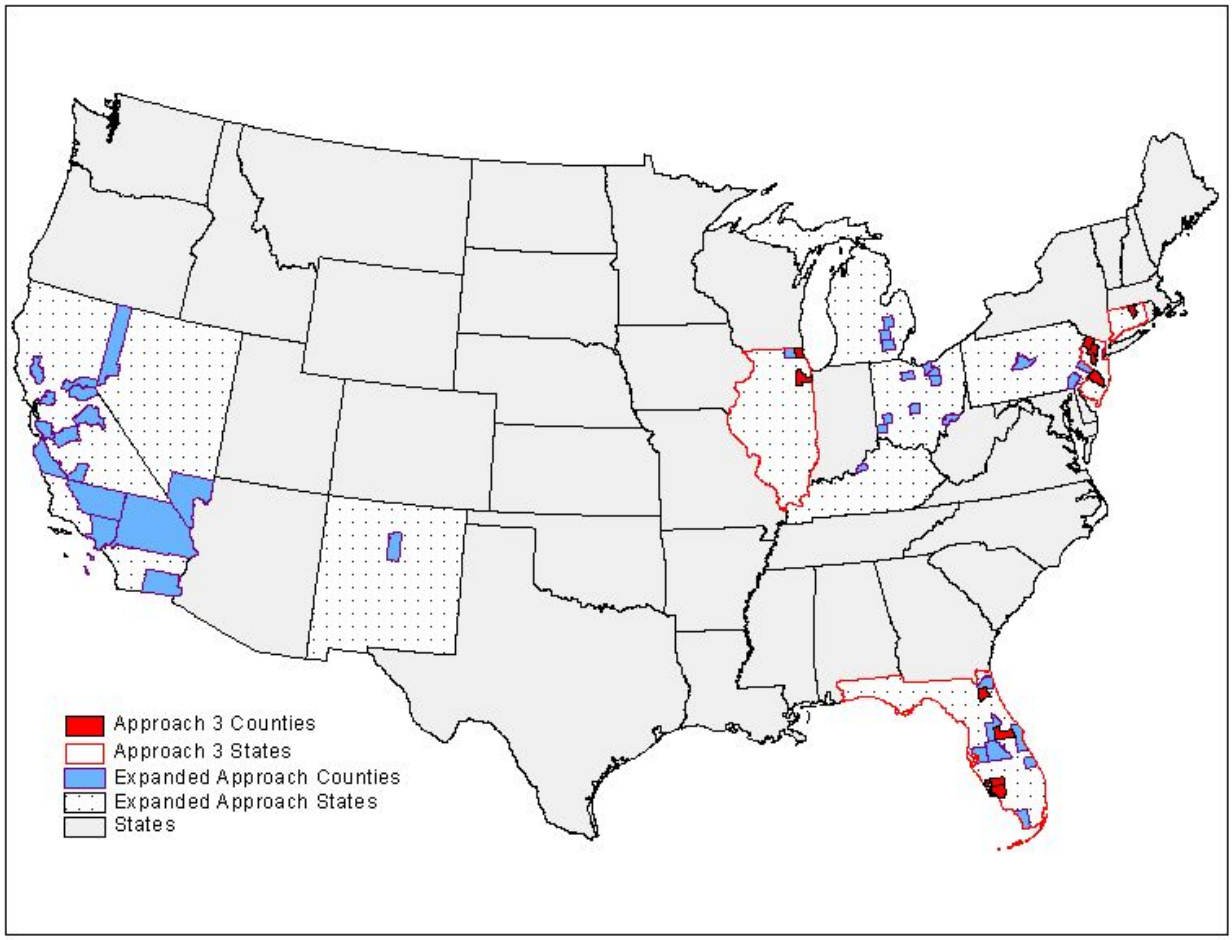

Figure E.8
Map 8: Results from "costly markets" approach (query A) to site selection for DME

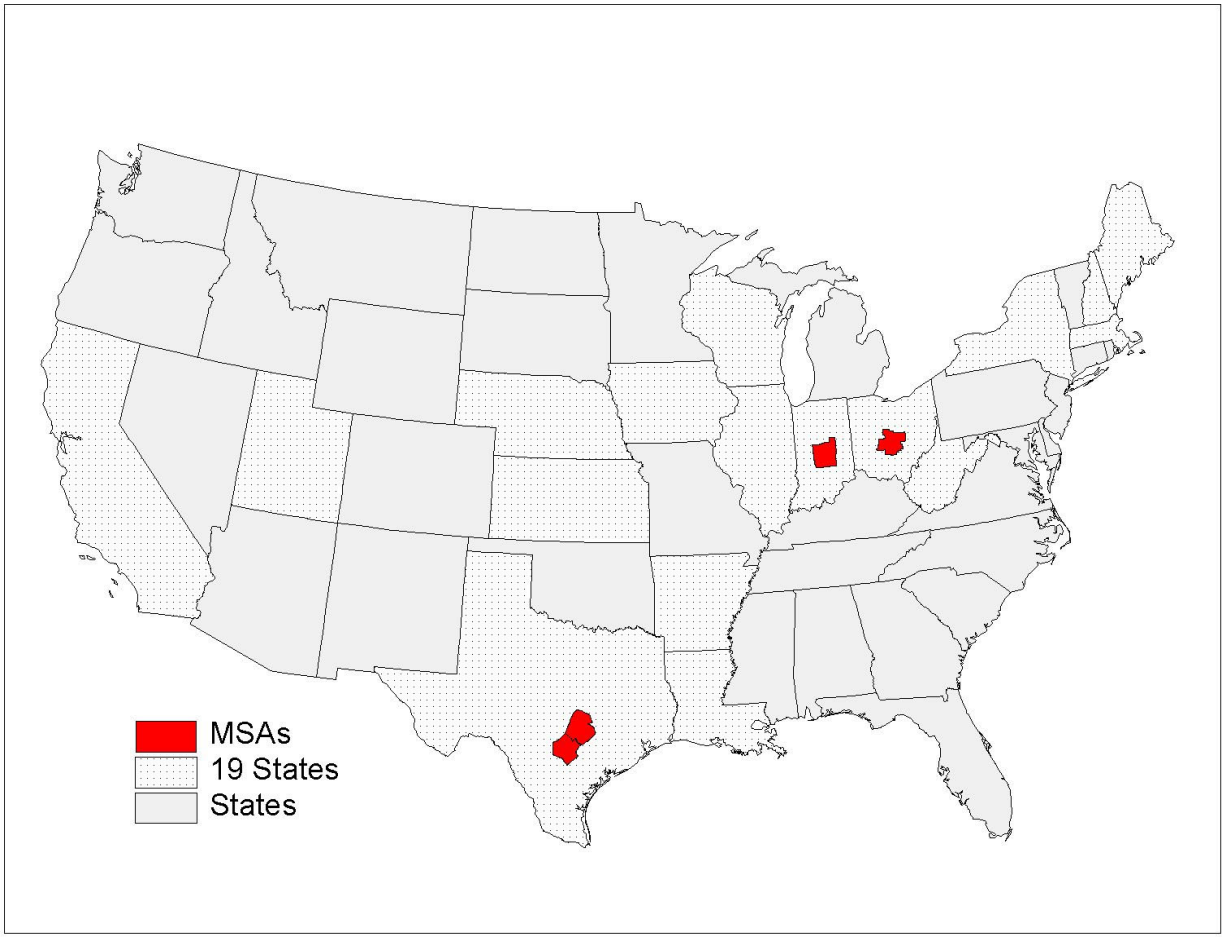

Figure E.9
Map 9: Results from "costly markets with competitive potential" approach (query B) to site selection for DME

Figure E.10
Map 10: Comparison of results from restrictive and expansive approaches to site selection for DME