

Documentation for the Nurses Web Tool

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1 Introduction

This web tool allows you to explore trends in union membership and union contract coverage for registered nurses in the United States. You can use the tool to generate trend plots and chloropleth maps showing how these quantities change over time, filtered and/or grouped according to a variety of

demographics (detailed below). The tool uses data derived from the Current Population Survey (CPS) public use microdata. For background information on the CPS, see the official CPS website¹.

2 Details of the data

The tool operates on data derived from the Current Population Survey (CPS) public use microdata (see the official CPS website for information on the raw CPS data). Each entry in the data used by the tool corresponds to an individual interviewed as part of the CPS, and includes various demographic data on that individual, as well as flags indicating whether the individual is a union member or covered by a union contract. Each entry also includes the year in which the individual was interviewed, and a statistical weight used to calculate union membership and union contract coverage proportions.

The following are descriptions of the variables in the data used by the tool, including the possible values or levels that a particular variable can assume:

<code>year</code>	The year the individual was interviewed.
<code>sex</code>	<p>The individual's sex. This is derived from the CPS variable <code>PESEX</code>.</p> <p>Levels: Male, Female</p>
<code>member</code>	Union membership flag. <code>TRUE</code> if the individual is a union member, and <code>FALSE</code> otherwise.
<code>covered</code>	Union contract coverage flag. <code>TRUE</code> if the individual is covered by a union contract, and <code>FALSE</code> otherwise.
<code>age</code>	The individual's age. This is derived from the CPS variable <code>PEAGE</code> or, if that is unavailable, the CPS variable <code>PRTAGE</code> .
<code>age_group</code>	<p>The individual's age group (16-24, 25-54, or 55 and over). This is derived from <code>age</code>.</p> <p>Levels: 16-24, 25-54, 55 and over</p>

¹<https://www.census.gov/programs-surveys/cps.html>

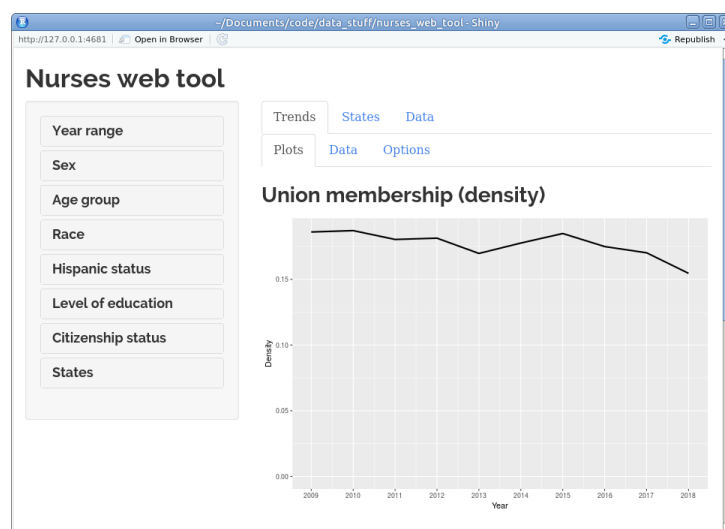
race	<p>The individual's race. This is derived from the CPS variable PTDTRACE. It has levels for some of the more common races, and a level Other for other races. The levels of this variable are less fine-grained than those of PTDTRACE (see the CPS documentation for details).</p> <p>Levels: White, Black, American Indian (Alaskan Native), Asian, Hawaiian/Pacific Islander, Other</p>
hisp	<p>Whether or not the individual is Hispanic. This is derived from the CPS variable PEHSPNON.</p> <p>Levels: Hispanic, Non-Hispanic</p>
educ	<p>The individual's level of education. This is derived from the CPS variable PEEDUCA. The levels of this variable are less fine-grained than those of PEEDUCA (see the CPS documentation for details).</p> <p>Levels: No high school, Completed high school, Some college, Associate degree, Bachelor's degree, Graduate degree</p>
citizen	<p>The individual's US citizenship status. This is derived from the CPS variable PRCITSHP. The levels of this variable are less fine-grained than those of PRCITSHP (see the CPS documentation for details).</p> <p>Levels: US native; Foreign-born, citizen; Foreign-born, non-citizen</p>
state	<p>The US state (including DC) where the individual resides. This is derived from the CPS variable GESTFIPS.</p> <p>Levels: (The two letter abbreviations for each of the 50 states, including DC)</p>
weight	<p>Statistical weight. Used to calculate union membership and union contract coverage proportions.</p>

3 Working with the web tool

The web tool provides you with two ways to explore union membership and union contract coverage: by examining trends and by examining state-wise patterns. You can filter the data according to the levels of many of the variables described above, and you can download the data if you desire to conduct more customized analysis.

3.1 Overview of the interface

When you first open the web tool, you are presented with the following interface:



The various components of the interface are described in the next few subsections.

3.1.1 The filtering tools

At the left side of the page you will notice a collection of drop down menus, each of which corresponds to a variable in the data used by the tool (which is described above). These are the *filtering tools*. The web tool operates on the subset of the underlying data selected using the filtering tools.

Clicking on a drop down menu in the filtering tools will reveal the levels of that variable currently included in the subset of the data being used by the

web tool, displayed using checkboxes, sliders, or other selection widgets. For example, in the case of checkboxes, a checked box indicates that the corresponding level of the variable is currently included; an unchecked box indicates that it is not included.

3.1.2 The Trends tab

Selecting the Trends tab at the top of the screen brings you to an interface for exploring trends in union membership and union contract coverage. This interface is described in detail below.

3.1.3 The States tab

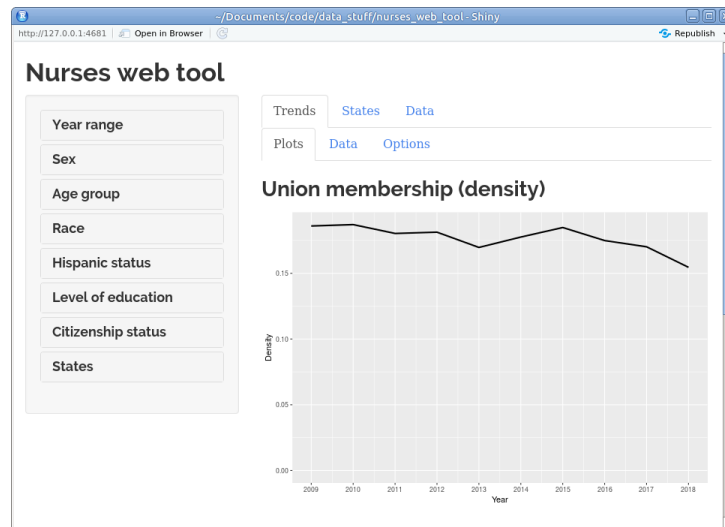
Selecting the States tab at the top of the screen brings you to an interface for creating choropleth maps for displaying union membership and union contract coverage per state. This interface is described in detail below.

3.1.4 The Data tab

Selecting the Data tab allows you to view and download the data selection currently being used by the tool. As described above, you can modify the data selection using the filtering tools at the left side of the page. The features of this tab are described in detail below.

3.2 Working with trends

If you select the Trends tab, you will be presented with the following interface:



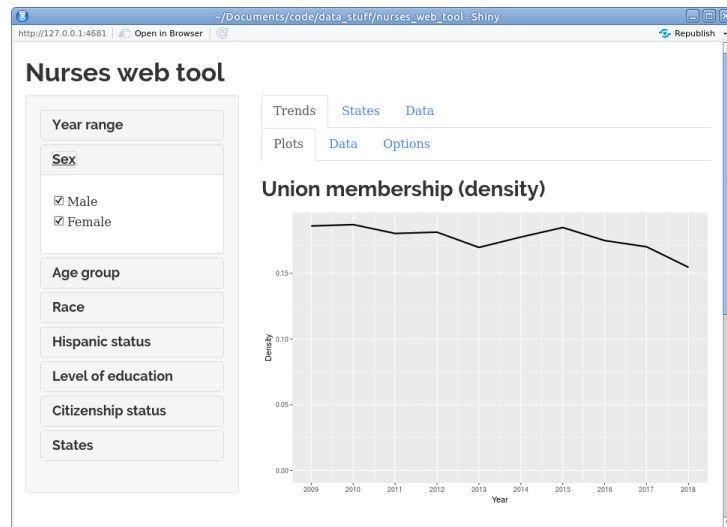
This interface allows you to explore trends in union membership and union contract coverage. There are three sub-tabs: Plots, for viewing the trend plots; Data, for viewing the data used to construct the trend plots; and Options, for setting options related to the trend plots.

To illustrate typical usage, we will work through several examples.

1. As a first example, let us create some basic trend plots showing union membership and union contract coverage trends for black, female nurses in the west coast states (California, Oregon, and Washington).

First, select Trends → Plots to access the interface for viewing trend plots.

Next we need to select the subset of data we want to work with. In this case, we want to examine black, female nurses in California, Oregon, and Washington. We can accomplish this using the filtering tools at the left side of the page. Click on the drop down menu labeled Sex in the filtering tools. You should see something like the following:



We only want to examine female nurses, so uncheck the checkbox labeled Male. Restricting our attention to black nurses is similar: select the Race tab from the filtering tools and uncheck every checkbox except for the one labeled Black.

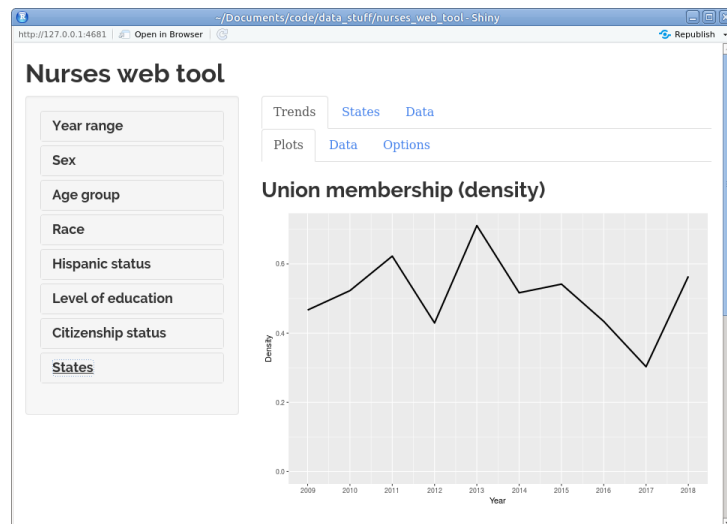
Selecting our states of interest is a little different. Select the States tab from the filtering tools. You should see something like the following:

This image shows a close-up of the "States" filter in the web tool. It includes the "Level of education", "Citizenship status", and "States" labels. The "States" dropdown menu is open, showing a list of state abbreviations: AL, AK, AZ, AR, CA, CO, and a downward arrow indicating more options.

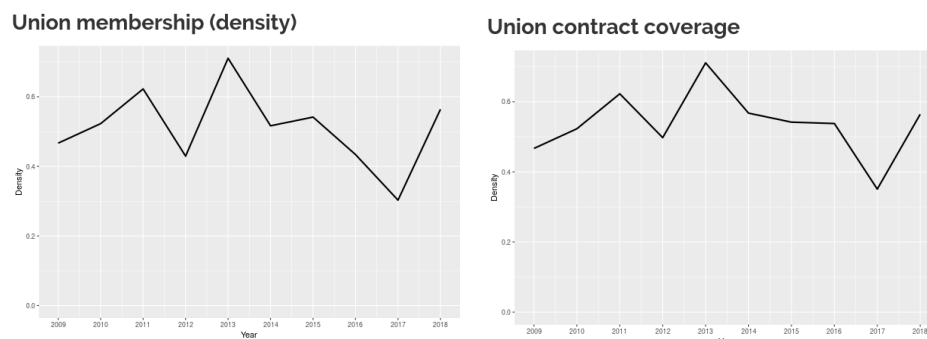
Clicking on the drop down menu allows you to select your states of choice:

In this case, we want to select California, Oregon, and Washington (labeled CA, OR, and WA, respectively, in the drop down menu above). The easiest way to do this is to click Deselect All to remove all states from the selection, and then to select CA, OR, and WA from the drop down menu. Do this now.

Note that you can hide a tab in the filtering tools by clicking on the tab again (just as you did to open the tab). Doing this, we end up with the following:

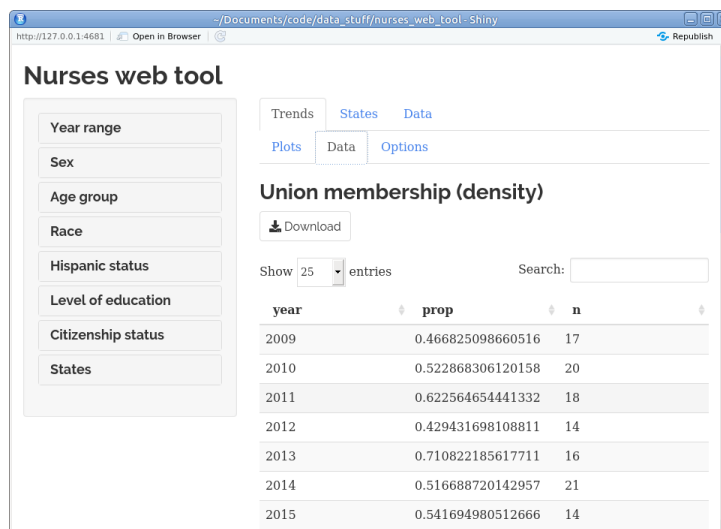


We now have two trend plots: one showing union membership over time, and one showing union contract coverage over time:



You can save either of these plots by right-clicking it and selecting the copy option from the drop-down menu, as you would with any other image on a webpage.

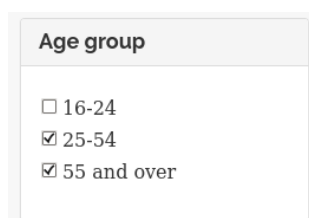
Note that you can view the data used to generate the two trend plots by selecting Trends → Data. Doing this, you should see the following interface, which allows you to examine the data and download it in CSV format if you decide to perform custom analysis:



- For our second example, we will create trend plots showing the difference in union membership and the difference in union contract coverage among nurses in the age group 25-54 and nurses in the age group 55 and over.

As in the previous example, go to Trends → Plots if you have not already.

Next we want to select the subset of data we want to work with. In this case, we want to restrict our attention to nurses in the age group 25-54 and those in the age group 55 and over. To do this, select the Age group tab in the filtering tools at the left of the page. Make sure the right age groups are selected. Specifically, the selection should look as follows:



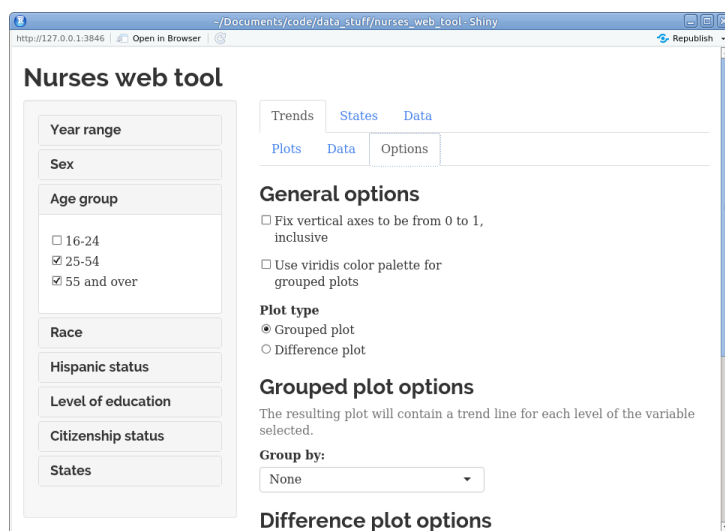
Age group

☐ 16-24

☒ 25-54

☒ 55 and over

Right now our two trend plots display union membership and union contract coverage for nurses aged 25-54 and nurses aged 55 and over *combined*. We want our plots to display the *difference* between these two age groups. To do this, go to Trends → Options. You should see the following interface:



Nurses web tool

Year range

Sex

Age group

☐ 16-24

☒ 25-54

☒ 55 and over

Race

Hispanic status

Level of education

Citizenship status

States

Trends States Data

Plots Data Options

General options

☐ Fix vertical axes to be from 0 to 1, inclusive

☐ Use viridis color palette for grouped plots

Plot type

☒ Grouped plot

☐ Difference plot

Grouped plot options

The resulting plot will contain a trend line for each level of the variable selected.

Group by:

None

Difference plot options

We want to take a look at the options for creating difference plots:

Difference plot options

The resulting plot will consist of a trend line of the difference between the first and second levels (i.e., first minus second) of the selected variable.

Variable:

Sex ▼

First:

Male ▼

Second:

Male ▼

These options may be currently disabled. Under the General options section, make sure the plot type is set to Difference plot:

General options

☐ Fix vertical axes to be from 0 to 1, inclusive

☐ Use viridis color palette for grouped plots

Plot type

☐ Grouped plot

☒ Difference plot

Next, go back to the difference plot options. Under the drop down menu labeled Variable, select Age group, and under the drop down menus labeled First and Second, select 25-54 and 55 and over, respectively. The options should now look like the following:

Difference plot options

The resulting plot will consist of a trend line of the difference between the first and second levels (i.e., first minus second) of the selected variable.

Variable:

Age group ▼

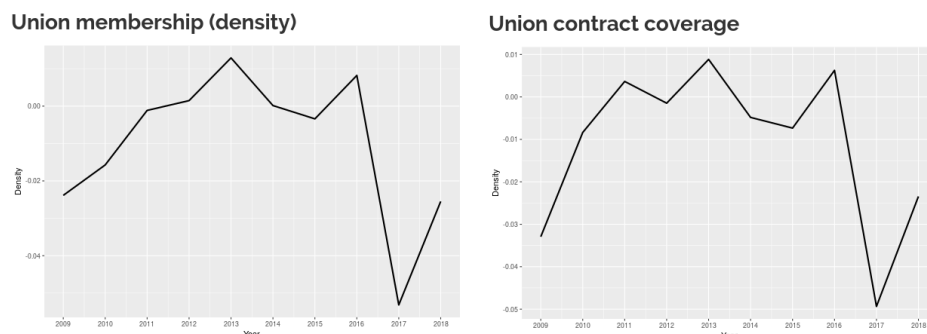
First:

25-54 ▼

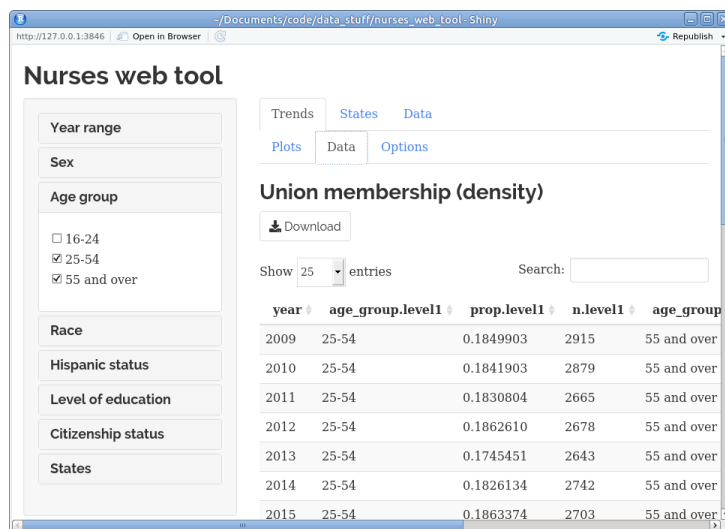
Second:

55 and over ▼

Now go back to Trends → Plots. We get the following two trend plots displaying the *difference* in union membership and union contract coverage, respectively, between nurses aged 25-54 and those aged 55 and over:



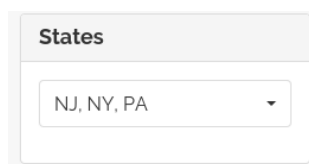
As in the previous example, you can view and download the data used to generate these plots under Trends → Data:



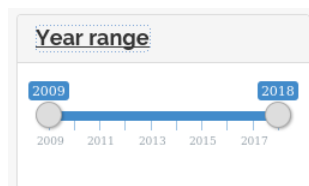
3. In our third and final example we will create trend plots comparing both union membership and union contract coverage among nurses in the tri-state area (New York, New Jersey, and Pennsylvania) who are US native, foreign-born citizens, and foreign-born non-citizens, from the year 2010 to 2016.

As before, start by going to Trends → Plots.

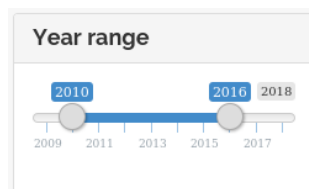
We want to restrict our attention to nurses in New York, New Jersey, and Pennsylvania (labeled NY, NJ, and PA, respectively in the filtering tools). As in the previous example, select the States tab in the filtering tools, click Deselect All, and then select NY, NJ, and PA from the drop down menu. After closing the menu, the state selection should look as follows:



Next, we want to restrict our attention to the years 2010 through 2016. In the filtering tools, click on the Year range tab. This will reveal a slide bar allowing you to select a year range:



Slide the knobs at the end of the slide bar in order to select the range 2010 to 2016:



Notice how the horizontal axis on each of the trend plots has changed to reflect this year selection.

Now that we have our data selected, it is time to turn to the trend plots themselves. Each of the trend plots currently displays only a single line showing union membership and union contract coverage, respectively, among *all* nurses in our selection. We want to be able to compare these two quantities among three groups of nurses: those who are US natives, those who are foreign-born citizens, and those who are foreign-born non-citizens. We can accomplish this by having

the trend plots display a separate line showing union membership and union contract coverage, respectively, for each of these groups. Doing this is straightforward. Go to Trends → Options. We want to work with the options for grouped plots:

Grouped plot options

The resulting plot will contain a trend line for each level of the variable selected.

Group by:

None ▼

In the drop down menu labeled Group by, select Citizenship status:

Grouped plot options

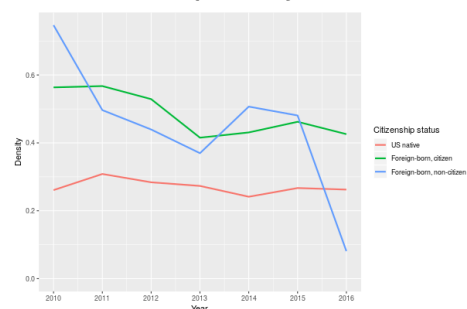
The resulting plot will contain a trend line for each level of the variable selected.

Group by:

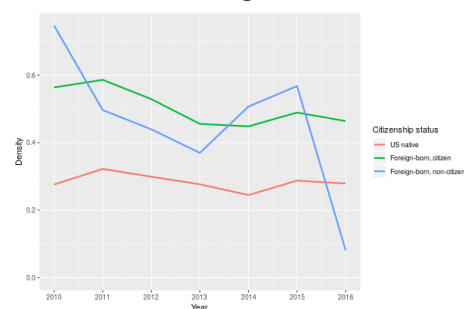
Citizenship status ▼

Now go back to Trends → Plots. Each of the trend plots should now have a separate line corresponding to each level of the Citizenship status variable, as we wanted:

Union membership (density)



Union contract coverage



The default color palette used to distinguish the groups may be difficult to distinguish for people with various forms of color-blindness, however. The viridis² color palette is a more robust alternative. To use it, go to Trends → Options and under General options, choose to use the viridis color palette:

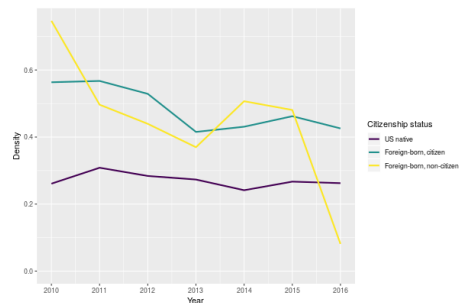
²<https://bit.ly/2n7D6tF>

General options

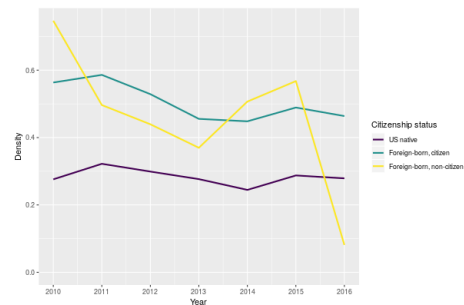
- ☐ Fix vertical axes to be from 0 to 1, inclusive
- ☒ Use viridis color palette for grouped plots

Now go back to Trends → Plots. Each plot will now use the viridis color palette to distinguish the groups:

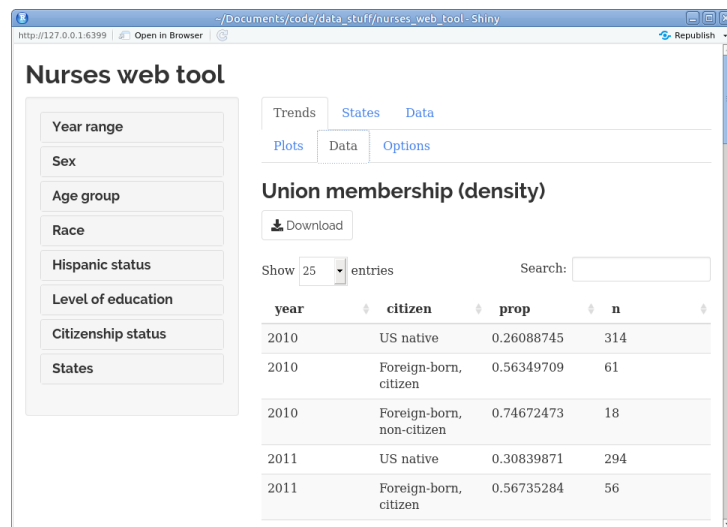
Union membership (density)



Union contract coverage

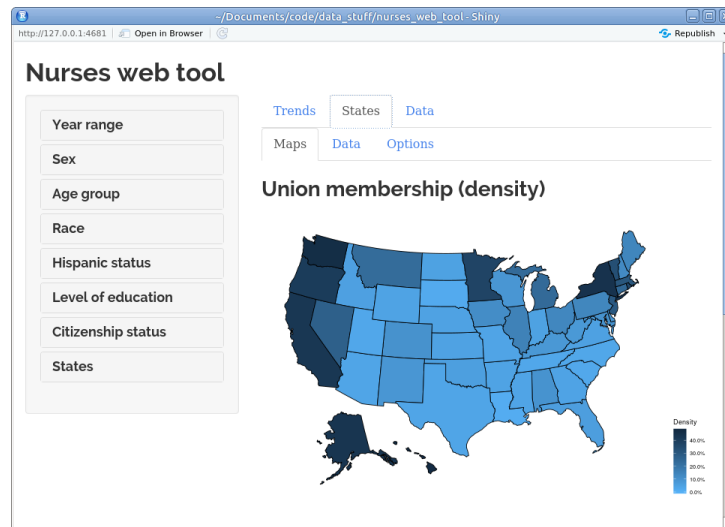


As in the previous examples, you can go to Trends → Data to view and download the data used to generate the plots:



3.3 Working with maps

If you select the States tab, you will be presented with the following interface:



This interface allows you to create choropleth maps displaying union membership and union contract coverage per state over the years selected. There are three sub-tabs: Maps, for viewing the choropleth maps; Data, for viewing the data used to construct the choropleth maps; and Options, for setting options related to the choropleth maps.

To illustrate typical usage, we will work through several examples.

1. As a first example, we will create a choropleth map showing union membership and union contract coverage among Hispanic nurses in the west coast states (California, Oregon, and Washington), over the years 2010 to 2015.

First, select States → Maps to access the interface for viewing choropleth maps.

Next we need to select the subset of the data we are interested in. In this case, we want to restrict attention to Hispanic nurses in California, Oregon, and Washington over the years 2010 to 2015. First, let us restrict ourselves to Hispanic nurses. To do this, click on the Hispanic status tab in the filtering tools. Make sure the checkbox labeled Hispanic is checked and the checkbox labeled Non-Hispanic is unchecked:

Hispanic status

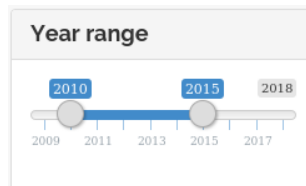
☒ Hispanic
 ☐ Non-Hispanic

To restrict ourselves to nurses in California, Oregon, and Washington, click on the States tab in the filtering tools and make sure that only CA, OR, and WA are selected (for details on how to do this, see the first example in section 3.2). After doing this, the selection listed under the States tab should look as follows:

States

CA, OR, WA

Finally, we need to restrict attention to the years 2010 to 2015. To do this, click on the Year range tab in the filtering tools and slide the knobs on the slide bar to cover the year range 2010 to 2015 (for more details, see the third example in section 3.2). After doing this, the slide bar should look as follows:

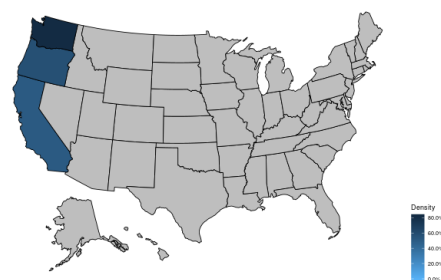


We end up with the following two choropleth maps for statewide union membership and union contract coverage, respectively:

Union membership (density)



Union contract coverage



The states shaded in gray have no data associated with them. Unsurprisingly, every state excluding California, Oregon, and Washington (the ones we selected) is shaded in gray. As such, it is probably desirable to only display the states we selected. To do this, go to States → Options and make sure the option to show only the selected states is checked:

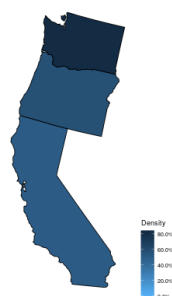
General options

☒ Show selected states only

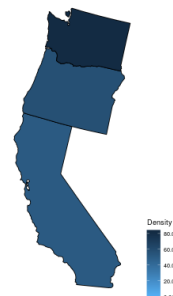
☐ Fix the color scale on the chloropleth maps

Now go back to States → Maps. Our chloropleth maps now display only our states of interest:

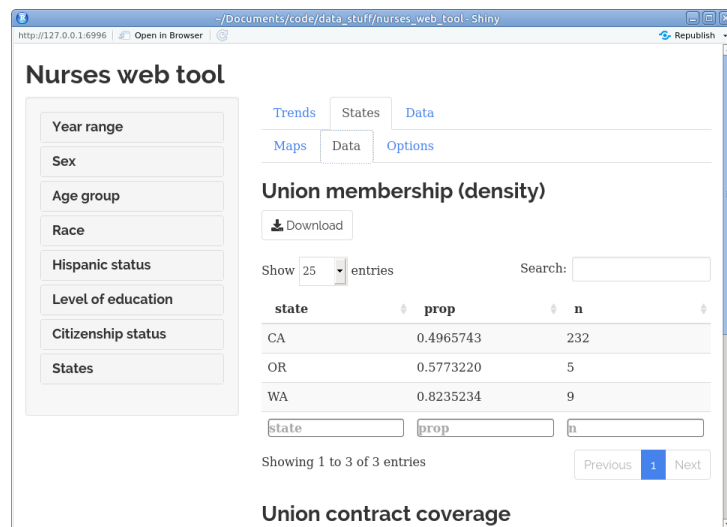
Union membership (density)



Union contract coverage



Note that you can view the data used to generate the two chloropleth maps by selecting States → Data. Doing this, you should see the following interface, which allows you to examine the data and download it in CSV format if you decide to perform custom analysis:



- For our second example, we will create a chloropleth map showing union membership and contract coverage among all nurses in all states in the year 2012.

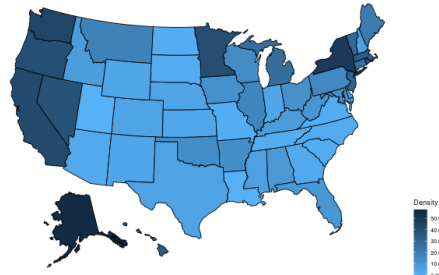
First, go to States → Maps if you have not already.

Next, we need to select our data. In this case, the only thing we need to do is restrict attention to the year 2012. To do this, click on the Year range tab in the filtering tools and move the knobs on the slide bar so that they both lie on 2012. The result should look as follows:

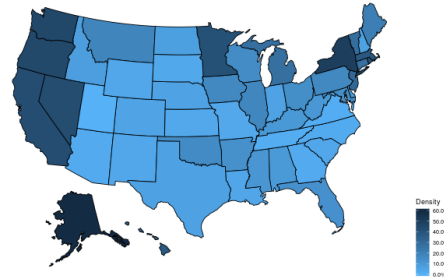


We now have the following two chloropleth maps, showing union membership and union contract coverage among *all* registered nurses in the United States in 2012:

Union membership (density)



Union contract coverage



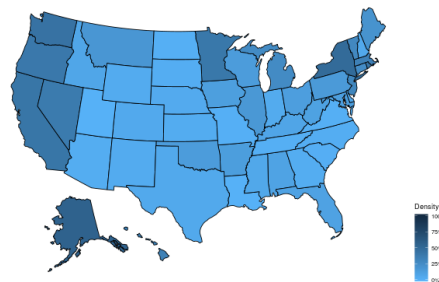
Notice that the legend displaying the density color scale for the map displaying union membership is slightly different from the one for the map for union contract coverage. In order to aid comparison between the two maps, it is a good idea to force the two maps to have the same color scale. We can do this by going to States → Options and ensuring that the option to fix the color scale is selected:

General options

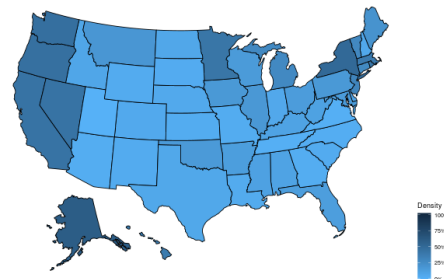
- ☐ Show selected states only
- ☒ Fix the color scale on the choropleth maps

Now each map has the same color scale:

Union membership (density)



Union contract coverage



As before, you can go to States → Data to view and download the data used to generate the maps:

Nurses web tool

Year range
Sex
Age group
Race
Hispanic status
Level of education
Citizenship status
States

Trends States Data
Maps Data Options

Union membership (density)

Download

Show 25 entries Search:

state	prop	n
AL	0.09554557	52
AK	0.56288083	32
AZ	0.02855381	33
AR	0.13191303	45
CA	0.41630942	250
CO	0.05170989	77
CT	0.25446797	90

3.4 Examining the data selection

If you select the Data tab, you will be presented with the following interface:

Nurses web tool

Year range
Sex
Age group
Race
Hispanic status
Level of education
Citizenship status
States

Trends States Data
Maps Data Options

Selected data

Download

Show 25 entries Search:

year	sex	member	covered	age	age_group	race
2009	Female	TRUE	TRUE	43	25-54	White
2009	Female	FALSE	FALSE	34	25-54	White
2009	Female	TRUE	TRUE	59	55 and over	White
2009	Female	FALSE	FALSE	51	25-54	White
2009	Female	TRUE	TRUE	48	25-54	White

This interface allows you to view the currently selected subset of the data, as well as download it in CSV format.

4 Bugs, code, etc.

4.1 Getting access to the code

The source code is open source and licensed under the GNU General Public License v3.0³. The code is available at the following repository on GitHub:

https://github.com/bnoland/nurses_web_tool

4.2 Submitting bug reports

If you notice something that could be a bug, or have another issue with the web tool, submit a report at the issue section of the project's GitHub page:

https://github.com/bnoland/nurses_web_tool/issues

4.3 If you have a question...

If you have a question about the web tool, feel free to contact me (the developer) by email at the following address:

benjaminolland93@gmail.com.

³<https://www.gnu.org/licenses/gpl-3.0.en.html>