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Article

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Data Visualization for Human Rights Advocacy

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Abstract

In a world of 'Big Data', data visualization allows the viewer to explore curated data; the creator to quickly convey complex information; and advocates to vividly display their view of a better world. Fields as disparate as journalism, environmental advocacy, and development assistance are taking advantage of these data-filled times. A similar movement can be described for the realm of human rights advocacy—although at a much smaller scale. Human rights advocates have been increasingly using data to better understand rights violations and to communicate their findings and messages to targeted audiences, from the general public to policymakers and judicial bodies. While the use of data and visualization among human rights advocates is becoming more common, innovations are being taken up unevenly, and advocates admit that choices about approaches and techniques are largely based on anecdotal evidence. This article introduces the results of preliminary research into some of these questions that are the product of collaboration between researchers from a school of engineering and a school of law. It provides an initial assessment of the field, presenting the results of a study examining the use of data visualization and other visual features by Amnesty International and Human Rights Watch through content coding and expert interviews. It then offers the findings of two crowdsourced user studies into pressing questions in the visualization field which hold promise for human rights advocates seeking to communicate their messages through data visualization, and concludes by suggesting further areas for research.

Keywords: data visualization; human rights advocacy; interdisciplinary approaches; methodology; reporting

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1. Introduction

In a world of 'Big Data' and open government, the visual display of data has become central to how we understand social problems and their potential solutions. Data visualization is the 'visual representation of "data", defined as information which has been abstracted in some schematic form' (Friendly 2009: 1). Visualization allows the viewer to explore curated data; the creator to quickly convey complex information; and advocates to vividly display their view of a better world. While charts and diagrams have long been used to present numbers, sophisticated displays of quantitative data were, until relatively recently, relegated to scientific and technical publications (Tufte 2001: 13 – 51). Innovations in computing, advances in graphical presentation, and the ubiquity of personal devices and software capable of analysing and presenting large data sets have set the scene for exponential growth in data visualization (Roberts et al. 2014: 50 – 1). Recent years have been witness to a new phenomenon in which innovative and often interactive visualization techniques are used to explore complex relationships among variables and create compelling stories based on data (Kosara and Mackinlay 2013; Segel and Heer 2010). Leading media organizations such as *The New York Times* and *The Guardian* have pioneered data-driven journalism supported by visualization and have played a major role in the popularization of this form.

The remarkable depth and breadth of data visualization has become possible not only through advances in computing, but also through the progressive 'datafication' of information in increasingly broad areas of knowledge, through which more and more phenomena are quantified and captured in big data sets (Mayer-Schönberger and Cukier 2013: 73–97). The recent explosion of data relevant to key social and economic issues available through the Internet has made it possible for organizations and researchers to identify patterns and trends that can be harnessed to inform decision making and to tell powerful stories. Fields as disparate as journalism, environmental advocacy, and development assistance are taking advantage of these data-filled times both to understand the world better and to shape compelling, informative, and convincing narratives.

A similar movement can be described for the realm of human rights advocacy—although at a much smaller scale. Human rights advocates—at the grassroots level and within small and large organizations—increasingly have been using data to deepen their understanding of rights violations and data visualization to effectively communicate their findings and messages to targeted audiences, from the general public to policymakers and judicial bodies (New Tactics in Human Rights 2013; Latonero and Gold 2015: 1–15). Visualizing data can be a powerful tool for making human rights arguments more accessible and compelling as compared to traditional reports or press releases. Occupy Wall Street's cry of 'We are the 99%!' turned data into a slogan and used data visualization to motivate protest, sparking a broad public debate over inequality (Cillizza 2013: 1; We Are the 99 Percent). Crowdsourced human rights information is submitted by witnesses, survivors, and advocates and presented on interactive maps that are increasingly influential in policy circles because they allow viewers to explore data in near real time (Humanitarian Tracker; Qayyam 2014).

Activists have used these visualizations to amplify their messages by reaching beyond local and national audiences. They have also enabled new types of analysis by aggregating data that was heretofore scattered across organizations and individual users. For example, advocates tracking violence in Syria have created Syria Tracker, which aggregates

crowdsourced text, photo, and video reports online and uses data mining techniques to present live maps of the Syrian conflict (Humanitarian Tracker). Intensive collaborations among scholars, advocates, and forensic specialists have enabled multi-layered investigative data visualizations such as those created by Forensic Architecture in collaboration with SITU Research aimed at examining spatial patterns by linking the geographical location of drone strikes and reports of civilian casualties (Forensic Architecture 2014). By creating accurate depictions of covert drone strikes, this project enables viewers to assess government claims against objective evidence.

Despite these advances, human rights organizations often do not have the knowledge and resources to create and incorporate complex visualizations and have commonly used more simple visual features in their day-to-day work. For example, in recent years, Human Rights Watch (HRW) and Amnesty International (AI), two prominent human rights organizations, have published numerous reports that use simple quantitative analyses of administrative data to identify and present human rights concerns, such as the excessive use of guilty pleas in the US federal criminal system (Human Rights Watch 2013) or the use of the death penalty in countries worldwide (Amnesty International 2010). These reports also often use basic graphs, charts, and descriptive statistics alongside legal and policy analysis (Root 2013). Similar work has been undertaken by the Center for Economic and Social Rights (CESR), which has published a series entitled 'Visualizing Rights' that presents rights-related analyses of development indicators, such as, for example, under-five mortality rates, using traditional bar charts, line graphs, and statistical tables (CESR).

AI and HRW are making some forays into using more sophisticated data visualization to convey a human rights message. Alongside a 2011 report analysing more than five million recorded transfers of detained immigrants, HRW published a series of data visualizations that explored the human rights dimensions of the transfers in more depth (Human Rights Watch 2011; Root 2013). AI and the American Association for the Advancement of Science (AAAS) have combined mapping with traditional human rights fact finding in the Eyes on Nigeria visualization project, in which users can explore geo-located evidence of violations (Amnesty International, Eyes on Nigeria).

While the use of data and visualization among human rights advocates is becoming more common, innovations are being taken up unevenly, and advocates admit that their beliefs about what such visualizations can achieve, as well as choices about approaches and techniques, are largely based on anecdotal evidence about what seems to work best with a given audience. Some pioneering work has been done by the Tactical Technology Collective (Tactical Tech) to produce simple, concrete guidance for advocates using data visualization. Tactical Tech's handbook and accompanying website 'Visualising Information for Advocacy' (Tactical Tech 2014) include accessible how-to guides on data and design and reviews of visualization tools. The organization also hosted three Info Activism training camps between 2009 and 2013.

Advocates themselves indicate that they are interested in improving their work through evidence-based guidance on when and how to use visualization to make their messages more persuasive and to limit counterproductive effects. While existing practical guidance provides some real-time solutions for pressing human rights advocacy needs, what is missing is rigorous research to identify research-supported techniques and design guidelines for advocacy-focused data visualization. Too little is known about the promises and pitfalls that arise when visualizing human rights. What are the factors that determine the effectiveness of visualizations for communicating advocacy messages? Are there specific types of

visualization that are more persuasive than others? How does the design of a visualization impact the audience? What precautions are necessary to prevent the audience from being misled?

This article introduces the results of preliminary research into some of these questions that are the product of collaboration between researchers from NYU's Tandon School of Engineering and School of Law (the NYU Engineering–Law research team). To this end it provides an initial assessment of the field, presenting the results of a study examining the use of data visualization and other visual features by AI and HRW through content coding, as well as expert interviews about the state of the field beyond AI and HRW. It then offers the findings of two crowdsourced user studies into pressing questions in the visualization field which hold promise for human rights advocates seeking to communicate their messages through data visualization. The studies focused on identifying factors affecting communication and influence that make communication through visualization informative and credible. The article presents the findings of these studies as relevant for the human rights field. While definitive conclusions are not possible at this early stage in the research, the studies examined in this article support a few initial findings. First, human rights organizations are increasingly using data visualization to improve the efficacy of their work, but advances are cabined by challenges related to human rights data itself, as well as limits in organizational capacity and relatively low data literacy within the human rights community. Second, experimental studies hold important lessons for the human rights field as it embraces data visualization. While visualization can enhance the persuasiveness of a message, it can also mislead—sometimes unintentionally. The article concludes by suggesting further areas for research.

2. Context: datafication of human rights

Human rights fact finding carried out by advocacy organizations has traditionally emphasized qualitative methods (Langford and Fukuda-Parr 2012: 222), especially interviewing. Case-based research has focused on giving voice to and learning from the experience of those targeted for violations and has often prioritized dynamics or populations not easily captured in statistical data. Despite this tradition of qualitative work, which still makes up for a big part of human rights reporting, human rights practitioners have in recent years joined the 'turn to metrics' observed in other disciplines (ibid.). In addition to the qualitative research, human rights advocates increasingly seek to find, interpret, and communicate quantitative information about rights violations, enabling them to know more and different things about rights abuses and fulfilment. Advocates increasingly seek quantitative measures to monitor progressive realization of rights, identify individuals responsible for violations, and improve policy recommendations (ibid: 225). Drawing on trends related to data processing and analysis in many fields, non-governmental organizations have begun to use a broader range of data and tools to document, classify, monitor, contextualize, prescribe, and advocate in response to rights violations (Landman and Carvalho 2010: 4; Satterthwaite and Simeone 2014: 8).[1] Techniques and tools vary widely—ranging from the rights-based analysis of official statistics (e.g. CESR and Asia Pacific Forum 2015; Human Rights Watch 2013), analyses of satellite imagery for dynamics analysable visually (e.g. Amnesty International, Eyes on Nigeria), to

1 The United Nations Office of the High Commissioner for Human Rights (OHCHR) has published a guidebook on designing and using human rights indicators (UN OHCHR 2012).

the use of crowdsourced events data (Physicians for Human Rights), and estimates of conflict-related deaths through complex statistical modelling (e.g. Price et al. 2014). The right kind of quantitative data can help investigators refine measurements, examine relationships, test statistical significance, compare varying cases, and consider alternative explanations for violations (Collier et al. 2004; Satterthwaite and Simeone 2014: 29).

The benefits of quantitative human rights data do not come without problems: practitioners often face complex social, economic, and political circumstances, resulting in specific challenges related to data collection, validity, and reliability in human rights. As Landman and Carvalho have noted, data on human rights 'necessarily will be "lumpy", biased and incomplete, since reporting of human rights violations is fraught with difficulties, including fear from victims, power of the offenders, comprehensive evidence and quality of communications technology, among others' (2010: 34). Very often, human rights abuses are difficult to document because researchers do not have access to those affected and survivors may be unable or unwilling to speak about the violations they experience due to concerns about security, reprisal, or stigma (Goldstein 1986: 617–20). When data is available, it may not adequately include communities that experience discrimination or marginalization and may entirely exclude or make invisible populations that experience criminalization (Stuart et al. 2015: 15–17; Purcell et al. 2012: 103–6). In many severe cases, data is falsified or destroyed (Andreas and Greenhill 2010).

Credibility and accuracy are the currency of human rights advocacy: human rights organizations cannot afford to use data that is not highly trustworthy. 'A human rights group should never lose a factual challenge', statistician Patrick Ball emphasizes. 'Our moral legitimacy depends on speaking truth to power' (Rosenberg 2012). This imperative, combined with the problematic nature of much quantitative data relevant to human rights, leads many advocates to avoid or limit its use (Root 2015). Yet, despite these challenges, there is an emerging trend among human rights fact finders to embrace and adapt methodologies akin to those of social science where relevant and feasible, including those which use quantitative methods and data (Satterthwaite and Simeone 2014). The increasing availability of data on human rights issues creates new opportunities for advocates to use data to better communicate their findings and messages to targeted audiences. Emerging from these trends is the growing use of data visualization.

This trend should not be overstated, however. The major human rights organizations still use the format of the human rights fact-finding report to anchor their advocacy. This kind of report has become a genre (Dudai 2009: 249–50; Gready 2009: 171–5) in part through the work of Amnesty and Human Rights Watch. While the genre has a number of identifiable features, the use of quantitative data is not one. Instead, these reports still tend to rely heavily on qualitative data such as the testimony of witnesses and survivors of human rights violations (Root 2015). While most human rights fact-finding reports contain little quantitative data that could be visualized, these reports do use visual communication. In fact, some of the qualitative data traditionally used in human rights fact finding is visual in nature (e.g. photos documenting a human rights violation or its aftermath) and can be a powerful element of an advocacy strategy. Understanding the evolution of the use of quantitative and qualitative visual communication features in these reports is therefore an important basis for the analysis of how data visualization is, and could be, used in human rights advocacy. As quantitative data is increasingly embraced by the human rights field, the use of visualization techniques for understanding and presenting that data will likely grow, and the genre of the human rights report may transform as well. The pathways for that evolution depend in part on how existing practices have developed.

3. Methodology

The NYU Engineering–Law research team set out to create an initial mapping that could serve as the basis for a later assessment of the state of the field for human rights visualization and to undertake some preliminary experiments on key visualization issues relevant to human rights advocacy. These first collaborative efforts are presented below, and form the basis for the research agenda sketched out in the conclusion of this article.

3.1 Study on the use of data visualization in human rights advocacy

3.1.1 Coding of human rights reports

To better understand the use of visual communication and emerging data visualization practices in the mainstream human rights field, the NYU Engineering–Law research team implemented a study concerning the use of visual features including data visualization by the two most prominent human rights organizations in their traditional fact-finding reports. This kind of report has a number of specific identifiable features that were used to define the object of study. Specifically, AI and HRW reports were included in the study if they: (a) presented facts and/or analysis explicitly based on some form of primary research, such as field or desk research; and (b) included specific recommendations related to the content of the report.[2]

The research team collected all 449 fact-finding reports authored and published by AI and HRW during the years 2006, 2010, and 2014 that were available in English and posted on the organizations' websites as PDFs.[3] The main findings of the study are therefore limited to the PDF versions hosted on the organizations' websites. The research team also collected and coded all AI and HRW fact-finding reports from the year 2000, but the even greater lack of uniformity with regard to the versions available on the organizations' websites made it unwise to include these in the final data set, so they were excluded from the formal analysis. These reports from 2000 do provide context for understanding the evolving online presence of the two organizations, however, and helped the research team choose

2 Recommendations were required to ensure advocacy-oriented reports. Numerous exclusion criteria were applied to ensure the data set was composed of reports based on original fact finding and aimed at a general audience. The data does *not* include: (a) reports styled as submissions to UN bodies, regional organizations, or other international entities; (b) amicus briefs and other legal filings; (c) memoranda, checklists, and 'backgrounders'; (d) legal or policy memoranda (i.e. documents that analyse legislation or policy without research into other sources); (e) summary 'World' or 'Annual' Reports; (f) books published by external publishing houses; (g) press releases, press backgrounders, or 'extended pressers'; and (h) summary versions of other reports by the same organization.

3 The data set comprises 147 reports from 2006, 145 from 2010, and 157 from 2014. This data set does not include the printed versions of the same reports, which might occasionally have looked different from the online versions. The HRW reports posted online are identical with the print versions as of 2003. The print versions of AI reports posted online are mostly identical with the print versions as of 2012 (communications with AI and HRW publications staff 2015). According to information received from AI and HRW staff, the occasional discrepancies are due to several factors including technical limitations concerning the incorporation of visual features, copyright concerns for online versions, different file formats used, and other internal inconsistencies (email communications and meeting notes with HRW and AI publications staff: emails from AI 23 June 2015 and 6 July 2015; meetings with HRW publication staff on 7 April 2015 and 18 March 2015; emails from HRW 3 April 2015, 9 June 2015 and 10 June 2015).

the year 2006 as a starting point for formal analysis, since by this time the online versions of reports had become more reliably identical to the print versions.

Several dozen variables were coded for each report. While the original intent was to analyse the data visualization work contained in these reports, it quickly became clear that the use of data visualization was very limited in the data set. The scope of the coding was therefore revised to include all visual features (encompassing all non-text elements such as photographs, tables, graphs, maps, etc.) in the body of the report. This broad coding allows for the analysis of data visualization in its broader context. The coding taxonomy was tailored to capture the characteristics of visual features in traditional human rights reporting as carried out by HRW and AI. It thus did not include the work of more specialized human rights organizations or even the most advanced visualization work of the organizations under examination, which is often not included in reports but is instead published as stand-alone web-based features. For example, AI's Eyes on Syria Project presents 'interactive evidence' of human rights violations such as torture and execution on geo-spatial maps alongside information about solidarity activities undertaken by Amnesty members in protesting against these abuses (Amnesty International, Eyes on Syria).

To provide context, researchers did examine a small subset of these more sophisticated visualizations produced by HRW and AI, as well as examining the visualizations produced by a small group of specialized organizations, including Physicians for Human Rights, the Center for Economic and Social Rights, Forensic Architecture, and SITU Studio. The findings from this auxiliary research are integrated into this article by way of context and examples. While AI and HRW are not representative of the whole sector, they are well resourced and are still the most well known organizations advancing international human rights worldwide. Their headquarters are based in the global North, where data visualization has become an increasingly familiar method of communication. As such, findings concerning these organizations can be expected to be enlightening for research on developments related to data visualization for human rights advocacy more broadly.

3.1.2 Semi-structured interviews with experts

To supplement the coding of human rights reports, the NYU Engineering–Law research team conducted semi-structured interviews with 18 experts working at the intersection of human rights and data, asking about their experience and opinions concerning the use of data visualization in the human rights field. The interviewees represent a broad range of experts extending beyond AI and HRW. The questions posed to these experts included the following: What trends have you observed in the use of data and data visualization in the human rights field? How do you/your organization use and/or create data visualizations? How do you/your organization evaluate your use of data visualization? Do you think data visualization is a persuasive tool for your target audience, and if so, why? Are there ways in which presenting data (e.g. through graphs or mapping) can have negative impacts on human rights advocacy?

3.2 Experimental studies of persuasion and deception in visualization

3.2.1 Experimental study of persuasive effect of visualization

One of the primary reasons that human rights organizations use visualization in their work is to persuade viewers. It is therefore important to investigate the dynamics behind

persuasive visualization for human rights. To understand the persuasive effect of data visualization, the NYU Engineering–Law research team undertook an experimental study into this issue (Pandey et al. 2015a). The research team built on persuasion research from psychology and user interfaces literature to explore the persuasive effects of visualization. This experimental user study defined the circumstances under which data visualization can make a message more persuasive, proposed hypotheses, and presented the results of quantitative and qualitative analyses on studies conducted to test these hypotheses. It compared visual treatments with data presented through bar charts and line charts, on the one hand, against treatments with data presented through tables on the other, and then evaluated their persuasiveness. It included several crowdsourced randomized controlled experiments that progressively refined methods for measuring the effect of visualization on persuasion.

3.2.2 Experimental study of deceptive effects of visualization

In a second experimental study (Pandey et al. 2015b), the NYU Engineering–Law research team examined the issue of deception—a phenomenon that could arise in human rights settings when advocates seek maximum impact without a full grasp of how visualization techniques may misrepresent the underlying data or mislead the viewer. This study began with an in-depth analysis of what deception means in the context of data visualization. The research team identified popular distortion techniques—including some found in human rights fact-finding reports in the data set described above—and the type of visualizations those distortions can be applied to, then examined why deception occurs with those distortions. This study involved the creation of a series of deceptive visualizations using selected distortion techniques and their deployment in a crowdsourced user study to assess the deceptiveness of those visualizations.

4. Results

This section first presents the results of the study on data visualization and other visual features in human rights advocacy, which drew on the coding of reports and interviews with experts. The section then summarizes the results of the two crowdsourced experiments as they relate to human rights advocacy.

4.1 Findings from study on data visualization in human rights advocacy

The data gathered through coding human rights reports and conducting interviews with experts in data and human rights points to several specific findings. First, while there was a limited expansion of data visualization by AI and HRW, the organizations increasingly used visual features in their human rights fact-finding reports from 2006 to 2010 and 2014, and there is increasing interest in using data visualization in the broader human rights field. Second, data visualization is being used with the intention of increasing the effectiveness of human rights advocacy. Third, specific data-related challenges present themselves in the human rights context and must be grappled with in designing guidelines for effective visualization.

4.1.1 Expansion of data visualization

The coding of visual features in the reports of AI and HRW and interviews with human rights experts suggests more frequent use of visual communication in advocacy reports in

recent years. The total number of visual features in the body of the reports almost tripled between 2006 and 2014: from 367 total features in 2006, it rose to 711 in 2010 and 988 in 2014. Looking at the average number of visual features per report, there was an increase from 2.5 visualizations per report in 2006, to 4.9 per report in 2010 and 6.3 per report in 2014 (see Fig. 1).

Between 2006 and 2010, there was an overall shift from shorter (20,000 words or fewer) to longer reports (20,001 – 40,000 words)—a development that could have contributed to the increase in the use of visual features during this period (see Fig. 2). However, this development was reversed again in 2014, with the majority of reports becoming shorter again (fewer than 20,000 words), while the number of visual features continued to increase

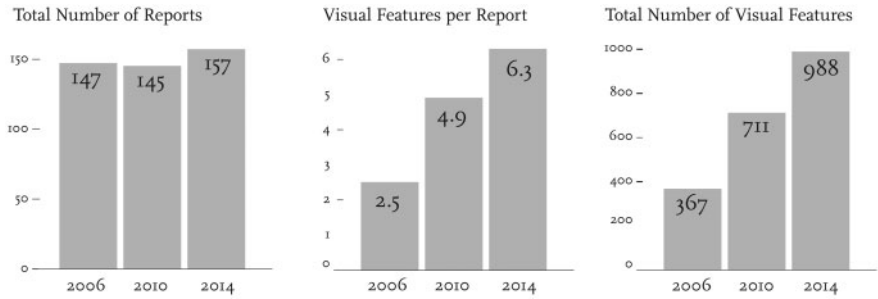

Figure 1. Total number of reports, visual features per report, and total number of visual features

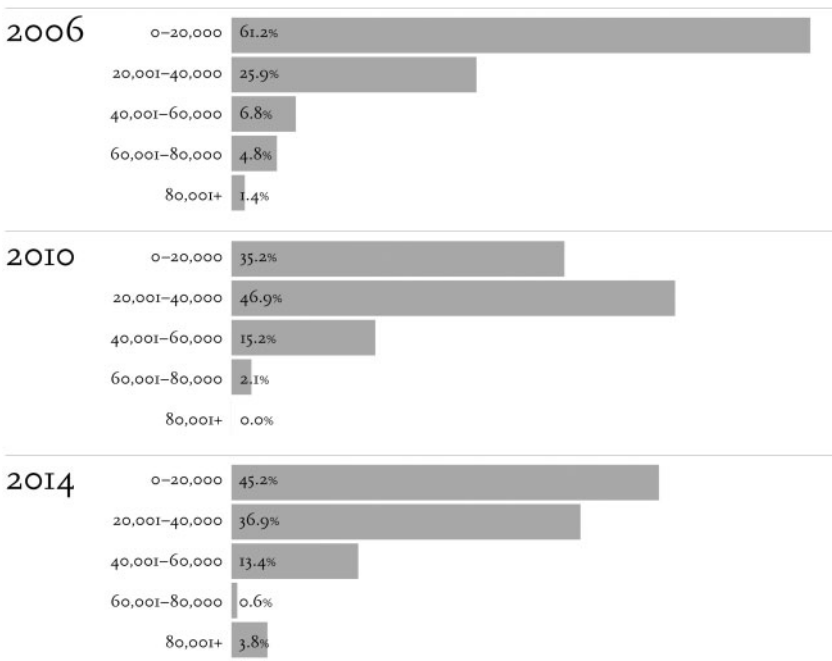

Figure 2. Percentage of reports by word count

further as compared to 2010. Thus, it seems that the increasing number of visualizations is not solely a function of the use of longer-format reports.

The vast majority of visual features found in these reports are photographs and not quantitative or spatial data visualizations. Although the way the 2000-era reports were saved electronically precluded the capture of most non-photo visual features, interviews with staff suggest that photos were the main—if not usually the only—non-textual features included in that era.[4] The primacy of photos remained during 2006, 2010, and 2014. Indeed, the number of photos represented in the reports dramatically increased from 259 in 2006 to 468 in 2010 and 741 in 2014 (see Fig. 3). In this context it is important to note that the photos in these human rights reports often served as an illustration of the observed human rights issues, but were not necessarily used as independent data or evidence. This is in contrast to specialized human rights organizations like Witness and social movements like Black Lives Matter, which increasingly use visual (photographic and video) evidence to document human rights abuses (Witness; Black Lives Matter).

Following photographs, the next largest groups of visual features identified in the human rights reports are tables and maps. The total number of tables and maps fluctuated between 2006 and 2014 (tables: 2006: 48; 2010: 82; 2014: 64; maps: 2006: 28; 2010: 87; 2014: 65). The use of satellite imagery also varied in absolute numbers: 20 satellite images in one report in 2006, nine images across four reports in 2010, and 61 images across 17 reports in 2014.

Taken as a whole, the 2006, 2010 and 2014 coding data suggests that use of photos and satellite images increased consistently year over year. The percentage of reports using tables in a given year almost doubled between 2006 and 2010, while the number of maps and other graphics (including charts, infographics, and drawings) tripled between 2006 and 2010. Between 2010 and 2014, the percentage of reports with maps, tables, and other graphics all declined slightly, but held close to the 2010 levels (see Fig. 4).

While the total number of photos in the reports increased over time, the portion of those features that were photos remained between 66 and 75 per cent, even including a drop in 2010 as compared to 2006 (see Fig. 5). While tables made up 13.1 per cent of the visual features in 2006, they made up 11.5 per cent in 2010 and 6.5 per cent in 2014. Maps made up between 6.6 and 12.2 per cent of the overall number of visual features during the three years under examination, with the lowest percentage in 2014. Satellite images were at 5.4 per cent in 2006, decrease to 1.3 per cent in 2010, and increased to 6.2 per cent in 2014.

A large portion of the maps in the coded reports contain geographical information only; maps were less frequently used as a format for the presentation of quantitative data (see Fig. 6).

Satellite imagery also showed regional trends: from 100 per cent Africa in 2006 to 54 per cent Middle East and 32.7 per cent Africa in 2014 (see Fig. 7).

The overall use of visual features presenting quantitative or geospatial data, including figures, tables with quantitative data, maps with quantitative data, and satellite images, all increased between 2006 and 2014. Both the number of reports using figures and charts as well as the number of reports using satellite imagery to display quantitative data showed a

4 Email communications and meeting notes with HRW and AI publications staff (emails from AI 23 June 2015 and 6 July 2015; meetings with HRW publication staff on 7 April 2015 and 18 March 2015; emails from HRW 3 April 2015, 9 June 2015, and 10 June 2015).

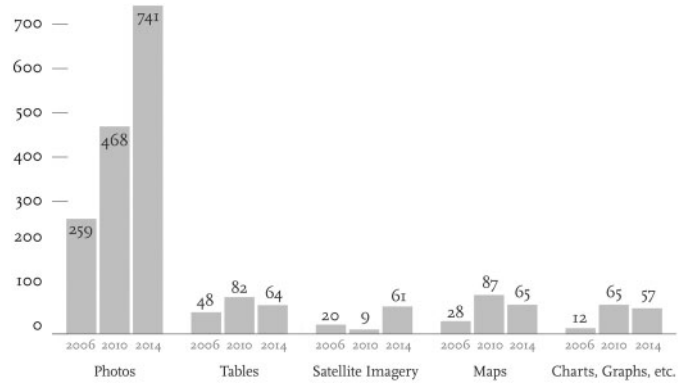

Figure 3. Number and type of visual features

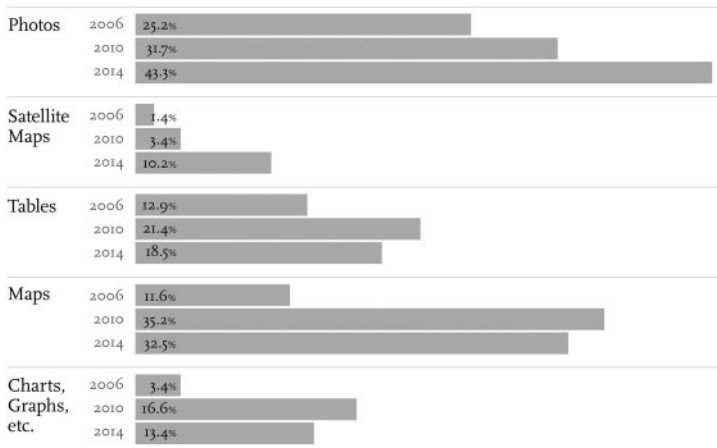

Figure 4. Percentage of reports with visual features

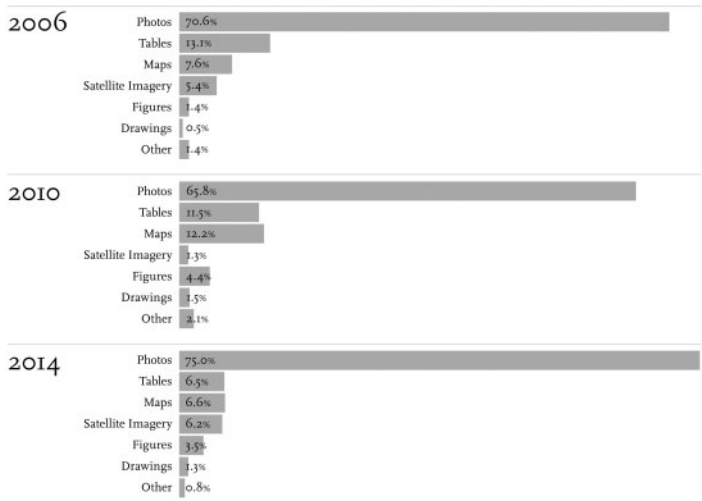

Figure 5. Visual features by percent

consistent year over year increase during the three years under investigation.[5] Reports with maps using quantitative data showed the most dramatic increase from one report in 2006 to 11 reports in 2010, while declining slightly to eight reports in 2014. Tables were the quantitative visual feature most frequently used in reports, increasing from 18 reports in 2006 to 26 reports in 2010 before dropping to 19 reports in 2014 (see Fig. 8 for a breakdown by percentage of reports).

While this may seem to suggest that in the same period when quantitative visualization was growing rapidly in other fields, it roughly plateaued in the human rights advocacy space, such a conclusion would be misleading. First, the 2010 data set had at least one report with a significantly larger number of each major type of visual feature; these outliers impacted this relatively small data set, inflating the 2010 numbers.[6] More importantly, any finding based on fact-finding reports should be tempered by looking more broadly at the two organizations' online content apart from reports. HRW and AI both host broad catalogues of photographs and video content that allow for narrative-style presentation of the organizations' findings in visual form.[7] HRW is known for its emotive photo essays, which convey the texture and depth of the experience of human rights violations. For example, the 2010 report 'Needless Pain: Government Failure to Provide Palliative Care for Children in Kenya' was accompanied by a haunting photo essay by photojournalist Brent Foster (Human Rights Watch 2010). AI is known for interactive online features that provide myriad ways for its members to turn its findings into action. Often this content is released alongside the organization's research reports. AI's interactive 'Eyes on' series, discussed above, integrates the findings of numerous reports and additional content in online satellite image-based platforms that allow the viewer to explore the data online. Many other online features are developed separately from specific research reports and encompass much larger efforts by the organization. Several examples will be discussed below.

Placing these findings in the broader context of human rights advocacy demonstrates that innovation in data visualization is indeed occurring in the human rights space—even within the context of the research report genre. A prominent example is a collaborative project examining the use of white phosphorus in urban environments by Forensic Architecture and SITU Studio. This project resulted in the simultaneous release of a static PDF report and an interactive online version entitled 'The Use of White Phosphorus Munitions in Urban Environments: An Effects-Based Analysis' (Forensic Architecture and SITU Studio 2012). The interactive report, which follows the broad structure of a

5 For the purpose of this study maps and satellite imagery are considered spatial representations. We distinguish between maps containing purely qualitative/geographical data (e.g. maps showing the names of the cities or places visited by researchers) and those displaying actual quantitative data (e.g. the number of refugees moving from one country in a given time frame).

6 For example, the HRW report 'Unjust and Unhealthy HIV, TB, and Abuse in Zambian Prisons' had 16 quantitative tables in 2010, double the second highest in 2010, HRW's 'Without Protection: How the Lebanese Justice System Fails Migrant Domestic Workers', which had eight quantitative tables. The AI report '"As if Hell Fell on Me": The Human Rights Crisis in Northwest Pakistan' had 13 figures in 2010, while the next highest was an HRW report which had five figures. HRW's '"I Want to Help My Own People": State Control and Civil Society in Burma after Cyclone Nargis', has seven quantitative maps. The next highest has two.

7 See HRW, Videos and Photos (https://www.hrw.org/video-photos); AI, Videos (https://www.amnesty.org/en/search/?resourceType=galleryarticle&resourceType=videoarticle).

Figure 6. Maps as a percent of total visual features

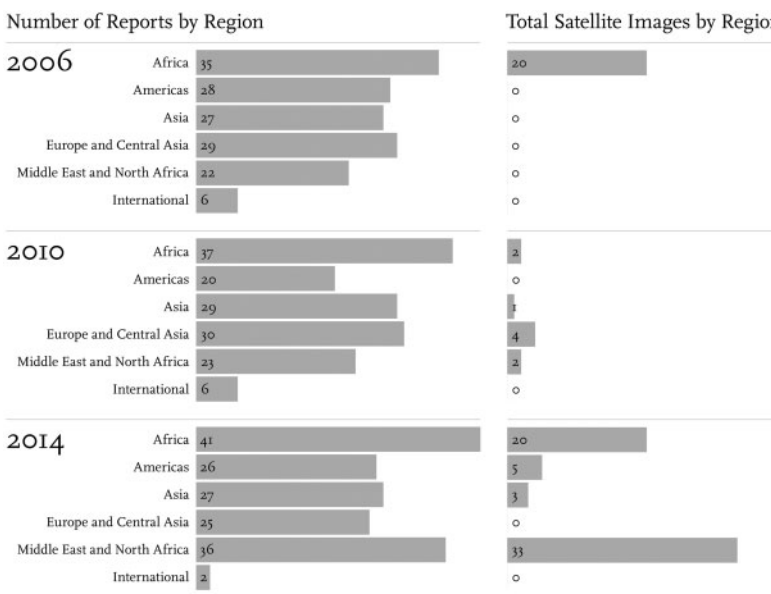

Figure 7. Number of reports by region, total satellite images by region

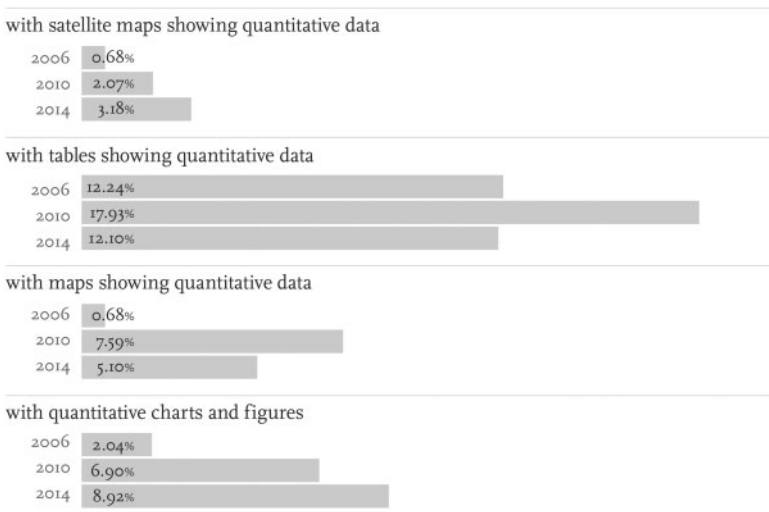

Figure 8. Percentage of reports with quantitative visual features

traditional human rights research report, also includes animations, videos, and other interactive features aimed at exploring and demonstrating the impact of this controversial munition (Forensic Architecture 2012).

While this kind of very sophisticated work is exceptional, data from key informant interviews suggests that human rights organizations across the spectrum are interested in increasing and improving their use of data visualization (interviews 3, 7, 11, 12, 13, 15, 18, 19). A programme coordinator at Tactical Tech notes:

> There's been quite a large change in frequency of organizations using visualization or wanting to. More and more human rights organizations globally are wanting to use [it]—from basic infographics to more complicated visualizations—in funding reports, organizational reports, in talking to the general public, media, and also as an outreach strategy. (Interview 13)

However, even major international human rights organizations such as HRW and AI do not have the necessary resources to do so at a significant scale, and information design and data visualization remain the expertise of a rather small group of very knowledgeable staff (interviews 3, 7, 11, 12, 13, 15, 18, 19). Enrique Piracés, founder of RightsLab, notes:

> When a report is about to be published—they will have the highest level of attention to every word ....They are very cautious about every word they are using. In relation to data—in general, I don't think it's the same level of attention. For example, these organizations wouldn't outsource the writing of a report, but they do this with visualization. (Interview 3)

An indicator pointing to a growing demand for data visualization in human rights advocacy is the existence of a technical support and training network. Experts from non-profit organizations such as Tactical Tech, the Human Rights Data Analysis Group (HRDAG), and Benetech specialize in providing technical support and training for human rights advocates interested in using data in their work (interviews 2, 3, 7, 13). As mentioned above, Tactical Tech, an organization that helps campaigners and activists more effectively use technology, has used and recommended visualization as an instrument of influence in activism. CESR, which works with national human rights institutions such as human rights commissions to build capacity to monitor economic and social rights, has co-published a handbook for such institutions with the Asia Pacific Forum (2015). This handbook contains a dedicated chapter presenting guidelines for the use of data visualization.

4.1.2 Data visualization is used to increase the effectiveness of human rights advocacy

Results of coding and data from expert interviews suggest that despite the somewhat limited take-up of data visualization by AI and HRW, it is nonetheless seen as a promising tool for human rights advocacy. While the coding results show that major human rights organizations use data visualizations relatively rarely as compared with their deployment of photographs, they do use such tools—in new areas of work as well as established ones. Several reports in the data set include visualizations presenting quantitative data about traditional human rights issues such as due process or physical integrity rights. For example, a 2010 AI report entitled '"As if Hell Fell on Me": The Human Rights Crisis in Northwest Pakistan' contains 13 charts and graphs presenting data about the number and timing of attacks on civilian and military targets, as well as statistics about drone strikes.[8] A fair number of

8 It should be noted that this report includes examples of (unintentionally) misleading graphics, and was drawn upon in designing the study discussed below.

	Lusaka Central	Mukobeko	Kamfinsa	Mumbwa	Mwembeshi	Choma	Overall (six prisons)
Average Age (years)	34	34	40	34	31	30	34
Prisoners to Reach Secondary or Higher Education (%)							
Males	79	86	85	79	70	79	81
Females	74	N/A	36	0	N/A	57	60
Zambian Nationals (%)	72	94	68	100	100	96	86
Married Prisoners (%)	41	47	53	69	70	56	53
Average Length of Time at Facility (months)							
Adults (19 years and older)	21	44	22	4	5	8	20
Males	27	44	27	4	5	8	22
Females	11	N/A	9	‹1	N/A	6	9
Juveniles (8-18 years)	17	18	4	8	N/A	2	11

Figure 9. Table of prisoner interviewee demographics from p.14 of the 2010 Human Rights Watch report, 'Unjust and Unhealthy: HIV, TB, and Abuse in Zambian Prisons'

visualizations found in the coded reports present quantitative data concerning newer areas of work, especially data concerning social, economic and cultural rights. For example, HRW's 2010 report 'Unjust and Unhealthy: HIV, TB, and Abuse in Zambian Prisons' contains more than a dozen tables presenting quantitative data concerning health rights such as access to TB and HIV testing and treatment, as well as data about due process rights like access to legal representation, demographics, and time in detention (see Fig. 9).

Also included in the data set are reports that present spatial analysis of human rights violations using satellite images. For example, the 2014 HRW report 'Razed to the Ground: Syria's Unlawful Neighborhood Demolitions in 2012–2013' presents analysis of 15 high-resolution commercial satellite images. Before and after images are shown, alongside colour-coded explanations of the destruction visible in the images.

A majority of the data experts interviewed explained the growing demand for and use of various types of data visualizations in human rights advocacy as an example of the common attempt to harness data for advocacy. Visualization is seen as a way of making data accessible and compelling (interviews 1, 2, 4, 8, 9, 11, 12, 13, 14, 15, 16), and thereby increasing the effectiveness of human rights advocacy efforts (interviews 2, 7, 8, 12, 13, 15). As Susan Wolfinbarger, Project Director of the Geospatial Technologies Project at AAAS, points out:

> Being able to figure out the best way to take a point that might be summarizing a huge amount of information and putting it into one small picture with a caption is really important considering how much media everyone is trying to absorb all the time. (Interview 12)

Experts emphasized the importance and prominence of new forms of visualization for human rights advocacy, and stressed the need for innovation in the display of quantitative and spatial data. Several experts described data visualization as an especially powerful tool, even a 'game changer' that allows advocates to lead their campaigns with seemingly irrefutable (often

quantitative, frequently scientific) evidence while still making the campaigns accessible and compelling to a broad audience (interviews 3, 4, 7, 13). Regarding her work with local groups in South America campaigning for government action, Emily Jacobi, Executive Director of Digital Democracy, notes: 'Testimonies weren't enough. There had to be visual evidence' (interview 8). This use of visual evidence is often linked to increasing use of quantitative data. As Jay Aronson, Director of the Center for Human Rights Science at Carnegie Mellon University, notes:

> Just coming in with a bunch of indigenous people and their stories doesn't necessarily persuade the court. You have to provide some data to back up your narrative claim .... When you put narratives in the context of how frequently they occurred, who were the perpetrators, how they perpetrated their crimes, this provides a stronger case for judges who need more than just a few stories to find someone guilty .... At the [International Criminal Court] they've had to beef up their evidence processes because they were criticized for not having adequate evidence and relying on testimony. So they really buffed up their data analytics. (Interview 16)

New and innovative forms of data visualization such as satellite imagery, interactive maps and infographics are seen as capable of crossing language and other barriers and often enable human rights organizations to make legible violations that were below the radar before (interviews 4, 7, 8, 9, 12, 13, 14). Many experts specifically emphasized the importance of the increasing use of maps and satellite imagery by human rights advocates (interviews 3, 4, 9, 12, 13, 14, 15, 18).[9] A few organizations play central roles in advancing particular capacities and techniques in this realm. For example, the Scientific Responsibility, Human Rights and Law Program of the American Association for the Advancement of Science has created a Geospatial Technologies Project that partners with human rights organizations to analyse human rights concerns that are amenable to spatial analysis. The AAAS provided the technical expertise behind AI's 'Eyes on' project, and has worked with numerous other organizations in a similar role (interviews 9, 12). This technical assistance is crucial, since professional geospatial expertise is rare among personnel at human rights organizations (interview 12).

Several experts pointed out that human rights organizations sometimes have staff with particular skills suitable to working with different kinds of human rights data. AI and HRW have numerous staff with doctoral degrees in public health or social science fields; this training is sometimes evident in their reports. For example, the report 'Unjust and Unhealthy: HIV, TB, and Abuse in Zambian Prisons', discussed above, was prepared by HRW's Health and Human Rights Division, which is led by epidemiologist Dr Joseph Amon. Specialist organizations often have staff with expertise beyond traditional human rights investigation. The Center for Economic and Social Rights has staff adept at analysing administrative and provider data using a human rights lens, and Physicians for Human Rights uses events-based data it collects itself or receives from medical-legal partners to analyse rights dynamics (interviews 4, 15). HRDAG and its Research Director Patrick Ball was cited by numerous experts as playing an important role in bringing statistical science to the human rights table (interviews 2, 3, 4, 6, 14, 16). For example, HRDAG has pioneered the use of multiple systems estimation, a method that can use the convenience samples of reported cases and other found data collected by human rights organizations to derive

9 For maps see also Kingston and Stam (2013).

scientifically valid estimates of volume and frequency for certain types of events, especially deaths (HRDAG 2013).

In addition to this general trend, human rights data specialists interviewed for this study identified a number of more specific reasons why data visualization has great potential for human rights advocacy. While some experts identified certain characteristics of visual features such as clarity or interaction as determinants for the effectiveness of a visualization (interviews 7, 12, 14), others suggested that the impact of a visualization depends on whether it is well designed for the specific audience (interviews 8, 11, 15). One expert underscored the ability of some forms of visual display—specifically satellite imagery—to transform a reader into a 'witness' (interview 12). Still others pointed out that visualized quantitative data lends human rights the stature of science (interviews 9, 20).

4.1.3 Specific data-related challenges arise in human rights advocacy contexts

Despite the potential benefits of using data visualization for human rights advocacy, experts also warned that the excitement about visualization can obscure the real challenges involved in using quantitative data for human rights advocacy. Several specific issues were identified by the experts. First, quantitative human rights data is often simply missing or non-existent. Second, there are significant quality and bias issues inherent in much quantitative data concerning human rights. Third, as a general matter, the field of human rights suffers from relatively low data literacy, leading to challenges in the analysis and presentation of quantitative data as well as its comprehension by target audiences.

There is more, better, and increasingly reliable data about some rights and some levels of obligation than there are about others.[10] For example, administrative and demographic data sets relevant to economic and social rights such as the right to water or health are generally more easily available than data sets related to violations like torture or disappearance, which tend to be secret and subject to public denial. However, even administrative and demographic data can present problems for a human rights analysis. For example, states lacking resources often rely on surveys conducted through the sponsorship of international agencies for demographic and health information about their own populations (Stuart et al. 2015: 24–5). Even when such data is collected, systematic biases may be inherent in questionnaires or sampling frames (which tend to undercount residents of informal settlements, for example, or to collect data at the household level, making disaggregation by gender impossible). According to the expert interviews, such data sets are often outdated, relevant variables are missing or lack nuance, or sample sizes are too small for meaningful disaggregation (interviews 2, 14, 15). Data related to criminal justice issues presents specific challenges as well. Law enforcement may have incentives to manipulate

10 Human rights range from economic and social rights such as the right to water, sanitation, food, and health, to civil and political rights such as the right to be free from arbitrary detention, torture, and unlawful killing. The legal obligations of states—and in some cases non-state actors—range from duties to refrain from committing violations, to affirmative obligations to protect individuals from the abusive acts of others, requirements that state officials not infringe on rights, and obligations for states to ensure the full enjoyment of rights. This broad substantive scope and range of duties means that data relating to a wide swathe of human endeavour is potentially relevant to human rights analysis.

data or data collection, for example to meet quotas (Eterno and Silverman 2012). Some marginalized groups and individuals such as Nepali communities in New York City (Adhikaar for Human Rights and Social Justice 2010), Roma communities in Central and Eastern Europe (Open Society Foundations 2013), and Kibera in Kenya (Blakemore 2016) have actively advocated for accurate representations in government data and official maps. However, when populations are stigmatized or criminalized, they may be excluded from data sets altogether (interview 6). Data can itself be collected in rights-violating ways, making organizations' reliance on it problematic (UN OHCHR 2012: 46–51).

At the other end of the spectrum, victims may be hidden from researchers, as with secret detention; data may be falsified, as with data concerning torture; or access to data may be restricted, as with government restrictions on satellite data in specific regions (interview 12). When data about secret government violations is available, it tends to be event-count data collected by human rights organizations based on reported cases. Such data sets are often rife with the sampling and reporting bias inherent when data is gathered in efforts to respond to the real needs of victims and not for analytical purposes (Price and Ball 2014). Extensive work has been undertaken to overcome these challenges, with some very promising results (Klingner and Silva 2013). Finally, some violations are extremely difficult to count or quantify, as with violations of human dignity (interview 14). The experts interviewed for this article stressed that these problems are persistent and important to address when designing and using data visualization techniques in the human rights realm.

A separate but perhaps equally important challenge is the low data literacy among both creators of, and audiences for, human rights data visualization. Statistical literacy remains lower than desired within the human rights advocacy world and there remains a lack of understanding of how both data and data visualization can be deployed most effectively to support human rights messages (interviews 2, 3, 11, 12, 15, 19). According to the expert interviews, these issues can have a major impact on the effective use of data visualization for the purposes of human rights advocacy. First, visualizations may be less effective than intended because human rights audiences may misread them (interviews 2, 4, 5, 6, 8, 14, 16, 20). For example, several experts pointed to maps as especially ripe for misinterpretation because of the assumptions viewers bring to such visualizations, combined with the limits of human rights data sets (interviews 2, 20). Patrick Ball, Research Director of HRDAG, explains:

> I think we have to be utterly responsible for the claims we make in public. There's no top end to how responsible we need to be. One of the things that's really clear to me is that the reason that the human rights community is taken at all seriously as much as we are is that we claim to speak the truth. We claim to be confronting the powers that be with the truth about the world. Well, if we're not speaking the truth, no one needs to pay any attention to us. The sloppiness of quantitative reasoning is an invitation to be dismissed by the world. (Interview 20)

Many data sets are convenience samples of reported cases. When these cases are placed on a map, inexperienced readers may assume that the lack of a reported case means that no human rights abuses exist on these 'blank spots' (interviews 2, 20). More generally, complex visualizations might obscure the reader's understanding of the information presented, especially when the audience does not have some basic knowledge about certain inherent limitations such as selection bias and data uncertainty (interviews 2, 20).

Another potential cause of a similar problem is that human rights practitioners can accidentally create visualizations that are distorted and therefore misleading. This is

particularly true as the programmatic staff in human rights organizations may lack data training and may therefore not be in a good position to produce or deploy accurate data visualizations (interviews 2, 3, 5, 12, 14, 15). Unlike many media outlets that have employed data scientists and designers and even created their own data visualization departments, only major human rights organizations have the in-house knowledge and resources to routinely create and incorporate effective visualizations (interviews 2, 3, 7, 11, 12, 13, 14, 15, 16, 18, 19). As Alix Dunn, Co-founder of the Engine Room, notes:

> The expectations are so high for organizations, so when they produce PDF reports with a big Excel pie chart in the middle of it, it seems disappointing. . . . Everyone is . . . failing at it miserably because not many people are good designers, crunch numbers, can tell stories around data—it's a new skill set. (Interview 19)

Many human rights visualizations are produced by outside consultants, detaching the research and communication process from each other. This results in a lack of systematic knowledge and research on the use of data visualization within the human rights movement. Little is known about the promises and pitfalls when visualizing human rights and it is often unclear whether the use of visualizations actually furthers the human rights advocacy goal. What are the factors that determine the effectiveness of visualizations for communicating advocacy messages? Are there specific types of visualization that are more persuasive than others? How does the design of a visualization impact the audience? What precautions are necessary to prevent the audience from being misled?

The following section will present findings from initial studies into these pressing questions, aimed at identifying factors that make communication about human rights through visualization informative and credible. Using randomized controlled experiments, the research team specifically (a) explored how certain visualization and personal attributes can lead to more or less credibility of message; and (b) investigated the extent to which people can interpret correctly the message of the data visualization and which visualization attributes can be misleading.

4.2 Findings from experiments concerning the effects of data visualization

4.2.1 Persuasive effect of visualizations

The interviews with human rights data experts suggest that data visualization is employed with the implicit or explicit assumption that graphical representation has a powerful persuasive effect on a target population. At the same time, numerous interviewees felt that human rights organizations often use strategies mismatched to the kind of data being presented or the story being told (interviews 2, 3, 12, 14, 15, 19). Visualization guides such as Tactical Tech's 'Visualising Information for Advocacy' and the CESR/Asia Pacific Forum guide for national human rights institutions advise the creator to always think about visualization from the perspective of the audience (Tactical Tech 2014: 13–14; CESR and Asia Pacific Forum 2015: 139–46). While this is certainly helpful, it is necessary to better understand how visualization impacts and influences people in order to choose the 'right' visualization for a specific audience or aim. In a study on the persuasiveness of data visualization, the NYU Engineering–Law research team investigated how certain visualization types and personal attributes of the reader can lead to greater or lesser message credibility.

For this study, several crowdsourced randomized controlled experiments were designed to test the hypothesis that graphical depiction of statistical information leads to increased persuasion when contrasted with non-graphical representation of the same

data. This hypothesis was an articulation of what the research team had identified as an implicit or explicit assumption of much of the existing data visualization work aimed at persuading an audience. This assumption is reflected in the current efforts of human rights organizations to increase the use of visualization in their advocacy as found in our interviews. In order to research this hypothesis, the team designed an experiment based on the measurement of attitude among study participants before and after the treatment. The study used topics that do not evoke extreme initial attitudes in the population and classified the participants according to their initial attitudes toward the topic ('prior polarization', classified as negatively/neutral/positively).[11] For neutral/weakly polarized viewers, that is, people who did not have a strong prior opinion on the issue, charts were more persuasive than tables. This measurement of attitude before and after the treatment confirms the hypothesis of the experiment by identifying a consistent trend that graphical information (data presented through charts) is more persuasive than textual information (data presented through tables) under certain conditions. Tables, on the other hand, seemed to outperform charts when the participants were negatively polarized, that is, had a strong initial attitude against the persuasive message. While the statistical significance could only be confirmed for the neutral/weakly polarized user findings,[12] the results clearly suggest that presentation type may have an effect on persuasion and that the effect may be modulated by initial attitude.

These results are extremely interesting when placed in the human rights context: the coding of reports found that mainstream human rights organizations are not following the general trend toward markedly more frequent use of sophisticated visualizations such as elaborate charts and infographics. Instead, these organizations are using more photos (2006: 259; 2010: 468; 2014: 741), while the number of simple graphs (2006: 12; 2010: 65; 2014: 57), satellite images (2006: 20; 2010: 9; 2014: 61), tables (2006: 48; 2010: 82; 2014: 64) fluctuate at low levels (see Fig. 3). While this approach may reflect an intuitive attempt to both convince their own supporters and persuade an audience that has reservations about human rights arguments, groups could use experimental findings to refine their strategic choices about using different types of charts and tables when targeting communications at different types of audiences.

4.2.2 Misleading effect of visualizations

A number of experts voiced their concern about the potentially misleading or confounding quality of some data visualization techniques used in human rights settings (interviews 2, 6, 14, 20). Some of these techniques were in fact located in the coding of HRW and AI reports (see examples in Figs 10 and 11).[13]

11 The selection of topics and participants is based on Hoeken's finding that '[i]t is much more difficult to change an existing belief than to form a new belief' (Hoeken 2001: 428). Visualizations are unlikely to change people's opinion if they are based on polarizing topics that evoke very strong negative or positive attitude or beliefs. Polarizing topics or participants with strong pre-existing opinions are therefore not suitable for testing persuasion.

12 Probably due to the smaller number of polarized participants, only one out of three topics presents statistically significant effects of presentation type on likelihood for this group. When the three topics were aggregated, however, the study did find a statistically significant effect.

13 For example, the 2010 AI report entitled '"As If Hell Fell on Me": The Human Rights Crisis in Northwest Pakistan', discussed above, contains examples of (unintentionally) misleading graphics, and was drawn upon in designing this study.

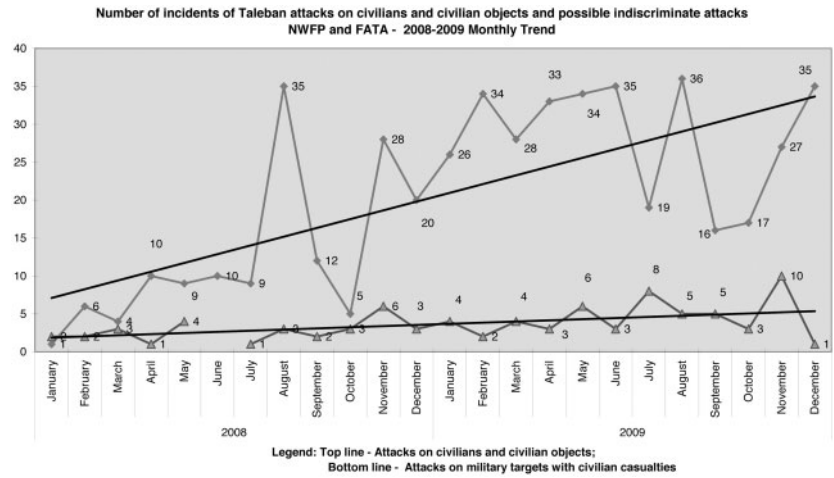

Figure 10. Table from p.12 of the 2010 Amnesty International report, '"As if Hell Fell on Me": The Human Rights Crisis in Northwest Pakistan'. The regression line is drawn to show that the number of incidents of Taleban [sic] attack have consistently increased over time, disregarding the missing data as well as high variance in the number of incidents

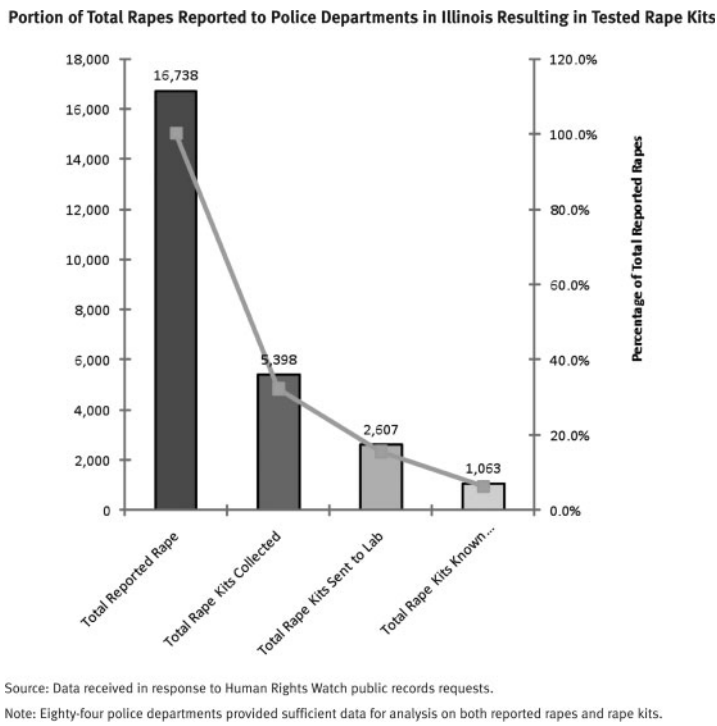

Figure 11. Table from p.12 of the 2010 Human Rights Watch report, '"I Used to Think the Law Would Protect Me": Illinois's Failure to Test Rape Kits'. The chart uses two different quantities and scales on the Y-axis (left and right). The chart suffers from two important issues: a) There is no label provided for the left Y-axis, and b) The values on the point-line chart should not be mapped to bars' heights

While manipulation of the facts and/or deception of the reader will usually not be intentional in the human rights realm, accidentally misleading visualizations can have a similar effect. The research team conducted a series of user studies to propose, test and establish the hypothesis that visual distortions can have an effect on the audience's interpretation of the visualization message and to determine how severe the different distortion techniques are in terms of deceiving the user. After having identified popular distortion techniques—including some used in human rights advocacy materials—and the type of visualizations those distortions can be applied to, the research team examined when deception occurs with those distortions. Several of these techniques, such as changing the aspect ratio on the axis, could result from lack of experience or knowledge in the creator and are therefore relevant to the human rights context. In order to test participants' response to the distortion techniques a number of simple visualizations were created, each of them applying one of the distortion techniques such as truncated axis or misrepresentation of quantity in an area. The visualizations were created from synthetic data based on real-life human rights issues (see Figs 12 – 15).

The study results suggest that participants who were presented with a deceptive visualization which intentionally exaggerated the message to be drawn from the data did perceive the underlying message in its exaggerated form at a statistically significant rate. Similarly, participants who were presented with a visualization that suggested a reversal of the message to be drawn from the underlying data were deceived at a very high rate.

These types of distorted visualizations can easily lead to a situation where the intended message of the visualization is misunderstood or lost. This scenario doesn't seem unlikely for the human rights realm where both creators and audience may have relatively low data literacy. Human rights advocates want to persuade, and will set out to find the most persuasive data visualization techniques. However, some techniques can be 'too' persuasive because they verge into being misleading. For example, when a human rights advocate uses a graph with a changed aspect ratio on the axis, this might support the overall advocacy message. But there is always a risk that the distorted visualization might deceive its audience, possibly without the intention and knowledge of the creator. While the study design limits these findings to a narrow set of design choices and possible reactions of the audience, further research revealing a fuller picture of misleading effects in data visualization could benefit the human rights community.

5. The way forward

Human rights experts interviewed for this study explained that their insights were mainly informal observations and speculations and that there is little systematized knowledge in the human rights community about core questions, including the effects of data visualization on key audiences, the extent and possible solutions to data literacy issues in this field, and how to handle common problems inherent in human rights data. Numerous experts explicitly called for more research into the kinds of questions set out in this article (interviews 1, 5, 6, 7, 13, 14, 15, 18).

While the data and visualization work of human rights advocates is becoming more sophisticated, innovations are being introduced unevenly, and advocates admit that choices about approaches and techniques are largely based on anecdotal evidence about what seems to work best with a given audience. While intuition-based work provides a practical solution for pressing human rights advocacy needs, what is missing is more rigorous research to identify techniques and guidelines that deal with the complexities of human rights reporting

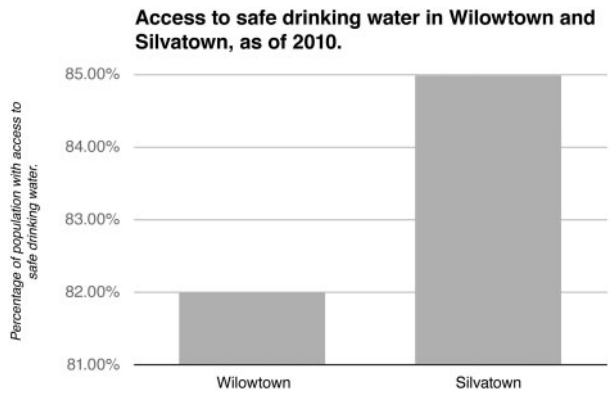

Figure 12. Truncated axis: the chart shows the percentage of population with access to safe drinking water in two towns, Wilowtown and Silvatown, as of the year 2010. The Y-axis is truncated, i.e. it starts from 80% instead of 0%, hence, exaggerating the comparison. Source: Pandey et al. 2015b

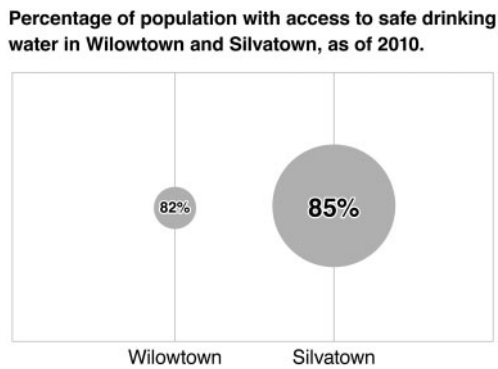

Figure 13. Area as quantity: the chart shows the percentage of population with access to safe drinking water in two towns, Wilowtown and Silvatown, as of the year 2010. Here, the quantitative information is not directly mapped to the area of the bubbles, hence, exaggerating the comparison. Source: Pandey et al. 2015b

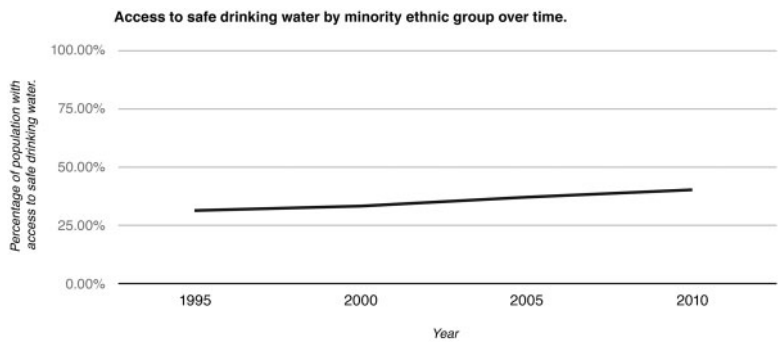

Figure 14. Aspect ratio: the chart shows the percentage of minority ethnic group population with access to safe drinking water in Silvatown over time. The aspect ratio of the chart has been distorted by stretching the X-axis. Here, the effect of improvement has been understated. Source: Pandey et al. 2015b

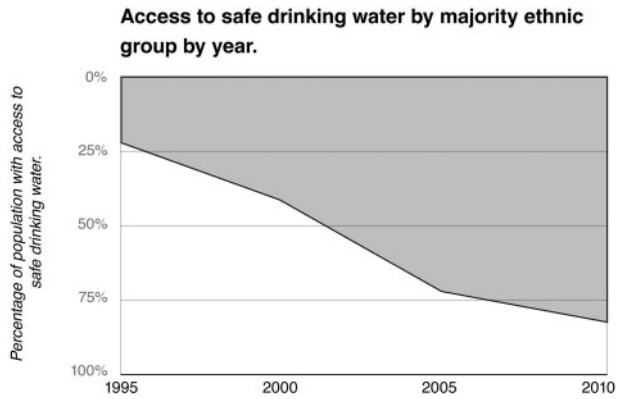

Figure 15. Inverted axis: the chart shows the percentage of majority ethnic group population with access to safe drinking water in Silvatown by time. Here, the Y-axis has been inverted, hence, creating an illusion that the access to safe drinking water has declined. Source: Pandey et al. 2015b

and advocacy. Experts and advocates themselves indicate that they are interested in improving their work through research-supported guidance on how to use visualization to make their messages more persuasive and to limit counterproductive effects.

To close this gap, the NYU Engineering–Law research team has embarked on a multi-year project to combine rigorous investigation into the complex questions at work in this space with an iterative process in partnership with human rights experts and organizations to design practical guidance for advancing evidence-based data visualization for human rights advocacy. In future work, this collaborative project will work with advocates to map the field more comprehensively, analyse the design space for human rights advocacy visualization, test innovations through user experiments, and offer evidence-based recommendations for improvements. Future research may also address how human rights organizations can advance the data literacy of their staff, institutionally promote the use of data visualization, and identify and mitigate potential risks.

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Conflict of Interest

The authors do not declare any conflicts of interest. However, they disclose that Katharina Rall serves simultaneously as Research Fellow with NYU School of Law and Researcher at Human Rights Watch. Her work on this article was conducted through her NYU Fellowship; this article was not written for HRW and does not reflect HRW's views.

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