Over-the-Counter Data's Impact on Educators' Data Analysis Accuracy

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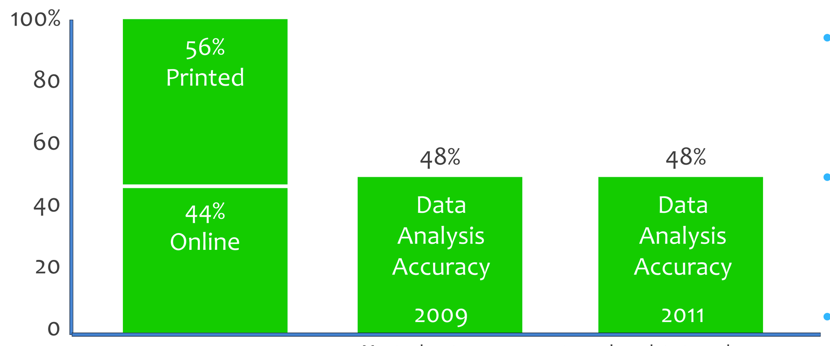
Problem

Data-Informed Decision-Making

Use Data System → **Make Decisions** → **Impact Students**



Most educators have access to data systems (Aarons, 2009; Herbert, 2011). 44% of educators use these systems directly, but the majority view printed versions of reports others use the data systems to generate for them (Underwood, Zapata-Rivera, & VanWinkle, 2008)

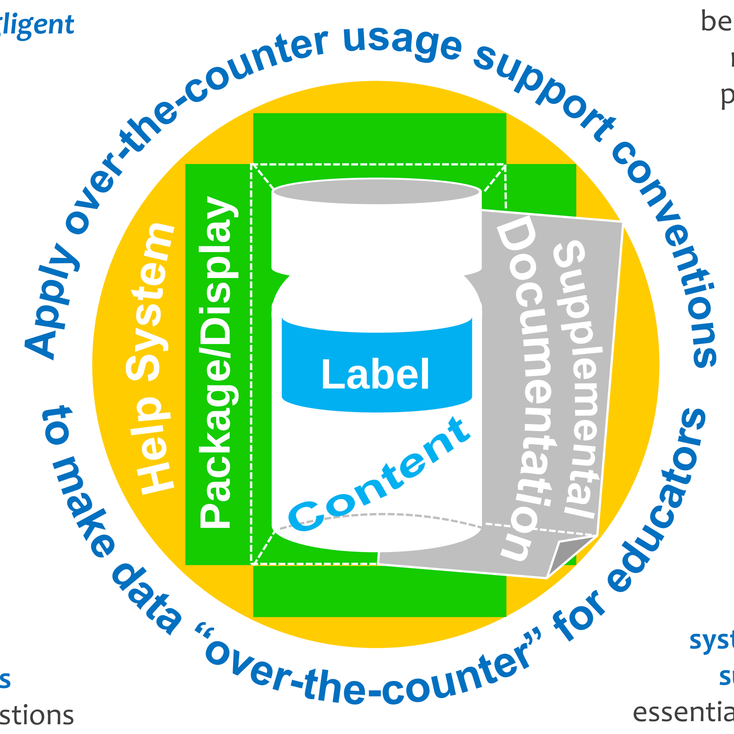
Most educators are eager to analyze data to make decisions, but they *cannot* make correct analyses if they do not understand how to do so (Van der Meij, 2008). In districts known nationally for *strong* data use, teachers achieved only 48% accuracy when making data inferences involving basic statistical concepts (U.S. Department of Education Office of Planning, Evaluation and Policy Development , 2009, 2011).

- Educators make data analysis errors impacting students,
- yet data systems and reports do not include analysis help, and
- it *was* undecided whether adding supports to data systems can reduce the number of analysis errors.

Theoretical Framework

Consider over-the-counter medication, where it would be ***negligent to not help*** users understand how to use the contents.

Someone wondering, "How many pills should I take?" can **immediately learn answers** to varied questions through a variety of means.



Usage support (e.g., labeling) found on over-the-counter medication can be employed with non-medication products, where they also result in **improved use** (Hampton, 2007; Qin et al., 2011).

What if data systems contained such supports… essentially making data "over-the-counter" for educators?

Literature Review

Educators' Data Analyses Are Often Flawed

- Data Quality Campaign, 2009
- Few, 2008
- Halpin & Cauthen, 2011
- Hattie, 2010
- Minnici & Hill, 2007
- National Association of States Boards of Education, 2012
- National Forum on Education Statistics [NFES], 2011
- Newman & Scholl, 2012
- Sabbah, 2011
- Stansbury, 2013
- Underwood, Zapata-Rivera, & VanWinkle 2008, 2010
- U.S. Department of Education Office of Planning, Evaluation and Policy Development [USDEOPEPD], 2009, 2011
- Van der Meij, 2008
- VanWinkle, Vezzu, & Zapata-Rivera, 2011
- Wayman & Cho, 2009
- Wayman, Cho, & Shaw, 2009
- Wayman, Snodgrass Rangel, Jimerson, & Cho, 2010
- Zwick et al., 2008

Example: Stakeholders (administrators, superintendents, etc.) frequently misunderstand and misinterpret score reports even though they are increasingly asked to make data-informed decisions (VanWinkle, Vezzu, & Zapata-Rivera, 2011).

PD and Staff

Professional Development (PD) and staffing supports (popular tactics for improved data use) tend to be beneficial to data use, but neither approach is foolproof.

PD:

Value varies • Majority of educators do not find it helpful • Not comprehensive enough • Struggles continue after • Requires $

Example: In a study where teachers received PD in measurement, *all* teachers struggled afterwards with statistical terms and measurement concepts (Zapata-Rivera & VanWinkle, 2010).

Staff Supports:

Quality varies • Knowledge is hard to share with others • Pacing can be off • Resources not always available • Requires $

Example: Knowledge management research indicated knowledge is hard to share with others, even when the intention to share it is there, especially when power or status is involved (Cho & Wayman, 2009).

Educators = Ideal Client Base

Higher than average:

- Intellect
- Education

So, What About Tool They Use?

Data Systems:

- Impact Analyses
- *Can* Support Analyses
- Typically Do *Not* Offer Support

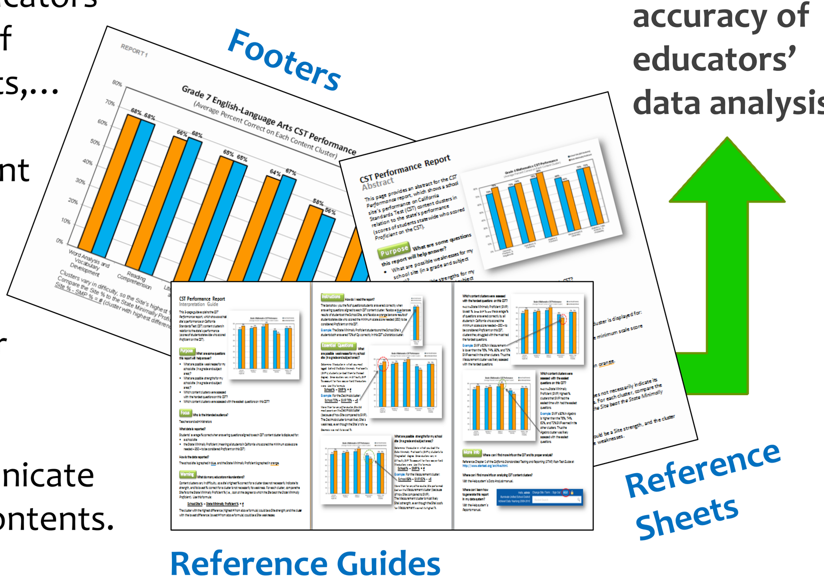
Sources:

- Aarons, 2009
- Cho & Wayman, 2009
- Hattie, 2010
- Hattie & Brown, 2008
- Herbert, 2011
- Minnici & Hill, 2007
- National Forum on Education Statistics [NFES], 2010
- Odendahl, 2011
- Stansbury, 2013
- Underwood et al., 2008, 2010
- USDEOPEPD, 2011
- U.S. Department of Education Office of Educational Technology [USDEOET], 2012
- USDEOPEPD, 2009
- Wayman, 2007
- Wayman, Snodgrass Rangel, Jimerson, & Cho, 2010
- VanWinkle, Vezzu, & Zapata-Rivera, 2011

Study Purpose

The purpose of this quantitative study was to:

- facilitate causal inferences…
- concerning the degree to which…
- including 3 different forms of data usage guidance…
- within a data system reporting environment…
- can improve educators' understanding of the data contents,…
- much like including different forms of usage guidance with over-the-counter medication is needed to properly communicate how to use its contents.



Increase accuracy of educators' data analysis?

Qs/Hypotheses/Variables

	Independent Variable	Question (Abbreviated)	Alternative Hypothesis
Primary Research Questions	**Support** Presence	**Q1.** Support's impact on analysis accuracy	↑ Analysis Accuracy
	Footer Presence	**Q2a.** Footer's impact on analysis accuracy	↑ Analysis Accuracy
	Footer Format (Moderate)	**Q2b.** Footer framing's impact on analysis accuracy	↑↓ Analysis Accuracy
	Reference Sheet Presence	**Q3a.** Reference sheet's impact on analysis accuracy	↑ Analysis Accuracy
	Reference Sheet Format (Moderate)	**Q3b.** Reference sheet framing's impact on analysis accuracy	↑↓ Analysis Accuracy
	Reference Guide Presence	**Q4a.** Reference guide's impact on analysis accuracy	↑ Analysis Accuracy
	Reference Guide Format (Moderate)	**Q4b.** Reference guide framing's impact on analysis accuracy	↑↓ Analysis Accuracy
Secondary: Site Demographics	**Level Type** (Elementary vs. Secondary)	**Q5a.** Level type impact on analysis accuracy	✖ Analysis Accuracy
	Level (Elem vs. Junior/Middle vs. High)	**Q5b.** Level impact on analysis accuracy	✖ Analysis Accuracy
	Academic Performance	**Q5c.** Academic performance impact on analysis accuracy	✖ Analysis Accuracy
	EL Population	**Q5d.** EL population impact on analysis accuracy	✖ Analysis Accuracy
	Socioeconomically Disadvantaged Pop.	**Q5e.** Socioeconomically Disadvantaged population impact on analysis accuracy	✖ Analysis Accuracy
	Students with Disabilities Population	**Q5f.** Students with Disabilities population impact on analysis accuracy	✖ Analysis Accuracy
Secondary: Educator Dem.	**Veteran Status**	**Q6a.** Veteran status impact on analysis accuracy	✖ Analysis Accuracy
	Role	**Q6b.** Current professional role impact on analysis accuracy	✖ Analysis Accuracy
	Perceived Data Analysis Proficiency	**Q6c.** Educator perception of own data analysis proficiency impact on analysis accuracy	✖ Analysis Accuracy
	Professional Development	**Q6d.** Professional development over the past year (devoted specifically to how to analyze student data) impact on analysis accuracy	✖ Analysis Accuracy
	Graduate-Level Courses	**Q6e.** Graduate-level educational measurement courses (educator has taken) impact on analysis accuracy	✖ Analysis Accuracy

Research Method

Population

(stratification)

- 3,307,600 U.S. educators
- United States (Demographically Diverse)
- All school site demographics
- All educator demographics

Sample

(cross-sectional)

- 211 educators > power analyses (priori two-tailed t-test resulted in a recommended sample size of at least 210 educators; priori F-test resulted in a recommendation of at least 153 educators)
- Open invitation to Southern CA (Demographically Diverse)
- All school site demographics
- All educator demographics

All national statistic means were encompassed by the range of sites used in the study.

Materials & Instruments

Survey

- Anonymous & Computer-Based
- 10 Multiple Choice Questions (Required to Complete Survey)
  - 6 Qs = Demographics / 4 Qs = Analyses of Data (Handouts)
- Validity & Reliability
  - each analysis question = 1 correct answer (distractors included all possible answers)
  - each analysis question's answer = objective (no interpretation of appropriateness of answers)
  - each analysis question & answer = based on straightforward CA Dept. of Ed. (CDE) guidelines

Handouts (7 Scenarios)

- Control Group (2 reports)
- 2 Footer Groups (same 2 reports as Control + varied-format footers)
- 2 Reference Sheet Groups (same 2 reports as Control + varied-format ref. sheets)
- 2 Guide Groups (same 2 reports as Control + varied-format reference guides)

Data Analysis

G*Power 3.1 Statistical Analysis Tool for Priori Power Analyses

- Two-tailed t-test
- F-test linear multiple regression analysis

Microsoft Excel with Microsoft 2010 Data Analysis Add-on Pack

- Regression analysis, charting, and coding

Predictive Analytics Software (PASW) Version 18 with Statistical Package for the Social Sciences (SPSS) Data Access Pack

- Independent Samples T-Tests
- Crosstabulations with Chi-square
- F-tests

Ethical Assurances

- Pilot test and risk assessment
- IRB approval and informed consent
- Privacy, confidentiality, and data handling
- Study design and reporting (protect integrity of results & application to real world practice)
- Steps to overcome threats to construct, external, & internal validity

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More Information

www.overthecounterdata.com

www.facebook.com/overthecounterdata

plus.google.com/u/0/b/117931157580458678473/117931157580458678473

www.linkedin.com/groups/OvertheCounter-Data-OTCD

www.pinterest.com/otcdata

@OTCData (twitter.com/OTCData)

Implications & Recommendations

Implications

- Report-specific footers, reference sheets, & reference guides each significantly increase educators' data analysis accuracy
- Educators want data system/report-embedded supports
- Educators struggle with data analyses
- Support benefits persist regardless of report or question type
- Data-informed decision-making and helping students
- Contributions to existing literature in the field:
  - whether data systems can help increase data analysis accuracy by providing analysis support within data systems and their reports, with the finding being that they can.
  - 3 specific supports that increase educators' data analysis accuracy.
  - the specific degree to which these supports increase educators' data analysis accuracy
  - how likely educators are to use each support
  - examples showing what effective footers, reference sheets, and reference guides look like, with templates (www.overthecounterdata.com) anyone can download and use anytime at no cost
  - whether minor modifications in support format impacted educators' data analysis accuracy, with the findings being that both formats were equally effective.

Recommendations

Data System and Report Providers

- Add footers, reference sheets, & reference guides to system
- Create direct., easy access to supports for each report in system
- Follow format guidelines in dissertation
- Use reference sheet and reference guide templates available at www.overthecounterdata.com

Educators

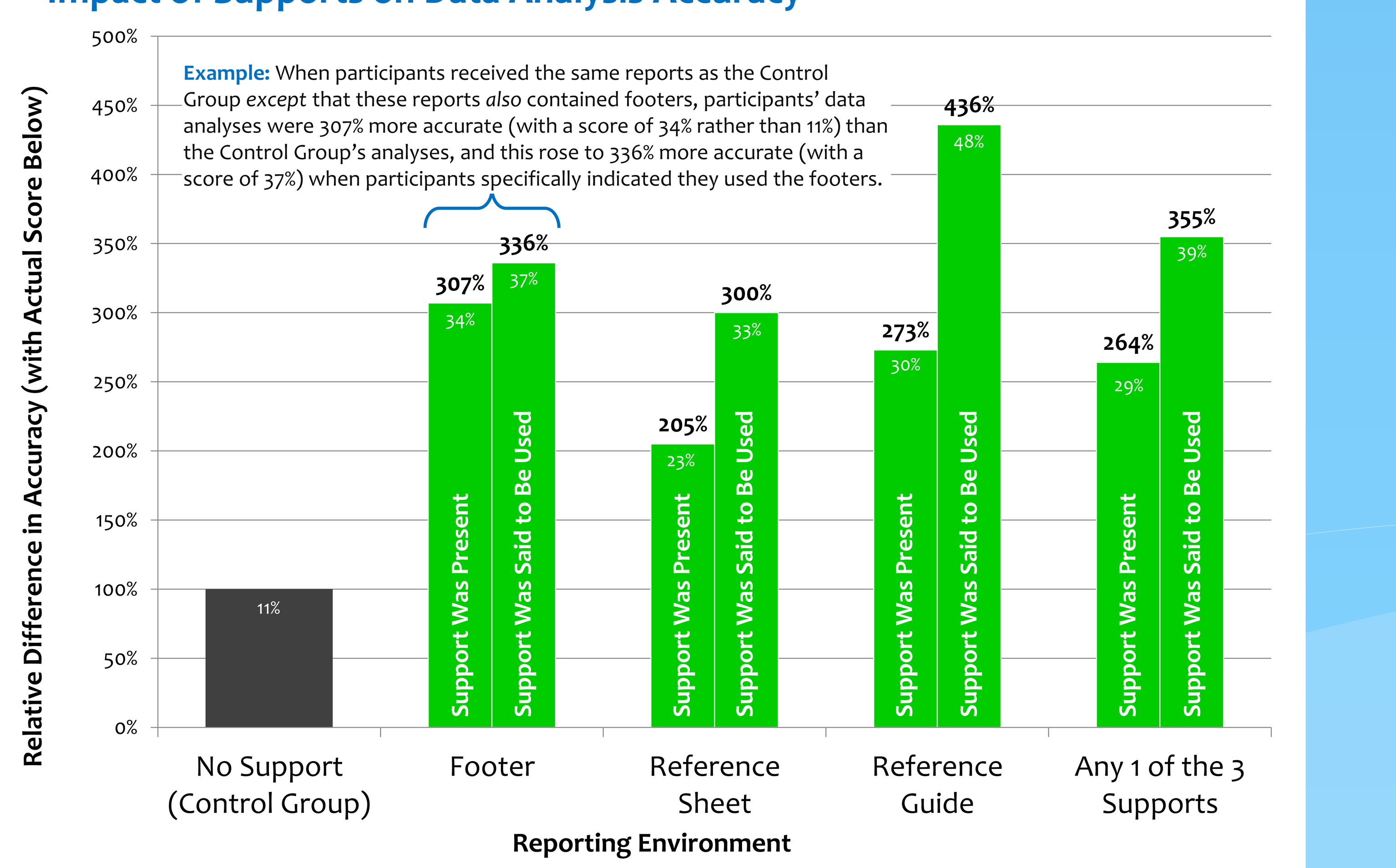
- Encourage current data system and report providers to add supports investigated in this study
- Use support inclusion as criteria for keeping or selecting a data system or report provider
- Promote awareness and dialogue about such supports in educator communities.
- Personally add supports to accompany the report if provider will not

Education Research Community

- All 3 supports simultaneously
  - Footer (Label)
  - Reference Sheet & Reference Guide (Supplemental Documentation)
- All over-the-counter data supports simultaneously:
  - Label (Footer & Also Effective Title)
  - Supplemental Documentation (Reference Sheet & Reference Guide)
  - Help System
  - Effective Package/Display
  - Effective Content
- Additional Formats/Framing

Findings

Impact of Supports on Data Analysis Accuracy



87% of Control Group participants indicated they ***would have* used supports** if supports had been available.

73% of the time **footers** were present, they **were used.**

50% of the time **reference sheets** were present, they **were used.**

52% of the time **reference guides** were present, they **were used.**

58% of the time ***any* 1 of the supports** was present, it **was used.**

All Supports Significantly Increased Educators' Data Analysis Accuracy

- All findings concerning primary variables (footers, reference sheets, and reference guides) were significant.

Site and Educator Demographics Had Insignificant Impact on Supports' Success

- All findings concerning secondary variables (school and educator demographics) were insignificant.

Minor Framing Modifications Had Insignificant Impact on Supports' Success

- All findings concerning minor modifications in support format were insignificant.