Examining data narratives in an equity-focused urban dashboard

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In this paper, we explore

This paper is a document analysis of a transit equity dashboard which maps access to opportunities (including jobs, colleges and universities, green space, and grocery stores) via public transit in 7 major U.S. cities. We follow two frameworks to describe the narrative elements (characters, spatial dimension, sequentiality & temporality, and tellability) of the dashboard. This narrative analysis allows us to characterize the narrative work that dashboards do, enabling the interpretation that produces meaning from data. By describing how an equity-focused dashboard tells stories, we aim to start a line of inquiry into how a narrative approach to analyses of data visualizations can support agonistic data practices.

1 INTRODUCTION

Data and mapping practices are central to racist and exclusionary housing and development practices in the United States' past (eg. redlining via mortgage risk assessment maps, see [17]) and present (eg. algorithmic redlining, see [1, 19]). As such, these institutionalized data practices must be reappropriated, re-imagined, or rejected in service of achieving equity or, more pointedly, caring for the communities they once discriminated against [16].

Critiquing hegemonic narratives and developing counter-narratives is an effective way to enact political power. To support these practices, we propose that a narrative approach to analyzing dashboards may support agonistic data practices and, by extension, the reappropriation of harmful data tools. In this paper, we present a document analysis of TransitCenter's Transit Equity Dashboard. By describing how an equity-focused dashboard tells stories itself, we aim to start a line of inquiry into how a narrative approach to data visualizations can support agonistic data practices.

1.1 Equity Mapping

"Access to opportunity" and "geographic of opportunity" refer to the geographic nature and effects of insufficient access on resource-poor communities [8, 9]. Opportunity analysis and mapping were instrumental to the Thompson v. HUD case in the 1990s, when Baltimore residents sued the HUD for concentrating affordable housing zoning within low-income and low-opportunity areas (Thompson v. HUD, 2001 as cited in [7]). This analysis, conducted by john powell of the Kirwan Institute, became a model for subsequent equity planning practices [7]. Scholars and activist planners continue to develop techniques to map access and opportunity to inform planning and policy, a practice

recently encouraged by the U.S. Department of Housing and Urban Development [14, 21, 22]. While well-intentioned, this rise should be met with concern as decision-making shifts to privileged datalogical sites [4]. Thus, potentially failing to achieve equitable public decision-making and harming the communities equity data initiatives aim to support.

Safranksy [19] critiques not the visual aspects of equity mapping, but its underlying algorithms. She argues, that algorithms may enact epistemic violence - "resulting from the marginalization of knowledges, values, and lifeworlds" (pg 213) and infrastructural violence through the disconnection of public works and services "in the name of making other areas stronger." (pg 214). Like the Market Value Assessment algorithm she critiques, the geography of opportunity - realized through equity mapping - is a proposition of economic and geographic reality positioned to adjudicate decisions about the distribution of public goods and services (pg 208). Historically, maps are a central tool for enacting this kind of violence. The increasing popularization of equity maps within planning and policy demands research that investigates the narratives embedded within data visualizations as a means to contest them.

1.2 Interpretation, Data Narratives, Agonistic Data Practice

Critiques of the representationalist paradigm highlight the centrality of human interpretation in data practices [10, 13].

Representationalism is "the view that representations (here, digital data) stand in mimetic relation to some external reality from which they are ontologically distinct" [4, p. 1]. Our goal in this paper is to explore the narratives in data visualizations as "organization and management shift interpretive work to certain privileged sites," namely the informational-visual register (Crooks, 2017, p 17).

Scholars have turned to narrativity as a way to understand interpretive practices that produce data-driven "insights." Specifically, Dourish and Gómez Cruz [6] show that parole officers employ narrative structure and resources (eg. characters, events, sequences, motives, and so on) to interpret data. The authors theorize that these "data narratives" have particular trajectories, temporalities, and cultural grounding. Data narratives orient the officer spatially as they tell stories about the parolees following or straying from the "right path" (p 5). Amidst a barrage of data streams, narrative enables the officers to "fix" data temporally using narrative structure to "situate it within a landscape of recognizable objects" (p. 6). Lastly, they emphasize that not only are stories culturally grounded, but so too are data practices and infrastructure. As such, the data practices, including conventions of representation, reflexively structure possibilities for data narration. In short, the *appearance* of representations (data) has narrative qualities and so does its *form* (the dashboard).

Borrowing from agonistic pluralism in political theory[15], Crooks and Currie [5] propose "agonistic data practices" to navigate the present double bind data activists face: community organizers need to employ data for its rhetorical power yet they are also subject to surveillance and oppression. They write, "agonistic data practices center on how communities can use data for contestation, not resolution, in efforts to motivate political action through affect and narrative-building." (p. 210) However, data takes many forms -spreadsheets, maps, tables, to name a few. Affect and narrative manifest differently in these manifold forms. Research has yet to take a narrative approach to explore how data activists utilize the narrative potentials of data visualizations to support agonistic data practices. In this paper, we propose a narrative method to analyze data tools. In part, agonistic data practices may involve attending to the visual conventions of data that "motivate political action through affect and narrative-building."

While scholarship has attended to the ways that visual conventions of data visualizations promote a sense of objectivity[12], we extend this emphasis on the rhetorical work of data visualizations. We ask, what *narrative* work do data visualizations do? How does data and its representation produce notions of space, time, characters that inform and motivate narrative practice?

2   METHOD

We aim to answer the call by Veel [23] "to rekindle the insights of twentieth-century literary theory concerning the relationship between form and content" (p. 7) with particular attention to how an equity-focused urban transit dashboard tells stories about disadvantaged communities, urban futures and the promise of the good life. Thus, through the conventions of data visualization, the dashboard presents a story of community "problems" (disadvantage) and design "solutions" (mobility via transit). Interrogating this story embedded in the form of the data visualization is a tactic for agonistic data practices. A turn to narrative allows us to attend to practices of storytelling in the digital age as various forms and methods of presentation are tied with institutional practices and various levels of legitimacy. As Veel notes, data and narrative are bound up in ways that reciprocally reshape each.

While Veel's focus is on text narratives generated by algorithms using data sets, our focus is on the data visualizations as storytellers. Drawing from data journalism, we refer Weber's definition of narrative as "a textual, visual, or multimodal representation that presents a story. As such, a narrative is the semiotic product of narrating" [24, p. 297, emphasis in original]. A story, then, is defined as "a sequence of actions or events unfold over time, involving one or more characters, often involving change" [11, p. 3-4]. Our *narrative* is the dashboard; using the frameworks outlined below, we describe the *stories* told by the dashboard.

We performed document analysis [3] on an equity-focused urban dashboard, its methodology, accompanying academic articles, and its higher-level "How it Works" page. We two frameworks of narrative as used in together data journalism [24] and critical data studies [11]. First is Weber's [24] components of storytelling adapted from Ryan [18]: *characters and events, spatial and temporal dimension, sequentiality, and tellability*. The second framework, adapted from Barthes [2] and Segel and Heer [20], identifies *reader-driven* and *author-driven* stories within the dashboard. In reader-driven dashboards, the reader is expected to do more story discovery work by engaging with the visualization. By contrast, "author-driven" dashboards offer little interactivity and are often highly annotated (p. 4). Narrative visualizations may be placed on a "spectrum of author-driven and reader-driven approaches" [20, p. 1146]. Dashboards may offer both author-driven and read-driven stories [11], as is the case with the dashboard analyzed in this paper

The dashboard stories that we analyzed are provided by TransitCenter's Equity Dashboard. TransitCenter is a New York-based foundation dedicated to improving transit in the United States. Updated monthly, the dashboard displays choropleth maps of major US cities with varying levels of accessibility to vital resources including jobs, hospitals, and colleges via public transit. Each city's map is accompanied by a data story, a separate page of additional narrative text and graphs that further describe the conditions of access to opportunity via public transportation.

Our analysis does not observe data or narrative practices *in situ*. Instead, we aim to interpret the dashboard story and accompanying documents that claim to serve policy and advocacy goals for transit equity. This method complements ethnographic and interview-based research as a tool for analyzing dashboards alongside situated practices of production and use.

3   FINDINGS

In this section, we draw on Weber's (2020) narrative constituents - characters, spatial dimension, sequentiality & temporality, and tellability - to analyze the story within the equity dashboard. We find that, consistent with other criticisms of algorithmic governance, the Equity Dashboard aims to optimize a datafied subject or population, through a market logic.
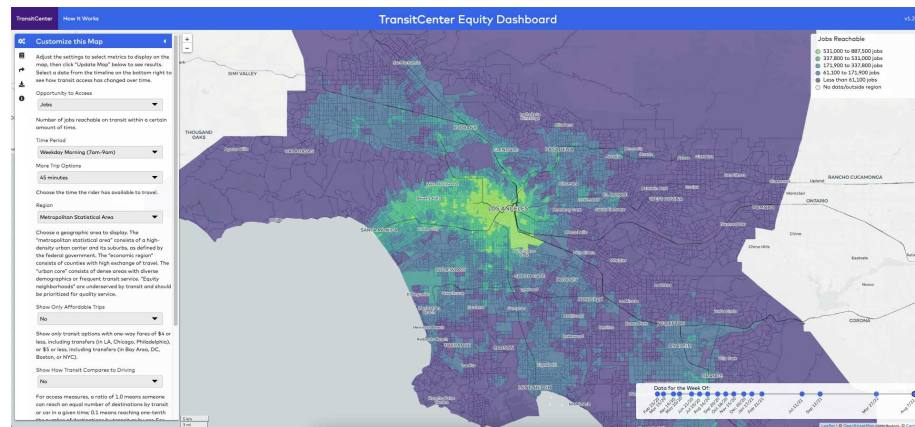
Fig. 1. Transit Equity Dashboard Map of Los Angeles: Job Accessibility via Public Transit

3.1 Characters

This equity dashboard centers on disadvantaged communities as the *characters* of its stories. Namely, these communities include "Black people, other people of color, people living in poverty, and single mothers." (https://dashboard.transitcenter.org/#readmore) On the map page, however, access measures and their corresponding colors on the map do not incorporate these demographics. "Accessibility is a function of transportation and land use (where essential destinations are located)" (cite…/methodology). To draw correlations between access and demographics, the map gives the option to plot certain demographic groups to see where they cluster within regions of access. Each city's Story page shows more specifics regarding access for each demographic group. Disparities across demographics are represented on each cities' Story page for the following: White, Asian, In Poverty, Essential Worker, Latinx, Weeknights, Single Mother, Black, and Low-Cost Fares. Of all the opportunities available for selection on the map, the story page only graphs job accessibility. This reiterates the dashboards focus on connecting people with job centers, rather maintaining a holistic view of vital resources .

3.2 Spatiality

There is a clear *spatiality* to this dashboard's story. Each region on the map has varying levels of access to opportunities across the region. Readers can select various parameters from drop-down lists and plot the access measures. The brighter green a region is, the more accessible the selected opportunity. The more blue and purple, the less access. TransitCenter explains, "The map pages can be queried to identify spatial patterns of transit access and access-to-opportunity trends in each region." (https://dashboard.transitcenter.org/#readmore, emphasis added) "Spatial patterns" are implied as regions of low-access inhabited by disadvantaged groups and contrasting access between neighborhoods. The dashboard encourages planners to find these patterns to determine where to develop to manage access to opportunity.

There is a second implied *spatiality* as the reader is meant to visualize the space between point A and point B, the home and the job, or the home and the hospital. The idealized transit infrastructure fills this space and transports people to areas with higher opportunity. By looking at the map, the reader is invited to consider the harm of inaccess through the space and time it takes to travel.

3.3 Sequentiality & Temporality

While processes of development and gentrification occur, TransitCenter hopes to "narrate the state of transit equity in each region, explaining how access to opportunity differs for groups of people and tracking changes in transit equity over time "(https://dashboard.transitcenter.org/#readmore , emphasis added). Maps themselves don't lend themselves to narrative analysis since they don't inherently have a temporal dimension. In Weber's words, "to turn other charts in narratives, we must add a temporal dimension" (Weber, 2020, p. 305). The equity dashboard allows the reader to step through monthly access measurements by clicking a timeline in the corner of the map. Thus, it has this temporal dimension. Readers can explore the time series and identify changes in access that signal positive or negative effects on equity measures. With this information, experts are expected to identify future areas for intervention or proof of equitable development.

In addition, each Story page has a timeline that plots the number of jobs accessible for each of these groups. The map and story page implies a causal connection between transit development, opportunity, and economic success. Specifically, this dashboard assumes that investing in transit infrastructure to bring disadvantaged people to areas of opportunity will repair structural inequities. The dashboard proposes that physical access is a main barrier to economic opportunity. Measuring opportunity to access at different times is intended to show the changes in measurable access implicitly caused by the forces of gentrification, development, or pandemic recovery.

3.4 Tellability

The hero of this narrative is transit infrastructure. Trains, buses, and bikes are going to get people where they need to go. The narrative is that transportation can grant access and solve inequity by bringing people to these opportunities. Planners, policymakers, and advocates are depicted as investigators of the conditions that produce access. Readers are invited to consider how developing transit could reduce the time it takes to travel to vital resources.

4 DISCUSSION AND FUTURE WORK

In this paper, we have shown that this equity dashboard does narrative work, conveying an economic story, tales of economic woes and promises of mobility. Our findings suggest that a narrative approach is useful to describe the characters, spatial dimension, sequentiality & temporality, and tellability told through and visualized by dashboards. Specifically, we demonstrate that this dashboard tells a story of economic subjects, inviting the reader to imagine the spatial experience of inaccess and how transit infrastructure may solve their economic disadvantage. Moreover, yet contrarily, the reader is placed as an investigator, invited to determine "spatial patterns" of inaccess that occur over a broader temporal scope. The story of reducing travel time is at odds with the story of spatial patterns. While we might imagine transit infrastructures as bridging inaccess, we are left wondering what structural forces (re)produce inaccess. This context is lost and must be retold in service of equity.

We propose that an analysis of dashboards that describes their embedded stories offers a way to critique data visualizations toward achieving the equitable reappropriation of data tools. Previous critical data studies scholarship has taken a social semiotic approach to describe how visual conventions produce senses of rationality and objectivity [12]. By extension, we argue that visual conventions may also produce *spatialities, temporalities, and characters* - elements of narrative - that frame interpretive practice. We hope to expand this inquiry by conducting an interview study guided by the question, how do data activists interpret and utilize different visual conventions toward affective and

narrative-building ends? Through further investigation, we will investigate how data activists use narrative to critique harmful ideologies and to tell stories of desired futures.

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