Public Life Study Datascapes that Visualize Space and Time

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Abstract: Public Life Studies (PLS) are widely used to evaluate public space, yet findings are often communicated through charts that flatten spatial and temporal nuance. This methods paper presents a hybrid workflow – community-based analog activity mapping, manual digitization, and algorithmic analysis/visualization – to generate "PLS datascapes". Using two temporary public space installations as case studies, we demonstrate how these visualizations reveal fine-grained spatial patterns and time-based behaviours that would remain hidden in conventional outputs, supporting more targeted design iteration and public communication of the social performance of public spaces.

Keywords: Public Life Study, data visualization, algorithmic analysis, social infrastructure, community-engaged scholarship, plazaPOPS

1 Introduction

This paper examines the use of community-based analog data collection methods, followed by data digitization and algorithmic computational tools, to create a type of visualization of Public Life Study (PLS) data that landscape architects can use to better evaluate the social performance of their designs. Going beyond standard PLS data visualizations, which typically result in pie or bar charts that communicate broad patterns and before and after comparisons about *who* was observed using a site, *what* people were observed doing, and *how* people were observed inhabiting a site, we outline a hybrid analog to digital method that results in the representation and analysis of PLS data that incorporates spatial and temporal dimensions. Allowing for a richer understanding of the public life occurring at a given site, and the impacts of a design or planning intervention, this method has the potential to enhance the design and evaluation of public spaces intended to function as social infrastructure.

The paper begins by discussing the typical outputs of the PLS method in research and practice. Next, based on research conducted to evaluate the social impacts of a temporary public space project designed by the authors, we outline the sequence of analog, digital, and computational methods we used for data collection, data digitization, data analysis, and data visualization, and showcase example datascape outputs. We discuss example spatial patterns that were revealed through this method, and to conclude, we reflect on the potential(s) of this method, and this type of visualization to communicate the spatial and temporal aspects of PLS data in an engaging and impactful manner.

2 Public Life Studies in Research and Practice

Environmental design evaluation (EDE) describes a broad research stream within landscape architecture and urban design concerned with the relationship between human experience and the designed environment, with intellectual roots that draw on multiple disciplines and

Journal of Digital Landscape Architecture, 11-2026, pp. 876-885. © Wichmann Verlag, VDE VERLAG GMBH · Berlin · Offenbach. ISBN 978-3-87907-770-0, ISSN 2367-4253, e-ISSN 2511-624X, doi:10.14627/537770083.

date back to at least the early 1960s. EDE's origins were formed in response to the modern, vehicle centric, technocratic and top down design of post war urban renewal, by critics, scholars, and practitioners who built a foundation of critiques (JACOBS 1961), theories (LYNCH 1960, GOFFMAN 1963, SOMMER 1969, FRIEDMANN et al. 1978), and methods (GEHL 1971,WHYTE 1980, APPLEYARD 1980, JACOBS 1985, BOSSELMANN 2008). International research associations such as the Environmental Design Research Association (EDRA) and the International Association of People Environment Studies (IAPS), established in 1968 and 1981 respectively, have provided a forum for the formalization, testing and dissemination of EDE methodologies for decades.

Situated within the broader EDE tradition and building in particular on the work of William H. Whyte and Jan Gehl, the Public Life Study is a methodology focussed on measuring observable social life within the public realm, often comparing effects before and after an intervention. Depending on the objectives of the study, and the resources available, a typical PLS study can involve intercept surveys, mapping of the stationary behaviour of users of a site (activity mapping), and pedestrian and cycling counts. Importantly, the study is typically conducted prior to an intervention, and then during an intervention, so that changes in patterns of use can be quantified. A user-friendly overview of these methods was published in the book 'How to Study Public Life*'* (GEHL & VARRE 2013).

Activity Mapping within the PLS tradition is still primarily conducted using analog data collection methods, with researchers observing a site with a clipboard and filling out worksheets with a pen or pencil. While EDE pioneers like William H. Whyte captured video footage of public space, and today, novel and money saving techniques that utilize video camera footage and object detection and tracking algorithms are being experimented with (DHANESWARA 2020, SCHLICKMAN & DOMLESKY 2019), these approaches remain challenging to implement, at least in academic research overseen by human subjects research boards, due to ethical and perception concerns associated with this type of surveillance.

The mapping aspects of Public Life Studies are a powerful tool to systematically understand who is using a space (researchers record the perceived age and gender presentation of users), what users are doing (activities like eating, phone time, or socializing, for example) and the location and posture of the user (users are ascribed a dot on a map, and whether they are sitting, standing, leaning, or lying down is recorded). And, when studies are done 'pre' and 'during' an intervention, changes in user patterns can be quantified. A PLS can be an important quantitative tool to evaluate whether an intervention achieves certain project goals. For example, if a project has a goal to create a more welcoming and inclusive environment, Activity Mapping can determine whether the age and gender diversity of users increased as a result of the intervention, or not.

Many PLS studies tend to present findings in the form of statistical charts and tables (KIM 2016, PUBLIC WORK et al. 2018), measuring and evaluating overall patterns of use, but not delving deeply into analyzing these patterns through a more granular spatial lens. The results might include pie charts showing the age mix of users of the site at different hours of the day and could also find interesting statistical patterns about how the prevalence of activities may vary by gender and age, but most PLS studies do not explore the spatial dimensions of these patterns. Are there particular areas or elements of a site that also correlate with these observed use patterns, and, building on Randy Hester's ideas about 'enabling form' how can these findings add to a more a specific evaluation of how specific design features and qualities of the site might play a role in *enabling* certain behaviours (HESTER 2006)?

Exceptions exist, including findings presented in the SWA published 'Field Guide to Life in Urban Plazas: A Study in New York City' (SCHLICKMAN & DOMLESKY 2019), which named and illustrated 25 patterns of human spatial behaviour (postures, physical arrangements of people based on social activities) in response to the physical characteristics of the sites that were being studied. In general, though, this level of spatial analysis remains uncommon in the PLS literature, suggesting opportunities for further development of these methods.

Additionally, data related to the dimension of time is limited in typical PLS studies. Activity Mapping usually involves collecting data by the hour and on specified study days (often a combination of weekday and weekend days). Data can therefore be analyzed according to time of day, leading for instance to an understanding of the hours of the day when a site is busiest, and comparisons across the days of the week. Activity Mapping, however, does not typically capture more detailed information about the duration of time spent at a site by each individual person observed, allowing for a more nuanced understanding of temporal patterns, and analysis against spatial, demographic, and activity-based variables.

3 Methods: From Analog to Digital

This paper focuses on the Activity Mapping component of a PLS conducted in association with two temporary tactical urbanism installations in Toronto, Canada led by the authors, one installed during the summer of 2023, and one during the summer of 2024. Both installations were part of plazaPOPS, a multi-year public space design and research initiative, and located in the same neighbourhood, but at different sites about 300 metres apart. For both installations, field work took place *without* the installation, ie: when the installation was not present, to gather baseline data, and *with* the installation, ie: when the installation was present, to compare impacts to the baseline condition.

In total, there were four data collection periods (two for each installation), and attempts were made to keep the *with* and *without* study periods as comparable as possible, including ensuring comfortable temperatures and weather conditions, and that school was in session (ie. avoiding summer holidays). For each period, data was collected on four days (2 weekdays and 2 weekend days), for 14 hours each day. A total of 25 researchers were involved in the data collection, 14 in 2023 and 11 in 2024, a combination of Community Based Researchers (CBRs), and Graduate Student Researchers (GSRs) from the MLA program at the University of Guelph.

During each hour, researchers would observe the study area and fill out a worksheet on a clipboard that included a map of the study area, and an associated matrix (see figures 1 and 2). For each person who was stationary within the study area (ie: spending any amount of time in a stationary position, and not simply walking by), the researcher would draw a dot on the map, marking their spatial location, and ascribe the dot a number. On the corresponding matrix, information would be captured in a row with a matching number, including the perceived age and gender of the person, their posture and activity, whether they were part of a group, and the time that they started and stopped their stationary activity.

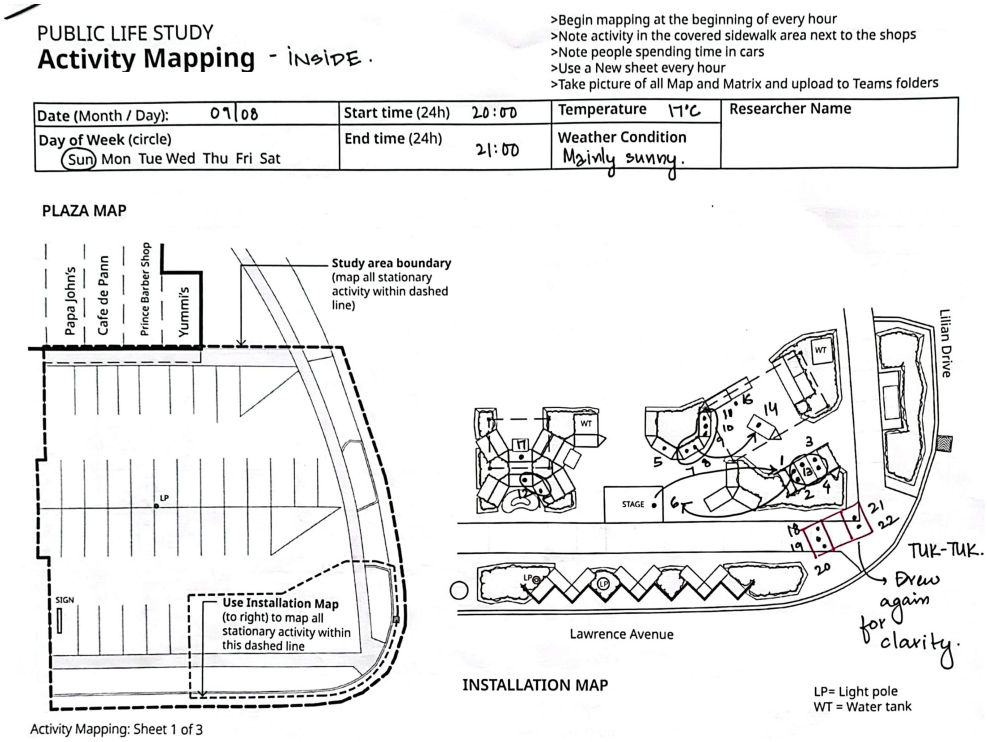

Fig. 1: Sample Activity Mapping map worksheet

All of the hard copy maps and matrices were collected and scanned, and then manually digitized into a master spreadsheet. The spatial location of each dot was entered as a latitudinal and longitudinal coordinate.

With the digitized data, Python libraries within Grasshopper, NumPy (numerical computing), Pandas (tabular data), and Matplotlib (2D plotting), were used to implement algorithms that generated pie charts and columnar summaries. Grasshopper components were then used to visualize and classify colors and exported into Adobe Illustrator to produce data visualizations.

Following data cleaning and restructuring, the finalized spreadsheet was directly linked to Grasshopper, enabling dynamic recognition and selection of multiple data attributes. Additional columns were generated during the preprocessing stage to aggregate category counts required for visualization, ensuring compatibility with specific chart types. Within Grasshopper, data were filtered and extracted according to the requirements of each visualization, allowing selected attributes and their corresponding quantities to be isolated and displayed using predefined color mappings. This workflow supported flexible, parameter-driven visualization while maintaining consistency across outputs.

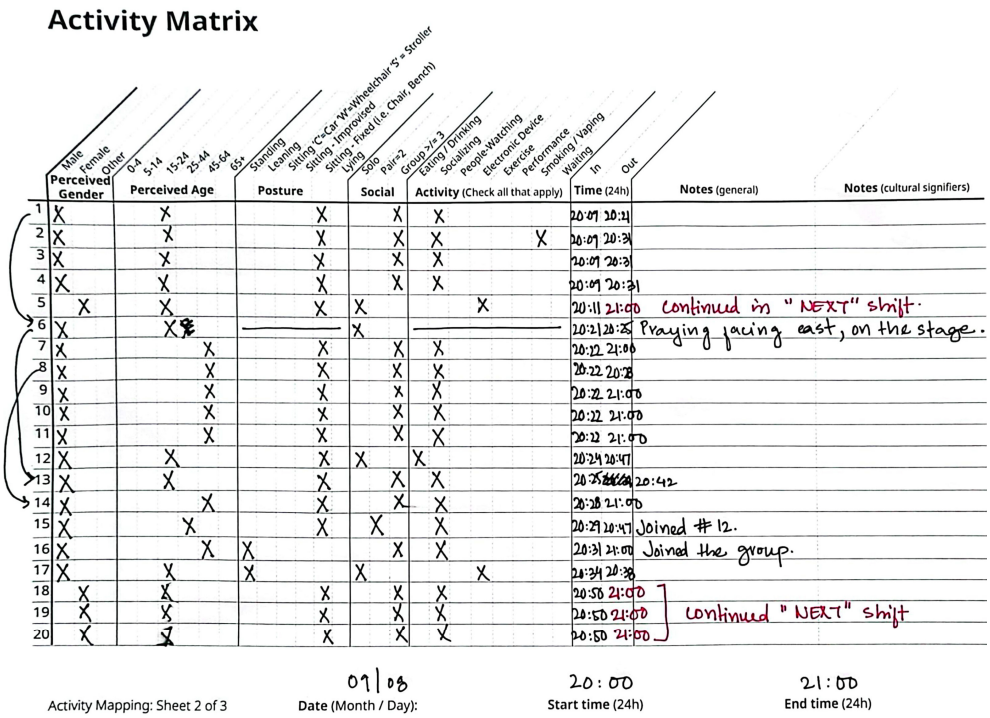

Fig. 2: Sample Activity Mapping matrix worksheet

In addition, Python scripting was used to analyze and visualize the distribution of selected parameters across three spatial conditions: *without* installation, *with* installation (inside installation), and *with* installation (adjacent to installation). For each condition, relative frequencies were calculated and normalized as percentages. These results were presented as side-by-side pie charts to facilitate direct visual comparison between conditions. Consistent formatting, color schemes, and percentage annotations were applied to enhance clarity and interpretability, enabling a comparative assessment of how selected parameters varied across installation scenarios.

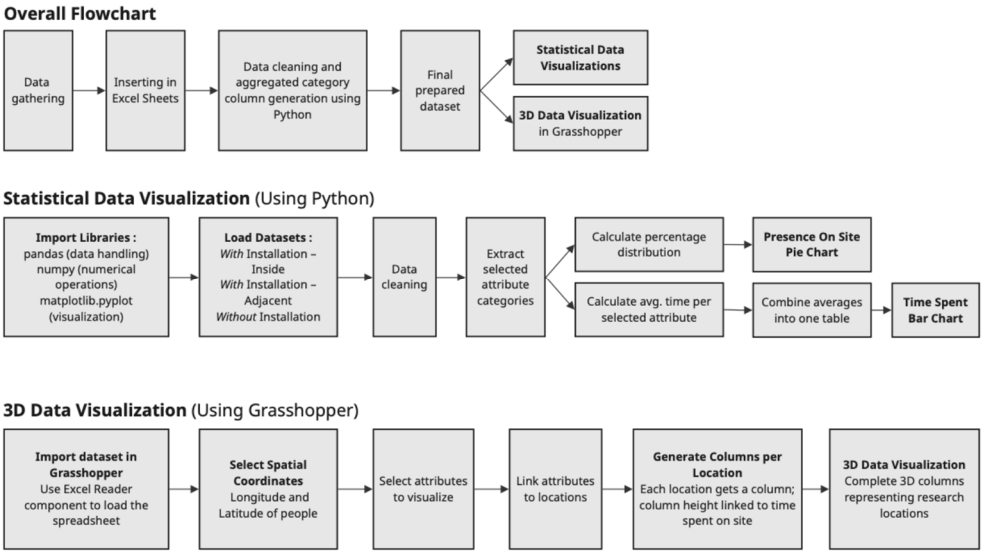

Fig. 3: Data analysis and visualization flow charts

4 Results – Spatial and Temporal Patterns of Public Life

To visualize the findings, datascape posters were created for each of five variables – *Age*, *Gender*, *Activities*, *Social Group* and *Posture* (figure 4 shows the Age poster for the 2023 site). The left half of each poster shows findings *without* the installation, and the right side shows findings *with* the installation. Colour schemes are consistent for each variable (pale yellow is the background colour for the *Age* variable), and associated categories use consistent colours (ie: green's and blues for each of the age ranges). These posters were exhibited at the Urbanspace Gallery in Toronto from September to December 2025, as part of *plazaPOPS: Paradise in a Parking Lot*, and will also be published in a public facing research report about the plazaPOPS initiative in 2026.

Each poster features "presence on site" pie charts that show the proportion of each category within each variable, ie: the Age poster for the 2023 installation (figure 4), includes charts showing that visitors in the 15-24 age range represented 11% of all observed people in the "without" condition, but grew to 32% of all people observed within the installation itself, in the "with" condition.

Each poster also includes "time spent" bar charts, illustrating the average amount of time (in minutes) that a person spent within the study area, organized by category. For example, on figure 4, the average 15-24-year-old spent 8 minutes at the site in the "without" condition, but 21 minutes inside the installation itself, in the "with" condition.

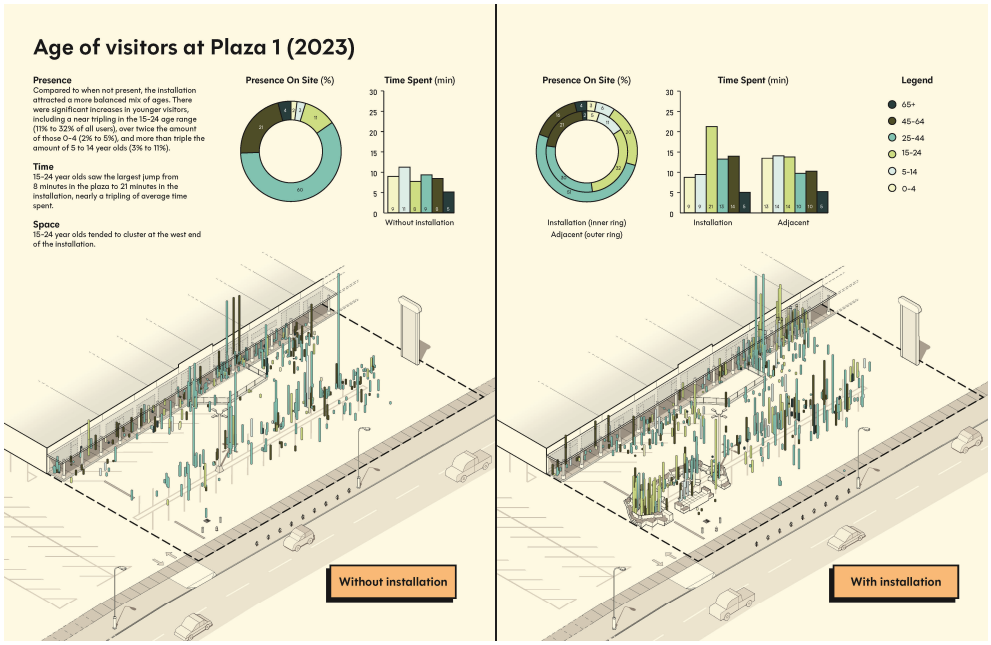

Fig. 4: "Age" Datascape for 2023 Installation

To complement and add depth to this statistical information, each poster features two axonometric maps of the study site. Individual people are represented as a column, colour coded based on the variables and categories, matching the pie and bar charts. The height of each column represents the duration of time spent, allowing for a quick visual understanding of patterns of use according to how much time people spent at the site, as well as broader spatial patterns.

In general, the study found that the installations led to more people being present at the sites, people spending more time, more gender balance, more age diversity, and more social behaviours. While this paper does not offer the opportunity for an in-depth discussion of all of the results, we offer an example of one significant spatial pattern that was revealed in the datascapes resulting from this method. The Age, Gender and Activities posters that analyze data from the 2024 installation revealed that in the "without" condition, middle aged men (aged 45-64) were found to socialize in the evenings, clustered in the shade of an existing sign on site. In the "with" condition, the pattern continued, but in a less spatially isolated manner; middle aged men continued to cluster in the same location, west of the installation site, but users of this age group were also distributed throughout the installation, amongst users of other age groups, suggesting that this group felt welcome within the installation, and perhaps even spent time interacting with groups of other ages.

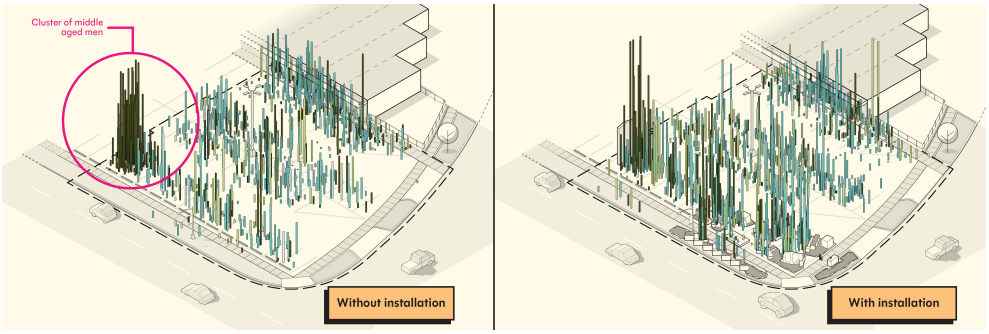

Fig. 5: "Age" Datascape for 2024 Installation, revealing spatial pattern of middle-aged men

5 Discussion

The data visualization method described in this paper has two key limitations. First, capturing the time in and time out for every user proved challenging during busy times on site, especially for the 2024 site, which was significantly busier than the 2023 site in all conditions. To mitigate this challenge, efforts were made as part of the "with" period of the study, to schedule an extra field researcher per shift during times of day that were known to be busier (typically evenings). One researcher focussed on use within the installation itself, while the other focussed on the remainder of the study area of the site adjacent to the installation. This approach proved effective, but was costly, and there still were times when the study area was so busy that time in and time out data was not captured or was incomplete. Incomplete lines of data were removed from the analysis, as a result.

This challenge was anticipated during the research design phase but capturing time in and time out for each site visitor was pursued regardless, to better understand whether capturing the duration of time spent would be possible, and whether the resulting analysis would reveal significant findings. This limitation represents a trade-off between quality and quantity of data captured and may only be appropriate on sites where activity levels are low enough to capture data with confidence, and/or where resources can cover the costs of the requisite field work.

A second limitation relates to the potential cost of conducting Public Life Studies. In this instance, the project was well resourced, and an operating philosophy of the initiative was to fairly compensate everyone involved, rather than relying on volunteer labour. That said, the study was costly to undertake, and researchers considering these methods need to be strategic in the instances (which projects) and approach (how many study days) they deploy in PLS studies of this type. One aspect of this method where significant labour saving might be possible, would be in capturing field data using a digital interface (an app on a phone or tablet), which would avoid significant time during the data digitization phase.

An app could also presumably address the challenge of capturing data about a person observed on site straddling different hours of site observation, i. e.: someone who is present from say 9:45 – 10:15am, during two overlapping researcher shifts (9:00 – 10:00am and 10:00 – 11:00am). The analog approach employed required instances such as these to be

matched up and manually checked to ensure only one data line in the master spreadsheet versus two, whereas a shared digital platform for data entry could easily resolve this, by having that person's presence pre-populated when data collection is handed over from one researcher to the next. Efforts were made during the research design phase of this project to source such an application, without success.

Another opportunity that the researchers see for the communication of this data, is to move beyond two-dimensional print-based outputs into the animation of the data through time-lapse video formats, or to develop interactive web-based information graphics allowing the viewer to toggle between different variables and use sliders to move through time. Also, additional variables like sun/shade patterns could be mapped and analyzed spatially.

6 Conclusion

The pattern of middle-aged men clustering in the "without" condition and then visiting the site in a more distributed pattern in the "with condition" (Figure 5), would not have been revealed using traditional PLS data outputs that do not include a granular spatial analysis. This pattern represents one important finding about how the installations functioned as social infrastructure for middle aged men, a demographic group that tends to experience higher degrees of social isolation and loneliness than other groups, suggesting that the installation's design welcomed the group, and may have even encouraged interaction with other demographic groups. Indeed, an ethnographic study conducted as part of the research and complimenting the Public Life Study but beyond the scope of this article, involving interviews with site users, confirmed this finding.

The posters were designed to engage a broad public audience through display within an exhibition (large format) and within a public facing research report (8.5" x 11" format). plazaPOPS, the public space research initiative associated with this article, aims to create inclusive installations that welcome a more age and gender diverse group of users and support a wider range of social activities, and a goal of these visualizations was to clearly communicate the social performance of the subject public spaces to an audience of municipal staff and elected officials, as part of efforts to advocate for enabling policies to support the sustainable funding and growth of the initiative. While it is not yet clear the impact these visualizations will have on advancing the initiative, it was clear through informal observation and feedback during several public tours of the exhibition, that many visitors were compelled to study them carefully.

In summary, the datascapes presented in this paper that pair baseline and intervention-period public life data and represent spatial and temporal data in addition to conventional pie and bar charts can be a tool to communicate the social performance of public space design projects. As Public Life Studies continue to be mobilized to inform public space design and policy, the methods outlined in this paper can enhance design evaluation toward more particular insights about who the design is impacting, how, where, and for how long.

Acknowledgements

The authors would like to express gratitude to the Social Sciences and Humanities Research Council of Canada (SSHRC) who funded the research published in this article, and to acknowledge the passion, dedication, and rigour of the large network of Graduate Student and Community Based Researchers associated with the plazaPOPS project without whom this work would not have been possible.

References

APPLEYARD, D. (1981), Livable Streets. Berkeley: University of California Press.

BOSSELMANN, P. (2008), Urban Transformation: Understanding City Form and Design. Island Press.

DHANESWARA, A. (2020), Capturing Human Behavior in Public Spaces. Institute for Advanced Architecture of Catalonia, May 29, 2020. https://bit.ly/4f4QzK7.

FRIEDMANN, A., ZIMRING, C. & ZUBE, E.H. (1978), Environmental Design Evaluation. Plenum Press, New York.

GEHL, J. (20111), Life Between Buildings: Using public space (6th Ed.). Island Press.

GEHL, J & SVARRE, B. (2013), How to Study Public Life. Island Press.

GOFFMAN, E. (1963), Behavior in public places. The Free Press, New York.

HESTER, R. (2006), Design for Ecological Democracy. The MIT Press, Cambridge.

JACOBS, A. (1985), Looking at Cities. Harvard University Press.

JACOBS, J. (1961), The Death and Life of Great American Cities. Random House, New York.

KIM, S. (2016), San Francisco Plazas Public Life Study. San Francisco Planning Department. https://bit.ly/48tAsmM.

LYNCH, K. (1960), The Image of the City. MIT Press.

PUBLIC WORK, GEHL STUDIO, SWERHUN ASSOCIATES, SAM SCHWARTZ CONSULTING LLC. (2018), Downtown Parks and Public Realm Plan: Public Space Public Life Study. City of Toronto. http://bit.ly/3BYQdpx.

SCHLICKMAN, E. & DOMLESKY, A. (2019), Field Guide to Life in Urban Plazas: A Study in New York City. SWA. https://bit.ly/48r0fMg.

SOMMER, R. (1969), Personal Space: The Behavioral Basis of Design. Prentice-Hall, Englewood Cliffs, NJ.

WHYTE, W.H. (1980), The Social Life of Small Urban Spaces. The Conservation Foundation, Washington D.C.