How to Improve Agency Data Visualization Strategies

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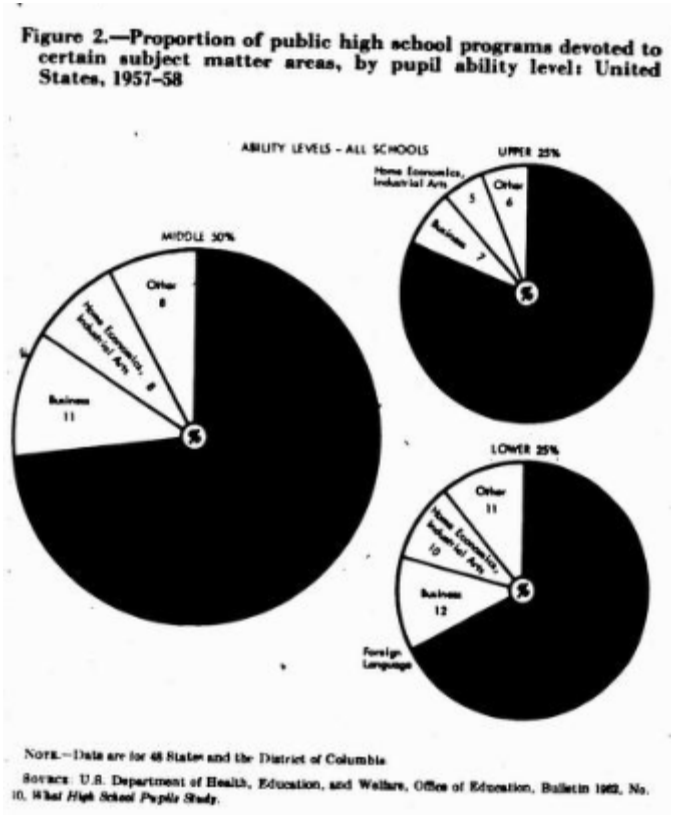
This presentation is intended to promote ideas. The views expressed are part of ongoing research and do not necessarily reflect the position of the U.S. Department of Education.

Data Visualization as a Key Communication Tool

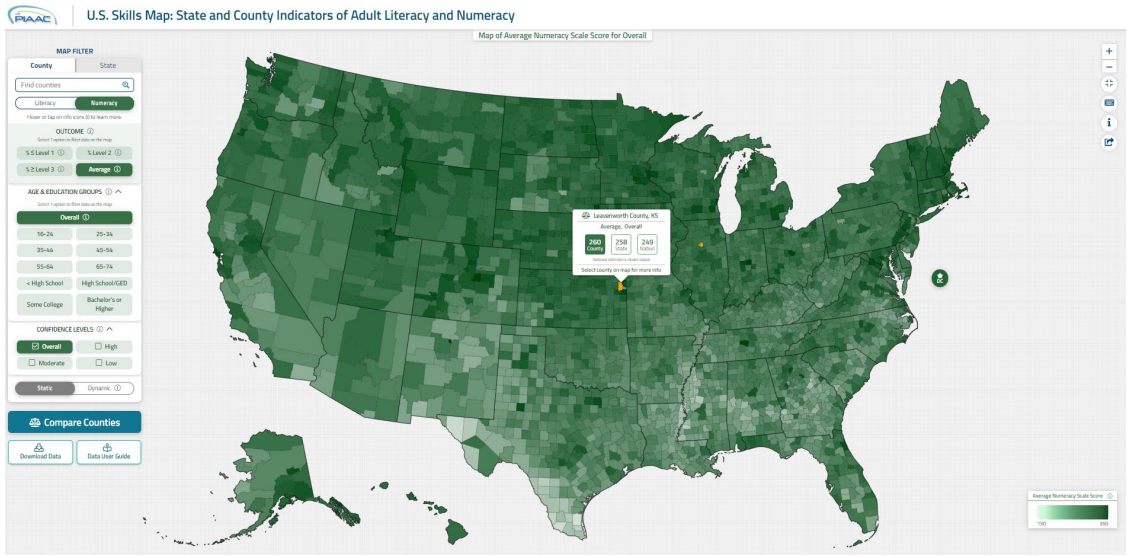


U.S. Government, Department of Health, Education, and Welfare, Office of Education, Digest of Educational Statistics, 1963 Edition, OE - 10024-63. Retrieved October 22, 2022, from https://files.eric.ed.gov/fulltext/ED544106.pdf

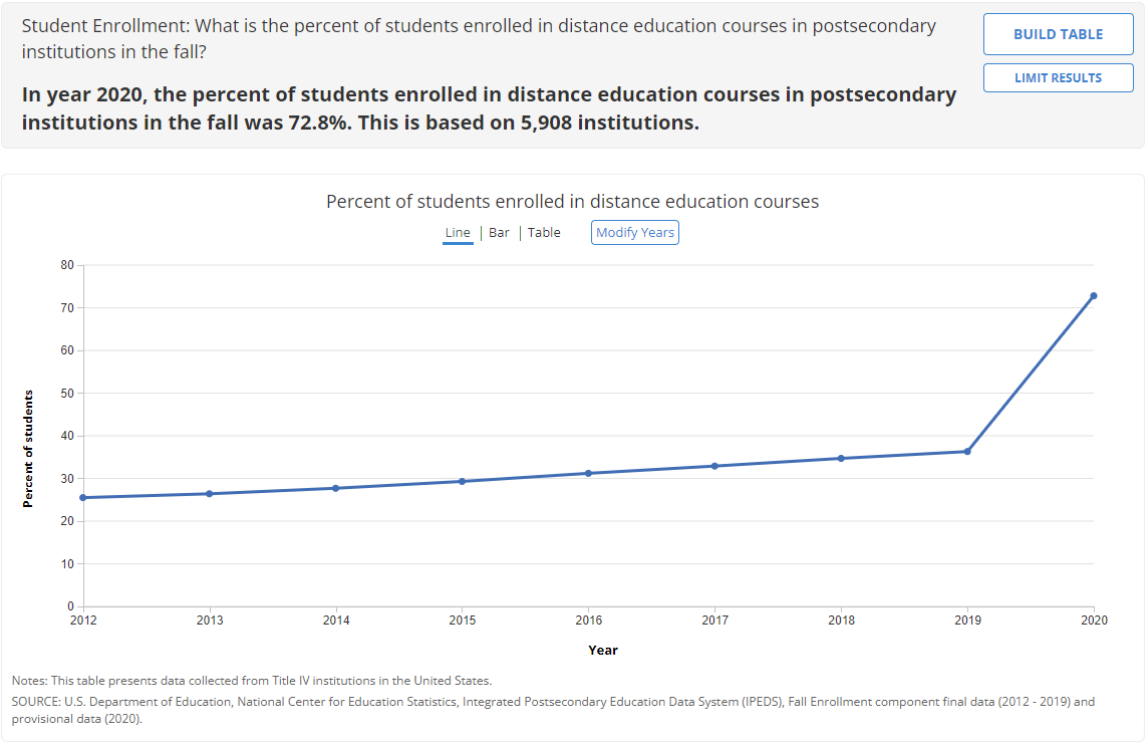
- NCES has an established history developing data visualizations
- Our stakeholders' expectations[1] have increased:
  - *"NCES can improve the accessibility and usability of its products, tools, website, and other dissemination platforms to allow a broader range of audiences to benefit from its products."*
- Development of a strategic approach to enhance communications efforts

1 National Academies of Sciences, Engineering, and Medicine. 2022. A Vision and Roadmap for Education Statistics. Washington, DC: The National Academies Press. Retrieved October 22, 2022, from https://doi.org/10.17226/26392.

Sample Data Visualizations



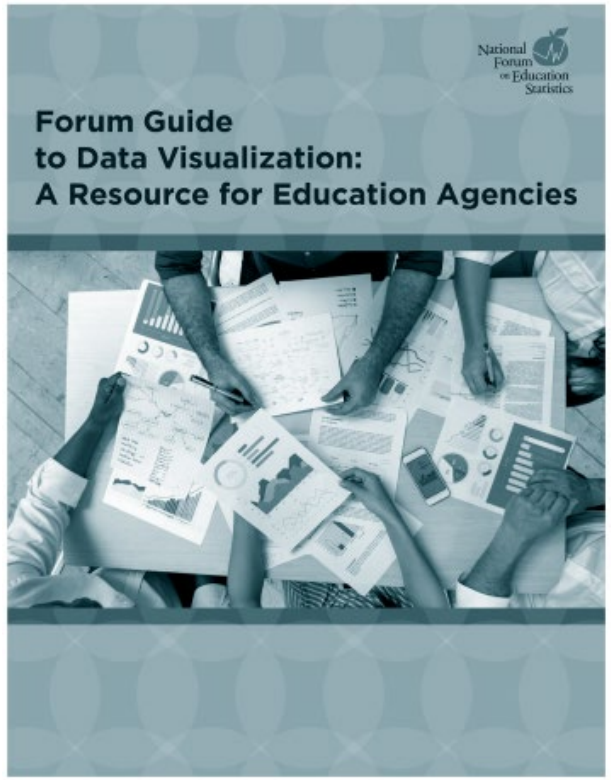
https://nces.ed.gov/surveys/piaac/skillsmap/



https://nces.ed.gov/ipeds/trendgenerator/

Data Visualization Resources

https://nces.ed.gov/nceskids/



National Forum on Education Statistics. (2016). Forum Guide to Data Visualization: A Resource for Education Agencies. (NFES 2017-016). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Steps Towards Improving Data Visualization Strategies

National Institute of Statistical Sciences Recommendations: **Strategy**

1. **Identifying the target audience** at the start of each project is a top priority.

2. A more strategic approach is needed for the **communication efforts between NCES and their contractors**.

3. Two products are needed for NCES staff and contractors:
    1. A branded **style guide**, particularly for charts, graphs, and tables.
    2. **Templates** for standard packages that can be reused by agency staff and contractors.

4. **Choice of static or interactive format** for each visualization depends on the particular use of the graphic and the audience. While interactive graphics often get high-profile attention, they also can interact badly with some platforms and can be expensive to create.

National Institute of Statistical Sciences. 2021. Innovative Graphics for NCES Online Reports. Washington, DC: U.S. Department of Education. Available: Retrieved October 22, 2022, from https://www.niss.org/research/innovative-graphics-nces-online-reports

National Institute of Statistical Sciences Recommendations: **Implementation**

5. Each visualization should be coupled with easy access to a data file, spreadsheet or other easily accessible format that contains both the **visualized measurements and their associated uncertainties displayed**.

6. By the final phase of implementation of the project, most visualizations produced by contractors should be designed so that NCES can **assure long-term maintenance** of the code and the capability to add new features without returning to the contractor for minor revisions

National Institute of Statistical Sciences. 2021. Innovative Graphics for NCES Online Reports. Washington, DC: U.S. Department of Education. Available: Retrieved October 22, 2022, from https://www.niss.org/research/innovative-graphics-nces-online-reports

Implementation Issues and Responses

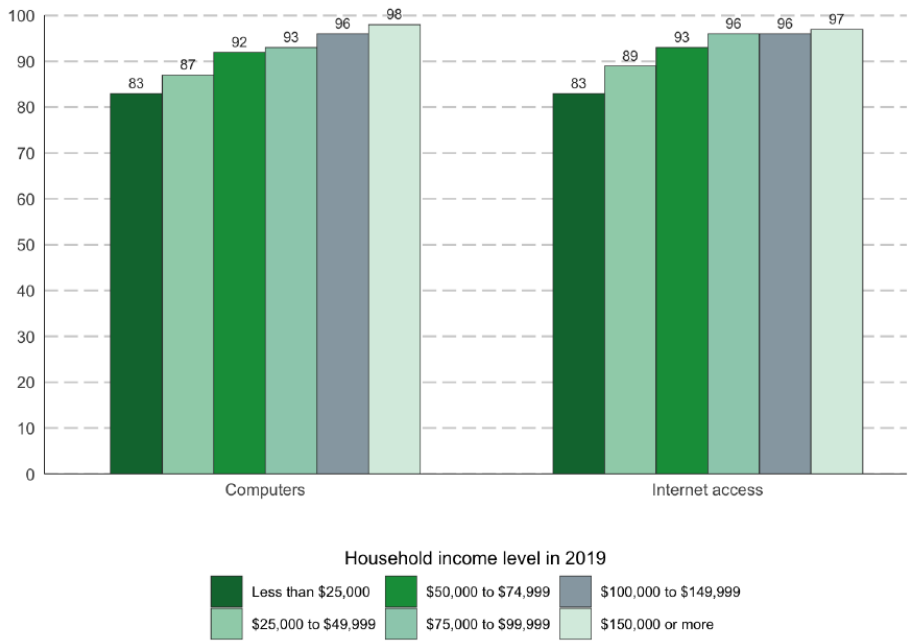
- **Issue 1**: Diverse group of users. IES users fall into 15 distinct segments
  - Educators
  - State education leader
  - Parents
- **Issue 2**: Development of data visualizations involves multiple areas
  - Subject matter experts
  - IT
  - Vendors
- **Issue 3**: Additional resources required to produce additional products

- **Response 1:** User experience testing of data visualizations
- **Response 2:** Identification and tracking of risks, assumptions, issues, and dependencies
- **Response 3:** Staff training and support

Data Visualization Handbook

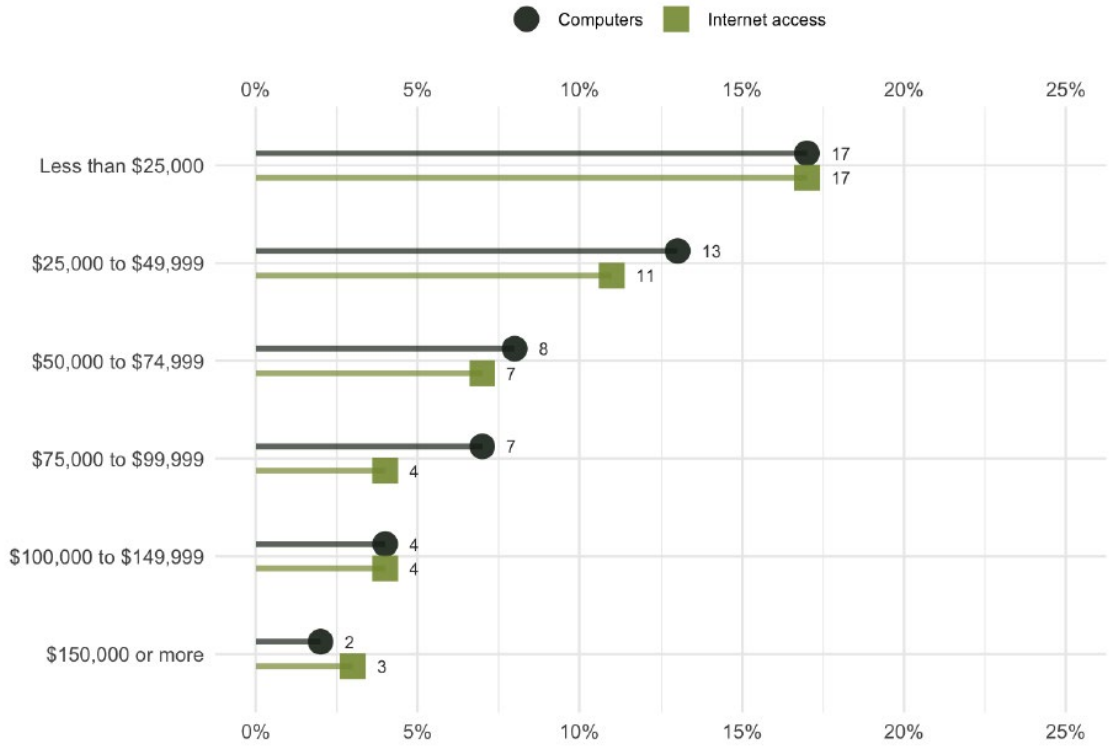
Among adults 18 years old and over who had children under age 18 in the home enrolled in school, percentage reporting that computers and internet access were always or usually available to children for educational purposes, by income level: September 2 to 14, 2020

Percent



NOTE: Although rounded numbers are displayed, the figures are based on unrounded data. Data in this figure are considered experimental and do not meet NCES standards for response rates. The survey question refers to enrollment at any time during the 2020–21 school year.

SOURCE: U.S. Department of Commerce, Bureau of the Census, Household Pulse Survey, collection period of September 2 to 14, 2020. See Digest of Education Statistics 2020, table 218.85.



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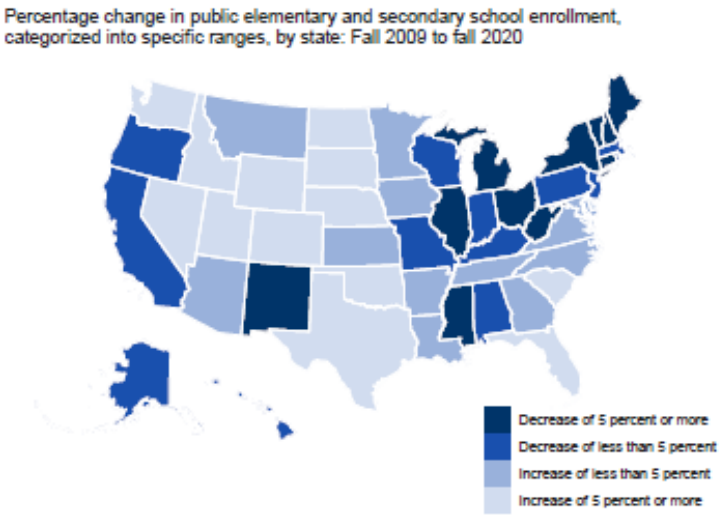
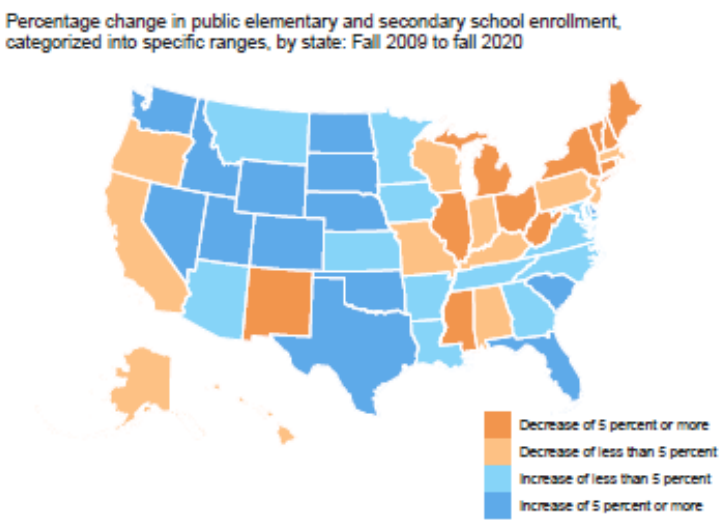
SOURCE: U.S. Department of Commerce, Bureau of the Census, Household Pulse Survey, collection period of September 2 to 14, 2020. See Digest of Education Statistics 2020, table 218.85.

Practical Guidance Supported by Research

Single Hue Pallet



Revised Visualization with Diverge Color Pallet

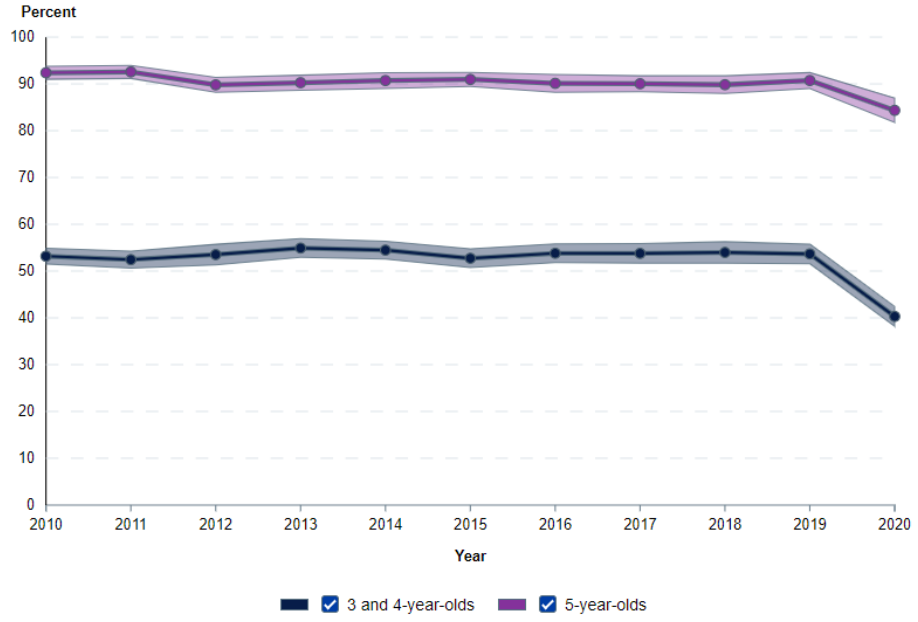


- Color scheme supports chart's statement
- Colors ordered by luminance
- Distances between consecutive colors above practical JND threshold
- Preserves natural ordering of the categories

Communicating Uncertainty

Figure 1. Percentage of 3- to 5-year-olds enrolled in school, by age group: 2010 through 2020

Modify figure | Line | Bar | Table | Confidence Interval

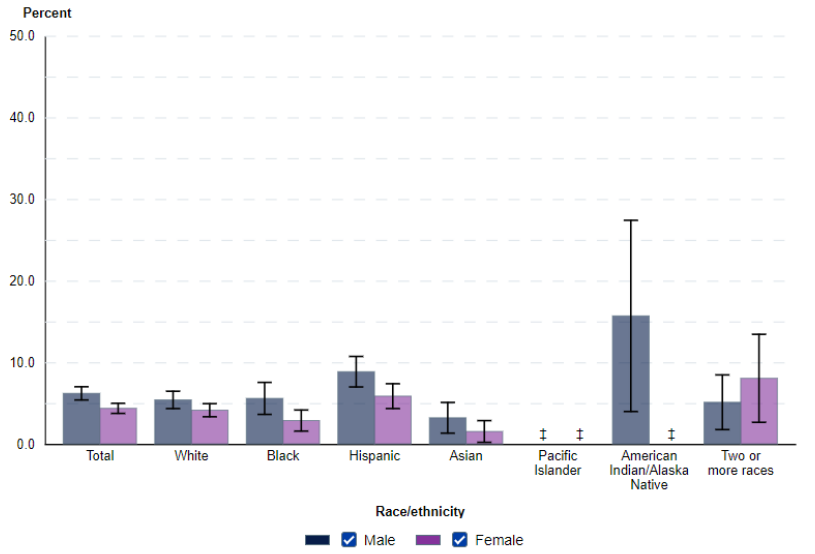


NOTE: Data exclude children living in institutions.

SOURCE: U.S. Department of Commerce, Census Bureau, Current Population Survey (CPS), October, 2010 through 2020. See *Digest of Education Statistics 2021*, table 202.20.

Figure 2. Status dropout rates of 16- to 24-year-olds, by race/ethnicity and sex: 2020

Modify figure | Bar | Table | Confidence Interval



† Not applicable.

! Interpret data with caution. The coefficient of variation (CV) for this estimate is between 30 and 50 percent.

‡ Reporting standards not met. Either there are too few cases for a reliable estimate or the coefficient of variation (CV) is 50 percent or greater.

NOTE: The status dropout rate is the percentage of 16- to 24-year-olds who are not enrolled in high school and who lack a high school credential (either a diploma or an alternative credential such as a GED certificate). Data are based on sample surveys of the civilian noninstitutionalized population, which excludes persons in the military and persons living in institutions (e.g., prisons or nursing facilities). Race categories exclude persons of Hispanic ethnicity.

SOURCE: U.S. Department of Commerce, Census Bureau, Current Population Survey (CPS), October 2020. See *Digest of Education Statistics 2021*, table 219.73.

NCES Next Steps

- Building internal capacity
- Coordinating across stakeholders
- Human centered design
- Enterprise support for generalizable task
- Tailored data visualizations by audience and dissemination mode

Thank you.

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