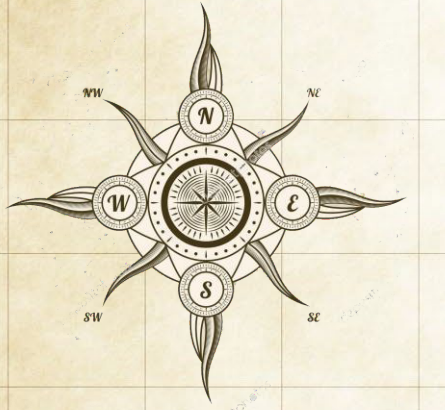
SAS® PROC GEOCODE By Example: A Case Study


NW
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Louise S. Hadden,
Independent Consultant

SAS® PROC GEOCODE By Example: A Case Study

Louise S. Hadden, Independent Consultant

Ms. Hadden has been using SAS® since the earth was a primordial soup, and still has her V5 manual (albeit in tatters). She spends much of her time supporting statistical analyses, specializing in complex reporting and visualizations in the Life Sciences. In her spare time, she volunteers at a local animal shelter, walking her own dog, taking pictures, and reads voraciously.. She is also the girl with the SAS tattoo!

Agenda

- Introduction
- PROC GEOCODE
- Required Input Data
- Binning / Proximity Calculations
- PROC SGMAP

NW
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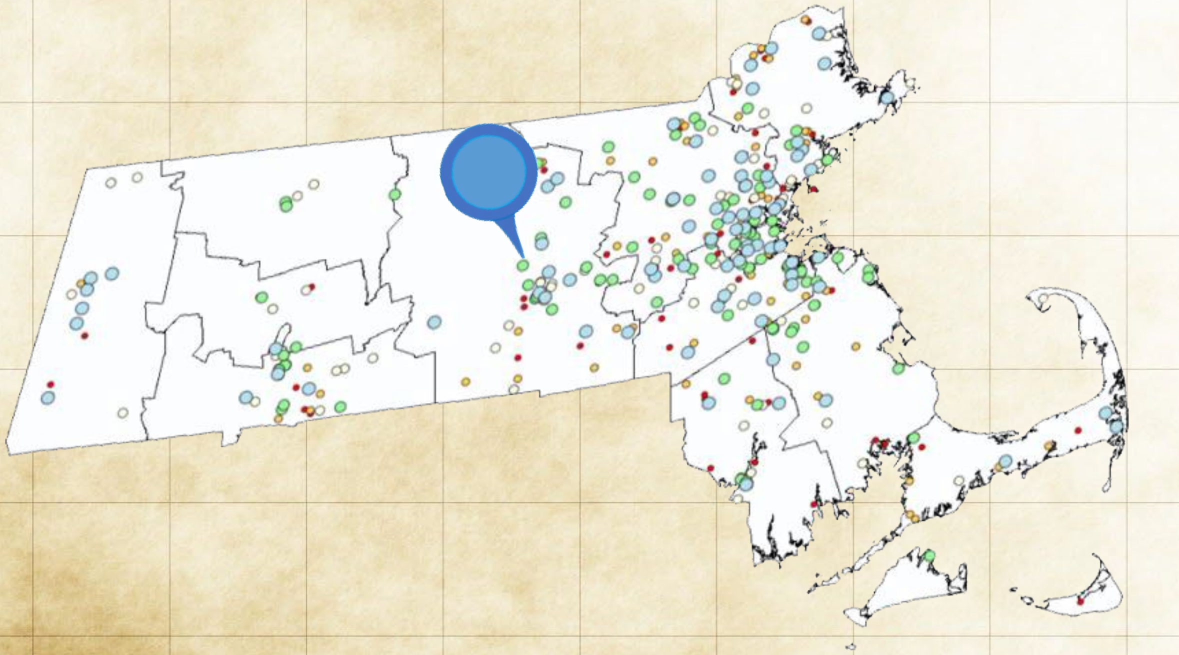
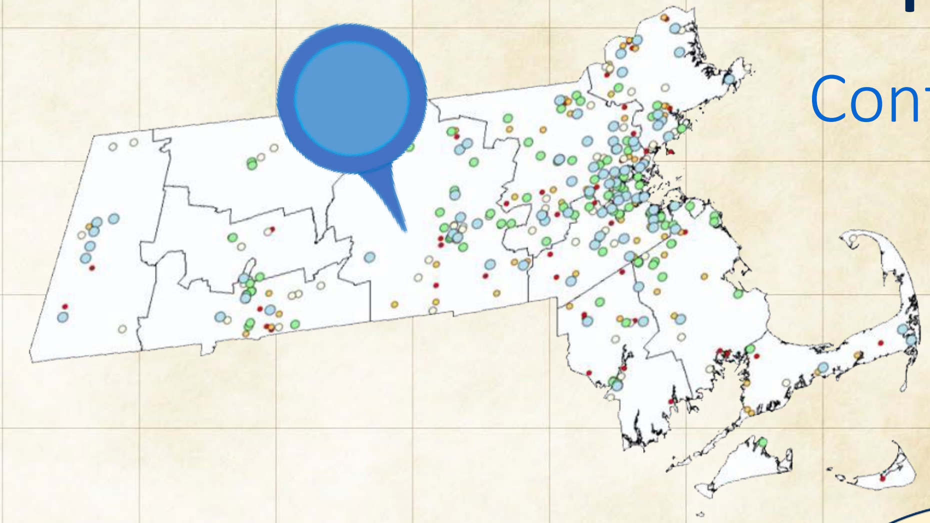


> Address geocoding, or simply geocoding, is the process of taking a text-based description of a location, such as an address or the name of a place, and returning geographic coordinates, frequently a latitude/longitude pair, to identify a location on the Earth's surface.”

Wikipedia

INTRODUCTION

Context for this Presentation



I work for a contractor

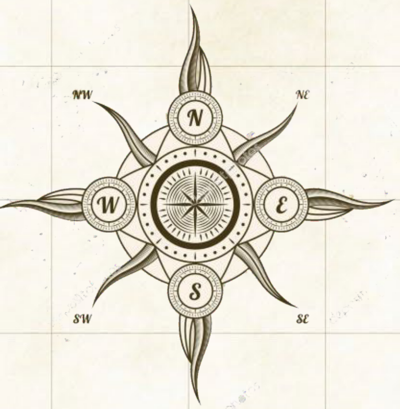
One of my major projects is for CMS

We collect, analyze and provide data to populate the Care Compare Website

Care Compare is a public facing website

We had a recent request to add geocoding information to the website

INTRODUCTION



1. Obtain address data, lookup data, and any “helper” data files
2. Geocode addresses, bin response data, calculate distances
3. Report out on geocoded addresses, map addresses

Fun Fact 1 Regarding SAS PROC GEOCODE

SAS PROC GEOCODE is part of BASE SAS, no longer part of SAS/GRAPH

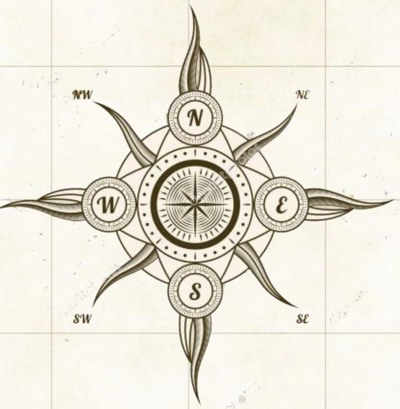
Fun Fact 2 Regarding SAS PROC GEOCODE

SAS PROC GEOCODE is not restricted to geographic entities in the United States

Fun Fact 3 Regarding SAS PROC GEOCODE

SAS PROC GEOCODE can be used to standardize your address data

PROC GEOCODE “Helper” Data Sets



1. SAS provides city and zip level datasets in the SASHELP folder
2. SAS provides a very limited street level data set in SASHELP
3. SAS provides a link to files required for street level geocoding and more on SAS MAPSONLINE

PROC GEOCODE

```
PROC GEOCODE /* Invoke geocoding procedure   */
method=STREET /* Specify geocoding method   */
data=work.prov /* Input data set of addresses   */
out=dd.GEOCODED /* Output data set with X/Y values   */
lookupstreet=street.usm /* Primary street lookup data set   */
type=SASHELP.GCTYPE; /* Lookup data set-added street type   */
RUN;
```

PROC GEOCODE

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PROC GEOCODE /* Invoke geocoding procedure   */
method=STREET /* Specify geocoding method   */
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RUN;
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PROC GEOCODE

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PROC GEOCODE /* Invoke geocoding procedure   */
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data=work.prov /* Input data set of addresses   */
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lookupstreet=street.usm /* Primary street lookup data set   */
type=SASHELP.GCTYPE; /* Lookup data set-added street type   */
RUN;
```

PROC GEOCODE

```
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data=work.prov /* Input data set of addresses  */
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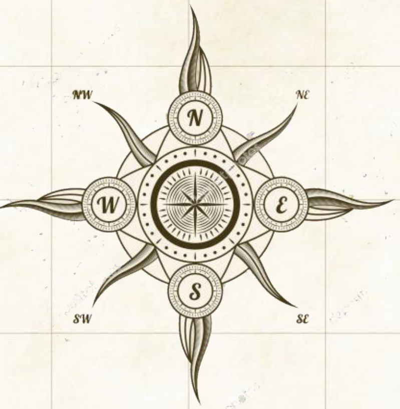
lookupstreet=street.usm /* Primary street lookup data set  */
type=SASHELP.GCTYPE; /* Lookup data set-added street type  */
RUN;
```

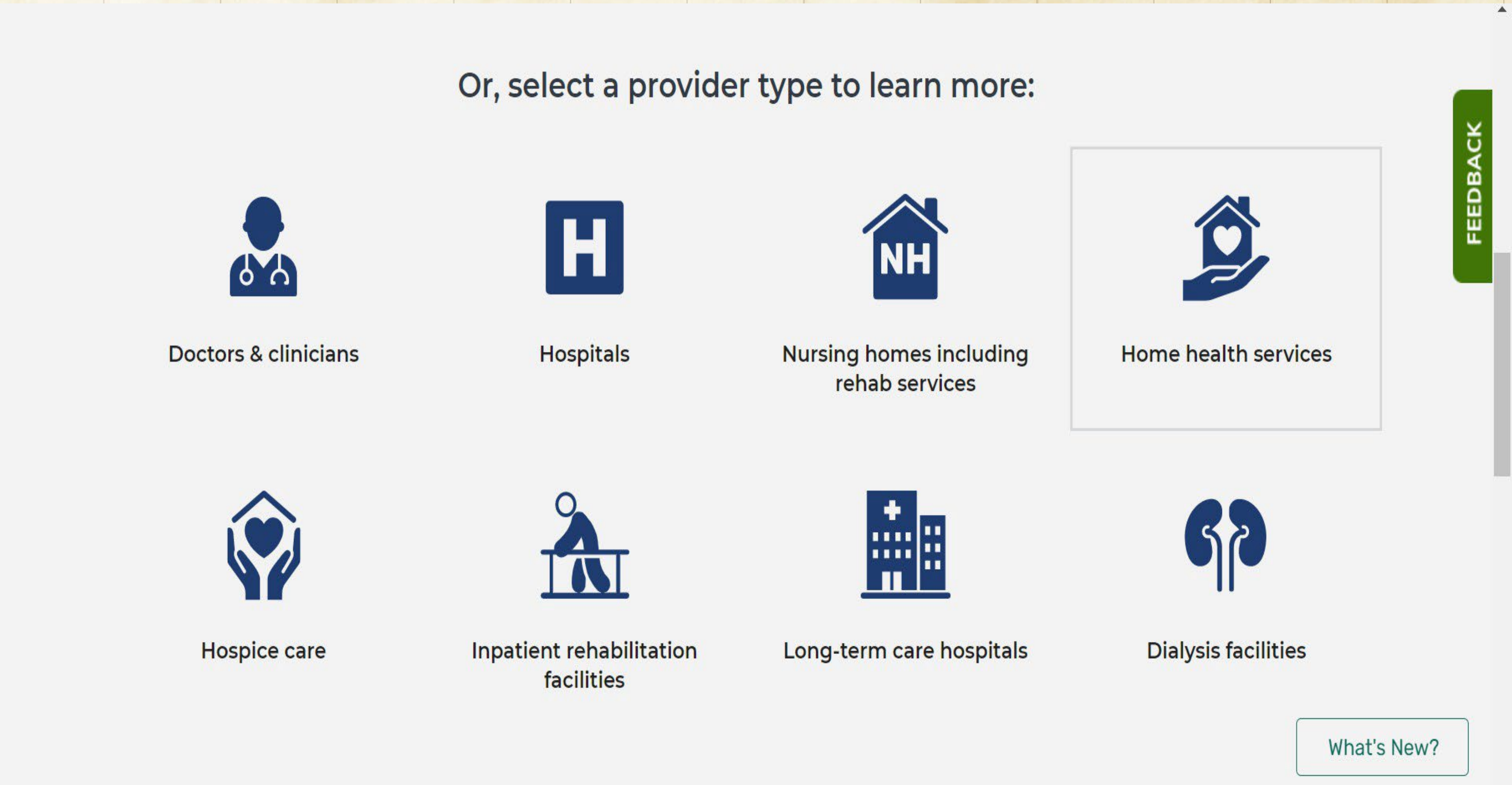
Required Data Sets for Case Study



1. Address Data: Nursing Home Data Base from Care Compare (CMS)
2. Street Lookup Data: Tiger Files
3. Street Type Standardization File: SASHELP.GCTYPE

Centers for Medicare & Medicare (CMS) Care Compare

https://www.medicare.gov/care-compare/

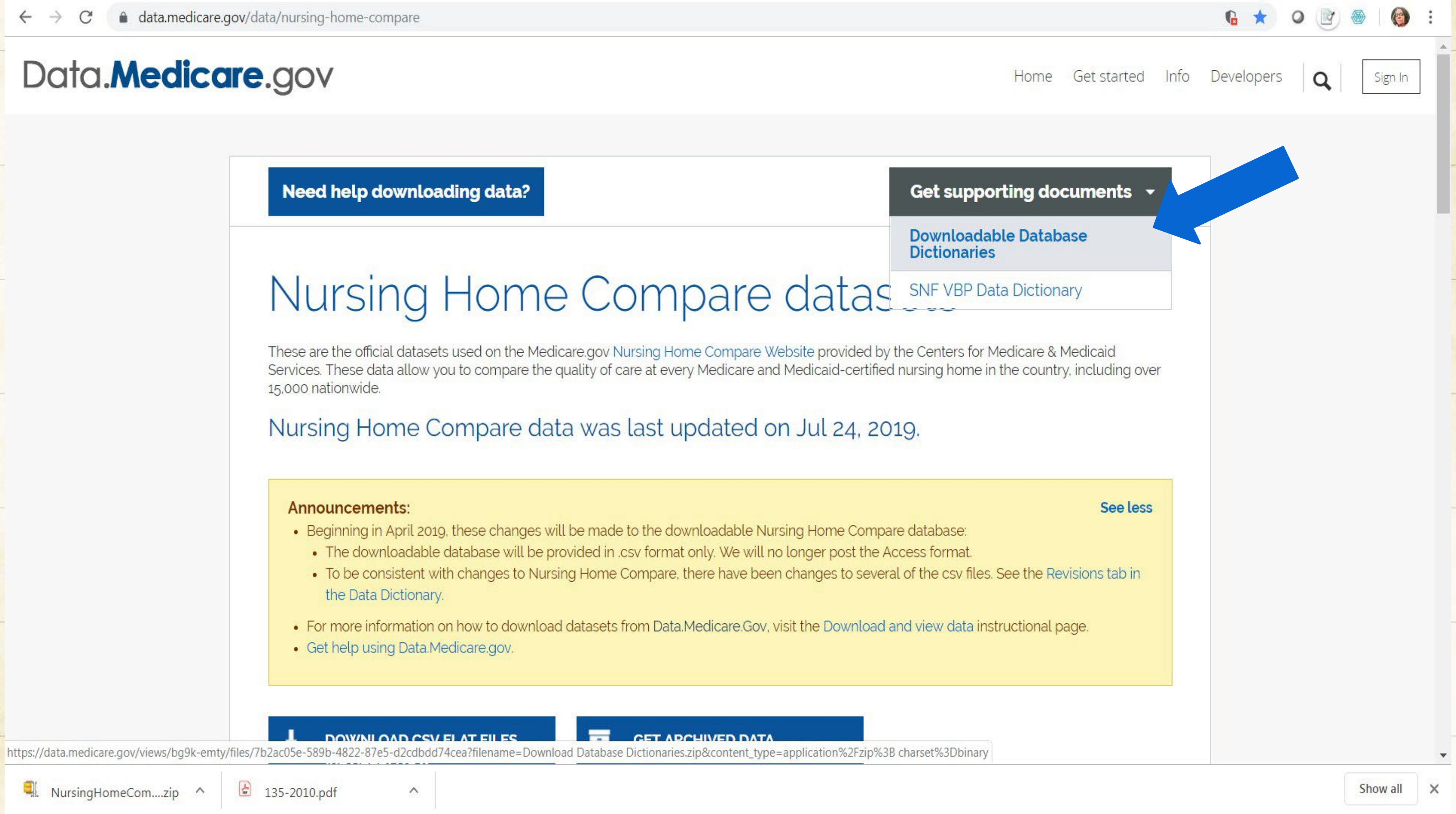


Or, select a provider type to learn more:

Doctors & clinicians
Hospitals
Nursing homes including rehab services
Home health services
Hospice care
Inpatient rehabilitation facilities
Long-term care hospitals
Dialysis facilities
What's New?
FEEDBACK

Centers for Medicare & Medicare (CMS) Care Compare

Download metadata by clicking on “Get supporting documents”


data.medicare.gov/data/nursing-home-compare
Data.Medicare.gov
Home
Get started
Info
Developers
Sign In
Need help downloading data?
Get supporting documents
Downloadable Database Dictionaries
SNF VBP Data Dictionary

Nursing Home Compare datas

These are the official datasets used on the Medicare.gov Nursing Home Compare Website provided by the Centers for Medicare & Medicaid Services. These data allow you to compare the quality of care at every Medicare and Medicaid-certified nursing home in the country, including over 15,000 nationwide.

Nursing Home Compare data was last updated on Jul 24, 2019.

Announcements: See less

- Beginning in April 2019, these changes will be made to the downloadable Nursing Home Compare database:
  - The downloadable database will be provided in .csv format only. We will no longer post the Access format.
  - To be consistent with changes to Nursing Home Compare, there have been changes to several of the csv files. See the Revisions tab in the Data Dictionary.
- For more information on how to download datasets from Data.Medicare.Gov, visit the Download and view data instructional page.
- Get help using Data.Medicare.gov.

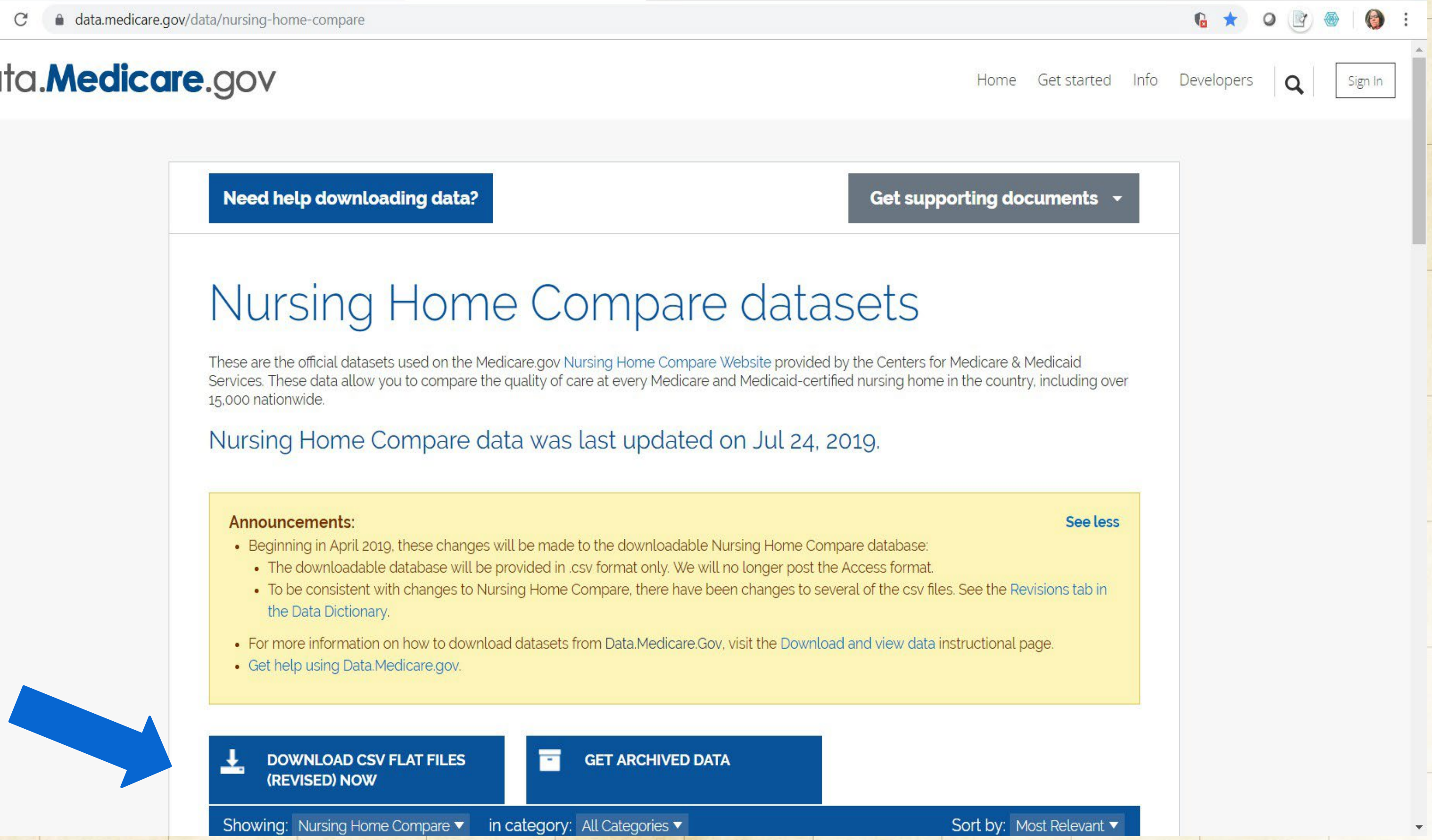
DOWNLOAD CSV FLAT FILES
GET ARCHIVED DATA

https://data.medicare.gov/views/bg9k-emty/files/7b2ac05e-589b-4822-87e5-d2cdbdd74cea?filename=Download Database Dictionaries.zip&content_type=application%2Fzip%3B charset%3Dbinary

NursingHomeCom....zip
135-2010.pdf
Show all

Centers for Medicare & Medicare (CMS) Care Compare

Download CSV file(s) by clicking on



data.medicare.gov/data/nursing-home-compare

Data.Medicare.gov
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Nursing Home Compare datasets

These are the official datasets used on the Medicare.gov Nursing Home Compare Website provided by the Centers for Medicare & Medicaid Services. These data allow you to compare the quality of care at every Medicare and Medicaid-certified nursing home in the country, including over 15,000 nationwide.

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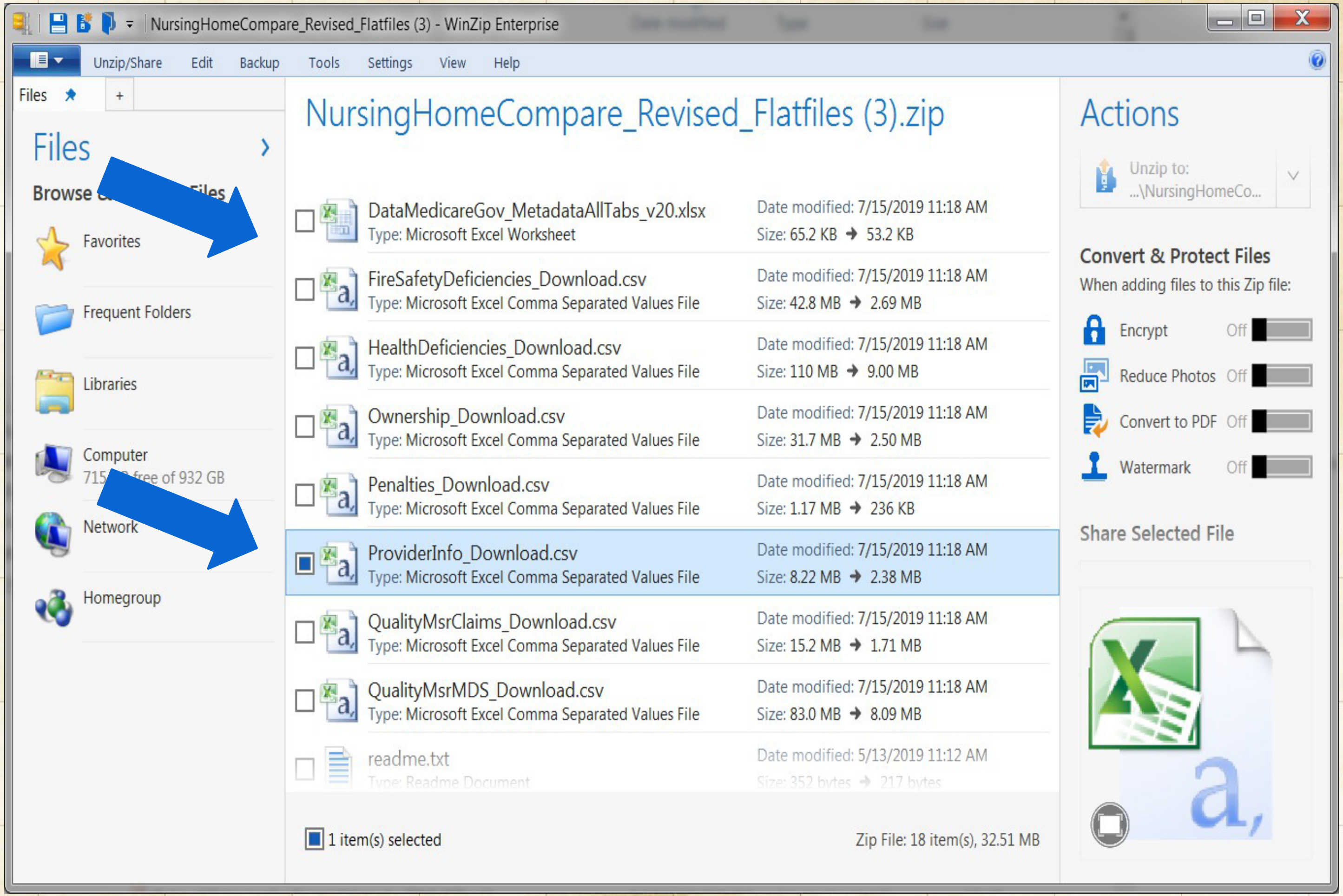
- For more information on how to download datasets from Data.Medicare.Gov, visit the Download and view data instructional page.
- Get help using Data.Medicare.gov.

DOWNLOAD CSV FLAT FILES (REVISED) NOW
GET ARCHIVED DATA
Showing: Nursing Home Compare
in category: All Categories
Sort by: Most Relevant

Centers for Medicare & Medicare (CMS) Care Compare

Open the downloaded zip file


NursingHomeCompare_Revised_Flatfiles (3) - WinZip Enterprise
Unzip/Share
Edit
Backup
Tools
Settings
View
Help
Files
Files
Browse
Favorites
Frequent Folders
Libraries
Computer
of 932 GB
Network
Homegroup
Actions
Unzip to:
...\NursingHomeCo...
Convert & Protect Files
When adding files to this Zip file:
Encrypt Off
Reduce Photos Off
Convert to PDF Off
Watermark Off
Share Selected File

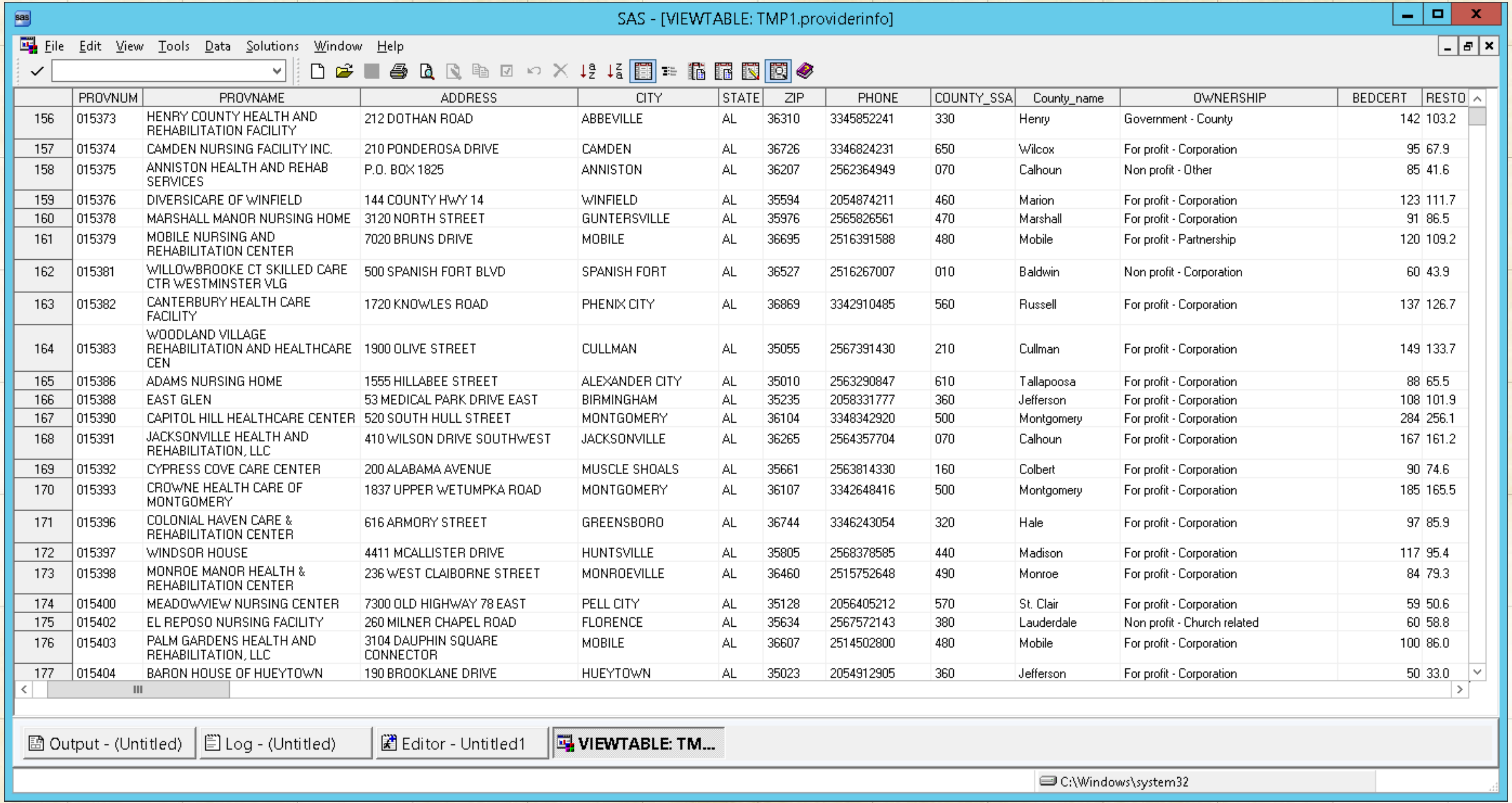
NursingHomeCompare_Revised_Flatfiles (3).zip

	File	Type	Date modified	Size
☐	DataMedicareGov_MetadataAllTabs_v20.xlsx	Microsoft Excel Worksheet	7/15/2019 11:18 AM	65.2 KB → 53.2 KB
☐	FireSafetyDeficiencies_Download.csv	Microsoft Excel Comma Separated Values File	7/15/2019 11:18 AM	42.8 MB → 2.69 MB
☐	HealthDeficiencies_Download.csv	Microsoft Excel Comma Separated Values File	7/15/2019 11:18 AM	110 MB → 9.00 MB
☐	Ownership_Download.csv	Microsoft Excel Comma Separated Values File	7/15/2019 11:18 AM	31.7 MB → 2.50 MB
☐	Penalties_Download.csv	Microsoft Excel Comma Separated Values File	7/15/2019 11:18 AM	1.17 MB → 236 KB
☑	ProviderInfo_Download.csv	Microsoft Excel Comma Separated Values File	7/15/2019 11:18 AM	8.22 MB → 2.38 MB
☐	QualityMsrClaims_Download.csv	Microsoft Excel Comma Separated Values File	7/15/2019 11:18 AM	15.2 MB → 1.71 MB
☐	QualityMsrMDS_Download.csv	Microsoft Excel Comma Separated Values File	7/15/2019 11:18 AM	83.0 MB → 8.09 MB
☐	readme.txt	Readme Document	5/13/2019 11:12 AM	352 bytes → 217 bytes

☑ 1 item(s) selected

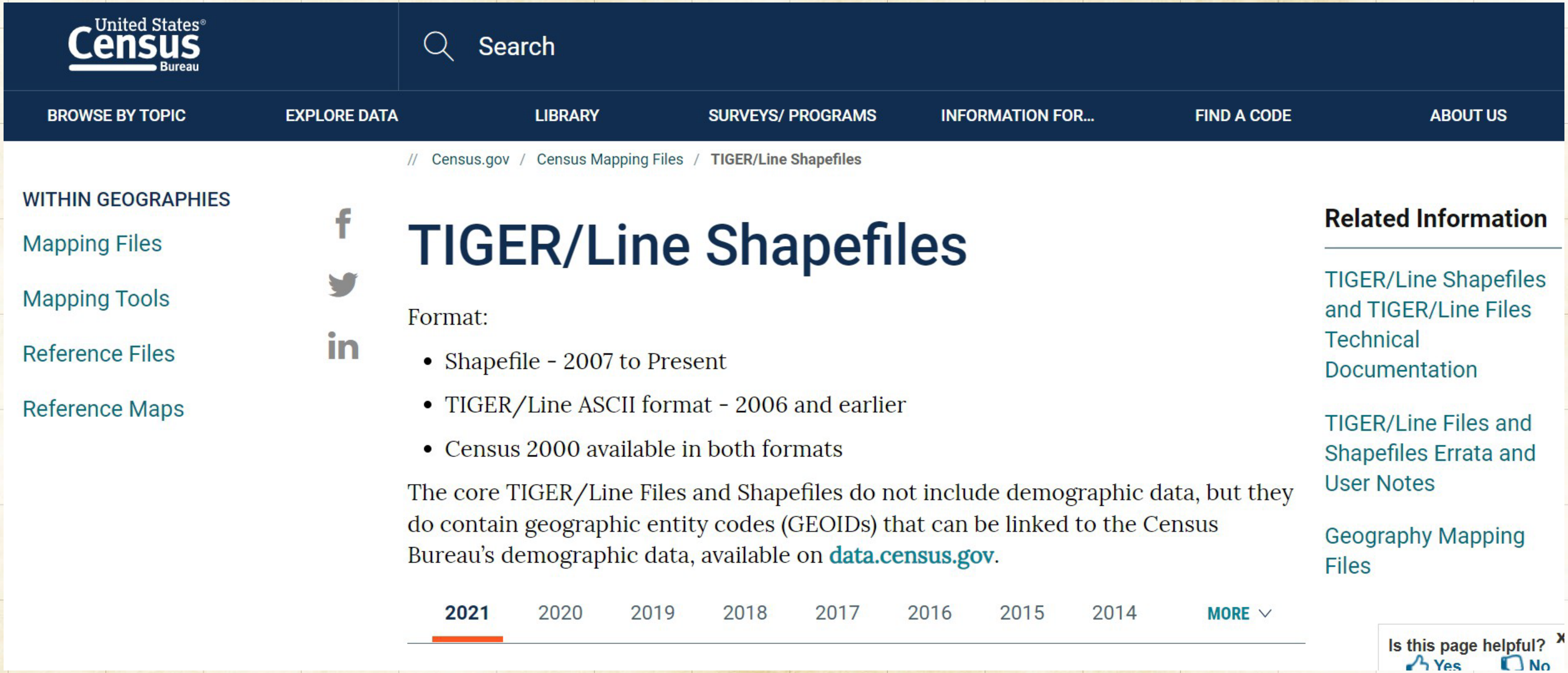
Zip File: 18 item(s), 32.51 MB

Centers for Medicare & Medicare (CMS) Care Compare



	PROVNUM	PROVNAME	ADDRESS	CITY	STATE	ZIP	PHONE	COUNTY_SSA	County_name	OWNERSHIP	BEDCERT	RESTO
156	015373	HENRY COUNTY HEALTH AND REHABILITATION FACILITY	212 DOTHAN ROAD	ABBEVILLE	AL	36310	3345852241	330	Henry	Government - County	142	103.2
157	015374	CAMDEN NURSING FACILITY INC.	210 PONDEROSA DRIVE	CAMDEN	AL	36726	3346824231	650	Wilcox	For profit - Corporation	95	67.9
158	015375	ANNISTON HEALTH AND REHAB SERVICES	P.O. BOX 1825	ANNISTON	AL	36207	2562364949	070	Calhoun	Non profit - Other	85	41.6
159	015376	DIVERSICARE OF WINFIELD	144 COUNTY HWY 14	WINFIELD	AL	35594	2054874211	460	Marion	For profit - Corporation	123	111.7
160	015378	MARSHALL MANOR NURSING HOME	3120 NORTH STREET	GUNTERSVILLE	AL	35976	2565826561	470	Marshall	For profit - Corporation	91	86.5
161	015379	MOBILE NURSING AND REHABILITATION CENTER	7020 BRUNS DRIVE	MOBILE	AL	36695	2516391588	480	Mobile	For profit - Partnership	120	109.2
162	015381	WILLOWBROOKE CT SKILLED CARE CTR WESTMINSTER VLG	500 SPANISH FORT BLVD	SPANISH FORT	AL	36527	2516267007	010	Baldwin	Non profit - Corporation	60	43.9
163	015382	CANTERBURY HEALTH CARE FACILITY	1720 KNOWLES ROAD	PHENIX CITY	AL	36869	3342910485	560	Russell	For profit - Corporation	137	126.7
164	015383	WOODLAND VILLAGE REHABILITATION AND HEALTHCARE CEN	1900 OLIVE STREET	CULLMAN	AL	35055	2567391430	210	Cullman	For profit - Corporation	149	133.7
165	015386	ADAMS NURSING HOME	1555 HILLABEE STREET	ALEXANDER CITY	AL	35010	2563290847	610	Tallapoosa	For profit - Corporation	88	65.5
166	015388	EAST GLEN	53 MEDICAL PARK DRIVE EAST	BIRMINGHAM	AL	35235	2058331777	360	Jefferson	For profit - Corporation	108	101.9
167	015390	CAPITOL HILL HEALTHCARE CENTER	520 SOUTH HULL STREET	MONTGOMERY	AL	36104	3348342920	500	Montgomery	For profit - Corporation	284	256.1
168	015391	JACKSONVILLE HEALTH AND REHABILITATION, LLC	410 WILSON DRIVE SOUTHWEST	JACKSONVILLE	AL	36265	2564357704	070	Calhoun	For profit - Corporation	167	161.2
169	015392	CYPRESS COVE CARE CENTER	200 ALABAMA AVENUE	MUSCLE SHOALS	AL	35661	2563814330	160	Colbert	For profit - Corporation	90	74.6
170	015393	CROWNE HEALTH CARE OF MONTGOMERY	1837 UPPER WETUMPKA ROAD	MONTGOMERY	AL	36107	3342648416	500	Montgomery	For profit - Corporation	185	165.5
171	015396	COLONIAL HAVEN CARE & REHABILITATION CENTER	616 ARMORY STREET	GREENSBORO	AL	36744	3346243054	320	Hale	For profit - Corporation	97	85.9
172	015397	WINDSOR HOUSE	4411 MCALLISTER DRIVE	HUNTSVILLE	AL	35805	2568378585	440	Madison	For profit - Corporation	117	95.4
173	015398	MONROE MANOR HEALTH & REHABILITATION CENTER	236 WEST CLAIBORNE STREET	MONROEVILLE	AL	36460	2515752648	490	Monroe	For profit - Corporation	84	79.3
174	015400	MEADOWVIEW NURSING CENTER	7300 OLD HIGHWAY 78 EAST	PELL CITY	AL	35128	2056405212	570	St. Clair	For profit - Corporation	59	50.6
175	015402	EL REPOSO NURSING FACILITY	260 MILNER CHAPEL ROAD	FLORENCE	AL	35634	2567572143	380	Lauderdale	Non profit - Church related	60	58.8
176	015403	PALM GARDENS HEALTH AND REHABILITATION, LLC	3104 DAUPHIN SQUARE CONNECTOR	MOBILE	AL	36607	2514502800	480	Mobile	For profit - Corporation	100	86.0
177	015404	BARON HOUSE OF HUEYTOWN	190 BROOKLANE DRIVE	HUEYTOWN	AL	35023	2054912905	360	Jefferson	For profit - Corporation	50	33.0

TIGER Data



United States Census Bureau
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INFORMATION FOR...
FIND A CODE
ABOUT US

// Census.gov / Census Mapping Files / TIGER/Line Shapefiles

WITHIN GEOGRAPHIES

- Mapping Files
- Mapping Tools
- Reference Files
- Reference Maps

TIGER/Line Shapefiles

Format:

- Shapefile - 2007 to Present
- TIGER/Line ASCII format - 2006 and earlier
- Census 2000 available in both formats

The core TIGER/Line Files and Shapefiles do not include demographic data, but they do contain geographic entity codes (GEOIDs) that can be linked to the Census Bureau's demographic data, available on data.census.gov.

2021 2020 2019 2018 2017 2016 2015 2014 MORE

Related Information

- TIGER/Line Shapefiles and TIGER/Line Files Technical Documentation
- TIGER/Line Files and Shapefiles Errata and User Notes
- Geography Mapping Files

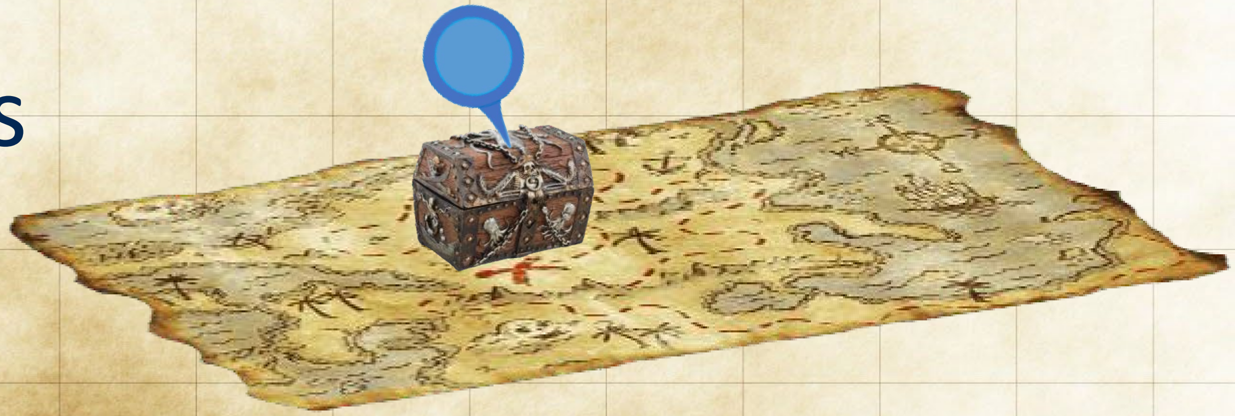
Is this page helpful?
Yes
No

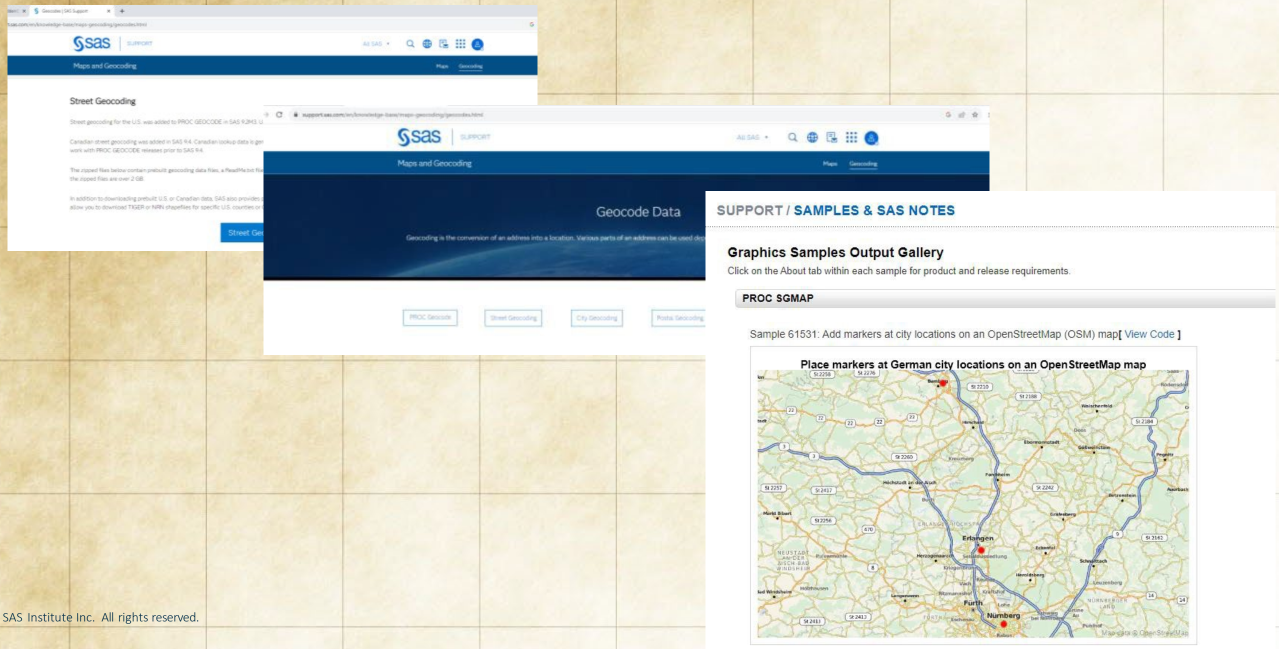
> TIGER stands for the Topologically Integrated Geographic Encoding and Referencing system and represents the U.S. Census Bureau's geographic spatial data”

U.S. Census Bureau

SAS MapsOnline

- Hidden treasure
- Geographic code samples
- Geographic files
  - Updates to SAS provided files: includes map files, selected SASHELP files, Zipcode files
  - TIGER files





Geocodes | SAS Support
sas.com/en/knowledge-base/maps-geocoding/geocodes.html
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SUPPORT
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Maps
Geocoding

Street Geocoding

Street geocoding for the U.S. was added to PROC GEOCODE in SAS 9.2M3. U

Canadian street geocoding was added in SAS 9.4. Canadian lookup data is ge
work with PROC GEOCODE releases prior to SAS 9.4.

The zipped files below contain prebuilt geocoding data files, a ReadMe.txt fil
the zipped files are over 2 GB.

In addition to downloading prebuilt U.S. or Canadian data, SAS also provides
allow you to download TIGER or NRN shapefiles for specific U.S. counties or

Street Ge
support.sas.com/en/knowledge-base/maps-geocoding/geocodes.html
sas
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Maps and Geocoding
Maps
Geocoding

Geocode Data

Geocoding is the conversion of an address into a location. Various parts of an address can be used de

PROC Geocode
Street Geocoding
City Geocoding
Postal Geocoding

SUPPORT / SAMPLES & SAS NOTES

Graphics Samples Output Gallery

Click on the About tab within each sample for product and release requirements.

PROC SGMAP

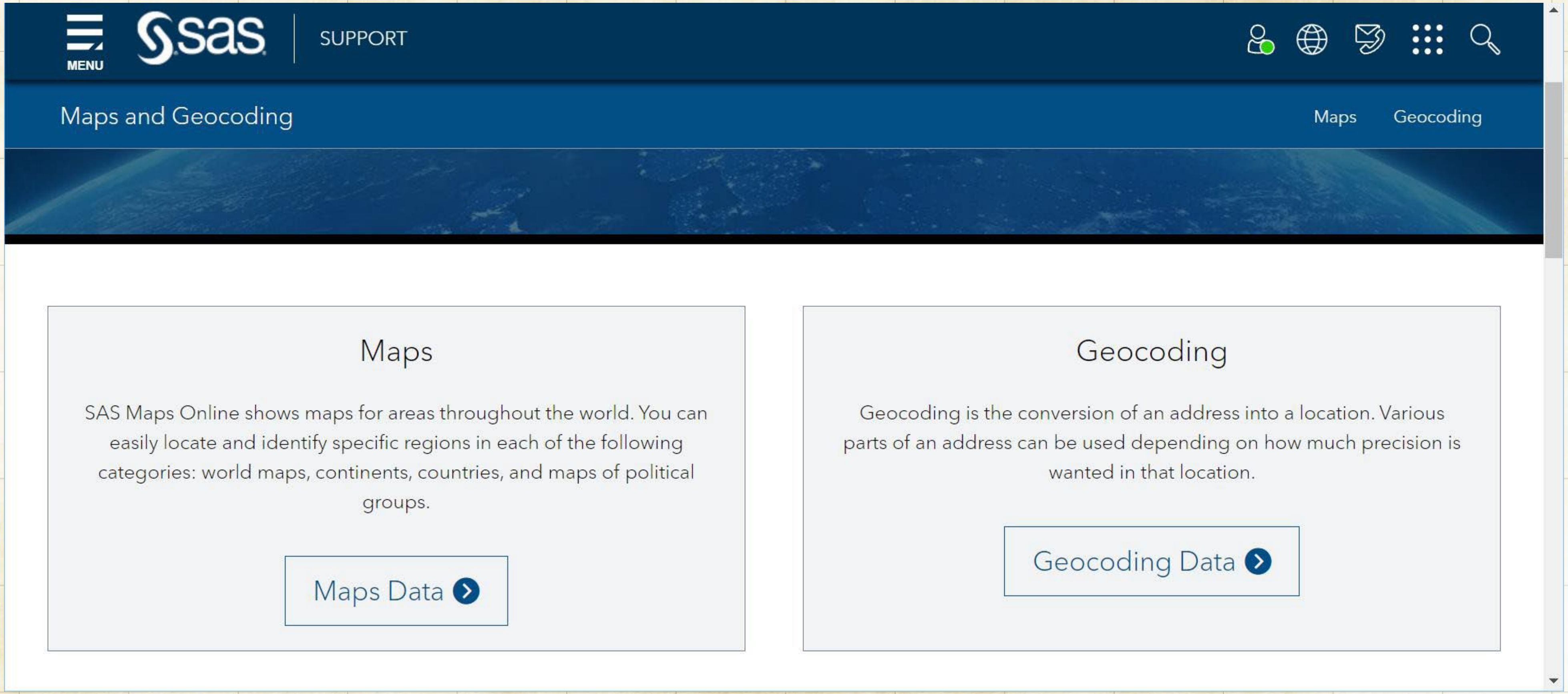
Sample 61531: Add markers at city locations on an OpenStreetMap (OSM) map[View Code]

Place markers at German city locations on an OpenStreetMap map

Bamberg
Erlangen
Fürth
Nürnberg
Forchheim
Ebermannstadt
Höchstadt an der Aisch
Herzogenaurach
Pegnitz
Map data © OpenStreetMap

Tiger Data

https://support.sas.com/en/knowledge-base/maps-geocoding.html


MENU
sas
SUPPORT
Maps and Geocoding
Maps
Geocoding

Maps

SAS Maps Online shows maps for areas throughout the world. You can easily locate and identify specific regions in each of the following categories: world maps, continents, countries, and maps of political groups.

Maps Data

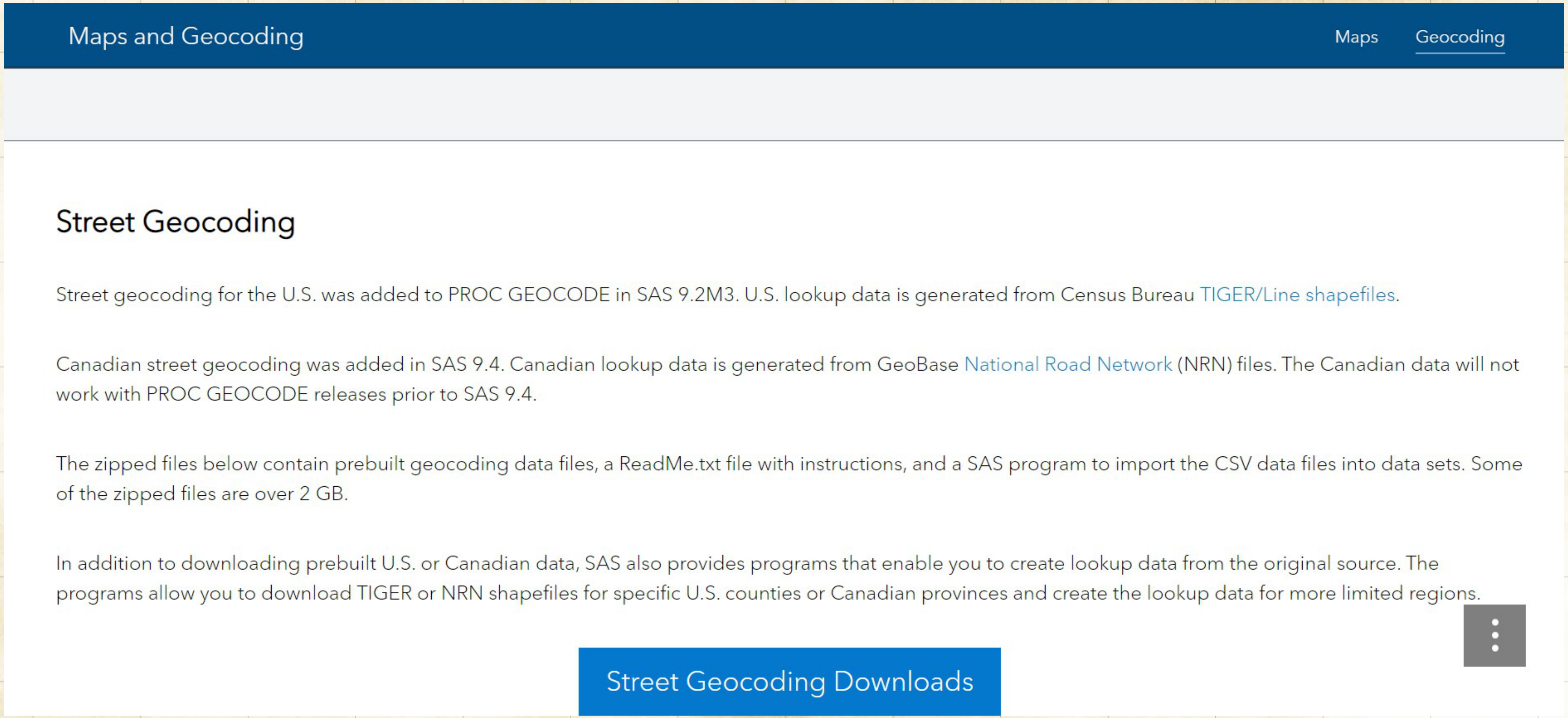
Geocoding

Geocoding is the conversion of an address into a location. Various parts of an address can be used depending on how much precision is wanted in that location.

Geocoding Data

Tiger Data

https://support.sas.com/en/knowledge-base/maps-geocoding/geocodes.html#street



Street Geocoding

Street geocoding for the U.S. was added to PROC GEOCODE in SAS 9.2M3. U.S. lookup data is generated from Census Bureau TIGER/Line shapefiles.

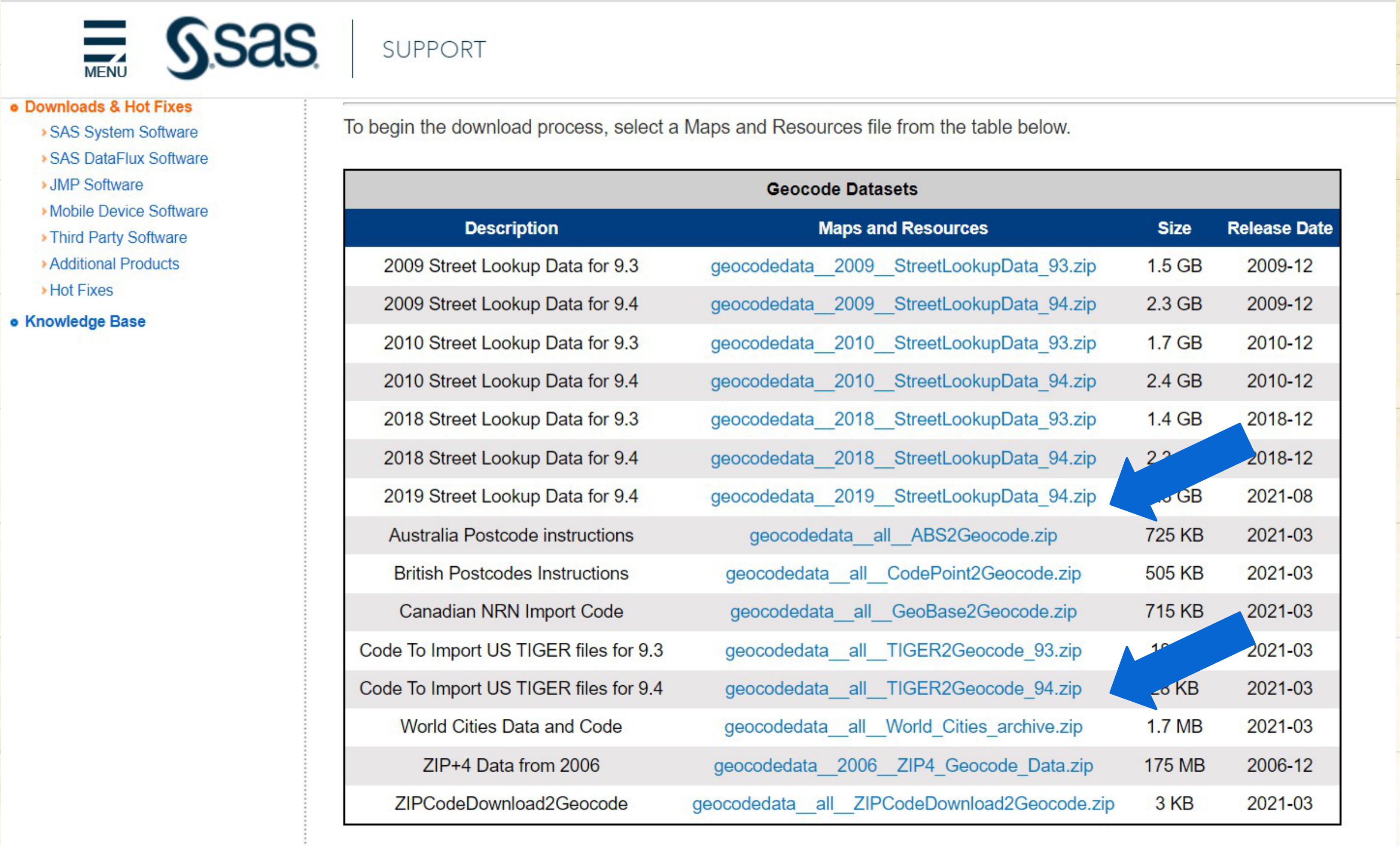
Canadian street geocoding was added in SAS 9.4. Canadian lookup data is generated from GeoBase National Road Network (NRN) files. The Canadian data will not work with PROC GEOCODE releases prior to SAS 9.4.

The zipped files below contain prebuilt geocoding data files, a ReadMe.txt file with instructions, and a SAS program to import the CSV data files into data sets. Some of the zipped files are over 2 GB.

In addition to downloading prebuilt U.S. or Canadian data, SAS also provides programs that enable you to create lookup data from the original source. The programs allow you to download TIGER or NRN shapefiles for specific U.S. counties or Canadian provinces and create the lookup data for more limited regions.

Tiger Data

https://support.sas.com/downloads/package.htm?pid=2557



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SAS DataFlux Software
JMP Software
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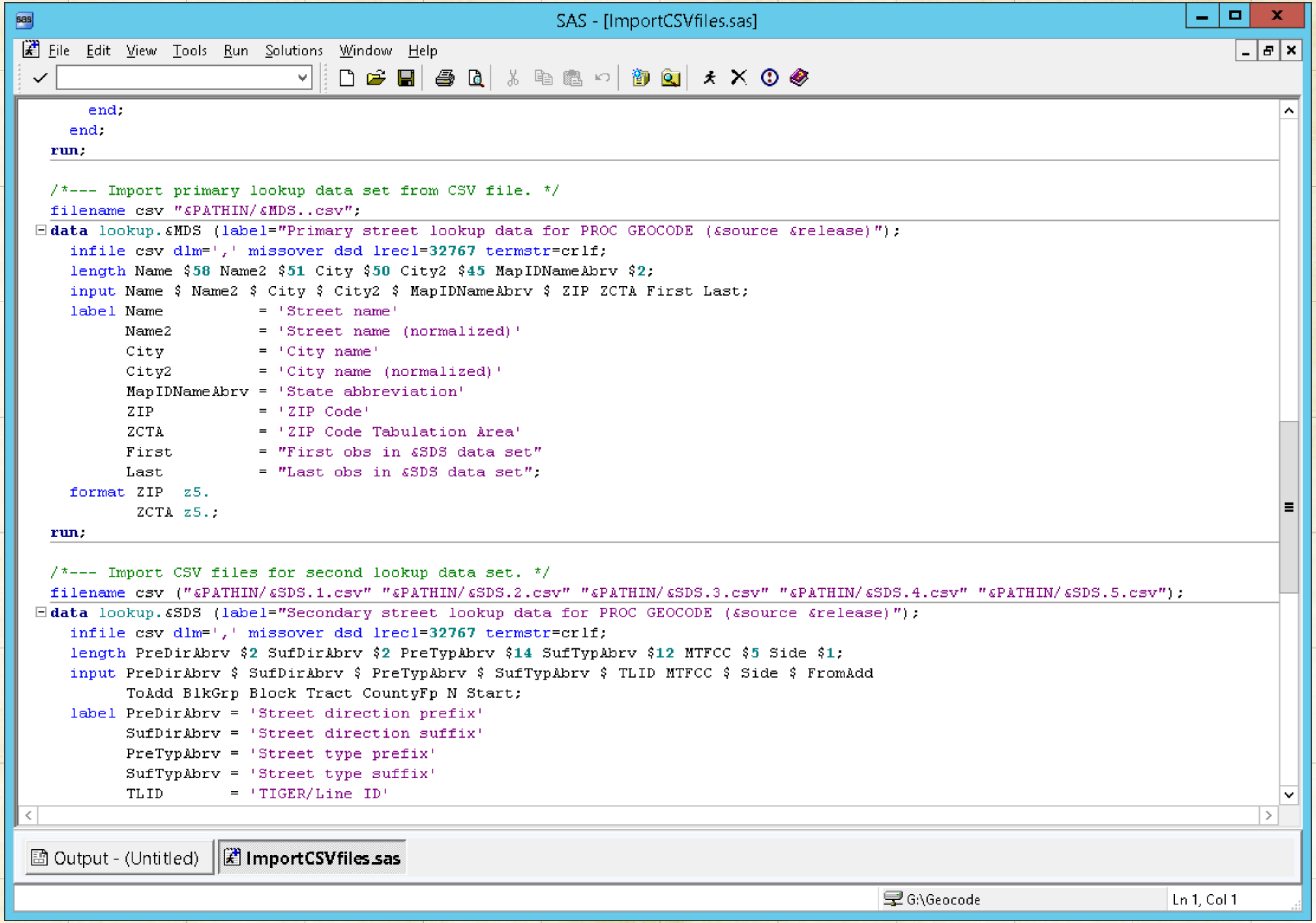
Third Party Software
Additional Products
Hot Fixes
Knowledge Base

To begin the download process, select a Maps and Resources file from the table below.

Geocode Datasets

Description	Maps and Resources	Size	Release Date
2009 Street Lookup Data for 9.3	geocodedata__2009__StreetLookupData_93.zip	1.5 GB	2009-12
2009 Street Lookup Data for 9.4	geocodedata__2009__StreetLookupData_94.zip	2.3 GB	2009-12
2010 Street Lookup Data for 9.3	geocodedata__2010__StreetLookupData_93.zip	1.7 GB	2010-12
2010 Street Lookup Data for 9.4	geocodedata__2010__StreetLookupData_94.zip	2.4 GB	2010-12
2018 Street Lookup Data for 9.3	geocodedata__2018__StreetLookupData_93.zip	1.4 GB	2018-12
2018 Street Lookup Data for 9.4	geocodedata__2018__StreetLookupData_94.zip	2.[illegible]	2018-12
2019 Street Lookup Data for 9.4	geocodedata__2019__StreetLookupData_94.zip	[illegible] GB	2021-08
Australia Postcode instructions	geocodedata__all__ABS2Geocode.zip	725 KB	2021-03
British Postcodes Instructions	geocodedata__all__CodePoint2Geocode.zip	505 KB	2021-03
Canadian NRN Import Code	geocodedata__all__GeoBase2Geocode.zip	715 KB	2021-03
Code To Import US TIGER files for 9.3	geocodedata__all__TIGER2Geocode_93.zip	1[illegible]	2021-03
Code To Import US TIGER files for 9.4	geocodedata__all__TIGER2Geocode_94.zip	[illegible] KB	2021-03
World Cities Data and Code	geocodedata__all__World_Cities_archive.zip	1.7 MB	2021-03
ZIP+4 Data from 2006	geocodedata__2006__ZIP4_Geocode_Data.zip	175 MB	2006-12
ZIPCodeDownload2Geocode	geocodedata__all__ZIPCodeDownload2Geocode.zip	3 KB	2021-03

Tiger Data

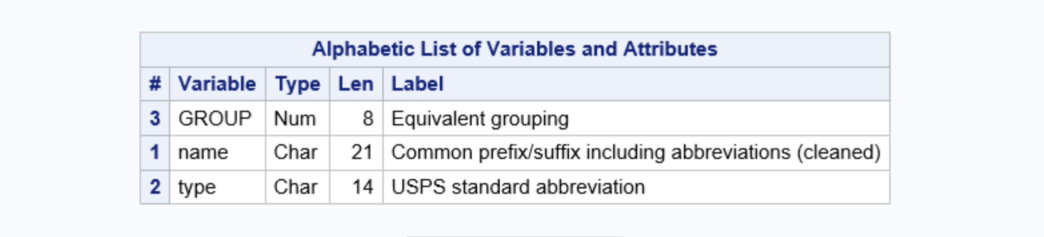


```
    end;
  end;
run;

/*--- Import primary lookup data set from CSV file. */
filename csv "&PATHIN/&MDS..csv";
data lookup.&MDS (label="Primary street lookup data for PROC GEOCODE (&source &release)");
  infile csv dlm=',' missover dsd lrecl=32767 termstr=crlf;
  length Name $58 Name2 $51 City $50 City2 $45 MapIDNameAbrv $2;
  input Name $ Name2 $ City $ City2 $ MapIDNameAbrv $ ZIP ZCTA First Last;
  label Name          = 'Street name'
        Name2         = 'Street name (normalized)'
        City          = 'City name'
        City2         = 'City name (normalized)'
        MapIDNameAbrv = 'State abbreviation'
        ZIP           = 'ZIP Code'
        ZCTA          = 'ZIP Code Tabulation Area'
        First         = "First obs in &SDS data set"
        Last          = "Last obs in &SDS data set";
  format ZIP  z5.
         ZCTA z5.;
run;

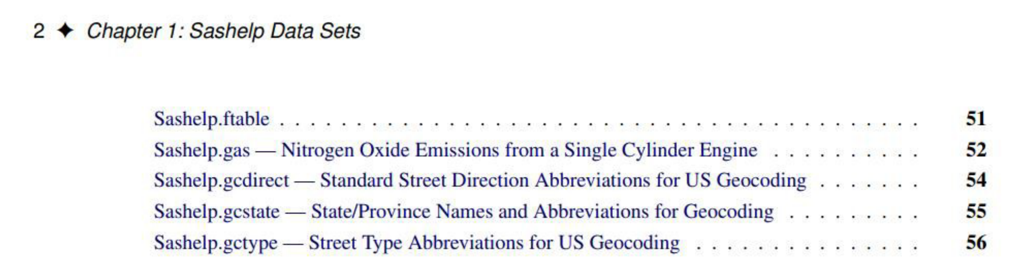
/*--- Import CSV files for second lookup data set. */
filename csv ("&PATHIN/&SDS.1.csv" "&PATHIN/&SDS.2.csv" "&PATHIN/&SDS.3.csv" "&PATHIN/&SDS.4.csv" "&PATHIN/&SDS.5.csv");
data lookup.&SDS (label="Secondary street lookup data for PROC GEOCODE (&source &release)");
  infile csv dlm=',' missover dsd lrecl=32767 termstr=crlf;
  length PreDirAbrv $2 SufDirAbrv $2 PreTypAbrv $14 SufTypAbrv $12 MTFCC $5 Side $1;
  input PreDirAbrv $ SufDirAbrv $ PreTypAbrv $ SufTypAbrv $ TLID MTFCC $ Side $ FromAdd
        ToAdd BlkGrp Block Tract CountyFp N Start;
  label PreDirAbrv = 'Street direction prefix'
        SufDirAbrv = 'Street direction suffix'
        PreTypAbrv = 'Street type prefix'
        SufTypAbrv = 'Street type suffix'
        TLID       = 'TIGER/Line ID'
```

SASHELP Files



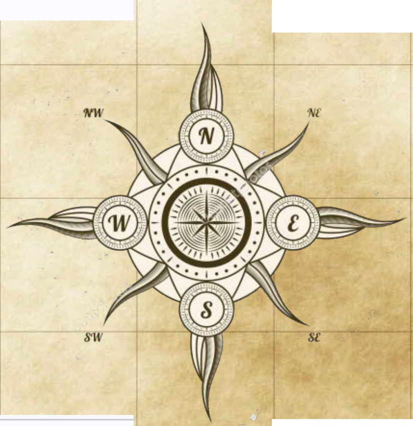
Alphabetic List of Variables and Attributes

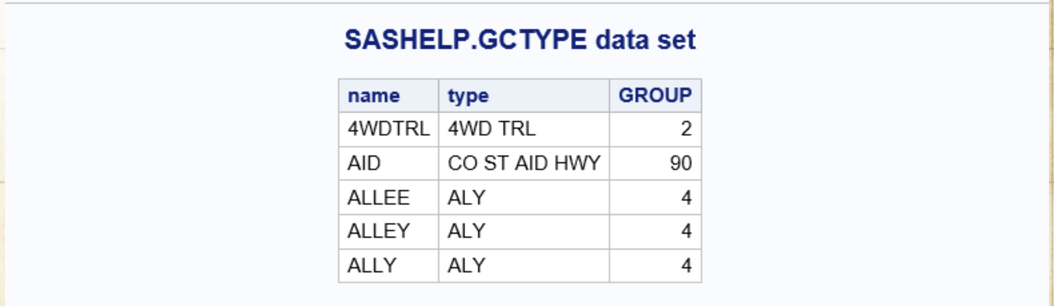
#	Variable	Type	Len	Label
3	GROUP	Num	8	Equivalent grouping
1	name	Char	21	Common prefix/suffix including abbreviations (cleaned)
2	type	Char	14	USPS standard abbreviation



2 ✦ *Chapter 1: Sashelp Data Sets*

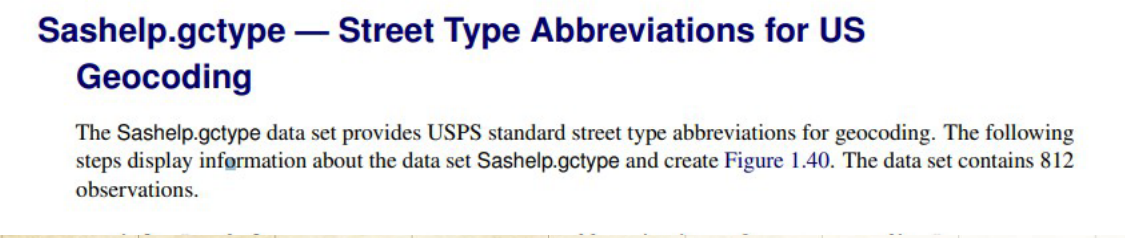
Sashelp.ftable 51
Sashelp.gas — Nitrogen Oxide Emissions from a Single Cylinder Engine 52
Sashelp.gcdirect — Standard Street Direction Abbreviations for US Geocoding 54
Sashelp.gcstate — State/Province Names and Abbreviations for Geocoding 55
Sashelp.gctype — Street Type Abbreviations for US Geocoding 56





SASHELP.GCTYPE data set

name	type	GROUP
4WDTRL	4WD TRL	2
AID	CO ST AID HWY	90
ALLEE	ALY	4
ALLEY	ALY	4
ALLY	ALY	4



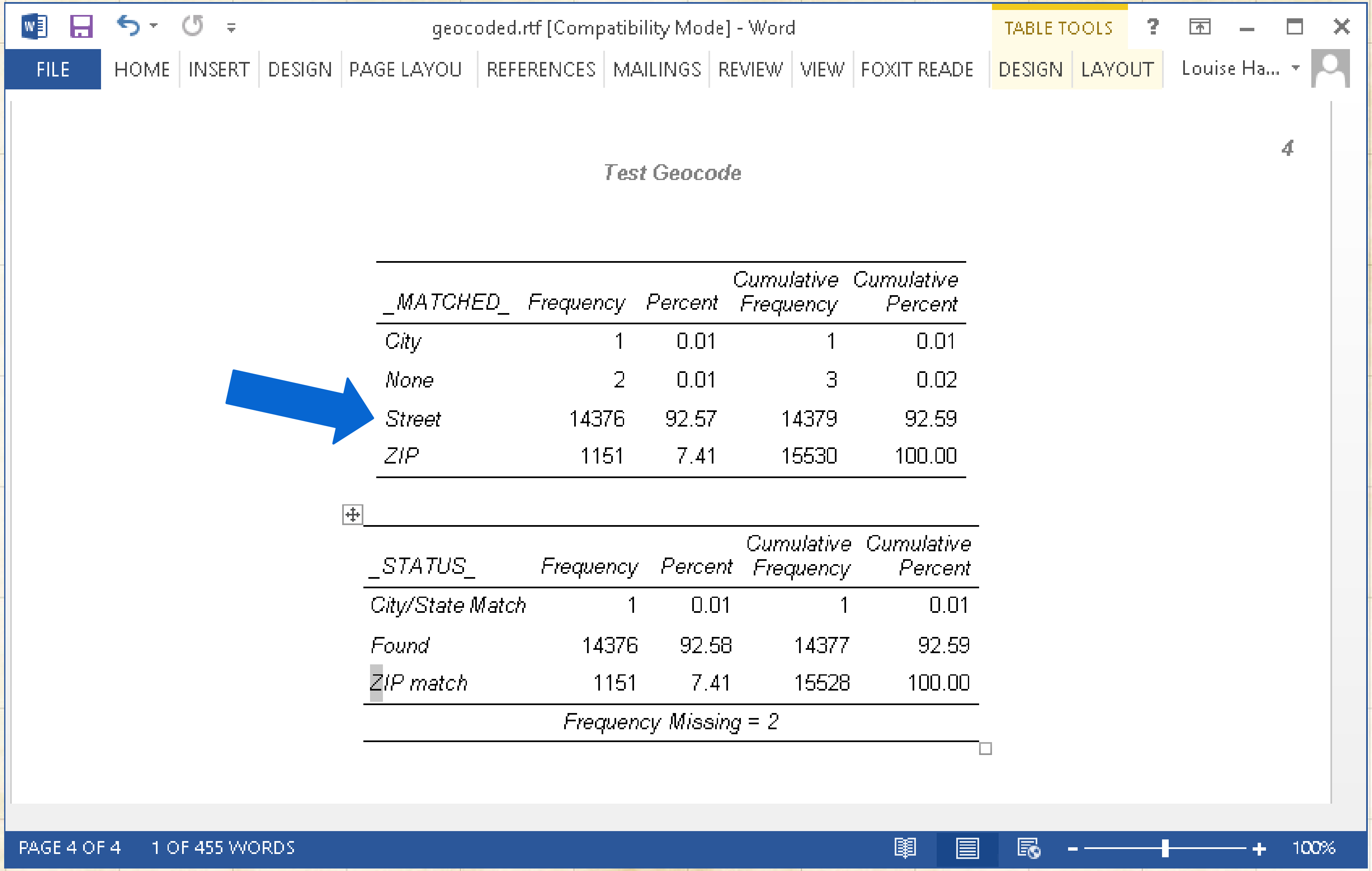
Sashelp.gctype — Street Type Abbreviations for US Geocoding

The Sashelp.gctype data set provides USPS standard street type abbreviations for geocoding. The following steps display information about the data set Sashelp.gctype and create Figure 1.40. The data set contains 812 observations.

PROC GEOCODE in Action

```
PROC GEOCODE /* Invoke geocoding procedure   */
method=STREET /* Specify geocoding method   */
data=work.prov /* Input data set of addresses   */
out=dd.GEOCODED /* Output data set with X/Y values   */
lookupstreet=street.usm /* Primary street lookup data set   */
type=SASHELP.GCTYPE; /* Lookup data set-added street type   */
RUN;
```

PROC GEOCODE in Action


geocoded.rtf [Compatibility Mode] - Word
TABLE TOOLS
FILE
HOME
INSERT
DESIGN
PAGE LAYOU
REFERENCES
MAILINGS
REVIEW
VIEW
FOXIT READE
DESIGN
LAYOUT
Louise Ha...
4
PAGE 4 OF 4
1 OF 455 WORDS
100%

Test Geocode

MATCHED	Frequency	Percent	Cumulative Frequency	Cumulative Percent
City	1	0.01	1	0.01
None	2	0.01	3	0.02
Street	14376	92.57	14379	92.59
ZIP	1151	7.41	15530	100.00

STATUS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
City/State Match	1	0.01	1	0.01
Found	14376	92.58	14377	92.59
ZIP match	1151	7.41	15528	100.00

Frequency Missing = 2

Data Preparation

First, we need to review our data. Our provider file has categorical, continuous, and binary variables as well as our geocoding data.

For visualizations, we want to “bin” or categorize response data, using a max of 5 categories to ensure comprehension.

Next, we want to associate categorized data with geographic entities, and, add some analytic variables based on geographic calculations.

Provider Data Preparation

```
PROC RANK DATA = state_sum
        GROUPS = 5
           OUT = stateranks_providers;
VAR ProviderR;
RANKS Provider_5 ;
RUN;
```

Geographic Data Preparation

SAS-supplied methods to obtain geographic distance calculations

%geodist macro and geodist(lat1,long1,lat2,long2,options) function – calculates the distance between two pairs of latitude and longitude, accounting for the earth’s curvature – as the crow flies

zipcitydistance(zip1,zip2) function – calculates the geographic distance between two zip code centroids – as the crow flies

Geographic Data Preparation

```
*******************************************************************;
** Create duplicate data sets, keeping only required variables,   **;
** and renaming keys to distinguish them                          **;
*******************************************************************;

data one;
   set dd ocodedprovjan2020 (keep=x y provnum overall_rating city
state rename (x=x1 y=y1 provnum=provnum1
overall_rating=overall_rating1 city=city1 state=state1));
run;

data two;
    set dd ocodedprovjan2020 (keep=x y provnum overall_rating city
state rename= x=x2 y=y2 provnum=provnum2
overall_rating=overall_rating2 city=city2 state=state2));
run;
```

Geographic Data Preparation

```
*******************************************************************:
** Full Join of two subsetted data sets                           **;
** Choose # of miles between to restrict data set                 **;
** remove instances of combining providers with self              **;
*******************************************************************;

proc sql ;
    create table three as select one.*
    ,two.*
    ,geodist(one.y1,one.x1,two.y2,two.x2,'M') as distancebetween
    from one,
    two
    where calculated distancebetween le 25 and
          calculated distancebetween ne . and
          one.provnum1 ne two.provnum2
    order by one.provnum1;
quit;
```

Geographic Data Preparation

```
****************************************************************;
** count the number of providers within 25 miles               **;
** for each record                                             **;
****************************************************************;

proc freq data=three;
    tables provnum1 / noprint out=provnum_counts
                      (keep=provnum1 count);
run;
```

Combining Data

```
*******************************************************************:
** merge counts per provider to joined data set                  **;
** create some different flags / variables                       **;
** remove missing values from overall_rating prior               **;
*******************************************************************;

data dd.four;
   merge three provnum_counts;
   by provnum1;
   if overall_rating1 lt '51' and overall_rating2 lt '51' then
       rating_diff=overall_rating1-overall_rating2;
   state_diff=(state1 ne state2);
   city_diff=(city1 ne city2);
run;
```

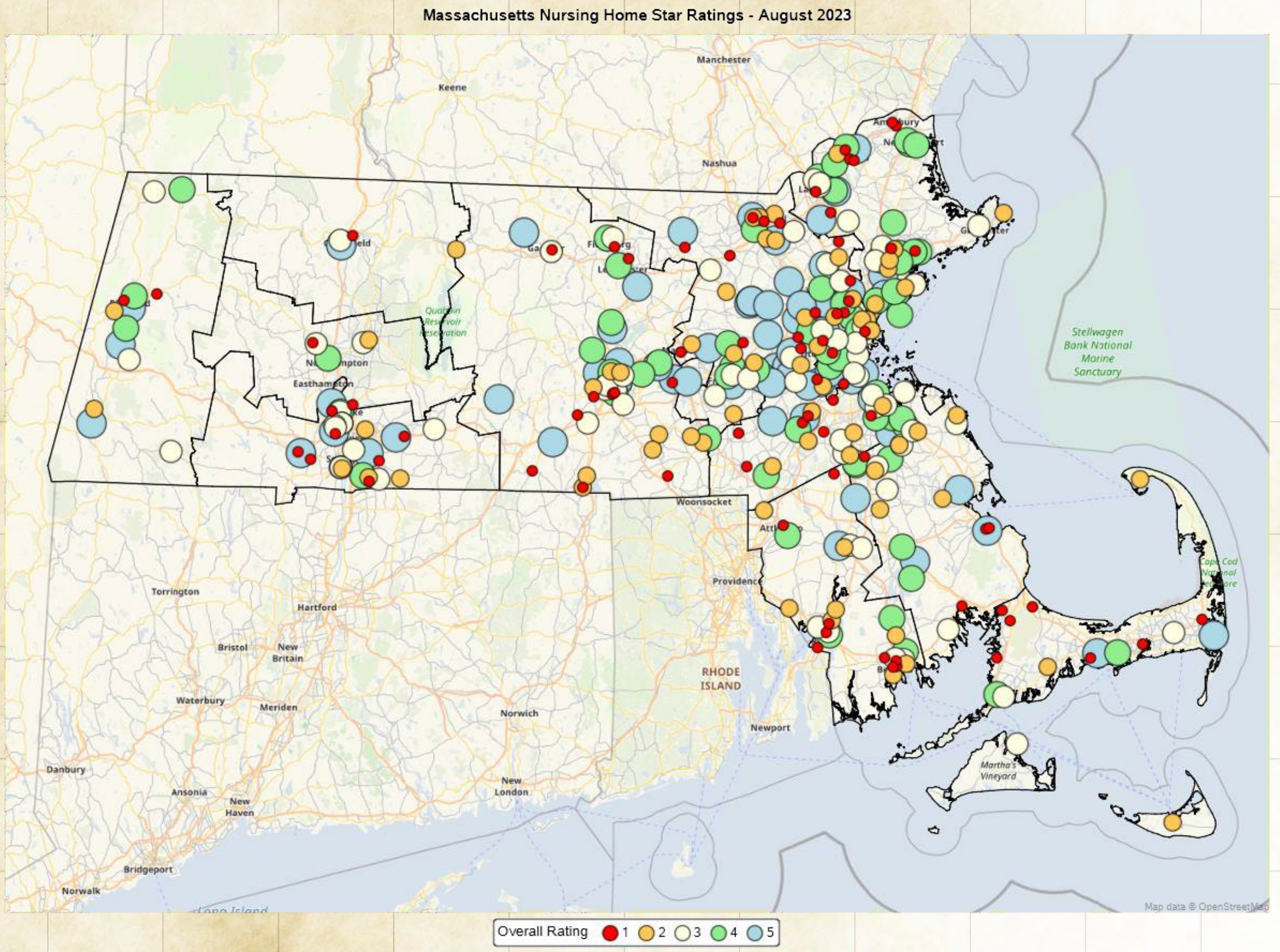
PROC SGMAP

- PROC SGMAP was introduced in SAS 9.4M5
- Creates maps and overlay plots including bubble, scatter, series or text plots
- Can use a discrete attribute map as in other SG procedures
- PROC SGMAP has brought mapping capacity to BASE SAS

PROC SGMAP

```
/* Create an ATTRMAP */

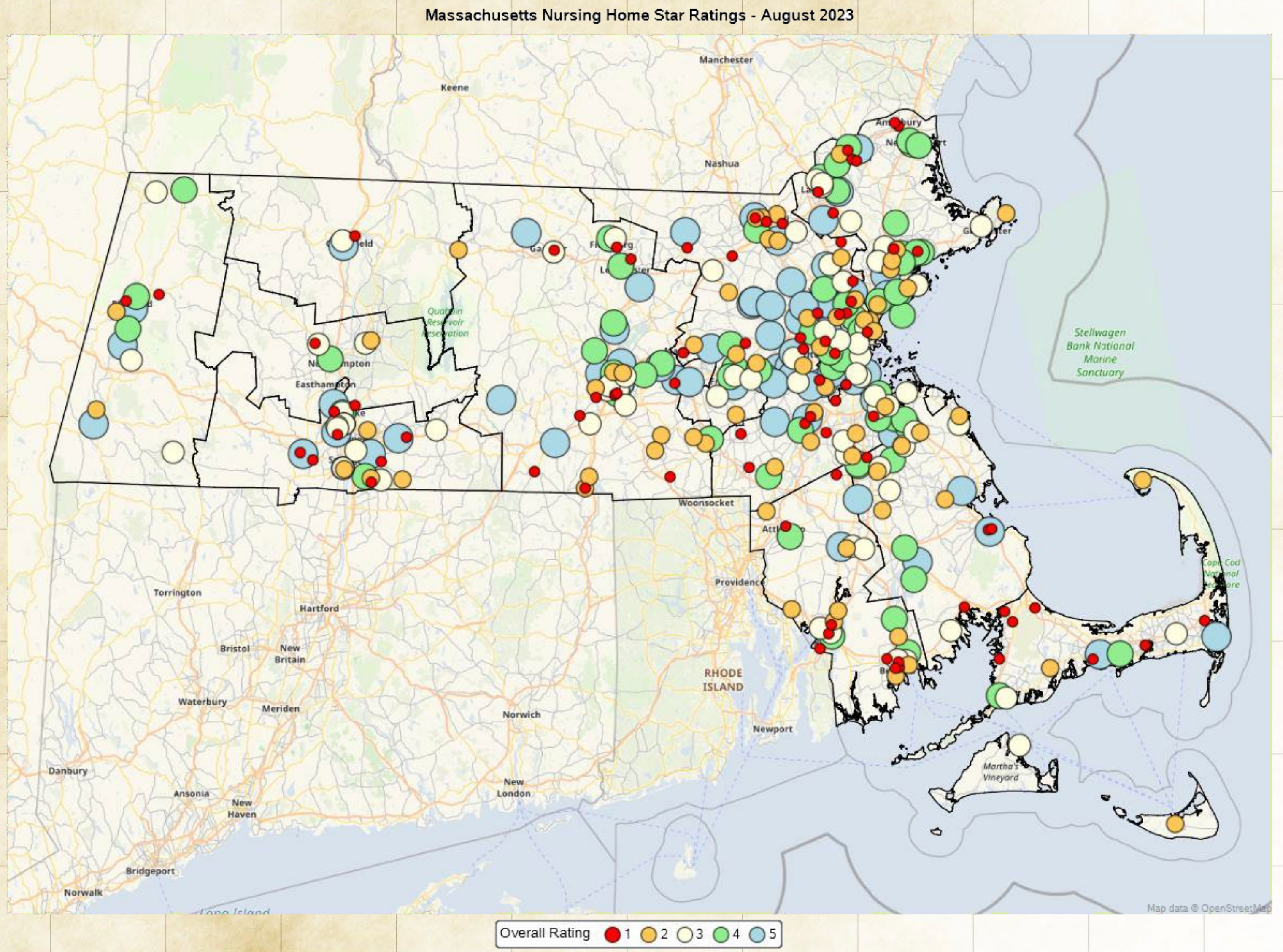
data attrmap1;
 length linecolor
      fillcolor $ 15;
 input ID $ value
      linecolor $
      fillcolor $ label $;
 datalines;
 id1 1 black red          1
 id1 2 black lightorange  2
 id1 3 black lightyellow  3
 id1 4 black lightgreen   4
 id1 5 black lightblue    5
 ;
```


Massachusetts Nursing Home Star Ratings - August 2023
Manchester
Keene
Nashua
Amesbury
Easthampton
Quabbin Reservoir Reservation
Stellwagen Bank National Marine Sanctuary
Woonsocket
Providence
Torrington
Hartford
Bristol
New Britain
Waterbury
Meriden
Norwich
RHODE ISLAND
Newport
Cape Cod National Seashore
Martha's Vineyard
Danbury
Ansonia
New Haven
New London
Bridgeport
Norwalk
Long Island
Map data © OpenStreetMap
Overall Rating ● 1 ● 2 ○ 3 ● 4 ● 5

PROC SGMAP

```
data geocoded;
     set dd.allfaclevel20230801
        (where=(state="MA"));
     or=comp5star;
     label or='Overall Rating';
     if not missing(or);
run;

proc sort data=geocoded;
     by or;
run;
```



Massachusetts Nursing Home Star Ratings - August 2023

Manchester
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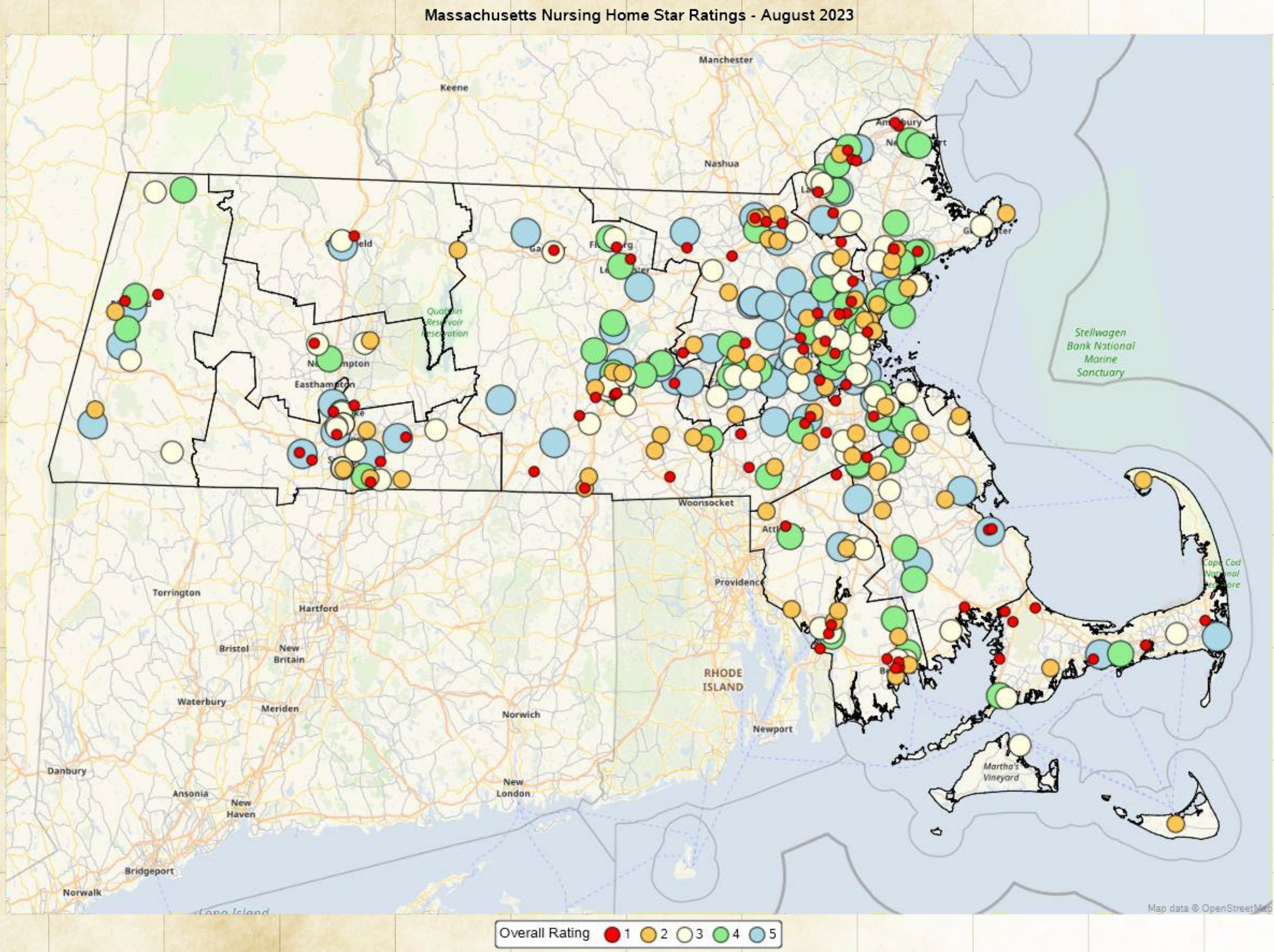
Nashua
Easthampton
Woonsocket
Providence
Torrington
Hartford
Bristol
New Britain
Waterbury
Meriden
Norwich
RHODE ISLAND
Newport
Danbury
Ansonia
New Haven
New London
Bridgeport
Norwalk
Stellwagen Bank National Marine Sanctuary
Martha's Vineyard
Map data © OpenStreetMap
Overall Rating ● 1 ● 2 ○ 3 ● 4 ● 5

PROC SGMAP

```
data mass;
  set mapsgfk.us_counties
  (where=(statecode='MA'));
run;

ods graphics / noscale
imagefmt=png
imagename="&name"
width=1200px height=900px
noborder;

title 'Massachusetts Nursing
Home Star Ratings - August
2023';
```


Massachusetts Nursing Home Star Ratings - August 2023
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Stellwagen Bank National Marine Sanctuary
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Easthampton
Quabbin Reservoir Reservation
Woonsocket
Providence
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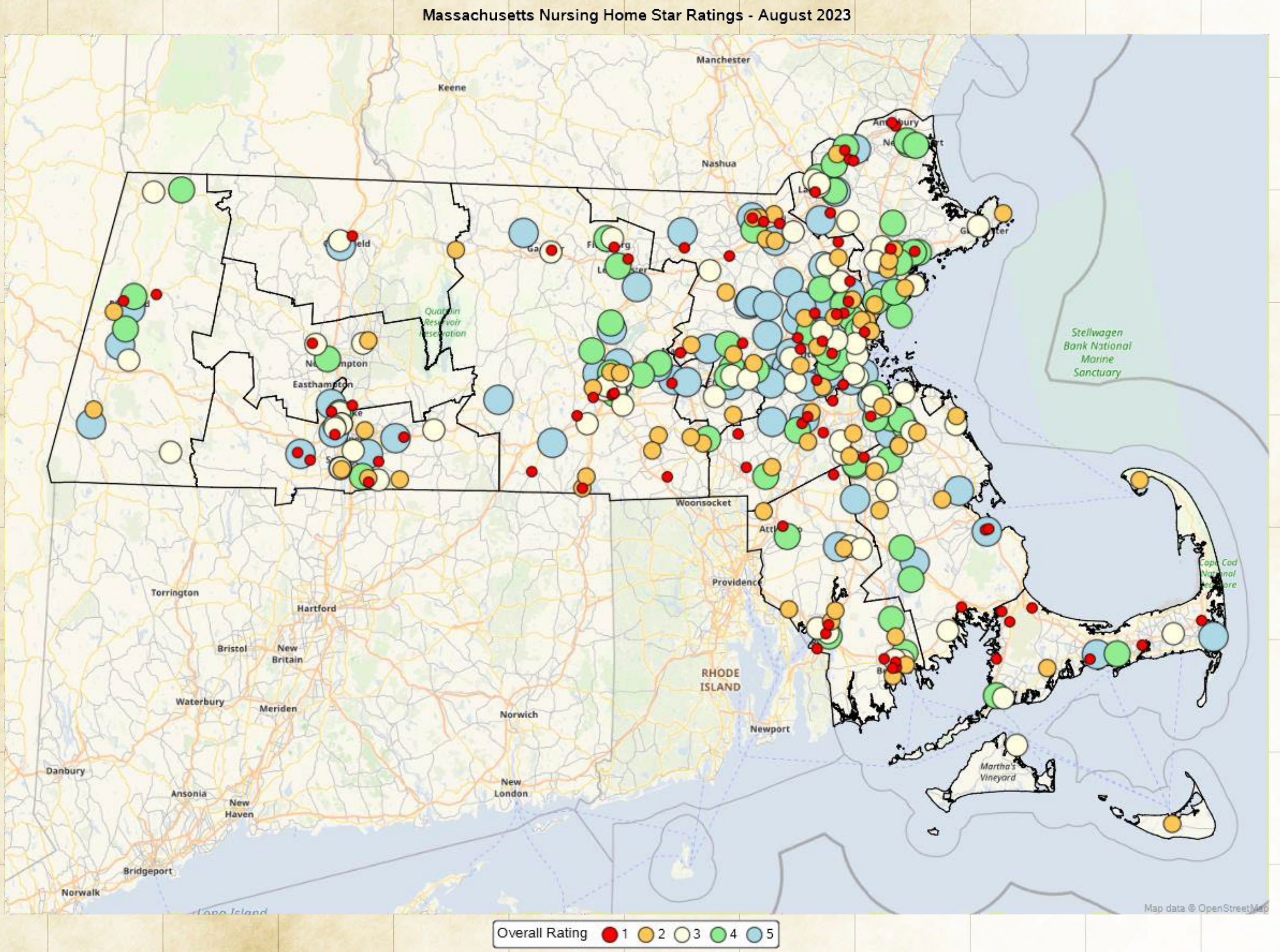
Bristol
New Britain
Waterbury
Meriden
Norwich
RHODE ISLAND
Newport
Danbury
Ansonia
New Haven
New London
Martha's Vineyard
Bridgeport
Norwalk
Long Island
Cape Cod National Seashore
Map data © OpenStreetMap
Overall Rating ● 1 ● 2 ○ 3 ● 4 ● 5

PROC SGMAP

```
proc sgmap mapdata=mass
     plotdata=geocoded
     des='Mass’
     dattrmap=attrmap1;
     openstreetmap;
     choromap / mapid=county
     lineattrs=(color=black) ;
     bubble x=longitude
     y=latitude
     size=comp5star100  /
     bradiusmax=15px
     bradiusmin=5px group=or
     attrid=id1;
run;
```


Massachusetts Nursing Home Star Ratings - August 2023

Manchester
Keene
Nashua
Quabbin Reservoir Reservation
Easthampton
Stellwagen Bank National Marine Sanctuary
Woonsocket
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Hartford
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RHODE ISLAND
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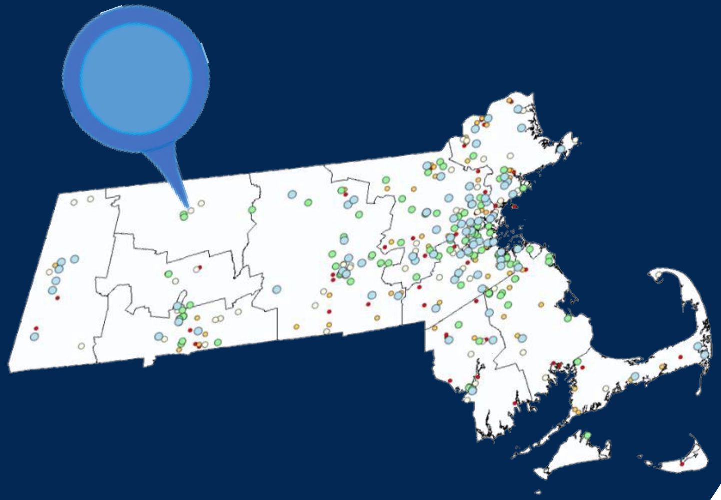
Meriden
Norwich
Newport
Martha's Vineyard
Danbury
Ansonia
New Haven
New London
Bridgeport
Norwalk
Map data © OpenStreetMap

Overall Rating ● 1 ● 2 ○ 3 ● 4 ● 5

In conclusion, SAS PROC GEOCODE can help you put YOUR data on the map, offers additional analytic opportunities, and normalizes your address information in the process!”



Questions? Contact me!

saslouisehadden@gmail.com

Scan me

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