Statistical practice under a qualitative mental model

Presentation to the 7th International Qualitative Research in Management and Organization Conference in Albuquerque, New Mexico, USA

Dan Spitzner, April 6, 2023

1. Greeting. Good afternoon, and thank you for attending this session. It is an honor to be surrounded by the energy of this conference, to have this opportunity to share ideas, and to be part of the greater exploration of knowledge and knowing.

2. Aims. There are two tasks I hope to accomplish in this presentation. The first is to address a question I suppose you are likely thinking: "What is a statistician doing at a qualitative conference?" Yes, I am an academic statistician, with traditional statistics training, and with a tenured faculty appointment in a traditional statistics department. I hope to succeed in assuring you, however, that I am not a wolf in sheep's clothing. I have a genuine interest in qualitative inquiry and in the possibility of co-liberation from the constraints that traditional perspectives have placed on qualitative *and* quantitative knowledge.

What I am not here to do is propose a template that would supposedly "help out" qualitative methodology through the adoption of scientifically-minded guidelines. Such an attempt has already been made (King *et al*, 1994, 2021), substantially debated, and rightly characterized as an example of "quantitative imperialism" (Bartels, 2010; see also Lather, 2018), which is a project that I am oriented against.

My second and main task is to explain the seemingly self-contradictory title of my presentation. I come here with an idea that I call "statistics under a qualitative mental model." It may not make sense at first glance, but my task is to convince you that it does make sense, to describe to you what it is, and along the way try to convince you that it is a good idea. I caution that from a broad vantage point the work I will be describing work-in-progress; the progress, however, is substantial, and supporting pieces of this work already appear in various publications. In what follows, I offer a sense of how I hope these pieces will eventually guide the idea's maturation into a fully formed methodology.

3. Practice and worldview. As for who I am and why I am interested in researching and writing our living world, let me start with this: Until recently, my intellectual story has been one of dissonance between the ideas that inspire me and the expectations of communities with which I have surrounded myself. I do like mathematics; this has always clicked with me. However, I have never bought into any sort of *quantitative imperative*. That is, I do not hold an urge to quantify everything, as if a thing cannot be known unless it is measured, standardized, and abstracted. Instead, it has been my perspective that deeper paths to knowing tend to overlap in one way or another with creativity, curiosity, expansive thinking, and compassion. Though I believe that mathematics can be part of these endeavors, I have been discouraged by how woefully they are cultivated within scientifically-minded communities.

A few years ago, I became fed up with the rigidity around me and took a sharp left turn in my professional writing, veering toward the discussions that I find to be the most fascinating and meaningful. My dual entry point was the literature on *mixed methods research* and *socially inclusive research*. The former exposed me to the techniques and tensions involved

in the coordination of qualitative and quantitative knowledge, and the latter to convincing arguments of the priority of community over individualism. This led to my first publication (Spitzner, 2021) after having embarked in this new direction. It proposes a *realignment* of statistical practice, one that switches out statistics' traditional alignment with science, and replaces it with a worldview associated with socially inclusive research[1]. Here we can see the seeds of the idea I am here to talk about today: statistics under a qualitative mental model makes a distinction between a researcher's *practice* of methodology and the *mental model*[2] they bring to it, the latter term being roughly synonymous with *paradigm* or *worldview*, and drawn from the mixed methods research literature. In addition to asserting the possibility of a realignment of practice and worldview, in that first paper I lay out the conceptual foundations of a socially-inclusive statistical methodology. I will say more about these foundations in what's to come.

This is the first of the major points that I want to make: The distinction between qualitative and quantitative need not be as sharp as is typically conveyed. Through a realignment of practice and worldview it is not implausible that statistical methodologies, under substantially revised guidelines, could take a seat among the assortment of *qualitative* tools. In mixed methods terms, I envision that statistics under a qualitative mental model would contribute to a *single-paradigm* (Teddlie & Tashakkori, 2003, p. 20), and decidedly qualitative-focused approach to multi-methodological research.

4. Upended quantitative methodologies. My hopes for statistics under a qualitative model are bolstered by the existence of non-traditional quantitative methodologies that embrace elements of the very idea. I call them *upended* quantitative methodologies, to reflect their unorthodox conceptual foundations. In one of my most recent papers (Spitzner, 2023b) I survey an array of such methodologies, and learn that many exhibit a recognizable overlap with guiding principles and practices of qualitative methodologies. I clarify that I do not adopt a strict definition of a qualitative mental model, in part to recognize that qualitative perspectives vary widely across researchers and constantly evolve with their research communities. In what follows I draw out aspects of a social-inclusion-flavored qualitative mental model, expressed as themes that are reflected in upended quantitative methodologies:

To begin, upended quantitative methodologies center *ethical criteria* in the formulation of research goals, having recognized that scientific perspectives are not well suited to accommodate them. All of these methodologies prioritize the use of *contextualized* analytical or interpretative tools. This priority directly resists such traditional prescriptions as an aspiration for objectivity, which can cause harm by situating dominant perspectives as the baseline against which all others are to be compared. For example, contextualization is prominent among the concerns of Indigenous statistics (Walter & Andersen, 2013; Kukutai & Walter, 2019), wherein it is noted that the use of traditional statistical tools has a tendency to produce deficit narratives and victim-blaming of marginalized communities.

Interestingly, Indigenous statistics has been formulated as a quantitative methodology that is intended for interpretation through a constructivist ontology (Walter & Andersen,

[1]Socially inclusive worldview: emphasis on "unity, cohesion, civic engagement, togetherness, or bridging the gap between 'us' and 'the other"' (Koikkalainen, 2011, p. 2).

[2]Mental model: reference to a researcher's "set of assumptions, understandings, predispositions, and values and beliefs" (Greene, 2007, p. 53).

2013, p. 53), the ontology commonly paired with qualitative methods. Moreover, there are separate connections to what is known as the *transformative-emancipatory paradigm* in mixed methods research (Mertens, 2003, 2012, 2018). This paradigm is pragmatic while being guided by social-justice aims, and arose partly in response to failures in representing the experiences of people in marginalized communities.

Another theme among upended quantitative methodologies is that they espouse *theory* in the implementation of research processes. For example, queer data, a perspective that reinterprets statistical practices connected to data about LGBTQ people, is described as a "clash between queer theory and actual people" (Guyan, 2022, p. 11). Social epidemiology, an approach to population research that rejects biological essentialism, is described as "a marriage of sociological frameworks to epidemiological inquiry" (Krieger, 2001, p. 669). Statistical methodologies associated with the quantitative criticalists (Stage, 2007) are guided by tenets derived from European critical theory (Kincheloe & McLaren, 1994).

Upended quantitative methodologies also—just like qualitative methodologies—take seriously the *complexity, multidimensionality, and co-constituted nature* of research phenomena. Exciting recent scholarship asserts the relevance of *diffractive analysis* to quantitative methodologies (Dixon-Román, 2017). Diffractive analysis draws on the *new materialist* notion that phenomena to be studied, and the very tools used to study them, are entanglements of material reality and discourse (Barad, 2007). It is a process that works with varied data types and varied methodologies to illuminate the interference patterns that emerge between them: researchers engage with data in what has been described as a "rhizomatic zigzagging flow" (Lenz Taguchi and Palmer, 2013, p. 675). Among its other impacts, diffractive analysis further weakens the distinction between qualitative *versus* quantitative modes of inquiry.

This is the second major point that I want to make: Statistics under a qualitative mental model is not only plausible, but, as evinced by upended quantitative methodologies, many of its broad elements are already implemented. There are further efforts to be made, however, which are revealed through consideration of the variation across these methodologies, particularly in how they regard the set of statistical tools that are currently available.

To see this, consider the assertion of Indigenous statistics' proponents that they are "not questioning the validity of ordinary least squares regression, factor analysis, chi-square correlation, or the myriad of other statistical tools" (Walter & Andersen, 2013, p. 56). That is, they do not critically examine traditional, science-oriented statistical techniques, but take a pragmatic stance, and derive force from the "social and political acceptance of the validity of statistical analysis" (p. 134). In contrast, quantitative criticalists *do* attend to the nuances of traditional statistical techniques. Accompanying discussion, however, tends often to make use of scientific language and to be guided by traditional ideas about statistical modeling and testing, all of which emphasizes this perspective's retention of key aspects of traditional science, especially around issues of methodology. My aspiration for statistics under a qualitative mental model is that it would fill a gap that appears to be present.

This is the third major point that I want to make: Statistics under a qualitative mental model is to extend existing interrogations of quantitative methodology to the finest level, that of statistical and inferential analysis of data. It is to promote existing tools for interpreting quantitative information, or create new ones, all manifesting the themes of upended quantitative methodologies that I have highlighted.

5. Statistical and inferential analysis of data. I am closing in, now, on the forefront of my progress in developing my idea. Out of respect for time, and since this is work-in-progress, I share in broad strokes just a few of the concepts with which I have been working. This next section of my presentation may seem a bit jumbled, as it is describes only pieces of a methodology that I have not yet stitched together.

I have adopted a blueprint, which has been enormously helpful. It is expressed in the following quote:

> From data in the form of numbers, one makes inferences in the same way as with data in the form of words, not by virtue of probabilistic algorithms. Statistics are not privileged. Inference is not mechanized. (M. L. Smith 1997, p. 77)

The author, Mary Lee Smith, is an education researcher who also writes about narrative inquiry. The assertions made here directly challenge key features of traditional decontextualized statistical practices. Taking other relevant literature into account, I read these sentences as criticism of the pursuit of automation and investment in mathematical models. Among these, the investment in models is closest to today's concerns. Indeed, mathematical models are problematic for a variety of reasons: models go hand-in-hand with the prescription of *generic* analysis procedures whose validity derives from the efficiency of standardization (Porter, 2020). In doing so, they discourage expansive, contextualized, and theory-informed interpretations of data. Models prioritize aspirations for *cleanliness and control*, which drive such thinking as has given rise to eugenics movements (D'Ignazio & Klein, 2020, p. 131). Models are fundamentally *representations*, and so fall under the new materialist criticism of creating a separation between subject and object (Barad, 2007; Dixon-Román, 2017; Spitzner 2023b). Models can furthermore be *ambiguous*, despite their precise mathematical formulation. For example, intersectionality researchers have encountered ambiguity when working with statistical models that would describe patterns of "interaction" in data collected across intersecting social variables (Bauer, 2014, sec. 4.1).

As a contextualized alternative to the use of models, I envision the deployment of socially-aware data-visualization approaches, such as are highlighted in feminist data practices (D'Ignazio & Klein, 2020; Hullman & Diakopoulos, 2011; Kennedy *et al.*, 2016). These practices acknowledge that the presentation of numbers and statistical summaries is subject to conventions of rhetoric, and always falls short of offering a "testimony of nature" (Hacking, 2006, p. 44). Highlighted among these approaches is the work of practitioners who undermine the possibility of neutrality in data-visualization, and who manifest guidelines for "leveraging, rather than resisting, emotion" (D'Ignazio & Klein, 2020, p. 77) as a means to push against oppressive hierarchies.

I also envision a role to play for a substantially modified form of an established statistical way of thinking known as *Bayesian inference*. Though known and routinely used in specialized contexts, Bayesian inference is far from the dominant statistical modality; nearly all statistics textbooks and standard statistical software packages support a distinct, so-called classical methodology. Bayesian inference continues, however, to find new areas of relevance: for example, a paper recently published in the *Journal of Mixed Methods Research* (Dion *et al.*, 2022) describes an innovative use of Bayesian methodology in transformative participatory research.

Why Bayesian inference? Well, my interest in this modality traces to my time as a traditional statistician, when I imagined it to be vehicle I could use to push the boundaries of my discipline. I was curious to explore the relevance of statistical ideas to non-scientific disciplines. To this end, because Bayesian inference is least rigid among established statistical theories, it seemed to me the most promising. In time, though, I learned that my curiosity was taking me into territory that crosses the line to apostasy. There are places where traditional statistical communities simply will not go. So, now I do this work on the outside, and remain curious as to how Bayesian ideas might fit in.

What is it about Bayesian inference that is potentially compatible with a qualitative mental model? Certainly not everything, at least not in its traditional form. It is helpful that Bayesian inference can be regarded as more of an organizational framework than a model-focused analysis system. Most promising is that it eschews strict adherence to an ostensible objectivity, leaving room for acknowledgement of *researcher positionality*[3], and for use with integrative study designs such as *methods braiding* (Watson 2020) that incorporate periods of reflexive evaluation[4]. Compatibility with diffractive analysis is another possibility.

Bayesian inference is a probabilistic framework, but it is amenable to non-traditional interpretations of probability. A Bayesian epistemologist would likely disagree with that statement, since there is a particular conception of probability that is *specifically* associated with Bayesian methodology. Nevertheless, if you recall my paper on socially-inclusive foundations for statistics, one task that I take on there is to challenge that conception. In particular, I push against an individualism conveyed in such concepts as a "rational man" who "chooses his decision by maximising the expected utility" (Lindley, 1958, p. 192). I instead hold up a conventionalist interpretation of Bayesian probabilities, one that derives from a social process of argument and counterargument, and that recognizes even isolated individuals as woven into the fabric of community.

I admit that Bayesian inference may introduce too much of a mathematical style for sweeping compatibility with a qualitative mental model. Nevertheless, I do envision specific contributions, particularly to matters of evidence reporting. In another paper (Spitzner, 2023a), I make use of the Bayesian framework to propose a strategy for expressing contextualized statements of evidence. Consider, for example, the situation of assessing whether an intervention is effective. Rather than accept a conclusion because it is determined to have a high probability of being the case, a contextualized approach emphasizes that rival conclusions do not simply disappear. A statement referencing, say, a 97% chance in favor of a particular conclusion is translated as follows: In a pool of 100 potential constructions of the situation, 97 are inconsistent with the results of the assessment, leaving 3 remaining, two of which remain alongside the one conclusion of particular interest. The former interpretation, in terms of chances, decontextualizes inference by treating it as a kind of gambling game. The latter is contextualized and explicit about the tasks of decision-making, as would be expected under a qualitative mental model. I call this a *pool-reduction strategy*, and establish mathematically that it is a non-standard articulation of Bayesian inference.

[3]Positionality: the fluid, overlapping identities of research participants and the influences of culture, history, and social location (Alcoff, 1988; Kezar & Lester, 2010; Meixner & Spitzner, 2021; Spitzner & Meixner, 2023)

[4]Reflexivity: "a self- scrutiny... a self-conscious awareness" (Bourke, 2014, p. 2)

6. Closing. The real challenge ahead is to try out these ideas on data, which is the focus of my current efforts. In the interest of time, I have not mentioned specific techniques with which I am experimenting and that I am hopeful will enable statistics under a qualitative mental model to become fleshed out. Some focused areas that I am exploring are the ambiguity of models in intersectionality research (Hinze *et al.*, 2012), and the quantitative criticalist technique of person-centered statistical analysis (Malcom-Piqueux, 2015). The aim of these investigations—as with all that I have presented today—is to stimulate expansive thinking in statistical practice, and to push it forward to where it draws guidance from ethical criteria, relies on context, embraces theory, and acknowledges the complexity of phenomena. Needless to say, I hope to have some additional findings to share with you soon.

Since conceiving of this effort, I have derived much from parallel experiences such as actually conducting and publishing the results of qualitative research (Spitzner & Meixner 2021), from teaching undergraduate students how to think critically about statistics, and from writing, writing, and more writing[5]. I have experienced frustration in the face of doubtful responses from my traditionally-minded colleagues, and joy in the embraces of newer connections who have cheered on my efforts. Although I have been talking a lot today about conceptual foundations, I have also come to appreciate that research methodology is powerfully influenced by institutional standards and ideologies. This brings me to the last major point that I'd like to make: advances in methodology are made within an ecology of methodologies, criticisms, and social forces, and the best of them are cultivated by caring, creative, and open-minded communities. I raised the question earlier: "What is a statistician doing at a qualitative conference?" The overarching answer is that I am here to make new connections, to participate in new communities, and to listen. I look forward to your questions and insights.

References

Alcoff, L. (1988). Cultural feminism versus post-structuralism: The identity crisis in feminist theory. *Signs: Journal of Women and Culture in Society*, *13*(3), 405-36.

Barad, K. (2007). *Meeting the universe halfway: Quantum physics and the entanglement of matter and meaning.* Durham, NC: Duke University Press.

Bartels, L. M. (2010). Some unfulfilled promises of quantitative imperialism. In H. E. Brady & D. Collier (Eds.), *Rethinking social inquiry: Diverse tools, shared standards* (2nd ed., p. 79-91). Washington, DC: Rowman & Littlefield Publishers.

Bauer, G. R. (2014). Incorporating intersectionality theory into population health research methodology: Challenges and the potential to advance health equity. *Social Science & Medicine*, *110*, 10-17. doi: 10.1016/j.socscimed.2014.03.022

[5] . . . and from reading, reading, and more reading.

Bourke, B. (2014). Positionality: Reflecting on the research process. *The Qualitative Report*, *19*(33), 1-9. doi: 10.46743/2160-3715/2014.1026

D'Ignazio, C., & Klein, L. F. (2020). *Data feminism* (Kindle ed.). Cambridge, MA: MIT Press. Retrieved from `Amazon.com`

Dion, A., Carini-Gutierrez, A., Jimenez, V., Ameur, A. B., Robert, E., Joseph, L., & Andersson, N. (2022). Weight of evidence: Participatory methods and Bayesian updating to contextualize evidence synthesis in stakeholders' knowledge. *Journal of Mixed Methods Research*, *16*(3), 281-306. doi: 10.1177/15586898211037412

Dixon-Román, E. J. (2017). *Inheriting possibility: Social reproduction and quantification in education.* Minneapolis: University of Minnesota Press.

Greene, J. C. (2007). *Mixed methods in social inquiry.* San Francisco: Jossey-Bass.

Guyan, K. (2022). *Queer data: Using gender, sex and sexuality data for action.* London: Bloomsbury Publishing.

Hacking, I. (2006). *The emergence of probability: A philosophical study of early ideas about probability induction and statistical inference* (2nd ed.). New York: Cambridge University Press.

Hinze, S. W., Lin, J., & Andersson, T. E. (2012). Can we capture the intersections? older black women, education, and health. *Women's Health Issues*, *22*, e91-e98. doi: 10.1016/j.whi.2011.08.002

Hullman, J., & Diakopoulos, N. (2011). Visualization rhetoric: Framing effects in narrative visualization. *IEEE Transactions on Visualization and Computer Graphics*, *17*(12), 2231-2240. doi: 10.1109/TVCG.2011.255

Kennedy, H., Hill, R. L., Aiello, G., & Allen, W. (2016). The work that visualisation conventions do. *Information, Communication & Society*, *19*(6), 715-735. doi: 10.1080/1369118X.2016.1153126

Kezar, A., & Lester, J. (2010). Breaking the barriers of essentialism in leadership research: Positionality as a promising approach. *Feminist Formations*, *22*(1), 163-185. doi: 10.1353/nwsa.0.0121

Kincheloe, J. L., & McLaren, P. L. (1994). Rethinking critical theory and qualitative research. In N. K. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (p. 138-157). Thousand Oaks, CA: SAGE Publications.

King, G., Keohane, R. O., & Verba, S. (1994). *Designing social inquiry: Scientific inference in qualitative research* (1st ed.). Princeton, NJ: Princeton University Press.

King, G., Keohane, R. O., & Verba, S. (2021). *Designing social inquiry: Scientific inference in qualitative research* (New ed.). Princeton, NJ: Princeton University Press.

Koikkalainen, P. (2011). Social inclusion. In M. Bevir (Ed.), *The SAGE handbook of governance.* London: SAGE Publications.

Krieger, N. (2001). Theories for social epidemiology in the 21st century: an ecosocial perspective. *International Journal of Epidemiology*, *30*, 668-677. doi: 10.1093/ije/30.4.668

Kukutai, T., & Walter, M. (2019). Indigenous statistics. In P. Liamputtong (Ed.), *Handbook of research methods in health social sciences.* Singapore: Springer.

Lather, P. (2018). Within and beyond neoliberalism: Doing qualitative research in the afterward. In M. Spooner & J. McNinch (Eds.), *Dissident knowledge in higher education* (Kindle ed., p. 171-195). Regina, Saskatchewan: University of Regina Press. Retrieved from `Amazon.com`

Lenz Taguchi, H., & Palmer, A. (2013). A more 'livable' school? a diffractive analysis of the performative enactments of girls' ill-/well-being with(in) school environments. *Gender and Education*, *25*(6), 671-687. doi: 10.1080/09540253.2013.829909

Lindley, D. V. (1958). Professor Hogben's 'crisis'—a survey of the foundations of statistics. *Journal of the Royal Statistical Society, Series C*, *7*(3), 186-198.

Malcom-Piqueux, L. (2015). Application of person-centered approaches to critical quantitative research: Exploring inequities in college financing strategies. In R. S. Wells & F. K. Stage (Eds.), *New directions for institutional research no. 163* (p. 59-73). San Francisco, CA: Jossey-Bass. doi: 10.1002/ir.20086

Meixner, C., & Spitzner, D. J. (2021). Social inclusion and mixed methods research. In P. Liamputtong (Ed.), *Handbook of social inclusion: research and practices in health and social sciences.* Cham: Springer.

Mertens, D. M. (2003). Mixed methods and the politics of human research: The transformative-emancipatory perspective. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social behavioral research* (p. 135-164). Thousand Oaks, CA: SAGE Publications.

Mertens, D. M. (2012). What comes first? the paradigm or the approach? *Journal of Mixed Methods Research*, *6*(4), 255-257.

Mertens, D. M. (2018). *Mixed methods design in evaluation.* Thousand Oaks, CA: SAGE Publications.

Porter, T. M. (2020). *Trust in numbers: The pursuit of objectivity in science and public life* (New Kindle ed.). Princeton, NJ: Princeton University Press. Retrieved from `Amazon.com`

Smith, M. L. (1997). Mixing and matching: Methods and models. In J. C. Greene & V. J. Caracelli (Eds.), *Advances in mixed-methods evaluation: The challenges and benefits of integrating diverse paradigms* (p. 73-85). San Francisco: Jossey-Bass Publishers.

Spitzner, D. J. (2021). Socially-inclusive foundations of statistics: an autoethnography. In P. Liamputtong (Ed.), *Handbook of social inclusion: research and practices in health and social sciences.* Cham: Springer. doi: 10.1007/978-3-030-48277-0_17-1

Spitzner, D. J. (2023a). A statistical basis for reporting strength of evidence as pool reduction. *The American Statistician*, *77*(1), 62-71. doi: 10.1080/00031305.2022.2026478

Spitzner, D. J. (2023b). Upending quantitative methodology for use in global public health. In P. Liamputtong (Ed.), *Handbook of social sciences and global public health.* Cham: Springer. doi: 10.1007/978-3-030-96778-9_51-1

Spitzner, D. J., & Meixner, C. (2021). Significant conversations, significant others: Intimate dialogues about teaching statistics. *Journal of Academic Development*, *26*(3), 292-306. doi: 10.1080/1360144X.2021.1954931

Spitzner, D. J., & Meixner, C. (2023). Mixed methods research in global public health. In P. Liamputtong (Ed.), *Handbook of social sciences and global public health.* Cham: Springer. Retrieved from `https://profile.virginia.edu/sites/g/files/jsddwu351/files/djs4y/GPHMM0_0.pdf` (To appear. Preprint)

Stage, F. K. (2007). Asking critical questions using quantitative data. In F. K. Stage (Ed.), *New directions for institutional research no. 133* (p. 5-16). San Francisco, CA: Jossey-Bass. doi: 10.1002/ir.200

Teddlie, C., & Tashakkori, A. (2003). Major issues and controversies in the use of mixed methods in the social and behavioral sciences. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social & behavioral research* (p. 3-50). Thousand Oaks, CA: SAGE Publications.

Walter, M., & Andersen, C. (2013). *Indigenous statistics: A quantitative research methodology.* Walnut Creek, CA: Left Coast Press.

Watson, A. (2020). Methods braiding: A technique for arts-based and mixed-methods research. *Sociological Research Online*, *25*(1), 66-83. doi: 10.1177/1360780419849437