

## ERRATA SHEET

### U.S. PIAAC Skills Map: State and County Indicators of Adult Literacy and Numeracy User Guide<sup>1</sup>

(NCES 2020-047)

APRIL 2023

An error was present in the user guide under Guideline 4 Examples 1 and 2. A formula is provided for an approximation of the standard error of the difference between the averages from two jurisdictions, or from two groups within the same jurisdiction. The approximation assumes independence between the two jurisdictions (or two groups within the same jurisdiction) being compared. The error was that the sum of the two variance estimates was originally divided by 2, when it should not be divided by 2. The corrected version and the original version are shown below.

---

<sup>1</sup> The U.S. PIAAC Skills Map User Guide is available both as a webpage within the Skills Map and at <https://nces.ed.gov/surveys/piaac/skillsmap/static/media/PIAAC-SAE-UserGuidance.fde98769cb39107f7fcd.pdf>

Correct Version (changes highlighted)

#### 4. Guideline 4 – Comparing skills percentages or averages for areas using model-based skills estimates

To compare skills estimates for two areas, differences in estimates can be computed using the skills data. Associated uncertainty measures require approximations. These statistical calculations are more involved and require cautionary notes (see the discussion below).

**Example 1: Compare average numeracy scores for two Pacific Northwest states.**  
The PIAAC SAE data for Oregon and Washington provide:

- a) The estimated average numeracy score for each state (NUM\_A), and
- b) The posterior variance of the average numeracy score, which is derived as the square of the product between the skills point estimate (NUM\_A) and its associated CV (NUM\_A\_CV).

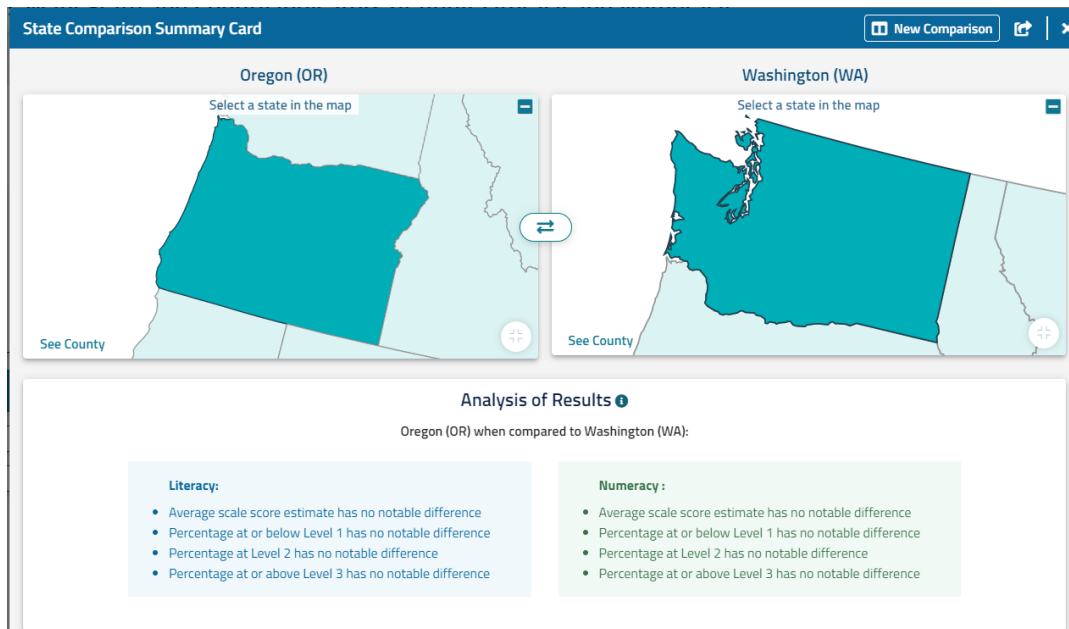
To compare the estimated average numeracy scores for these two states, construct a test statistic by taking the difference between the two state-level estimated average numeracy scores in (a) and dividing it by its standard error:

$$\frac{\text{(Oregon)} \quad \text{(Washington)}}{\sqrt{13.3+9.9}} = -0.42,$$

where the standard error of difference between the two state-level estimated average numeracy scores in (a) is approximated by the square root of the sum of the two estimated variances in (b).

Then, compare the absolute value of the test statistic to 1.96, the theoretical z value at a significance level  $\alpha=0.05$ . Since  $0.42 < 1.96$ , one fails to reject the null hypothesis that the average numeracy scores for these two states are equal and conclude that there is not enough evidence to conclude that the average numeracy scores for these two states are different. This result is consistent with the result displayed in the Skills

Map summary card for comparing Oregon and Washington, 'Average scale score estimate has no notable difference.'



As noted before, the skills estimated variances are not directly available from the PIAAC SAE data. However, also as mentioned above, they can be derived as the squares of the products between the skills point estimates and their associated CVs. For example, for Oregon, the skills estimated variance of the estimated average numeracy score is equal to  $(260.4 \times 0.014)^2 = (3.65)^2 = 13.3$ .

**Example 2: Compare average literacy scores for 25 to 34 years old and 35 to 44 years old in California.** The PIAAC SAE data for California provide information for individuals 25 to 34 years old and 35 to 44 years old in California:

- The estimated average literacy scores (LIT\_A), and
- The posterior variances of the average literacy score, which are derived as the squares of the products between the skills point estimates (LIT\_A) and their associated CVs (LIT\_A\_CV).

To compare the estimated average literacy scores for these two age groups within California (CA), construct a test statistic by taking the difference between the two state by age group-level estimated average literacy scores in (a) and dividing it by its standard error:

$$\frac{(\text{CA 25 to 34 years old}) - (\text{CA 35 to 44 years old})}{\sqrt{26.9+36.6}} = 2.65,$$

where the standard error of difference between the two state by age group-level estimated average literacy scores in (a) is approximated by the square root of the sum of the two estimated variances in (b).

Then, compare the absolute value of the test statistic to 1.96, the theoretical z value at a significance level  $\alpha=0.05$ . Since  $2.65 > 1.96$ , one would reject the null hypothesis that the average literacy scores for these two age groups within California are equal and conclude that there is enough evidence the average literacy scores for these two age groups within California are different.

As noted before, the skills estimated variances are not directly available from the PIAAC SAE data, but can be derived as the squares of the products between the skills point estimates and their associated CVs. For example, for California 25 to 34 years old, the skills estimated variance of the estimated average literacy score is equal to  $(273.2 \times 0.019)^2 = 26.9$ .

## Original Version (original text is highlighted)

### 4. Guideline 4 – Comparing skills percentages or averages for areas using model-based skills estimates

To compare skills estimates for two areas, differences in estimates can be computed using the skills data. Associated uncertainty measures require approximations. These statistical calculations are more involved and require cautionary notes (see the discussion below).

#### Example 1: Compare average numeracy scores for two Pacific Northwest states.

The PIAAC SAE data for Oregon and Washington provide:

- a) The estimated average numeracy score for each state (NUM\_A), and
- b) The posterior variance of the average numeracy score, which is derived as the square of the product between the skills point estimate (NUM\_A) and its associated CV (NUM\_A\_CV).

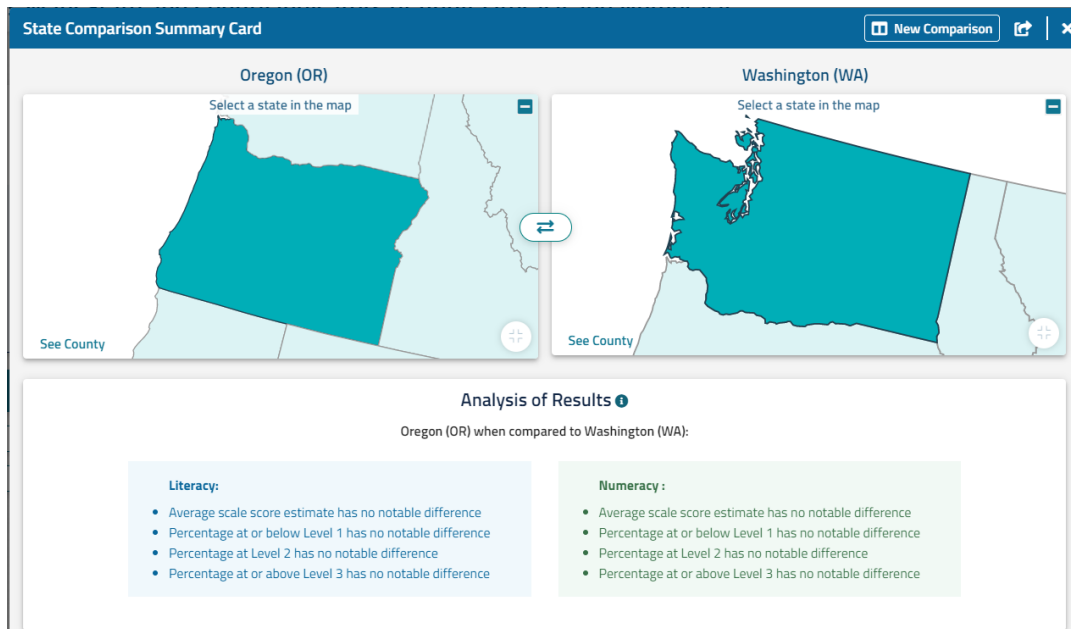
To compare the estimated average numeracy scores for these two states, construct a test statistic by taking the difference between the two state-level estimated average numeracy scores in (a) and dividing it by its standard error:

$$\frac{\text{(Oregon)} \quad \text{(Washington)}}{\frac{260.4 - 262.4}{\sqrt{(13.3+9.9)/2}}} = -0.59,$$

where the standard error of difference between the two state-level estimated average numeracy scores in (a) is approximated by the square root of half of the sum of the two estimated variances in (b).

Then, compare the absolute value of the test statistic to 1.96, the theoretical z value at a significance level  $\alpha=0.05$ . Since  $0.59 < 1.96$ , one fails to reject the null hypothesis that the average numeracy scores for these two states are equal and conclude that there is not enough evidence to conclude that the average numeracy scores for these two states are different. This result is consistent with the result displayed in the Skills

Map summary card for comparing Oregon and Washington, 'Average scale score estimate has no notable difference.'



As noted before, the skills estimated variances are not directly available from the PIAAC SAE data. However, also as mentioned above, they can be derived as the squares of the products between the skills point estimates and their associated CVs. For example, for Oregon, the skills estimated variance of the estimated average numeracy score is equal to  $(260.4 \times 0.014)^2 = (3.65)^2 = 13.3$ .

**Example 2: Compare average literacy scores for 25 to 34 years old and 35 to 44 years old in California.** The PIAAC SAE data for California provide information for individuals 25 to 34 years old and 35 to 44 years old in California:

- a) The estimated average literacy scores (LIT\_A), and
- b) The posterior variances of the average literacy score, which are derived as the squares of the products between the skills point estimates (LIT\_A) and their associated CVs (LIT\_A\_CV).

To compare the estimated average literacy scores for these two age groups within California (CA), construct a test statistic by taking the difference between the two state by age group-level estimated average literacy scores in (a) and dividing it by its standard error:

$$\frac{(\text{CA 25 to 34 years old}) - (\text{CA 35 to 44 years old})}{\sqrt{(26.9+36.6)/2}} = 3.74,$$

where the standard error of difference between the two state by age group-level estimated average literacy scores in (a) is approximated by the square root of half of the sum of the two estimated variances in (b).

Then, compare the absolute value of the test statistic to 1.96, the theoretical z value at a significance level  $\alpha=0.05$ . Since  $3.74 > 1.96$ , one would reject the null hypothesis that the average literacy scores for these two age groups within California are equal and conclude that there is enough evidence the average literacy scores for these two age groups within California are different.

As noted before, the skills estimated variances are not directly available from the PIAAC SAE data, but can be derived as the squares of the products between the skills point estimates and their associated CVs. For example, for California 25 to 34 years old, the skills estimated variance of the estimated average literacy score is equal to  $(273.2 \times 0.019)^2 = 26.9$ .