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Review of *Painting by Numbers* by Jason Makansi

Thomas J. Pfaff
Ithaca College, tpfaff@ithaca.edu

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Abstract

Makansi, Jason. *Painting By Numbers: How to Sharpen Your BS Detector and Smoke Out the "Experts."* (Tucson, AZ: Layla Dog Press, 2016). 196 pp. ISBN 978-0-9984259-0-0.

In Painting *by Numbers* Jason Makansi adds another book to the quantitative literacy bookshelf, with a book focusing on models. The book offers twelve commandments to aid the reader in assess quantitative models. The second section of the book offers examples to apply the models. Increasing quantitative literacy is crucial and generally, the more books the better. Unfortunately, this book is too superficial, often misses key ideas, and can easily lead a person to climate denialism. This book may do more harm than good.

Cover Page Footnote

Tom Pfaff is a professor of mathematics and former honors director at Ithaca College in New York. He has an interest in applying mathematics to issues of sustainability and is currently focused on disseminating this material on his sustainability math blog http://sustainabilitymath.org/

Another good book to provide quantitative literacy education to the general population is always welcomed. This can be a difficult audience, the challenge being to balance the need to be accessible to this general population while maintaining an appropriate level of rigor and avoiding oversimplification. As a book for quantitative literacy novices, *Painting by Numbers* by Jason Makansi misses this mark. The book aims to provide the reader with the reasoning skills to be able to analyze numerical models and the conclusions drawn from them, but it comes with a number of caveats. The preface states that the book is not intended to be a means of science denial. It further states that "the absence of positive examples of modeling and numerical analysis is deliberate." Even though these statements are explicitly stated in the preface, the less quantitatively experienced reader, who may walk away with the impression that anything with numbers can be dismissed, may too easily forget them. Further, there are too many overgeneralizations and missed opportunities to educate, which adds to the impression that numerical information should always be viewed negatively.

The table of contents holds great optimism for the book. In section 1 the author lays out the twelve commandments of a numerical skeptic. This may bring to mind the book *What the Numbers Say* (Niederman and Boyum 2004), which lays out ten habits of highly effective quantitative thinkers. The second section contains a number of examples to which the commandments are applied. The author states that he "didn't consciously select articles I thought were egregious in their violations," but instead chose from examples he came across in his daily life while writing the book. Some of these examples seemed overstated or superficial, and the book would have been improved with more purposefully and deeply researched illustrations tied more directly to the themes.

For those who have already developed quantitative literacy skills, the book invites resistance before the end of the preface. For example, two paragraphs discuss the baseball metric WAR (wins above replacement), which aims to measure the value of a player in the number of additional wins a team can expect by employing this player rather than an average player at the same position. The author uses WAR as an example of how there are "few standards governing how numerical analysis is applied" noting that Wikipedia states that WAR is a "non-standardized Sabermetric baseball statistic." The use of WAR is less than a decade old and has evolved somewhat over that time. So, while stating it is non-standardized is technically correct, there is more to the story. The author could have easily done some research beyond Wikipedia and engaged in a richer discussion of WAR. For example, can we really measure the value of a player in terms of extra wins above an average player? Do we really care whether WAR

accurately measures the change in wins if we know that it properly ranks player ability? In other words, is a player with a WAR of 4 better than one with a WAR of 3, even if they aren't really gaining exactly 4 or 3 extra wins over a season? Unfortunately, this type of superficial example is pervasive throughout the book and may lead the quantitative literacy novice to be more uniformed than educated.

The commandments are generally good and at times clear. For example, "acknowledge error" and "identify assumptions," the first two, were clear and effective. But then we get to "find the weakest link," the third commandment. The weakest link chapter urges readers to look for the "most error-prone link" in a model. Excellent point, but the first example of the chapter, the body mass index or $BMI = 0.045 \times (\text{Weigth in kg})/(\text{Height in meters})^2$, has issues. The author uses himself as an example by noting that his weight in the morning, after a good workout, is 10 pounds lower than when he gets on the scale on the doctor's office. He points out that the difference in BMI from the two weighings is 6% or 24.7 compared to 26.2, with a healthy range of 19-25. In other words, the "error" in weight is the difference between a healthy BMI and an unhealthy BMI. He then conjectures about scenarios, such as losing an employment opportunity because of being overweight based on BMI when maybe he isn't.

Again, technically the weak link in the model has been identified. Yet, this misses a larger point and leaves out valuable discussions. First, while height doesn't change, weight does fluctuate throughout the day. So, which of the two weight measurements is more appropriate for calculating the BMI? Well, any wrestler will tell you that the morning weight after a workout is low due to some likely dehydration. In other words, the BMI of 24.7 is likely artificially low and chances are his BMI is over 25. At the same time, the author could discuss the problems with hard cutoffs, like those used in the BMI and other measurements. Does one really go from healthy to unhealthy if their BMI changes from 24.9 to 25?

The conjectures about using BMI to discount insurance or employment are important because BMI should not be used in this way. Unfortunately, the author only provides only conjectures and not actual instances which would have made the argument more compelling. Oh, and the folks for which BMI is truly problematic are bodybuilders as they are all unhealthy based on BMI.

It is not difficult to find statements in the book that are overstated or superficial. In chapter 19, he implies that everyone got the polls wrong in the 2016 election. Again, this isn't exactly true as the national polls had Clinton winning the popular vote by a small percentage and she did, in fact, win by 2 percent. If you get past this exaggeration in the first paragraph and make it near

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the end of the chapter you get this: "None of this explains why all the pollsters got Michigan wrong but seemed to have done a pretty good job in most of the other states." In fact, pollsters did not do a pretty good job in most other states as the average absolute difference in state polling was 3.9 points in 2016.[1] This was the worst in presidential elections from 1988 onward. Further, Michigan wasn't even the largest polling error for a state. In fact, it seems to be the eighth worst.[2] The author does make a number of fair points about errors and problematic assumptions that can (and have) occurred with polling, but this reviewer would have preferred more nuance and perhaps the inclusion of some additional sources on this important issue.

Despite the author's claim that the book is not meant to be about science denial, that is exactly how it comes off at times. Starting at the bottom of page 87, he has this to say:

> When you assess numbers rationally without fear or favor, you sometimes wonder whether anyone is making any progress towards "objective reality." Global climate change is permanently altering the inhabitability of our planet. Or, global climate change has been occurring for millennia and there's really nothing mankind needs to do about it. Both of these broad conclusions are backed up to the hilt with numerical analysis by seasoned and rational scientists—though as I stated earlier, the vast majority agree with the former conclusion over the latter.

True, he includes the last sentence, but that does not make up for the rest of the paragraph. This is a textbook example of the false equivalence that occurs in journalism today. No, both sides are not backed up to the hilt with numerical analysis. It is easy to see how a climate denier would take away from the book that there are truly two sides to the climate "debate."

Overall, the exposition of the book comes off as a first-person rant. We are even treated to a half-page exposition documenting how the author is "a very healthy guy." There are some important points that the author tries to make, but the exposition, limited research, and overgeneralizations obscure the key points. The preface states that the book should be considered a prelude to the more thorough books listed in the Appendix. The appendix is, in fact, a useful resource,

[1] https://www.nytimes.com/interactive/2016/11/13/upshot/putting-the-polling-miss-of-2016-in-perspective.html?mcubz=0

[2] https://www.washingtonpost.com/news/the-fix/wp/2016/11/10/how-much-did-polls-miss-the-mark-on-trump-and-why/?utm_term=.bcf758f7aa46

and this reviewer would recommend starting with those books, or even with *What the Numbers Say*, which isn't in the appendix.

References

Niederman, Derrick, and Boyum, David. 2004. *What the Numbers Say: A Field Guide to Mastering Our Numerical World.* Portland, OR: Broadway Books.