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STATE HEALTH ACCESS DATA ASSISTANCE CENTER

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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.

Now, we will look at two ways to test statistical significance using State Health Compare – a 'Fast' method that is a quick, visual test and a more 'Robust' method that uses a formula to test significance.

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 see if two estimates are statistically different is to compare their margins of error on State Health Compare's state ranking charts.

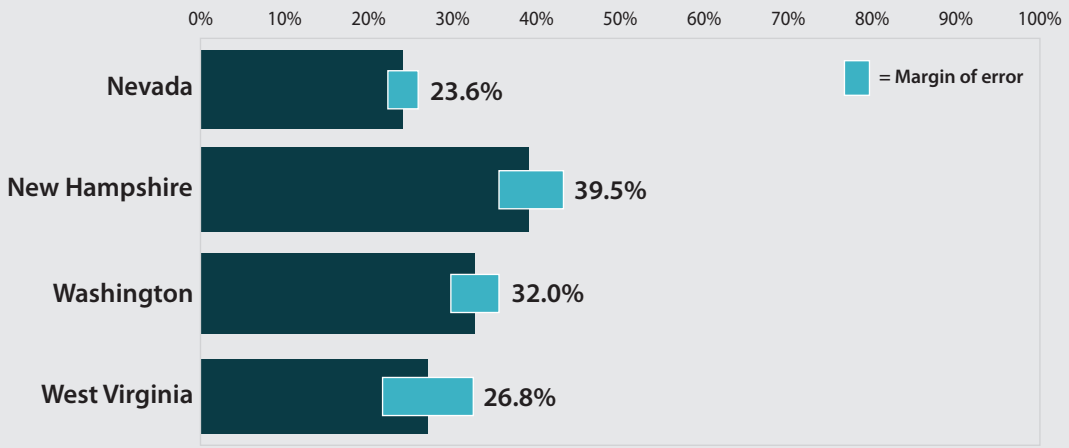
Percent who had a medical appointment by video or phone in the past year

In the example below, looking at the National Health Interview Survey (NHIS) measure "Percent of individuals who had a medical appointment by video or phone in the past year," which measures utilization of telehealth visits, we can quickly see that New Hampshire had a higher percentage of people who had a telehealth visit than Nevada. We can visually test the significance of this difference by examining the margins of error. In this case, the lower bound of the New Hampshire estimate's margin of error is greater than the upper bound of the Nevada 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 Washington and West Virginia overlap, there is likely no statistically significant difference in the rate of adults who had a telehealth visit between those two states.

Percent who had a medical appointment by video or phone in the past year

Timeframe
2021-2022

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, that 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, also called a statistical test.

Below, we discuss how to do a common 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 NHIS measure "Percent who had a medical appointment by video or phone in the past year." On the State Health Compare website, select the "Download Data" button in the upper right-hand corner. After clicking this, there will be a screen with 3 steps to complete. The first step instructs the user to select one or more locations (in this example we will use Nevada, New Hampshire, Washington, and West Virginia). Then, follow the second step on State Health Compare to choose the intended indicator(s) for study (again, this example will use "Percent who had a medical appointment by video or phone in the past year" and will select "Total"). Finally, under the third and last step, choose the timeframe for the selected indicators (in this example we will use 2021-2022) and 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. T-tests, however, use not only margins of error but also standard errors. 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.

= MOE/1.96
SE for Nevada: 0.01876/1.96 = 0.00957

Table 1. Transforming Margins of Error into Standard Errors

FIPS	Location	Time Frame	Data Type	Data	MOE	SE
32	Nevada	2021-2022	Percent	0.2359	0.01876	0.00957
33	New Hampshire	2021-2022	Percent	0.3948	0.03924	0.02002
39	Washington	2021-2022	Percent	0.3196	0.03331	0.01670
40	West Virginia	2021-2022	Percent	0.2680	0.05086	0.02595

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 Nevada to New Hampshire, and Washington to West Virginia. To take the difference, subtract estimate 2 (New Hampshire, in this case) from estimate 1 (Nevada). The same process is repeated with our second pair of states, West Virginia (estimate 2) and Washington (estimate 1).

= Estimate 1 - Estimate 2
Difference between the estimates (NV and NH): 0.2359 – 0.3948 = -0.1589

Table 2. Taking the Difference Between Estimates

State	Percent	Standard Error	Difference
Nevada	0.2359	0.00957	-0.1589
New Hampshire	0.3948	0.02002	
Washington	0.3196	0.03331	0.0517
West Virginia	0.2680	0.05086	

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.

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

Table 3. Calculating the t-score

State	Percent	Standard Error	Difference	T-Score
Nevada	0.2359	0.00957	-0.1589	-7.162
New Hampshire	0.3948	0.02002		
Washington	0.3196	0.03331	0.0517	1.665
West Virginia	0.2680	0.05086		

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 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-score)>1.96,"*","")

Table 4. Determining Statistical Significance

State	Percent	Standard Error	Difference	T-Score	Significance
Nevada	0.2359	0.00957	0.1589	7.162	*
New Hampshire	0.3948	0.02002			
Washington	0.3196	0.03331	-0.0517	-1.665	
West Virginia	0.2680	0.05086			

Table 4 shows that the difference in the rates of telehealth visits (2021-2022 data) between Nevada and New Hampshire is statistically significant at a 95% confidence level, while the difference between Washington and West Virginia 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 National Health Interview Survey (NHIS) data, National Center for Health Statistics (NCHS). The NHIS sample is drawn from the Integrated Health Interview Survey (IHIS, MN Population Center and SHADAC). Data were analyzed at the University of Minnesota's Census Research Data Center because state identifiers were needed to produce results and these variables were restricted.

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 suppressed because the number of sample cases was too small or the estimate had a relative standard error greater than 30%.

Definition: Rates of individuals who had an appointment with a doctor, nurse, or other health professional by video or by phone in the past twelve months for the civilian non-institutionalized population.