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# Statistical Reasoning in Journalism Education

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## Abstract

Surveys of journalism department heads in 1997 and 2008 showed general support for the need for journalism students to reason with statistical information. Stronger support was associated, in particular, with the perception that this cognitive skill would give students an advantage in the journalism job market. However, many chairs also perceived constraints to learning, such as student inability and/or unwillingness to focus on this material and the difficulty most of their faculty would have teaching it. Some of these concerns may be more perceptual than actual.

## Keywords

science, journalism, statistical reasoning, journalism education, numeracy

Science communicators traffic regularly in information fraught with uncertainties. That, in turn, requires them to be able to not only navigate a landscape full of numbers but also use statistical reasoning skills to make sense of what scientists do and do not know. Frankly, statistical reasoning capability should be part of the tool kit of professional communicators of all kinds, a position long argued by stalwarts such as Philip Meyer, whose 1973 book *Precision Journalism* jump-started a modest trend in research and statistical training, and science/medical writers Victor Cohn and Lewis Cope (2001), who wrote *News & Numbers* to bring similar skills into the journalism classroom. But statistical literacy is unarguably critical to those who seek to explain scientific ways of knowing to general audiences.

Despite that, it is difficult to detect a sense of urgency in the provision of such training for science communicators specifically and for professional communicators generally. Journalism schools, long heralded as the most obvious locations for professional communication training, should be replete with numeracy and statistical instruction. But they are not. The coauthors, themselves situated in journalism units, decided to explore the extent of such training, as well as possible reasons for its presence or absence in a curriculum. Aided initially by the inestimable Victor Cohn, who covered health for many years for *The Washington Post*, we conducted two surveys of chairs/directors of journalism units across the United States. Done 10 years apart, the surveys were designed to learn the extent of statistical training in U.S. journalism programs, whether such efforts increased or declined over time, and why these patterns might exist. We focused on the perceptions of chairs/directors because we were interested in institutional reactions to our questions. While individual professors do choose to provide statistical training in their courses (the coauthors are examples of that), such efforts run the risk of being one-person shows that, without institutional undergirding, fail to survive their creators.

In this commentary, we first share with our readers the modest literature that has coalesced around this issue. We then offer results of our decadal look at journalism unit activities. Finally, we offer some reflections on what those data tell us and recommend for the future.

Statistical reasoning is viewed by many as distinct from numeracy, and we will attempt to maintain that distinction here. Although definitions of numerical literacy vary widely, Coben (2000) offers one useful to our thinking:

> To be numerate means to be competent, confident, and comfortable with one's judgments on *whether* to use mathematics in a particular situation and if so, *what* mathematics to use, *how* to do it, what *degree of accuracy* is appropriate, and what the answer means in relation to the context. (p. 35)

Statistical reasoning comes into play when an individual encounters situations calling for decision-making in the context of incomplete information. Garfield (2002) notes,

> Much of statistical reasoning combines ideas about data and chance, which leads to making inferences and interpreting statistical results. Underlying this reasoning is a conceptual understanding of the important ideas, such as distribution, center, spread, association, uncertainty, randomness, and sampling.

Gigerenzer, Gaissmaier, Kurz-Milcke, Schwartz, and Woloshin (2008) argue that all citizens should attain reasonable levels of "statistical literacy" and take journalists to task for communicating risk probabilities in ways easily misperceived by audiences. Garfield (2002) agrees on the value of these cognitive skills for "journalists and science writers, who are interested in how to best explain and critique statistical information in the media."

## What We Already Know

Studies of numeracy among lay publics are more common than are studies of statistical literacy. In both domains, though, most efforts find nonscientists to be challenged. Biannual assessments of mathematical performance among eighth-grade students in the United States, for example, have tracked a slow but steady increase in skill levels since 1990 but still find that more than one in four students score "below basic" (National Center for Education Statistics, 2011). A 2008 survey of the statistical literacy of German and American adults (Galesic & Garcia-Retamero, 2010) found that respondents correctly answered more than half of the questions; Germans scored better than Americans and level of education was a strong predictor of performance. Applying such knowledge, however, can be problematic. While students can often do well in a statistics course, Garfield (1998) notes, they are likely to perform poorly when called on to use statistical reasoning to solve real-world problems.

Although systematic evidence is sparse, journalists probably fare no better at either numerical or statistical literacy than do other segments of the population. Yet much of the essential information that underlies today's news reflects decision making under uncertain conditions. The economy, energy, environment, elections, health risks, and health care, for example, all require reporters to handle statistics adeptly. Cohn and Cope (2001) observed in their book, "Even when we journalists say we are dealing in facts and ideas, much of what we report is based on numbers" (p. 3). For example, a 3-month case study of a daily newspaper found that nearly half of the local news stories included mathematical calculations requiring at least some basic numerical skill on the part of the reporter. What is more, this kind of story usually had greater prominence, tending to appear toward the front of each section (Meier, 2002).

Critiques of journalists' statistical acuity are common and, likely, warranted. Even the top news organizations stumble on occasion. For example, in its January 16, 2007, issue, the *New York Times* published a page-one story, based on census data, claiming that the majority of American women were living without spouses, probably for the first time in history. The problem, as investigated by *New York Times* Public Editor Byron Calame (February 11, 2007), was that the reporter included 15- to 17-year-old women, most of who still live with parents, in the analysis. Without them, the "majority" aspect of the story disappeared along with its page-one worthiness, according to Calame, who did some simple statistical sleuthing of his own. The reporter's mathematical calculations were not in question, but his statistical judgment was. Afterward, the *New York Times* created a vetting network of staffers with expertise in demographics and statistics to help edit articles that involve those subjects.

We know that journalism schools provide scant training in numerical skills. In 2009, a survey of journalism department chairs in the United States found that respondents regarded their students' math skills as "poor" but were unlikely to offer courses designed to ameliorate that problem (Cusatis & Martin-Kratzer, 2010).

But what about training in statistical reasoning? Has provision of such training changed over time, as calls for skill building in this arena have intensified? And if the acquisition of statistical reasoning skills remains a lower priority in journalism units, why?

## The Studies

In 1997 and again in 2008, we surveyed administrators of a probability sample of journalism programs at colleges and universities in the United States. The programs and their administrators (e.g., department chairs) were identified from that year's edition of the *Journalism & Mass Communication Directory* and the *Dow Jones Journalism Career and Scholarship Guide*.

The 1997 survey of 219 programs (out of a population of 430) was conducted by surface mail and achieved a response rate of 75% (*n* = 164). The 2008 survey used the same sample of 219 programs as did the 1997 study in an attempt to make the results of the two surveys as comparable as possible despite the likely changes in administrative leadership. The 2008 survey, however, used both surface mail and online procedures. Four of the programs had gone out of existence in the 11 years between the two surveys, leaving a sample of 215 for the 2008 effort. The 2008 response rate was 63% (*n* = 135). While 105 of those 135 journalism units responded in both 1997 and 2008, only 20 respondents were the same individuals. So we have treated respondents from the two waves as independent groups in our analysis.

The questionnaire in both cycles began with the following definition of statistical reasoning:

> In this survey we are interested in your ideas about the extent to which your undergraduate journalism students should be introduced to statistics and especially to statistical reasoning. By "statistical reasoning" we don't mean their ability to compute statistical tests. Instead, we mean their ability to think systematically and reason using numerical data, for example:
>
> - to assess critically the quality of data
> - to apply data appropriately to problem-solving
> - to understand the limits to generalizability
> - to understand probability and risk
> - to recognize when better data and information are needed for decision-making (e.g., when the data provided are incomplete or not comparable) and to diagnose what information is missing.

Administrators then were asked to respond, using 5-point Likert-type scales, to a series of 15 statements about statistical reasoning as related to journalism education and the journalism profession. Other items asked them how, if at all, they would prefer statistical reasoning to be taught to journalism students; whether any courses that teach statistical reasoning are offered in their programs; and whether such courses are optional or required for most or all of their journalism students. The questionnaire also gathered information about the highest degree offered and the size of the program (number of faculty and number of students).

## What Did We Learn?

Let us shoot right to the take-home messages. Journalism administrators believe that statistical literacy is important, that it gives their students a leg up in the communication business. But they tell us that their journalism units rarely provide such training, for a variety of reasons. This "we value the topic but do not provide it" gap has been remarkably stable over time. It was the main message of our 1997 study, and it was just as true when we returned to the field in 2008.

Now, let us turn to some more specific reflections on those patterns.

### Statistical Training Is Valuable

The vast majority of administrators in each of the surveys agreed that it is important for their journalism students to be able to reason statistically. At least two thirds of the respondents in both waves also believed that statistical reasoning skills give students a competitive edge in the journalism job market. In 1997, about 67% of the administrators agreed with the statement, and in 2008, 72% agreed.

## Who Should Provide Statistical Training?

The most common response (41% in 1997; 47% in 2008) was that statistical training should be offered across the journalism curriculum by embedding it in a variety of courses. However, more than half of the chairs (53% in both 1997 and 2008) felt that most of their faculty would have difficulty teaching statistical reasoning as part of their journalism classes; a substantial portion of the respondents (56% in 1997; 41% in 2008) said that inclusion of statistical reasoning in a reporting course should be left up to the instructor. And since only slightly more than a third of the programs (35% in 1997; 36% in 2008) require most or all of their students to take a statistical reasoning course within journalism (e.g., in a course such as research methods or computer-assisted reporting), the bottom line is that statistical reasoning is not a common part of the journalism curriculum, either as a stand-alone course offering or as a topic embedded in other journalism courses.

Despite their concern about faculty pushback if challenged to address the topic, these chairs detected some modest undercurrents of enthusiasm for inclusion of statistical literacy in journalism classes. One chair stated that her or his program "includes survey research and statistical reasoning in upper division advanced reporting, also in an undergraduate research class and in an honors class." Another said that available courses "explain stats while working on reporting methods for stat stories. We also cover basic research stats in a capstone course so students are prepared to understand stats they read [in the literature]." The administrator of one program reported that 10 faculty members were making special efforts to include statistical reasoning in their courses. "All incorporate percentages as a comparative reasoning tool," the chair reported. "One teaches property tax rates. Others discuss examples of poor statistical reasoning in current news stories." None of the chairs offered science journalism as a course that emphasizes statistical literacy.

Next to planting statistical reasoning instruction in existing journalism courses, the second most popular approach among the chairs (30% selected the option in 1997 and 25% in 2008) was to require students to take at least one statistical reasoning course offered elsewhere in the university. And one in five, both in 1997 and in 2008, would opt for a statistical reasoning course specifically designed for journalism majors.

Half of the administrators surveyed (51% in 1997; 47% in 2008) reported that most or all of their journalism students were required to take courses somewhere in the university—including their own programs in a few cases—that include statistical reasoning instruction. But only about one in four believed that their students receive adequate levels of instruction in the topic.

## Are Students Willing to Engage in Statistical Learning?

Although the two surveys did not directly examine the extent to which journalism students might be motivated to engage statistical reasoning or gauge their extant abilities to deal with probability and statistics, teachers and administrators believe that student motivation is closely related to readiness to learn. Their perceptions of beliefs about numbers and statistics, thus, may play an important role in provision of statistical reasoning instruction.

When it comes to learning statistical reasoning, more than three quarters of the administrators (78% in 1997; 79% in 2008) believed that most of their journalism students would rather avoid such material. The personal experiences of some corroborate those perceptions. "We worked with local professionals in print journalism and advertising to develop an Information Gathering course required of all majors," said one chair. "It included applied statistics. After 1 year of listening to student complaints, the faculty voted to eliminate it."

Even more dramatically, more than 40% of the administrators in each wave (48% in 1997; 42% in 2008) believed that most of their majors do not have the mathematical aptitude required to do well in basic statistics courses at their respective universities. While nearly a third disagreed with that contention in each of the two waves,

administrators in these two surveys revealed considerable uncertainty about whether their majors were capable of statistical literacy.

# What Do We Make of These Patterns?

## A Decade Has Made Little Difference

The stability of responses to our questions about teaching statistical literacy has been remarkable over the 10-year span between 1997 and 2008. As is the case with numeracy, we suspect, statistical reasoning is one of those topics that is embraced in principle but given a lower priority in practice in journalism units, even though the Accrediting Council on Education in Journalism and Mass Communication (2008) requires that students must be able to apply basic numerical and statistical concepts. Administrators seem convinced of the importance of such learning but remain unwilling or unable to muster training responsive to the need. The passage of time has not increased the volume of statistical reasoning training in journalism units in the United States.

## Statistical Training May Be the Castor Oil of Journalism Pedagogy

Approximately half of the administrators surveyed reported that their students are receiving statistical reasoning instruction somewhere in their university. The presence of course options elsewhere may be one reason why such training is comparatively rare within the journalism curriculum itself. But another reason for such neglect in journalism programs may be that administrators feel that nobody—neither faculty nor students—wants statistical training. While a bit more than a quarter of the administrators (26% in 1997; 29% in 2008) said that, to the extent they can, they reward faculty who bring statistical reasoning into their classes, these unit leaders also feel that the typical journalism major may literally be unable to handle numbers.

This last belief is probably unwarranted. Becker and Graf (1994) analyzed the 1989 to 1993 SAT scores of high school seniors intending to major in journalism. Strikingly, they found that these students possess quantitative skills sufficient for a general university education that includes basic math and statistics. More recent data (2001-2005) revealed essentially the same results, as shown in Table 1. One concern is that the perception by administrators and faculty that journalism majors are math-phobic is a self-fulfilling prophecy, one that the occupation keenly needs to shed.

**Table 1.** Average SAT Scores for College-Bound Seniors, 2001-2005 Combined.

| | SAT Score | | | | | |
|---|---|---|---|---|---|---|
| | | Among those intending to major in a communication field | | | | |
| | All intended college majors | All communication majors[a] | Journalism | Advertising | Public relations | Radio/TV telecommunications |
| Verbal | 507 | 526 | 552 | 524 | 529 | 496 |
| Math | 517 | 506 | 514 | 516 | 507 | 489 |

Source: Derived from data provided by the College Board. Copyright © 2001-2005 The College Board (www.collegeboard.com).

[a]Includes intended majors in advertising, business and technical writing, communication, film, journalism, public relations, radio/television, and telecommunications.

## Do Science Journalism Courses Serve as Bastions of Statistical Reasoning Instruction in a Sea of Writing and Reporting Courses?

Our surveys did not isolate science journalism courses for particular scrutiny, as they are relatively uncommon in journalism programs. But such courses likely have focused on issues of evidence far longer than have other courses in their journalism homes. It is unlikely that such courses are regarded as "leading lights" in journalism pedagogy, but interest in issues of evidence is increasing among journalism educators, and science journalism courses may indeed be positioned to lead the way on this matter.

A recent editorial in *Science* magazine pleaded with K-12 and university educators to enhance statistical literacy training. Davidian and Louis (2012) warned that "the future demands that scientists, policy-makers, and the public be able to interpret increasingly complex information and recognize both the benefits and pitfalls of statistical analysis" (p. 12). Journalists will remain important mediators of such information, and it will be up to journalism education to prepare their majors for such a future. This two-decade study suggests, however, that journalism educators have not yet risen to that challenge.

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