



# Significance Testing Using State Health Compare

## AUTHOR

**Robert Hest**  
Graduate Research Assistant,  
SHADAC

## ABOUT SHADAC STATE HEALTH COMPARE

State Health Compare combines estimates previously available separately through the SHADAC Data Center and the [Robert Wood Johnson Foundation](#) (RWJF) Data Hub. The new, merged tool brings together estimates on a wide range of health-related topics in an effort to allow analysts and policymakers to view state-level data through a broad [Culture of Health](#) lens.

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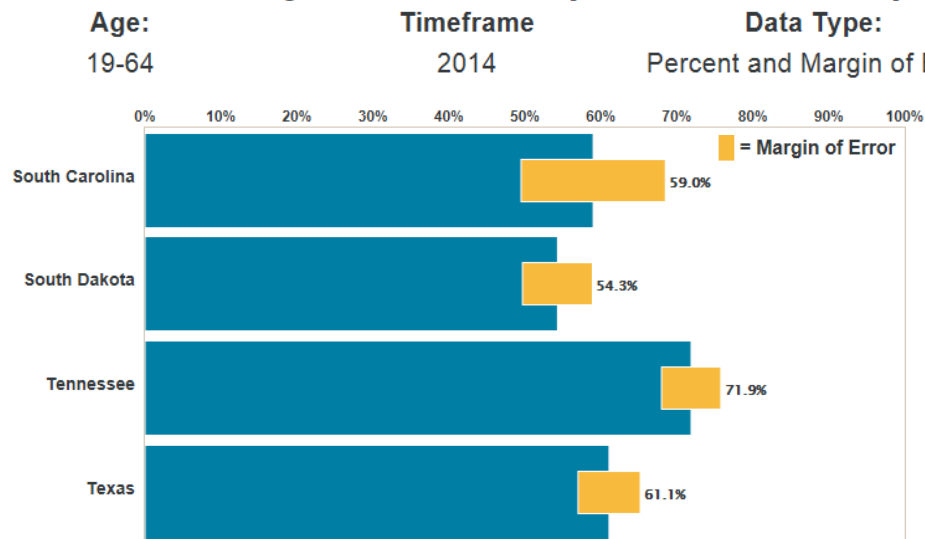
## State Health Compare Provides Margins of Error

In addition to providing state-level estimates related to health and health care from a number of federal surveys, State Health Compare provides information about the margins of error (MOE) of these estimates. The margin of error gives information about the uncertainty of an estimate. For practical purposes, it allows the user to say with a specified level of confidence (in this case, a 95% confidence level) that the true population value lies within a certain range of the provided estimate. A larger margin of error indicates a lower level of precision in the estimate.

## Fast: Using Margins of Error to Visually Test Differences

The margin of error also allows users to assess the statistical significance of differences in estimates from state to state, from year to year, or between demographic groups. One easy way to visually observe if two estimates are statistically different is to compare their margins of error on State Health Compare's state rank charts.

## Percent who had general doctor or provider visit in the past year



In this example, looking at the NHIS indicator “Had General Doctor or Provider Visit in Past Year for ages 19-64,” we can quickly see that Tennessee had a higher rate of provider visits in 2014 than Texas had. We can visually test the significance of this difference by examining the margins of error. In this case, the lower bound of the Tennessee estimate’s margin of error is larger than the upper bound of the Texas estimate’s margin of error, indicating that the difference between these states’ estimates is likely statistically significant. We can also see that because South Carolina’s and South Dakota’s error bars overlap, there is no statistically significant difference in the rate of provider visits between these two states.

## Robust: Using Margins of Error to Conduct a Hypothesis Test

Though visually comparing margins of error is quick and easy, this method is best used to get a rough approximation of statistical significance. To get a more robust test of statistical significance, it is better to use a hypothesis test. Below we discuss how to do a statistical test called a *t*-test to see if the difference between two independent estimates is significant at the 95% confidence level.

### Step 0: Download data from State Health Compare

Before we can conduct significance testing, we need to download the relevant data from State Health Compare. In this example, we will stick with the NHIS indicator “Had General Doctor or Provider Visit in Past Year”, but look at all ages. From the State Health Compare web site, select **Download Data** from the top bar, choose locations (in this example we will use South Carolina, South Dakota, Tennessee, and Texas), choose the indicator, choose a timeframe (in this example we will use 2014), and then select the **Download Data** button. The data will download as a compressed folder that contains a Comma-Separated Values (.CSV) file that can be opened in Microsoft Excel. Open the data in Excel.

### Step 1: Transform margins of error into standard errors

State Health Compare uses margins of error calculated with a 95% confidence level. To transform these margins of error into standard errors (SE), divide the margin of error by 1.96, the critical *t*-value for a two-sided hypothesis test with a 95% level of confidence and a large sample size.

$$= \text{MOE}/1.96$$

$$\text{SE for South Carolina: } 0.090/1.96 = 0.046$$

Table 1. Transforming Margins of Error into Standard Errors

FIPS	Location	Age	Time Frame	Data Type	Data	MOE	SE
45	South Carolina	Total	2014	Percent	0.681	0.090	0.046
46	South Dakota	Total	2014	Percent	0.624	0.098	0.050
47	Tennessee	Total	2014	Percent	0.772	0.035	0.018
48	Texas	Total	2014	Percent	0.695	0.030	0.015

### Step 2: Find the difference between the two estimates

The next step is to take the difference between the two estimates. In this case, we will compare South Carolina to South Dakota and Tennessee to Texas. To take the difference, subtract estimate 2 from estimate 1.

$$= \text{Estimate 1} - \text{Estimate 2}$$

$$\text{Difference between the estimates (SC and SD): } 0.681 - 0.624 = 0.057$$

Table 2. Taking the Difference Between Estimates

State	Percent	Standard Error	Difference
South Carolina	0.681	0.046	<b>0.057</b>
South Dakota	0.624	0.050	
Tennessee	0.772	0.018	<b>0.077</b>
Texas	0.695	0.015	

### Step 3: Calculate the *t*-score

A *t*-score is the ratio of the difference between the two estimates to the variability of the estimates. It answers the question, "How close to 0 is this difference given the variability of the estimates?"

The *t*-score is calculated using the formula below.

$$\frac{\text{Difference in estimates}}{\sqrt{(\text{SE}_1^2 + \text{SE}_2^2)}}$$

Here is the *t*-score for the difference between South Carolina and South Dakota:

$$0.057 / \text{SQRT}(0.046^2 + 0.050^2) = 0.840$$

Table 3. Calculating the *t*-score

State	Percent	Standard Error	Difference	<i>t</i> -score
South Carolina	0.681	0.046	0.057	<b>0.840</b>
South Dakota	0.624	0.050		
Tennessee	0.772	0.018	0.077	<b>3.274</b>
Texas	0.695	0.015		

### Step 4: Establish a *critical t*-value and determine statistical significance

The final step is to determine if the two estimates are statistically significantly different. We do this by establishing the *critical t*-value that we want to indicate statistical significance. If the *t*-score is larger than this *critical t*-value, we can say that the difference in estimates is statistically significant with a certain level of confidence.

To establish a *critical t*-value, we need to select a desired level of confidence. A 95% level of confidence is fairly typical. With a large sample size (typical for survey data), a *two-tailed critical t*-value for a 95% level of confidence is 1.96.<sup>1</sup> This means that if the absolute value of our *t*-score is larger than 1.96, we can say that the estimates are significantly different at the 95% confidence level.

To have Excel place a star next to any estimate significant at this level of confidence, use the Excel formula below:

$$=IF(ABS(t\text{-score}) > 1.96, "*", "")$$

Table 4. Determining statistical significance

State	Mean	Standard Error	Difference	<i>t</i> -score	Significance
South Carolina	0.681	0.046	0.057	0.840	
South Dakota	0.624	0.050			
Tennessee	0.772	0.018	0.077	3.274	*
Texas	0.695	0.015			

Table 4 shows that the difference between South Carolina and South Dakota is not statistically significant at a 95% confidence level, and the difference between Tennessee and Texas is statistically significant at this level.

<sup>1</sup> To establish a critical *t*-value with a different level of confidence or with a different sample size, users can reference tables of critical *t*-values freely available on the web. The National Institute of Standards and Technology provides a free table of critical *t*-values. Degrees of freedom is one less than the sample size.