**Position Statement: Document your visualizations!** / David Christensen

One approach to representing inequity is through visualization of an opportunity index. An “opportunity index” is a composite score of multiple indicators selected to express relative opportunity in a community. Indicators might include: income, wealth, education, race, social support networks, or proximity to spatial phenomena, such as a public park, library, health care facility, or toxic waste site. The visualization of an “opportunity index” is known as an “opportunity map.”

Opportunity maps are conceived as a visualization practice to communicate equity variation in an area and to assist in resource allocation decisions; however, little attention has been given to the ethical challenges this presents. Looking to other fields of inquiry including critical theories in geography, public planning, and social sciences can inform the formation of ethical principles. There is room for improvement in the community of practice, particularly with documentation of visualizations.

Opportunity maps are constructed abstractions. They are a form of rhetoric. Labeling opportunity mapping as rhetorical is not intended to undermine their merits. It is, in part, an acknowledgement that consensus for how to measure and solve inequity is elusive. There are a multitude of value judgements in the construction of opportunity maps—geocoded data (indicators of opportunity or inequity) are selected (or excluded); geographic aggregation levels identified as optimal; index algorithms chosen; tools selected for visualization; design elements encoded; persuasive narratives authored, with many permutations between different indices.

Opportunity mapping is not only rhetorical, but also an act of scientific inquiry. Its scientificity is supported, in part, by academic research which has sought to progress opportunity mapping practice. Areas of inquiry have included: optimization of indicator selection, the effectiveness of opportunity maps at different zones and scales, among other studies. As a scientific inquiry, opportunity mapping is (or should be) imbued with the similar ethical rigor. The “replication crisis” in the social sciences introduced new thinking about ethical scientific inquiry and yielded improved scientific efficacy. The introduction of these improvements, especially calls for disclosure and sharing of underlying study data, have application to ethical opportunity mapping.

Ethical opportunity mapping practice can address both the rhetorical and scientific concerns through improved documentation. Ethical opportunity mapping can be conceived as the pursuit of disclosure, plurality, contingency, and empowerment. These four principle were synthesized by Dork, Feng, Collins and Cerpendale (2013) as a starting point for critically evaluating data visualizations that raise awareness of social issues.

I propose extending these principles using an evaluation checklist that can be used by opportunity map makers during construction, or by others in evaluation and critique. Opportunity mapping ethics may be improved by adhering to this checklist:

Disclosure

* Visualization includes clearly identified documentation.
* Documentation includes a non-technical executive summary.
* Documentation describes lineage of individual indicators used in an index.
* Documentation describes index calculation.
* Documentation describes geographic aggregation level and zones.
* Documentation describes any software tools used in calculation or visualization process.

Plurality

* Visualization contains multiple perspectives where possible. (example: option to interactively substitute variables)
* Visualization contains appendix maps, or equivalent. (example: visualizing individual values used to construct the index)
* Documentation includes indicators of any known uncertainty (including margin of error)

Contingency

* Visualization contains alternate experience for making sense of the map (example: appendix maps with overlaid supplemental data)
* Interactivity allows for centering to the user’s experience

Empowerment

* Visualization and documentation are distributed in a package (example: any distributions always include persistent access to all documents)
* Documentation includes code for replication (example: links to Github repository)
* Documentation includes tips for replication and illustrative code recipes
* Replication code is offered in alternate computer languages when possible. (example: offer in popular & free computer language, if proprietary tools were used)
* Visualization and documentation encourages further exploration of data

While this checklist is developed with opportunity mapping in mind, it can be generalized to other types of visualization. Visualization practitioners can use this checklist as a guide when developing ethical documentation, or adapt terms and ideas for local use. Visualization instruction should encourage critical thinking skills around inclusion of ethical documentation. Some questions for students might include: How do you balance “complete documentation” with the visualization heuristic, “reduced cognitive load”? Does “complete documentation” introduce additional ethical issues? How do you balance the desire to produce persuasive visualizations with a plurality of interpretations?

Even with improved visualization documentation, ethical dilemmas will persist and should be examined by future research. Ethical documentation may conflict with other ethical principles. Take for example The Opportunity Atlas developed by Chetty, Friedman, Hendren, Jones, and Porter (2018). This Opportunity map reports aggregated outcomes in adulthood by census tract using anonymized longitudinal data from IRS tax records. The authors make a concerted effort at disclosure through extensive online documentation, but complete data sharing is simply not possible. In this case, the ethics of disclosure are superseded by the ethics of privacy. Limited access to individual data prevents deeper scrutiny, with potentially non-trivial implications—as public housing authorities allocate significant resources to re-house families within specific census tracts based on this research (Badger, 2018).

Map makers also have little control over how their maps are reused. Opportunity map documentation may contain context framing to express limited utility, but that does not stop other organizations from reusing opportunity maps in unintended ways. Resource-challenged organizations may default to using whatever map is available, as an alternative to using nothing at all. Emphasizing levels of known uncertainty within documentation is one mitigation technique. Other actors may try to take advantage with knowledge reuse in unsupported ways. For example, the Jarmin index, which identified health opportunity in the UK, was subsequently reused in the 1990s to determine general practitioner pay differentials, even with no evidence that the index score correlated to any workload differences (Smith, 1991).

Other dilemmas will persist. There is a paradox between the data visualization heuristic, “reduced cognitive load” and the competing need for complete documentation. While data visualization often seeks economic communication of complex ideas, layers of supplement, documentation, interactivity, and alternative representations may add to the complexity. Attempts at amelioration might consider how information is organized, prioritized and employ document wayfinding.

**References**

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