

Significance Testing using State Health Compare

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About State Health Compare

SHADAC's State Health Compare is a free, user-friendly online data tool for obtaining state-level estimates on topics related to health and health care. Analysts and policymakers can use State Health Compare to break down estimates by demographic categories, observe changes and trends over time, generate data visualizations and download data sets.

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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 several federal surveys, SHADAC's [State Health Compare](#) data tool provides information about the margins of error (MOE) for these same estimates. The margin of error for a data point gives information about the (im)precision 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 ranking charts.

Percent of adults who forgo needed medical care due to cost

In the example below, looking at the BRFSS measure "[Rates of adults that forgo needed medical care due to cost](#)," we can quickly see that Georgia had a higher percentage of people forgo medical care due to cost than Hawaii. We can visually test the significance of this difference by examining the margins of error. In this case, the lower bound of the Georgia estimate's margin of error is greater than the upper bound of the Hawaii estimate's margin of error, indicating that the difference between these states' estimates is statistically significant. On the other hand, because we can see that the error bars for Illinois and Indiana overlap, there is likely no statistically significant difference in the rate of adults who forgo medical care due to cost between these two states.

Percent of adults who could not get medical care when needed due to cost

Timeframe
2021

Data Type:
Percent and Margin of Error



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 type of 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 BRFSS measure “Rates of adults that forgo needed medical care due to cost.” From the State Health Compare homepage, select the “Download Data” button in the upper right-hand corner. Next, follow the instructions under Step 1 to select desired states (in this example we use Georgia, Hawaii, Illinois, and Indiana). Then, follow Step 2 to choose the intended indicator for study (again, this example will use “Percent of adults who could not get medical care when needed due to cost” and will select “Total”). Finally, under Step 3, choose a timeframe (in this example we will use 2021), then click the “Download Data” button on the bottom left. The data will download a compressed folder that contains a Comma-separated Values (CSV) file that the user should then open in Microsoft 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 (MOE) into standard errors (SE), we first divide the MOE by 1.96, which is the critical t-value, or test statistic, for a two-sided hypothesis test with a 95% level of confidence and a large sample size.

$$\text{SE for Georgia: } 0.0130/1.96 = 0.0066$$

Table 1. Transforming margins of error into standard errors

FIPS	Location	Time Frame	Data Type	Data	MOE	SE
13	Georgia	2021	Percent	0.1551	0.0130	0.0066
15	Hawaii	2021	Percent	0.0526	0.0071	0.0036
17	Illinois	2021	Percent	0.0978	0.0132	0.0067
18	Indiana	2021	Percent	0.0864	0.0072	0.0037

Step 2: Find the difference between the two estimates

The next step is to calculate the difference between the two estimates. In this case, we will compare Georgia to Hawaii, and Illinois to Indiana. To take the difference, subtract estimate 2 (Hawaii, in this case) from estimate 1 (Georgia).

$$\text{Difference between the estimates (GA and HI): } 0.1551 - 0.0526 = 0.1025$$

Table 2. Taking the difference between estimates

State	Percent	Standard Error	Difference
Georgia	0.1551	0.0066	0.1025
Hawaii	0.0526	0.0036	
Illinois	0.0978	0.0067	0.0114
Indiana	0.0864	0.0037	

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.

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

Table 3. Calculating the t-score

State	Percent	Standard Error	Difference	T-Score
Georgia	0.1551	0.0066	0.1025	13.56
Hawaii	0.0526	0.0036		
Illinois	0.0978	0.0067	0.0114	1.49
Indiana	0.0864	0.0037		

Note: T-scores were calculated using unrounded estimates and standard errors and may differ from those calculated with rounded estimates and standard errors as presented.

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

In the final step, we need to determine if the two estimates are statistically significantly different. This is done 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 typical. With a large sample size, a two-tailed critical t-value for a 95% level of confidence is 1.96.¹ 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 an asterisk 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	Percent	Standard Error	Difference	T-Score	Significance
Georgia	0.1551	0.0066	0.1025	13.56	*
Hawaii	0.0526	0.0036			
Illinois	0.0978	0.0067	0.0114	1.49	
Indiana	0.0864	0.0037			

Table 4 shows that the difference between Georgia and Hawaii is statistically significant at a 95% confidence level, while the difference between Illinois and Indiana is not statistically significant at this level.

¹ 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, available from <https://www.itl.nist.gov/div898/handbook/eda/section3/eda3672.htm>. The “degrees of freedom” is one less than the sample size.

Source: SHADAC analysis of the Behavioral Risk Factor Surveillance System (BRFSS) public use files.

Notes: The margin of error (MOE) represents the uncertainty of an estimate due to sampling variability; the calculated MOE is 95%. N/A indicates that data were not available or suppressed because the number of sample cases was too small. There is a break in series because BRFSS implemented cell phone sampling and an advanced weighting method in 2011.

Definition: Rates of adults that forgo needed medical care due to cost for the civilian non-institutionalized population 18 years and over.