

Significance Testing using State Health Compare

Author

Robert Hest, MPP
Research Fellow, SHADAC

About State Health Compare

State Health Compare is a user-friendly and easily accessible online data tool to obtain state-level data on a range of topics, such as insurance coverage, access, cost, utilization, and outcomes—as well as social and economic measures related to health and health care. The web tool allows analysts and policymakers to compare data across states and view trends over time 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 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 (un)certainty 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.

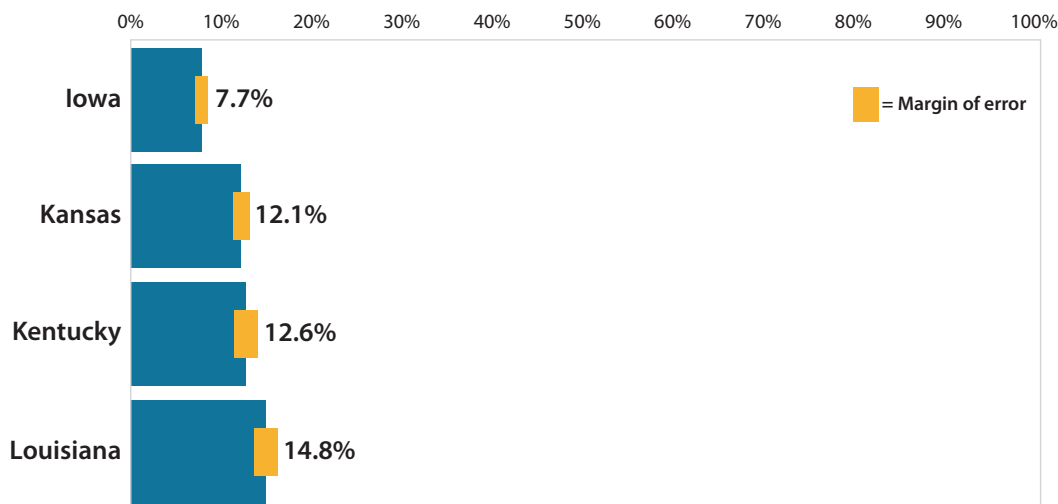
Percent of adults who forgo needed medical care due to cost

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 Louisiana had a higher percentage of people forgo medical care due to cost than Iowa. We can visually test the significance of this difference by examining the margins of error. In this case, the lower bound of the Louisiana estimate's margin of error is larger than the upper bound of the Iowa estimate's margin of error, indicating that the difference between these states' estimates is likely statistically significant. On the other hand, because we can see that the error bars for Kansas and Kentucky overlap, there is 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
2018

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 website, select the “Download Data” button in the upper right-hand corner. Next, follow the instructions under Step 1 to select the desired locations (in this example we will use Iowa, Kansas, Kentucky, and Louisiana). 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 2018) and then click the “Download Data” button on the bottom left. The data will download as 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.

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

$$\text{SE for Iowa: } 0.0068/1.96 = 0.0035$$

Table 1. Transforming margins of error into standard errors

FIPS	Location	Time Frame	Data Type	Data	MOE	SE
19	Iowa	2018	Percent	0.0775	0.0068	0.0035
20	Kansas	2018	Percent	0.1213	0.0087	0.0044
21	Kentucky	2018	Percent	0.1264	0.0126	0.0064
22	Louisiana	2018	Percent	0.1483	0.0131	0.0067

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 Iowa to Louisiana, and Kansas to Kentucky. To take the difference, subtract estimate 2 (Louisiana, in this case) from estimate 1 (Iowa).

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

$$\text{Difference between the estimates (IA and LA): } 0.0775 - 0.1483 = 0.708$$

Table 2. Taking the difference between estimates

State	Percent	Standard Error	Difference
Iowa	0.077	0.0035	0.071
Louisiana	0.148	0.0067	
Kansas	0.121	0.0044	0.005
Kentucky	0.126	0.0064	

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
Iowa	0.077	0.0035	0.071	9.393
Louisiana	0.148	0.0067		
Kansas	0.121	0.0044	0.005	0.656
Kentucky	0.126	0.0064		

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

The final step is to determine if the two estimates are statistically significantly different. We do this by establishing a “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, 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 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	Percent	Standard Error	Difference	T-Score	Significance
Iowa	0.077	0.0035	0.071	9.393	*
Louisiana	0.148	0.0067			
Kansas	0.121	0.0044	0.005	0.656	
Kentucky	0.126	0.0064			

Table 4 shows that the difference between Iowa and Louisiana is statistically significant at a 95% confidence level, while the difference between Kansas and Kentucky 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.