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Topic (ii) Statistical literacy

TOP 10 STATISTICAL WRITERS' BLOCKS

Invited Paper

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I. INTRODUCTION

1. It's not as if statisticians can't write or that economists are semi-literate. The fact of the matter, as I see it from my seat as the publishing chief at the U.S. Bureau of Labor Statistics, is that statisticians and economists generally write with considerable mechanical competence and visible passion for their subject matter. It is not our technical inability to write, and especially not an inability to write for the professional audience that is the central issue, it is our failure to communicate with the rest of the world.

2. When I set out to organize my part of the session on statistical literacy, the part focusing on the writing side of the problem, I found some resistance to the notion that there was a deficiency-in-writing component to statistical literacy that paralleled the more thoroughly-documented difficulty in reading statistics. My thesis is that there is a considerable amount of work yet to be done to make sure that the statistical community is fully literate—able to write—to go along with the work my colleagues are doing to help the audience read statistics.

3. The work we have done in terms of statistical storytelling is valuable in a wide variety of contexts. Using only the multi-centric American statistical system to find examples, we can see opportunities taken to engage in statistical storytelling and develop engaging styles of communication about the meaning and interpretation of the numbers.

- The Census Bureau's "Facts for Features"
- The Economic Research Service's *Amber Waves*
- The Bureau of Labor Statistics' *Occupational Outlook Quarterly*
- The Bureau of Justice Statistics' "Key Facts at a Glance"
- The Energy Information Agency's "Energy Basics 101"

4. However, in the official statement of statistical findings it is still too common that communication breaks down and I can't propose in good conscience that official communiqués are an appropriate place for telling stories or trying to be entertaining. In this paper, I nominate my top 10 obstacles to official statistical communication; why is it that the official statistical communiqué is so difficult to write well?

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5. The Top-10 format was chosen carefully. If I chose fewer, say seven, I'd have to cast this as "The 7 deadly sins of statistical writing," and the problem simply isn't quite that bad. If I chose more, say 12, I would have to cast this as a "12-step program for overcoming statistical writers' blocks," and I'm simply not quite that smart.

6. So, in the sections that follow I identify, explain briefly, and provide an example of these 10 issues. The examples were drawn *almost* exclusively from the work of my own agency, but I'm sure much will be familiar to many. My goal is simply to identify and admit to suffering from these blocks. After all, one of the most widely-recognized characteristics of twelve-step groups is the requirement that participants admit that they have a problem.

II. (1) LET THE NUMBERS SPEAK FOR THEMSELVES

7. I know this advice was given to me and would guess that it was given, at some point or points, to all of us at this session. The problem is that numbers don't really speak at all without some assistance from an interpreter. The quip, "Statistics will say anything if you torture them enough," makes it vital that we, as official communicators, provide numbers with a safe, objective, analytical place to talk with an interpreter sympathetic to the integrity of the data. Otherwise, the interpretation will be in the hands of those with the most sophisticated tools of persuasion. In my example, the numbers do speak, but I wonder who would be listening by the end of the paragraph.

- Before seasonal adjustment, the Producer Price Index for Finished Goods decreased 1.4 percent in February to 157.8 (1982 = 100). From February 2005 to February 2006, prices for finished goods rose 3.7 percent. Over the same period, the index for finished energy goods advanced 17.0 percent, prices for finished goods other than foods and energy increased 1.7 percent, and the finished consumer foods index fell 1.3 percent. For the 12 months ended February 2006, prices for intermediate goods moved up 8.2 percent, and the crude goods index rose 12.9 percent.

III. (2) ZERO-DEFECTS PARALYSIS

8. Statistical agencies are proud of their reputations for accuracy and precision. With some justification, we know that errors great and small are a danger to such reputations. In the production side of the house, this is usually reflected in careful testing, exhaustive quality control, and comprehensive training. And the clear objective of all that testing, control, and training is to never, ever make an avoidable mistake—and don't make any unavoidable mistakes while you're at it. Unfortunately, the surest way for a communicator to never make a mistake is to never make a statement. The cost of one strategy for never being wrong—saying as close to nothing as possible—is to almost never be right either.

- "In this example, there is a pay premium of approximately 44 percent for all private industry occupations in San Francisco relative to all private industry occupations in Brownsville; however the difference in average pay between San Francisco and Brownsville may or may not be statistically significant."

IV. (3) WHAT WE FIND VERSUS WHAT WE DO

9. It never fails to amaze me either, but it's true: Very few people very much care what statistical agencies do. Many people, however, seem to care very much about what statistical agencies find out by doing whatever it is they do. What starts as a laudable impulse to document concepts and methods first, and thus head off some questions from the few, can "bury the lead" for the many. Even a fairly glossy chartbook I reviewed recently had first bullets that defined in exquisite detail what we considered a family or how we calculated a displacement rate before giving the reader the facts they are looking for. I'm not sure why we allow it, but there are far too many releases that have some variant of the example as their lead sentence.

- “The Bureau of Labor Statistics of the U.S. Department of Labor reported today multifactor productivity data – output per combined units of labor and capital inputs – for 2003 and 2004.”

V. (4) BEING CORRECT IS BEING RIGHT

10. This point, the matter of what we do versus what we find that precedes it, and the point on statistical hypothesis testing that follows, are closely related. In many cases, it looks as if a writer’s goal is to demonstrate that the correct procedures were followed correctly, than to ensure that the right conclusion is drawn from the data available.

- Nonfarm payroll employment was little changed (+56,000) in October, and the unemployment rate was essentially unchanged at 5.0 percent

VI. (5) THE BALEFUL INFLUENCE OF SIGNIFICANCE TESTS AND CONFIDENCE INTERVALS

11. This is the one example I have drawn from outside my own little patch here at BLS. I’m in the business, and I’m not sure what to make of this paragraph. I tremble to think of what my family, friends, and neighbors would think. Just to be fair, I’ll confess that I have signed off on publications that called ordered lists of data “arrays” because “rankings” might be taken to imply that all pairwise combinations had been tested and found to be different at a standard level of statistical significance.

- Privately-owned housing units authorized by building permits in March were at a seasonally adjusted annual rate of 2,059,000. This is 5.5 percent ($\pm 0.9\%$) below the revised February rate of 2,179,000, but is 1.9 percent ($\pm 1.0\%$) above the March 2005 estimate of 2,021,000.

VII. (6) PRECISION IS CLARITY

12. We are minutely drilled in the precise details of our surveys and programs. Every definition is carefully thought through, every word on the form and in the interviewer’s manual is precisely meant. Where I believe we sometimes err is in assuming that transferring that detailed precision to the report on the findings will make the findings clear. In the example below, there are about seven degrees of precision. But I would propose that it is actually clearer to say “College graduates earn two and a half times what high school dropouts earn.” That is three degrees of precision, and fits in half the space of the set-up phrases of the example.

- “For example, among workers 25 years old and over, median weekly earnings of wage and salary workers who usually work full time are nearly two and a half times more for persons with at least a college degree than for those who have not completed high school.”

VIII. (7) EVERYONE NEEDS TO KNOW EVERYTHING WE HAPPEN TO KNOW

13. This particular block is rarer than it once was. There are fewer of the one-sentence word counts in the scores with dozens of parentheticals and clauses in squads of eight marching together as compound, complex, convoluted, and, in most cases, complete sentences. However endangered this tendency may be, we still had an author submit the following *footnote* (as the fourth of 27 in a 10-page manuscript):

⁴ The following table summarizes the state of estimates on CPI bias up through the Boskin Report:

Recent Estimates of Bias in the U.S. Consumer Price Index		
Author(s)	Point Estimate	Interval Estimate
Advisory Commission to Study the CPI (1995)	1.0	0.7 - 2.0
Michael Boskin (1995)	1.5	1.0 - 2.0
Congressional Budget Office (1995)	----	0.2 - 0.8
Michael R. Darby (1995)	1.5	0.5 - 2.5
W. Erwin Diewert (1995b)	----	1.3 - 1.7
Robert J. Gordon (1995)	1.7	----
Alan Greenspan (1995)	----	0.5 - 1.5
Zvi Griliches (1995)	1.0	0.4 - 1.6
Dale W. Jorgenson (1995)	1.0	0.5 - 1.5
Jim Klumpner (1996)	----	0.3 - 0.5
Lebow, Roberts, and Stockton (1994)	----	0.4 - 1.5
Ariel Pakes (1995)	0.8	----
Shapiro and Wilcox (1996)	1.1	0.7 - 1.6
Wynne and Sigalla (1994)	less than 1.0	----

This table is adapted from Moulton (1996)

IX. (8) THOU SHALT NOT JUDGE

14. Much the same as it is in all statistical agencies, our vision statement at the Bureau of Labor Statistics contains phrases such as “strongest commitment to integrity and objectivity” and “producing impartial, timely, and accurate data.” We all understand why it might not be appropriate to use phrases that imply unemployment is bad or that price stability is a desired state. But not making a judgement can go too far. In the example, the word “incident” is used very consistently in connection with motor vehicles improperly contacting each other, other solid object, or pedestrians. In my early days in statistical communication, I suggested that everyone calls that an “accident” and would most likely think that an “incident” was something different (and quite probably think it was something less serious). I was very firmly told we couldn’t use the word accident because it made the judgement that the incident could not have been prevented.

- “Fatal highway incidents were up slightly in 2004 after declining the two previous years. The 1,374 fatal highway incidents recorded in 2004 represented about one out of every four fatal work injuries in 2004. Although nonhighway incidents (such as those that might occur on a farm or industrial premises) dropped slightly in 2004, other kinds of transportation incidents increased, led by incidents involving workers struck by vehicles or mobile equipment.”

X. (9) THE AUDIENCE-OF-ONE PROBLEM

15. Every statistical communiqué is meticulously crafted for its specific audience. For better or for worse, that audience is one person—the senior executive with the authority to clear that release. On the better side, these individuals know a lot about the subject matter, have a good sense of how specific data fit into a broader understanding of the world, and genuinely want to communicate with that world. On the worse side, these individuals believe everyone knows the subject matter and how it fits into the bigger picture, so the shortcuts to communication that work for them will work for the world. In fact, many of these individuals are sure those shortcuts make the prose more elegant and knowledgeable sounding. The example below is from our Web site: The links under the title “Effects of Katrina on methodology” go to papers that reflect high levels of expectation of the audience; the “Overview” is what we could hammer out for the less-knowledgeable of the readership. One comment we received from the senior official when we submitted what became known as “Katrina lite” was, “Do you *really* think we need to simplify this more?”

Effects of Hurricane Katrina on BLS Employment and Unemployment Data Collection and Estimation

- Effects of Katrina on methodology:
 - **Quarterly Census of Employment and Wages**
 - **Mass Layoff Statistics**
 - **Local Area Unemployment Statistics**
 - **Current Employment Statistics Survey**
 - **Current Population Survey**
- **Overview: Hurricane Katrina and Employment Situation Report -- a short, non-technical summary**

XI. (10) THE VERBAL-PICTORIAL EQUIVALENCE RATIO HYPOTHESIS

16. We often are told that a picture is worth a thousand words. This empirical statement has been enthusiastically accepted by the statistical community. I have noticed that articles submitted to our *Monthly Labor Review* are increasingly chart heavy (as seen in the examples), that a “visual essay” feature we launched recently is oversubscribed, and that we are much more frequently asked to produce chartbooks in lieu of more ponderous annual bulletins. Sometimes this is the right thing to do—I’m especially mindful of the last example. But sometimes it is just that the hypothesis above is taken too literally and 10 charts and a few bullet points are thought to be the equivalent of a 10,000 word article.

17. I am going to propose an alternate hypothesis: H_2 : The modal verbal equivalence of a statistical chart is 5. In time series, “The series is going up (down)”; in cross-section, “A is larger (smaller) than B.” Yes, visualization is an important aid to understanding, but it is not a complete substitute for written communication. Well-integrated writing, visualization, and presentation are still the communicator’s objective. The articles

- “Strong employment gains continue in 1994.” *Monthly Labor Review*, February 1995.
<http://www.bls.gov/opub/mlr/1995/02/art1full.pdf>
 - 2 charts in 15 pages
- Lower unemployment in 2005, *Monthly Labor Review*, March 2006.
<http://www.bls.gov/opub/mlr/2006/03/art1full.pdf>
 - 9 charts in 14 pages

XII. SUMMARY AND CONCLUSION

18. Writing about the science of statistics is something of an art; writing about official statistics is a highly refined version of the art. In many ways the best official writing on statistics is analogous to the art of haiku poetry; an exercise in creating insight and clarity within a rigidly defined form. The 10 issues I have noted here are things that may be keeping us from writing our official statistical communiqués in even ordinary prose.