**Seeing Suicide: A Historical Review and Current Practices of Data Visualization and Suicide**

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Suicide is a leading cause of death globally and a profound public health concern, with rates of suicide continually on the rise (Bould et al., 2019; Naghavi et al., 2019). As suicide rates increase, the need to better understand patterns, risk factors, and methods of prevention has never been more urgent. One particularly powerful tool in the effort to understand and address suicide has been data visualization. Throughout history, visual representations of suicide data have played a pivotal role in shaping public perception, guiding policy, and informing clinical practice. To best understand how to use data visualization today in this effort, it is critical to understand how it has developed throughout history. This paper will discuss the historical development of suicide visualization, from early statistical tables to modern neuroimaging. It will also explore how visual communication strategies have evolved, and how they can be designed more thoughtfully in the future to both inform and protect vulnerable populations.

**Historical Context – The 1800s**

One of the earliest attempts to systematically quantify and compare suicide rates was undertaken by French lawyer and statistician André-Michel Guerry (Friendly, 2008; Guerry, 1833). Drawing on official records from Paris between 1974 and 1832, Guerry compiled extensive data on suicide occurrences, including information about methods, demographics, and seasonal trends. A particularly innovative aspect of his work involved the classification of suicide notes by apparent motive, which is considered one of the first examples of content analysis in the social sciences (Friendly, 2008). Guerry also visualized regional suicide rates across France using shaded maps, which are now recognized as some of the earliest choropleth maps in history. These maps revealed striking geographic patterns in suicide and laid the groundwork for spatial and comparative visualizations that would later be built upon by others, including Émile Durkheim, who is often mistakenly credited for these early innovations in visualization.

A table with numbers and text

Description automatically generated Durkehim expanded on Guerry’s work and was instrumental in shifting the focus of suicide research from individualistic explanation to broader societal influences. One of his most influential works, *Suicide: A Study in Sociology* (1987), employed extensive tables and comparative methods to explore how social integration influenced suicide. Prior to Guerry and Durkehim, suicide was viewed as a highly individual and personal phenomenon. Durkheim used official government suicide statistics from across Europe to argue that suicide can be explained through social structures. In doing so, he introduced a sociological framework that transformed the way suicide was conceptualized. He analyzed suicide rates by various demographic and social variables, such as country of birth, social class, religion, relationship status, highlighting the influence of broader societal conditions. The table to the right, translated and adapted from *Suicide*, illustrates his method of organizing motives for suicide across sex and time periods. These early tabular structures allowed Durkheim to surface patterns in the data that would otherwise remain invisible.

A map of suicides and alcoholism

Description automatically generatedWhile Durkheim did not produce maps himself, the way he structured and compared data across regions was inherently spatial. Later scholars adapted his tables into visual maps of suicide rates. For example, the maps shown below are a transformation of his work on suicide and alcoholism across regions in France, with darker areas representing higher rates. These visualizations reflect how Durkheim’s foundational data work continues to inform we visualize suicide.

**Historical Context – The 20th Century**

A graph with lines and numbers

Description automatically generatedA graph of different age groups

Description automatically generated with medium confidence Following Guerry and Durkheim’s foundational work, the 20th century marked a shift in how suicide data was collected, interpreted and shared. Suicide began to be understood not only as a sociological phenomenon, but as a critical public health issue. As such, research methods, and accordingly, methods of how we visualize suicide, continued to expand. For example, researchers began using line graphs to visualize suicide statistics, facilitating easier interpretation of trends over time. Bar graphs also became popular during this time, which were essential for visualizing differences in suicide rates between groups. Dublin and Bunzel’s 1933 publication, *To Be or Not to Be: A study of Suicide,* exemplified this approach through their use of both bar and line graphs to depict suicide trends across various demographics and time periods. Dublin and Bunzel (1933)’s work was pivotal in how researchers communicated information around suicide. While the topic of suicide was becoming increasingly discussed in the literature (e.g., Kern, 1953; Oliven, 1954), almost all publications were text only. These visualizations not only made the data more accessible to policymakers and the public, but also underscored the multifaceted nature of suicide as a social and health-related phenomenon. Below are samples of graphs included in their work.

*To Be or Not to Be* was incredibly influential in shaping our understanding of suicide as a public health concern, and shifted the conversation from merely the prevalence of suicide to changes society can make. Notably, Dublin and Bunzel were not scientists or suicidologists, they worked for a life insurance company. Initially, they believed it essential to publish this book to reduce the cost of suicide to insurance companies. With this concrete goal in mind, they were able to make suggestions on what needs to be done to reduce the rate of suicides. In particular, they point out the unjust nature of the economic order and use statistics and visualizations to emphasize that as long as wealth is unequally divided and unemployment is widespread, the suicide rate will continue to increase. Moreover, their work emphasized psychological factors that underlie suicide and the importance of mental hygiene (Johannsen, 1935). Through their use of line graphs, they were able to objectively indicate the projected rates of suicides and did so in a language that is understood by all (e.g., the economy), not just those with a concern for public health.

A blurry image of a person

Description automatically generated With suicide now viewed as a public health concerns and novel ways to visualize suicide to the public available, various media outlets began publishing data on suicide. For example, in 1933, *The New Yorker* published an article by James Thunder, a cartoonist, writer, and journalist entitled *Behind the Statistics.* In this article, Thunder critiqued using statistical approach to understanding complex human behaviours, such as suicide. In this way, he created a narrative behind the person struggling with suicidology, and used cartoons, rather than graphs to communicate his message. Rather than viewing his work as a contrast to the graphical representations of suicide, it can be seen as a compliment, through using visualizations and stories that reach those who may not understand or be moved by graphs and statistics. However, his early visualizations (as seen to the right) were rather devoid of meaning and relation to suicide.

A graph showing the number of deaths

Description automatically generated Thunder was amongst one of the first that published articles about suicide that reached a broader audience, as these articles were often retracted from the public eye (Witte & Stettner, 2015). Nevertheless, by the mid-20th century, suicide data was increasingly visualized for public consumption. Magazines such as *Life* and *Time* reportedly featured graphs tracking suicide trends, often highlighting demographic shifts post-WWII (Schulten, 2012). These visualizations, though not always accessible in full today, reflect a broader movement in which suicide was framed as a pressing public health issue using the persuasive power of graphics. Examples of articles on suicide became more readily available in the 1990s. For example, Johnson Publishing Company published an article in 1996 on suicide deaths among black males, utilizing images, numerical labels, and captions to illustrate the rise in suicide deaths over time (e.g., bar graph below).

**Modern Ways of Visualizing Suicide**

While tables and graphs (e.g., line and bar) are still used today, advances in science and technology have led to novel and diverse ways to visualize suicide. For example, advances in neuroscience have significantly enhanced our ability to understand and visualize suicide risk. Neuroimaging research has revealed underlying neurobiological abnormalities associated with suicidal behavior, which may improve risk prediction and inform treatment options (Carballo et al., 2013). Through technologies like functional magnetic resonance imaging (fMRI), researchers can visualize brain regions implicated in suicidality, offering insights that were previously unattainable. For instance, fMRI studies have identified alterations in the prefrontal cortex and amygdala, regions associated with emotional regulation and impulse control, during suicidal ideation (Dobbertin et al., 2023). These visualizations, as seen in the figure below, offer a window into the neurological underpinnings of suicide and may contribute to future biomarkers for early interventions.

A close-up of a brain

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A graph of different colored lines

Description automatically generated Alongside developments in neuroscience, the rise in predictive data mining (e.g., using data analysis techniques, including machine learning and statistical models, to discover parents and make predictions about future outcomes) has opened new possibilities for identifying individuals at risk of suicide. By analyzing large scale datasets, such as electronic health records, social media activity, and population health databases, researchers can uncover subtle patterns and risk factors that go unnoticed in traditional clinical settings (Walsh et al., 2018). For example, Walsh et al., 2018 used data from 3250 individuals who attempted suicide and developed machine learning algorithms that accurately predicted future suicide attempts based on various predictors (e.g., demographic data, diagnoses, past health care utilizations, socio-economic status, and medication data). The figure to the right summarizes the importance of the top 50 predictors for suicide across time points, with larger points indicated greater importance. These types of data visualizations are critical in being better able to understand how suicide risk shifts over time, ultimately helping us better understand who may be most at risk of suicide and when.

While data mining and machine learning approaches to geographical data are useful, they have limitations in their ability to detect anomalies in the data (Department of Health, 2022). A data dashboard, on the other hand, presents analytical outputs through visualizations such as pie charts, time series graphs, and maps, enabling the user to understand the relationship between the spatial and temporal dimensions of an event (Benson et al., 2022). Dashboards can facilitate cluster detection, risk profiling, and trend observation, and they provide a means to share critical information with researchers and stakeholders. Benson et al. (2022) used retrospective suicide mortality data to create and validate a dashboard prototype that delivers predictive analytics for suicide mortality data in a user-friendly format. The results of their study suggest that the prototype is a feasible and practical tool for proactive suicide intervention and real-world application. The figures below are examples of visualizations that would be in the dashboard-style interface. While they are static, highlighting a limitation to sharing data visualization knowledge through article publications, the interface itself would provide significantly more nuanced information. For example, while the image below is a static geographical map, in the dashboard users would be able to zoom into specific regions, hover over clusters to find detailed information (e.g., number of cases, gender/age breakdown, as seen in the pie charts to the left), and view color gradients that show intensity/rate over time.

*A map with different colored circles

Description automatically generatedA pie chart with numbers and a graph

Description automatically generated with medium confidenceA screenshot of a graph

Description automatically generated*

Not only is the proposed dashboard prototype valuable for facilitating data-sharing between researchers, but it also provides a user-friendly interface that is accessible to the general population. This accessibility is critical, as one of the key elements of suicide prevention is raising awareness and disseminating knowledge (Hoven et al., 2009). Often, individuals experiencing suicidal ideation suffer in silence, either due to stigma or lack of awareness about available supports (Goldblatt & Ronningstam, 2023). In this context, data visualization becomes a powerful tool for both dissemination crucial information about suicide and combatting stigma.

Historically, media figures like Thunder (1933) and others have contributed to raising awareness by publishing articles that highlighted suicide rates and potential causes. While this was an important step in sharing knowledge, the focus in earlier years was primarily on identifying the existence of the issue and understanding the reasons behind it. In contrast, contemporary infographics, such as those developed by the National Institutes of Health, the American Foundation for Suicide Prevention (AFSP), the Centre for Disease Control and Prevention (CDC), and the World health Organization (WHO), are more likely to combine data with emotionally resonant messaging (e.g., “You are not alone”) and actionable advice, such as hotline numbers or information regarding risk. Organizations such as AFSP are now also creating visualizations that are designed to be easily shareable on social media platforms such as Instagram (e.g., “social sharables;” <https://afsp.org/social-shareables/>). These types of visualizations are easily understood by the general population, making them particularly effective tools for reducing stigma and promoting help-seeking behaviours amongst individuals struggling with suicidal ideation (Kutcher et al., 2016; Wei et al., 2013). Unfortunately, research on the effectiveness of visual aids such as posters and infographics in suicide campaigns is scarce A blue telephone and pink hearts on a green background

Description automatically generatedand a critical direction for future research.

A hand holding a phone

Description automatically generated

Given the broad reach of suicide-related visualizations, it is essential to carefully consider how to use visuals safely and appropriately in suicide prevention campaigns. Some studies have begun exploring how to ensure we create safe and effective suicide prevention media messages. Results suggested that visual messages should validate or reflect the target group’s issues and needs and promote help-seeking behaviours (Ftanou et al., 2018). Moreover, it is important to keep in mind that while some visualizations and messages may have a positive impact for some audiences, they may have a negative impact for others. For example, messages designed for peers and family about being supportive and identifying warning signs of suicide may leave those who have lost a loved one to suicide feeling isolated and guilty (Ftanou et al., 2018). Thus, as with all visualizations, it is critical to consider *who* the target audience is.

The CDC has also outlined best practices for developing appropriate and compelling messages for suicide prevention. Similar to Ftanou et al. (2018), they emphasize the importance of the message itself that is being communicated by the visualizations. Messages should emphasize that suicide is preventable and tell stories of hope, resilience and survivorship. It is also essential to appropriately use language that helps to destigmatize suicide. For example, using phrases such as “die by suicide” instead of “committed suicide.” To help build a safe suicide prevention campaign, the CDC suggests the following:

* Select compelling images that evoke empathy, hope, or support to help engage viewers
* Carefully consider the colour palate (e.g., avoid colours that denote death or have specific negative cultural interpretations)
* Choose formats that will be most effective for the target audience (e.g., animated gifs, static images, billboards, etc.)
* Avoid photographs of specific suicide locations or images that depict a suicide act or means and imagery that implies a person is in pain.
* Adhere to accessibility best practices, such as alt text for images, readable font sizes, and distinguishable colours and colour combinations (Centre for Disease Control and Prevention, n.d.).

**Summary and Next Steps**

Overall, data visualization has played a critical role in understanding, preventing, and raising awareness around suicide since the early 1800s. Early pioneers such as Guerry and Durkheim used tables to categorize suicide rates across variables like gender, socioeconomic status, geographic location, and marital status. Their work was instrumental in shifting perceptions of suicide from an individual phenomenon to a social and societal issue. Inspired by their contributions, others expanded suicide visualization through maps, bar graphs, and line graphs, offering increasingly nuanced insights into suicide patterns.

Today, methods of visualizing suicide have evolved dramatically. Researchers, policymakers, and healthcare professionals now leverage technologies such as neuroimaging, predictive data mining, and interactive dashboards to understand suicidality at deeper levels. It is critical that researchers continue to consider how to best visually represent the increasingly complex suicide data and ensure that articles include these visualizations.

The rise of social media platforms has further broadened the reach of suicide-related information; whereas suicide was once sensationalized primarily in tabloids, save for rare exceptions like Thunder, it is now commonly addressed through public-facing infographics and educational posters. While these advancements have been pivotal in reducing stigma and promoting awareness, the broader dissemination of suicide-related visuals demands greater caution and ethical consideration. Future research must focus on identifying best practices for designing effective and sensitive suicide visualizations tailored to diverse audiences, to continue enhancing suicide prevention efforts.

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