



The Opportunity Cost: Using a Narrative Approach to Reframe Pro-equity Urban Informatics

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ABSTRACT

This paper is an exploration of storytelling in an urban data dashboard. 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 urban dashboards do, enabling the interpretation that produces meaning from data. Given the duality of data and data visualization and their primacy in both directing and critiquing racialized state power, this poster argues that understanding narrative is vital to determining how, when, and why particular kinds of data visualizations might serve authentic community-defined political goals and when they do not. We aim to start a line of inquiry into how analytic attention to narrative in data visualization can support political change through agonistic data practices.

CCS CONCEPTS

• **Human-centered computing** → **Empirical studies in HCI**; **Empirical studies in HCI**.

KEYWORDS

data visualization; data practices; datafication; dashboards; storytelling; urban data

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1 INTRODUCTION

Data and data visualization (including maps, dashboards, tables, charts, infographics, et al.) are central to racist and exclusionary public policy in the United States' past (e.g., redlining via mortgage risk assessment maps, see [21]) and present (e.g., algorithmic redlining, see algorithmic redlining, see [1, 22]). At the same time, contemporary racial justice advocates increasingly turn to data and data visualization as modes of critiquing and reshaping public policy. For example, scholars and activists engaged in struggles

over "social justice objectives" use counter-mapping—the production of counter-hegemonic maps and visualizations—in service of community-defined goals [6, 14]. Given the duality of data and data visualization and their primacy in both directing and critiquing racialized state power, this poster argues that understanding narrative is vital to determining how, when, and why particular kinds of data visualizations might serve authentic community-defined political goals and when they do not. In other words, data can support genuine community-defined and social movement goals or it may serve as both evidence and vehicle of discriminatory public action. We aim to start a line of inquiry into how analytic attention to narrative in data visualization can support political change through what Crooks and Currie have called agonistic data practices [5]. Agonistic data practices are those uses of data and data visualization for political communication that build grassroots political power through mobilizing the affective and narrative capacities of digital data.

This paper develops methods for narrative analysis applied to a set of urban transit equity dashboards and their supporting documentation. Although critical studies of data [8, 15, 17] have pointed to narrative as an important aspect of data visualization, few methods exist for mapping understandings about narrative structure onto data visualizations (with the exception of work on data journalism [29] and critical data studies [13]). One novel aspect of this methodological approach is that it distinguishes between narrative elements of data visualization and narrative elements of the underlying data: from our perspective, visualization conventions are also narrative devices that can supplement, undercut, contradict, or emphasize other narrative elements. We present this method as complementary to more established methods of studying data work and data visualizations, such as ethnographic and interview-based approaches. In sum, our analysis finds that the transit equity dashboard does narrative work, conveying a tale of economic woes to be solved by mobility. Our analysis foregrounds characters, spatial dimension, sequentiality/temporality, and tellability, narrative dimensions that trouble the simple distributive solution presented.

1.1 Equity Mapping

With equity in mind, U.S. public planning has recently turned to equity maps and "access to opportunity" to decide where to develop based on a distributive ethic. Within housing policy and urban planning, "access to opportunity" and "geography of opportunity" refer to the geographic nature and effects of insufficient access on resource-poor communities [10, 11]. In other words, planning for equitable access to opportunity involves granting sufficient access to resources including jobs, grocery stores, hospitals, and colleges. Opportunity analysis and mapping were instrumental to



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the Thompson v. U.S. Department of Housing and Urban Development (HUD) case in the 1990s, when Baltimore residents sued HUD for concentrating affordable housing zoning within low-income and low-opportunity areas [9]. An equity map produced by John Powell at the Kirwan Institute, showed the locations of affordable housing mapped onto zones showing access to opportunity [9]. 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 [18, 24, 25]. While well-intentioned, the rise of equity maps should be met with concern as decision-making shifts to the privileged sites of data work [4]. Thus, potentially failing to achieve equitable public decision-making and harming the communities that these data initiatives aim to support.

Critiques of data-centric modes of decision-making in urban planning focus on the ways in which data practices marginalize voices outside their purview. In some urban planning cases, municipalities used "market value analysis" (MVA) to determine areas too economically risky for development [22]. Rather than aiming to disinvest in economically risky communities, decisions based on "access to opportunity" aim to invest in disadvantaged communities determined by low access scores. Despite this goal, equity maps share similarities to MVA which raise concerns about the application of data tools toward distributive justice. Like the MVA, access to 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. Safransky warns that these algorithms may enact epistemic violence "resulting from the marginalization of knowledges, values, and lifeworlds" and infrastructural violence through the disconnection of public works and services "in the name of making other areas stronger" [22, pg 213-214].

Historically, maps are a central tool for enacting epistemic violence, disinvestment, and segregation. The increasing popularity of equity maps within planning and policy demands research that investigates the complex politics of pro-equity goals within privileged sites of decision-making. As a way to reappropriated harmful data visualizations, we turn to narrative to describe the stories embedded within them which reveals those stories' (mis)alignment with authentic community-defined political goals.

1.2 Data Narratives Toward Agonistic Data Practices

Our interest in narrative accords with a body of work in critical data studies and design that disputes the objectivity and observer-independence of digital data [12, 16]. Narrative helps digital data stand as a proxy for complex objects and phenomena (e.g., equity, communities, transit, investment, the future) by giving the viewer a structure in which to place, order, and relate the various elements depicted. Narrative also exceeds the sum of all the depicted parts, creating a story that unfolds between and across quantitative observations.

Recently, scholars turn to narrative as a way to understand interpretive practices that produce data-driven insights. For example, Dourish and Gómez Cruz [8] show that parole officers employ narrative 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." 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. Narratives told with data are always told from "here and now." While Dourish and Gomez Cruz focus on underlying elements of data narratives, we aim to show the narrative elements that exist within data visualizations. In short, narrative qualities exist in the conventions of data visualizations, not just the stories told with data. Data visualizations, then, can be used for their narrative-building capacities, a primary goal of agonistic data practices.

Borrowing from agonistic pluralism in political theory [19], Crooks and Currie propose "agonistic data practices" to navigate the present double bind data activists face: community organizers need to employ data for its rhetorical power but are also subject to surveillance and oppression [5]. 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, and tables, to name a few. Research has yet to take a narrative approach to explore how analytic attention to narrative potentials of data visualizations can support genuine community-defined and social movement goals.

2 METHOD

We aim to answer the call by Veel [28] "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 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 data visualization is a tactic for agonistic data practices. A turn to narrative allows scholars to attend to practices of data storytelling as community members vie for the legitimacy of their causes [20].

Our focus is on urban data visualizations as storytellers. For our purposes, we draw from data journalism which defines narrative as "a textual, visual, or multimodal representation that presents a story. As such, a narrative is the semiotic product of narrating" [29, p. 297]. A story, then, is defined as "a sequence of actions or events unfold over time, involving one or more characters, often involving change" [13, p. 3-4]. Our *narrative* is the dashboard; using the frameworks outlined below, we describe the *stories* told by that dashboard.

For our analysis, we followed critical data studies methods that examine dashboard stories. In particular, Jarke and Macgilchrist [13] combine narrative frameworks to show how an educational management dashboard tells stories about student and teacher roles that motivate particular interventions to manage the risk of poor

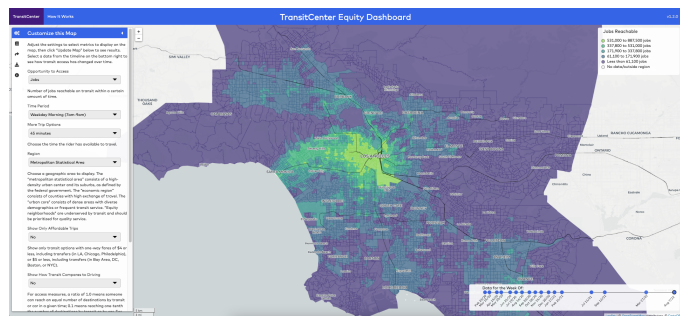


Figure 1: Transit Equity Dashboard Map of Los Angeles: Job Accessibility via Public Transit (<https://dashboard.transitcenter.org/map/la>)

student performance. Similarly, the goal of the analysis presented in this poster is to examine how an urban data dashboard tells certain stories about economic precarity and developmental interventions (namely access to opportunities via public transit).

The first author performed document analysis [3] on an equity-focused urban dashboard, its methodology, accompanying academic articles, and its higher-level "How it Works" page. We used two frameworks of narrative as illustrated in data journalism [29] and combined in critical data studies [13]. First is Weber's components of storytelling: *characters and events, spatial and temporal dimension, sequentiality, and tellability* [29]. This allows us to map the narrative components onto the dashboards' visual conventions and show how the dashboards are storytellers *themselves*. The first author read for these components across the various city maps, stories, and the material accompanying the dashboard. Pointedly, Jarke and Macgilchrist write, "data dashboards tell narratives about heroes, danger and victims, they have their own temporality, and create and configure emotional responses" (p. 4). The second framework, adapted from Barthes [2] and Segel and Heer [23], identifies "reader-driven" and "author-driven" stories within the dashboard. In reader-driven dashboards, the reader is expected to do more discovery work by engaging with the visualization. By contrast, author-driven dashboards offer little interactivity and are often highly annotated [13, p. 6]. This allows us to identify what aspects of the story are open to interpretation and what is presented as fact. Dashboards may offer both author-driven and reader-driven stories, as is the case with the dashboard analyzed in this poster.

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. We present this method as complementary to more

established methods of studying data work and data visualizations such as ethnographic and interview-based approaches.

3 FINDINGS

In this section, we draw on Weber's narrative constituents - characters, spatial dimension, sequentiality/temporality, and tellability - to analyze the story within the equity dashboard [29]. 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. Specifically, this dashboard tells a story about transit infrastructure's ability to improve access for disadvantaged communities. The map is intended to help planners and policymakers make a case for equitable transit development by finding areas of low opportunity that might benefit from transit to nearby lands of opportunity.

3.1 Characters

The 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." [26]. To draw correlations between low access and these identities, the map gives the option to plot certain demographic groups, showing how they often cluster in low-opportunity areas. Each city's Story page shows more specifics regarding access for each demographic group. Disparities across demographics are represented on the Story pages for the following markers: 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 on a timeline. This reiterates the dashboard's focus on connecting people with job centers, rather than maintaining a holistic view of vital resources.

3.2 Spatiality

As a map, there is a clear *spatiality* to this dashboard's story. Notably, TransitCenter describes that "accessibility is a function of transportation and land use (where essential destinations are located)" [27]. As such, the role of transit in this narrative is to solve for this function, minimizing the harms of low access. To do so, each region on the map has varying levels of access to opportunities (eg. jobs, hospitals, parks, colleges, and more). Readers can select various opportunities from a drop-down list and plot the access measures dependent on the time of day, maximum trip time, and trip affordability. Brighter green regions indicate higher access to the selected opportunity; blue and purple regions indicate lower access. TransitCenter explains, "The map pages can be queried to identify spatial patterns of transit access and access-to-opportunity trends in each region." [26] "Spatial patterns" may include regions of low access, sharply contrasting access between neighborhoods or changes in access over time. The dashboard encourages planners to find these patterns to determine where to develop transit and 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 to the job, the home to the hospital, etc. The idealized transit infrastructure fills this space and transports people to areas with higher access to

opportunity. By looking at the map, the reader is invited to consider the cost of inaccess through the space and time it takes to travel, and the relief that better transit infrastructure could provide.

3.3 Sequentiality & Temporality

Maps don't lend themselves to narrative analysis since they inherently do not have a temporal dimension. [29, p. 305]. TransitCenter's Equity Dashboard allows the reader to step through monthly access measurements by clicking a timeline in the lower right corner of the map. Thus, it has this temporal dimension and a story can be told from the map's variations over time. Amidst processes of development and gentrification, 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" [26]. Readers can explore the time series and identify changes in access that signal positive or negative changes in "access to opportunity." With this information, planners 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 imply a causal connection between transit development, opportunity, and economic success. Measuring access to opportunity at different times is intended to show the changes in access implicitly caused by the forces of gentrification, development, or COVID-19 pandemic recovery.

3.4 Tellability

Tellability refers to a story's ability to answer the question, "What's the point?" In the case of this transit equity dashboard, the hero is the transit infrastructure that saves people from areas of deficient opportunity. Trains, buses, and bikes are going to grant access to opportunity. Thus, transit is proposed as a solution to place-based inequity and the harms of inaccess. The reader is meant to consider how developing transit could reduce the time it takes to travel to vital resources. The dashboard positions inequity as a problem of physical access solved by strategic investment in affordable transportation.

4 DISCUSSION AND FUTURE WORK

In this paper, we show that this equity dashboard tells a tale of economic woes and the 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 and cost of inaccess. Moreover, the dashboard suggests that transit infrastructure may solve the costs of disadvantage through optimal investment strategy. In this sense, the dashboard is author-driven, strictly scoping transit as the solution to inaccess. Contrarily, the reader is also placed as an investigator, invited to determine "spatial patterns" of inaccess that occur over time. Since the reader must do more interpretive work, this aspect of the dashboard is more reader-driven. While we might imagine transit infrastructures as bridging access, the reader is left wondering what structural forces (re)produce inaccess.

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 [15]. By extension, we argue that data visualizations also produce *spatialities*, *temporalities*, and *characters* - elements of narrative - that enable interpretation through storytelling. Within TransitCenter's Transit Equity Dashboard, these narrative elements combine to tell a story of economic opportunity, access, and transit solutionism. Equity is framed in terms of distributive justice, granting physical access to disadvantaged communities via transit. The dashboard suggests it can help locate where to equitably develop by finding areas on the map where "spatial patterns" occur. Notably, the dashboard suggests physical inaccess to these locations is a primary barrier, rather than a symptom of marginalization. In addition, the dashboard story does not concern itself with the processes of gentrification and its threat to areas that develop new transit infrastructure [7].

To expand and complement this inquiry into using data visualizations for agonistic data practices, we will conduct an interview study guided by the question, how do data activists interpret and utilize different visual conventions to leverage the affective and narrative-building capacities of data? This larger project will explore how data activists conceptualize and operationalize narrative elements of data visualizations for community-defined political goals.

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