

Decolonizing statistical analysis

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Dan Spitzner, February 18, 2021

Good afternoon, and thank you for being part of this session. It is an honor to be a panelist at the AAAD conference. Today, I will share part of my story as an academic statistician who struggles with the traditional conceptual underpinnings of my discipline, and the scientific worldview within which it is often practiced. These underpinnings are heavily steeped in positivist-type philosophies, with a focus on detachment from the object of study, and an emphasis on rational behavior of individuals. They are philosophies that have been used with great effectiveness by colonizers. (See de Sousa Santos, 2018). Our previous speaker, Prof. Liamputtong, has described for us a very different worldview, which values social inclusion. As an approach to research, social inclusion invites the participation of those being researched, and upholds community as much as the individual. It attends to such notions as “unity, cohesion, civic engagement, togetherness, or bridging the gap between ‘us’ and ‘the other’” (Koikkalainen, 2011, p. 2) and includes such research modes as “participatory, emancipatory, partnership and user-led research” (Nind, 2014, p. 1), among others. Today, I will describe a portion of my efforts to incorporate these ideas, and subsequently decolonize, at least some small corner of my discipline.

My story is partly one of early ignorance to the consequences of positivist-type philosophies: as a young adult, it was simply the case that I enjoyed studying mathematics; moreover, I excelled at it, and found that exercising a talent offered me personal and professional stability throughout the tumultuous years of my early adulthood. At the same time, I have long held strong creative interests, and draw primary guidance from contemplating the manner in which artists, musicians, poets, and other creatives engage with the world. As I developed professionally, it became clear to me that the community with whom I share a joy of mathematics falls into conflict with the communities with whom I connect by way of other interests. At times, the internal, personal conflict arising from my participation in these conflicting communities would become paralyzing.

I pause for a moment to acknowledge that it may seem strange in an academic setting to hear me talk about my personal history and struggles. I speak personally in part because of the voice I have found in autoethnography, a method that I apply in the chapter I contributed to Prof. Liamputtong’s book, on which I base many of my remarks today (Spitzner 2021). For those unfamiliar, autoethnography is qualitative method of inquiry; according to Laura Ellingson and Carolyn Ellis, it operates through the narratives of “researchers who systematically introspect and record their experience with the intent of evoking emotional response from readers” (Ellingson and Ellis, 2008, p. 449). Its diversity of forms intersect along the three axes of “writing and research process (*graphy*), culture (*ethnos*), and self (*auto*)” (Ellingson and Ellis, 2008, p. 446, attributed to Reed-Danahay, 1997, p. 2). My own style tends toward *analytical* autoethnography, with a heavy emphasis on writing and research process. I find the method especially helpful to incorporate my own positionality into inquiry, an element that is largely dismissed in positivist-type research.

With that being said, I am a white, cis-gendered, heterosexual male; I grew up in a rural, politically-conservative area in western New York state, and received all of my education from

state schools. I acknowledge that I have benefitted from considerable privilege; I nevertheless come to you in the midst of a struggle to achieve some degree of personal and professional integration, and to invite you into conversation.

In my book chapter I look under the surface of the traditional guiding tenets of statistical methodology, noting a rhetoric of power that underlies the insistence on objectivity, the elitist outcomes of confirmation approaches, and the illusory character of generalization, all of which had already been highlighted by feminist and decolonization scholars. (See Haraway, 1988; Harding, 2008; Smith, 2012; and de Sousa Santos, 2018.) I frame my overarching objective for the chapter in terms of alignment between practice and worldview. Whereas my interest in mathematics has compelled me develop skills in statistical practice, I aim to decouple that practice from its traditional worldview and realign it with a socially-inclusive worldview.

To clarify the level statistical practice at which I direct my inquiry, I wish to set as a reference point recent discussion by Tahu Kukutai and Maggie Walter on Indigenous statistics (Kukutai and Walter, 2019). The practice they describe is statistics not only “*about* Indigenous peoples but also statistics *for* Indigenous people and statistics *by* Indigenous people” (p. 2). One of their key observations is a tendency for non-Indigenous research methodology, when applied to Indigenous peoples, to focus on deficits, sometimes to the point of victim-blaming. In their example study of cardiovascular disease among Māori people in Aotearoa, New Zealand, they note that researchers without a strong understanding of Māori culture tend to select variables that would reinforce stereotypes of poor *individual* choices and health behaviors. In contrast, a Māori researcher who is embedded in their culture would likely take into consideration *social* factors that drive health inequalities, such as dispossession, colonialism, and ongoing marginalization. Let us take note of this difference in the selection of variables between the Indigenous and non-Indigenous researcher.

In other discussion, Kukutai and Walter refer generically to statistical analysis as a “method” to be applied within a “methodological frame” (p. 12). For example, it is the methodological frame that influences the selection of variables. As a developer of statistical methodology, my concern is with nuances *within* statistical analysis, which I view as a methodological frame of its own. The way researchers work with, interpret, and report conclusions on the basis of numbers can be, and is, dominated by positivist-type attitudes toward inquiry, regardless of what variables are selected as input to a statistical analysis. For example, positivist-type influences establish the widely used practice of reporting statistical results in terms of p-values and confidence intervals, and interpreting statistical uncertainty in term of generalization from sample to population. Even at the fine-grained level of statistical analysis, these influences can have a an exclusionary impact on the practice of inquiry.

I would like to offer an illustration of how the seemingly stable concept of an empirically-measured, numerical data-point fundamentally depends on culture. Rather than attempt to argue this within a statistical data-analysis context, I turn to an example from cartography. The centerpiece is an early map of Oceania created by the Polynesian navigator Tupaia, while he was on board the ship of English Captain John Cook during the latter’s first voyage to the Pacific Ocean in 1769. The modern-day writer Christina Thompson compiles (in Thompson, 2019, ch. 7) observations of this map made by Cook’s English compatriots, who were impressed by the amount of information it contained, but were nevertheless puzzled by what they saw as unexpected errors in the arrangement of some islands. As explanation, Thompson writes that the map “represents a fusion of two completely different knowledge

systems.” She notes that Cook’s cartographic perspective “was not that of a participant on the ground but of an observer high in the sky;” on the other hand, Tupaia’s perspective “is the way we actually experience geography—the perspective, for example, of someone standing on the deck of a boat.” Clarifying these distinctions, Thompson furthermore (in ch. 23) draws a parallel to a modern-day study of how apartment dwellers describe their living spaces. It is found in that study that some take on a “map” perspective, similar to Cook’s: they describe the spatial arrangement of rooms relative to others. Others take on a “tour” perspective, similar to Tupaia’s: they describe how a person would travel through the space in order to traverse from one room to another.

The relevance of this example is that it has to do with how we interpret numbers, and that is precisely the role that statistical analysis is intended to play. In a parallel to Cook’s perspective of an abstract observer in the sky, the dominant mode of statistical practice today is one of elevated detachment, and an emphasis on hypothesizing supposed laws of nature and teasing out their arrangement. (See Mayo and Cox, 2006.) That is, its development is primarily guided by the tenets of positivist-type science. For realignment to a socially-inclusive worldview, part of what I have in mind is to replace the observer in the sky with the positionality of the researcher and others who participate in the research.

It is fortunate that some of the technical framework that would be useful for such a practice is already in place. We may draw on a methodology well known among the statistical community as Bayesian analysis, whose name refers to a mathematical result from probability theory called Bayes’s theorem. This particular framework for statistical analysis is organized into three steps, which are to be carried out consecutively: the first is to gather existing knowledge about the phenomenon being studied; the second is to gather relevant numerical data; and the third is to apply Bayes’s theorem to update existing knowledge with that provided by numerical data. In order to practice this methodology, it is necessary to describe knowledge in mathematical terms, and for that purpose the language used is probability. Each step is centered around a particular probabilistic description: the prior probability distribution in step one, the data-generating probability distribution in step two, and the posterior probability distribution in step three.

On a strictly technical level, Bayesian analysis a mature framework that is equipped to take on data-analysis problems from the very simple to the extraordinarily complex. I look promisingly to this methodology because of its explicit mechanism for incorporating positionality into statistical analysis, that being the prior probability distribution. Bayesian statisticians recognize this capacity, to a certain extent, and have for more than a century had to defend their approach from statisticians working in a more dominant mode, despite support from epistemologists who judge that Bayesian reasoning is among the rare quantitative analysis systems that meets a high standard of logical coherence.

This is not to say that Bayesian analysis, as it is traditionally conceived, is suitable for use in socially-inclusive research. A key stumbling block is that its underlying philosophies have the shape of a colonizer’s mindset, drawing on such imagery as, for example, the optimal actions of a “rational man” (Lindley, 1958, p. 192). In my book chapter, the primary task I take on is stripping Bayesianism of its traditional epistemological foundations and replacing them with a new set of foundations that are compatible with a socially-inclusive worldview. My focus in this effort is on how knowledge is elicited, or, in other words, how it is brought forth: a traditional Bayesian perspective is that knowledge is elicited by probing the minds

of individual experts, thus setting the scene for other minds to be deemed unqualified and excluded; I argue, instead, that individuals are woven into the fabric of community, and that knowledge is brought forth through a process that I call community elicitation.

This concept lays the groundwork for increased participation in the process of quantitative analysis. By characterizing numbers and mathematical concepts like probability as elements of a language system, rather than as disembodied, empirical objects, it emphasizes the conversation within which quantitative analysis takes place. All participants in research, including those being researched, contribute to this conversation, and are eligible sources of influence on all aspects of the research process.

As we know, philosophical stances have practical consequences. My interest as a statistician is the development and application of methodology, and I would like to use my remaining time to sketch out my ongoing effort to develop a statistical practice that is guided by the epistemological realignment I have described.

One result of realignment is the establishment of points of contact between qualitative and quantitative methodologies. In particular, the element of positionality, introduced *via* the Bayesian framework, forms a bridge to qualitative approaches where inquiry's central purpose is transferability and translation of knowledge across communities, not the positivist's goal of universal generalization. In addition, the story-like structure of the Bayesian approach, laid out as an arc of transformation from prior knowledge to posterior knowledge, ties in to forms of qualitative methodology that use narrative as a tool for inquiry.

Because of these connections, my own professional story has been moving in the direction of mixed methods research. As our next speaker, Prof. Meixner, will discuss, this is a class of research methodology that ties in both qualitative and quantitative methods, and holds promise as a tool for socially-inclusive research. (See also Meixner and Spitzner, 2021) I have, in particular, become keenly interested in the decades-long and continuing debate over compatibility between qualitative and quantitative stances (see Hathcoat and Meixner, 2017), and the observed difficulties of achieving integrated, holistic mixed methods research studies (see Bryman 2007).

I hope to make a contribution to the discussion on mixed methods research in two ways. As regards to qualitative and quantitative compatibility, I propose a novel resolution to this tension, which is not to seek compromise, dialogue, or a unifying framework between qualitative and quantitative stances. Instead, I aim to follow the roadmap offered by community elicitation toward a class of statistical methodology that is, as strange as this may sound, essentially qualitative in character. In the current landscape, the only statistical methodology available is customized to a worldview that is noted for social exclusion and irresponsibility. This need not be so.

Secondly, I aim to erode the specific barrier to integration in mixed methods studies due to skill specialization. I refer, here, to instances where a research team of both statisticians and a qualitative researchers is assembled, but the two groups' disjoint perspectives on research lead them to fall into a compartmentalization of roles, according to their skill specialties, which prevents the research from being carried out and interpreted with a holistic team effort. To address this, I strive to develop pedagogy that would engage students in statistics with qualitative and socially-inclusive perspectives, and would furthermore train qualitatively-minded students in Bayesian techniques at a low technical level.

Ultimately, none of this is possible without conversation, discussion, and exchange of

ideas. As my story of achieving integration within *myself* unfolds, I have a great wish to surround myself with a community of people who are animated by socially inclusive research and the work of decolonization. Should you be stimulated by any of what I have presented today, I would be excited to connect with you.

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