



Invisible Inequalities:

Uncovering Gender-Based Data Bias

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“Representation of the world, like the world itself, is the work of men; they describe it from their point of view, which they confuse with the absolute truth.”

Simone de Beauvoir

Introduction

Gender-based data bias is a pervasive problem that affects our understanding and ability to address issues of gender inequality. Gender-based data bias occurs when women or gender minorities are systematically excluded or underrepresented in datasets, leading to inaccurate or incomplete knowledge about their experiences and needs. This bias can take many forms, including inadequate data collection methods, biased data analysis, and biased data interpretation (Kozłowski et al., 2020).

International Women's Day is a time to reflect on progress towards gender equality and to address the ongoing challenges that women face. One of the key challenges is gender-based data bias, which refers to how data collection, analysis, and interpretation can perpetuate or amplify gender-based inequalities. This bias can have serious consequences for women's health, economic opportunities, accessing education, and social status, and can limit our understanding of the experiences and needs of women across diverse contexts.

This discussion paper explores gender-based data bias from multiple perspectives, including healthcare, workplace, education, public participation, and disability/accessibility. We will examine how gender-based data bias manifests in different contexts and intersects with other forms of bias and discrimination. Some of the key questions we consider include the following:

- What are the consequences of gender-based data bias, and how does it perpetuate gender inequalities?

- How does gender-based data bias manifest in different sectors, such as healthcare and business, and what are the specific consequences of this bias?

- How do other forms of bias and discrimination, such as racism and ableism, intersect with gender-based data bias, and what are the consequences for individuals who belong to multiple marginalised groups?

- What are some strategies for addressing gender-based data bias and creating more inclusive and equitable data practices?

To address these questions, we will draw on various academic sources, including studies on gender-based data bias in healthcare, business, education, public participation, and disability/accessibility, as well as broader discussions of intersectionality and social justice. Through this exploration, we hope to shed light on how gender-based data bias perpetuates and reinforces gender inequalities and to identify strategies for creating more equitable and inclusive data practices that promote gender equality. Therefore, it is essential to examine the extent and consequences of gender-based data bias and to explore potential solutions to this issue. This discussion paper will also review the current state of knowledge on gender-based data bias, its consequences for gender equality, and potential solutions, including the need for improved data collection methods, greater diversity in data analysis teams, and increased transparency in data reporting.

Background and definition

Gender-based data bias refers to the systematic distortion or inaccuracy in data collection, analysis, and reporting that result from a failure to recognise and account for the differences between genders (World Health Organisation, 2019). This bias can occur in various fields, such as health, education, business, the public sphere, and disability and accessibility, and can lead to negative consequences such as limited access to resources, discriminatory policies and practices, and reduced quality of services for specific gender groups.

Gender-based data bias is a long-standing issue overlooked in data collection and analysis practices. For many years, women and gender minorities have been underrepresented in research studies, surveys, and other forms of data collection, resulting in a lack of understanding of their experiences and needs. This gap has perpetuated gender inequality and resulted in policies, programs, and services that fail to address the needs of women and gender minorities (Beaman et al., 2019).

Despite increased attention to gender-based data bias in recent years, it remains a pervasive problem in many areas of research and policymaking. For example, women are consistently underrepresented in clinical trials, accounting for only 39% of participants in phase III trials for cardiovascular disease, despite accounting for nearly half of all cardiovascular disease cases (Vahidy et al., 2018). This underrepresentation

has resulted in a lack of understanding of the impact of drugs and treatments on women's health, potentially leading to harmful health outcomes.

Similarly, gender-based data bias in economics has resulted in policies that fail to address the needs of women, hindering their economic participation and perpetuating gender inequality (Aguirre et al., 2019). Women are often paid less than men for the same work, and women's work is frequently undervalued and under-compensated (Manduca et al., 2021). This prejudice has resulted in a persistent gender pay gap and a lack of diversity in leadership positions. The COVID-19 pandemic has further highlighted the consequences of gender-based data bias. Women have been disproportionately affected by the pandemic, both in terms of health outcomes and economic impact (Wenham et al., 2019). However, early data on COVID-19 did not account for gender differences, leading to inadequate policy responses that failed to address the specific needs of women and gender minorities.

Therefore, it is essential to address gender-based data bias and to ensure that data collection, analysis, and interpretation practices are inclusive and representative. This step requires a concerted effort to address the systemic barriers that lead to the underrepresentation of women and gender minorities in research and data collection and to ensure that gender is considered in all aspects of data analysis and interpretation.

Intersectionality of Gender-Based Data Bias

Gender-based data bias does not exist in a vacuum, and it is important to consider how it intersects with other forms of bias, such as race, ethnicity, and socioeconomic status. Intersectionality is the recognition that individuals have multiple identities that intersect and overlap, leading to unique experiences of oppression and marginalisation. Intersectionality is important when addressing gender-based data bias because it highlights how gender intersects with other identities, such as race, ethnicity, and socioeconomic status, to create unique experiences of bias and discrimination.

For example, in the case of menstrual health management, black women in the United States are more likely to experience menstrual symptoms and have difficulty accessing menstrual products due to factors such as poverty and discrimination (West et al., 2018). This intersectionality highlights the need to address not only gender-based data bias but also how other forms of bias can exacerbate gender inequalities. Another example can include women of colour in the United States are more likely to experience maternal mortality than white women (Howell et al., 2018). This

disparity is partly due to racial bias in the healthcare system, which can lead to delayed or inadequate care. Women of colour are also more likely to experience bias in the workplace, such as being passed over for promotions or experiencing harassment (Smith, 2016).

Studies have shown that individuals who experience multiple forms of marginalisation may be especially vulnerable to bias in healthcare settings (Eckstrand et al., 2017). For instance, transgender people of colour often face significant barriers to accessing healthcare, including discrimination, lack of insurance coverage, and lack of provider knowledge and sensitivity (James et al., 2016). This lack of access to appropriate healthcare can lead to serious health consequences,

such as increased rates of HIV and other sexually transmitted infections.

Moreover, a study by Wong et al. (2019) found that Asian American women may be more likely to experience bias in the workplace than other groups, as they are often stereotyped as submissive and lacking in leadership skills. This stereotype can result in Asian American women being overlooked for promotions and leadership positions, even when highly qualified.

To address gender-based data bias, it is important to recognise and address how it intersects with other forms of bias. This effort requires a comprehensive approach that considers the complex and intersectional nature of oppression and marginalisation.

Healthcare

Gender-based data bias is a significant issue in medical research and practice, leading to a lack of understanding of the unique health needs and experiences of women and gender minorities. Historically, medical research has focused on men and male animals, leading to a lack of data on the impact of sex and gender on health outcomes and treatments (Garcia et al., 2021). This discrepancy has resulted in healthcare interventions that are often based on a "one size fits all" approach, which may not be effective or safe for women and gender minorities.

Examples of gender-based data bias in the medical sector include the underrepresentation of women in clinical trials and the lack of consideration of gender differences in diagnosing and treating diseases. For instance, women are often excluded from clinical trials, particularly during their reproductive years, due to concerns about the safety of drugs and treatments for pregnant women and their fetuses (Pregenzer-Wenzler et al., 2021). However, this exclusion has led to a significant gap in our understanding of how medications and treatments affect women. For example, a study published in the journal *Nature* found that women are more likely to experience adverse reactions to medications than men but are less likely to be included in clinical trials (Powers et al., 2017).

Additionally, gender-based data bias has led to a lack of understanding of the differences in disease presentation and outcomes between men and women. For example, heart disease is often considered a

"man's disease," and women are often misdiagnosed or undertreated, leading to poorer outcomes (Mehta et al., 2016). Similarly, autoimmune diseases, such as lupus, affect women at much higher rates than men, yet diagnosis and treatment are often based on data from male populations, leading to delayed or ineffective treatment (Sabbagh et al., 2018).

Another consequence of gender-based data discrimination in medicine is the misdiagnosis or delayed diagnosis of medical conditions in women. A study published in the journal *JAMA Internal Medicine* found that women with heart attacks were more likely to be misdiagnosed than men due to differences in how the condition presents in different genders (Tamis-Holland et al., 2016). Additionally, women with conditions such as endometriosis and fibromyalgia have historically struggled to receive accurate diagnoses due to a lack of understanding about how these conditions present differently in women (Denny, 2019).

To address gender-based data bias in the medical sector, there is a need to ensure that women and gender minorities are adequately represented in clinical trials. Similarly, data collection, analysis, and interpretation must consider the impact of sex and gender on health outcomes and treatments. This measure requires a multidisciplinary approach that involves collaboration between researchers, policymakers, and healthcare professionals to promote gender equity and improve health outcomes for all.

Workplace

Gender-based data bias is a pervasive issue that affects many aspects of society, including the business world. Using skewed data in decision-making can significantly affect women, leading to discrimination and unequal opportunities. Gender-based data bias is particularly prevalent in the workplace, where women often face challenges related to pay equity, promotion, and leadership opportunities. Additionally, there is a growing awareness of the impact of periods on women's work lives and how a lack of consideration for menstrual health can contribute to gender-based data bias in the workplace.

Gender-based data bias in business has been well-documented in various studies. One area of concern is the gender bias in algorithms used for hiring and promotion decisions. These algorithms may be plugged into skewed data, perpetuating gender stereotypes and leading to a lack of diversity in the workplace. For example, studies have found that gendered wording in job advertisements can deter women from applying, leading to fewer female applicants and, ultimately, less gender diversity in the workplace. Furthermore, studies have found that women are less likely to receive promotions than men, and when they do, they often receive smaller pay raises. This gap can be attributed to gender bias in decision-making processes, such as performance evaluations and allocating tasks and responsibilities. For example, a study found that job postings with male-oriented wording received more applicants and were perceived as more appealing to both genders, while job postings with female-oriented wording received fewer applications and were perceived as less appealing to both genders (Gaucher,

Friesen, & Kay, 2011). Other studies have found that women are less likely to receive promotions than men, and when they do, they often receive smaller pay raises (Eagly & Carli, 2007).

Periods are a biological reality for women and can impact their work lives. However, periods are often considered taboo in the workplace, and there is little consideration for menstrual health in work policies and practices. Therefore, gender-based data bias in business leads to a lack of support for women during their menstrual cycles. For example, a study found that women who experienced premenstrual symptoms were more likely to miss work or school, and this absenteeism was more likely to be attributed to non-illness-related factors, such as "personal issues" (Johnson & Dalton, 2018). Additionally, women may have to deal with a lack of adequate menstrual product disposal facilities, leading to potential embarrassment and discomfort in the workplace. This lack of support for menstrual health can contribute to gender-based data bias in business, perpetuating gender stereotypes and discrimination against women.

Gender-based data bias is a complex issue that affects many aspects of society, including the business world. The impact of periods on women's work lives is increasingly recognised. Thus, businesses and policymakers need to address this issue, such as implementing policies that support menstrual health in the workplace and conducting regular audits to identify and address gender-based data bias in decision-making. By taking these steps, we can create a more equitable and inclusive workplace for all genders.

Education

Gender-based data bias is also a critical issue in the field of education. It can manifest in many ways, from data collection methods that overlook the unique challenges and experiences faced by girls and young women to biased curricula and assessments that perpetuate gender stereotypes and limit girls' access to quality education.

One example of gender-based data bias in education is the underrepresentation of girls in STEM (science, technology, engineering, and mathematics) fields. Data

shows that girls are just as capable as boys in these fields but are often discouraged or overlooked due to societal biases and stereotypes. The UNESCO Institute for Statistics reports that globally, women make up only 35% of STEM students in higher education, and the gender gap widens as the level of education increases (UIS, 2021). This lack of representation and recognition of girls' achievements can perpetuate gender-based discrimination and limit opportunities for women in STEM careers.

Gender biases can also impact how teachers interact with their students. Studies have found that teachers may unconsciously treat boys and girls differently, with boys receiving more attention and praise for academic achievement while girls receive more criticism and feedback on their behaviour (Pahlke et al., 2014; Sadker & Sadker, 1994). This situation can affect girls' confidence and self-esteem, leading to lower academic performance and reduced participation in class.

Additionally, gender-based data bias can also contribute to gender-based violence in schools. Data collection methods that do not include specific questions about gender-based violence, such as sexual harassment or assault, can lead to underreporting and inadequate response to such incidents, perpetuating a culture of violence and discrimination against girls and young women in educational settings. For instance, a study in Uganda found that less than half of the surveyed schools had reporting mechanisms for sexual harassment, and only 4% of female students who experienced harassment reported it to a teacher or school authority (Sifuna et al., 2019).

Furthermore, gender-based data bias can also affect educational policies and funding. For example, educational systems may allocate resources and funding to subjects and programs that are traditionally male-dominated while neglecting subjects and programs that are traditionally female-dominated (e.g., home economics, arts, and humanities). This perpetuates gender stereotypes and biases, limiting the opportunities available to students and reinforcing gender inequality in education and beyond.

Overall, gender-based data bias in education has serious implications for girls' education and the promotion of gender equality. Addressing this issue requires a concerted effort to collect and analyse gender-disaggregated data, develop gender-sensitive curricula and assessments, and promote inclusive and equitable educational environments. By prioritising gender equity and ensuring that all students have equal access to quality education, we can work towards a more just and equitable society.

Public Participation

Gender-based data bias can have a significant impact on public participation, both in terms of access to information and in terms of opportunities for engagement. When data is biased towards one gender, it can result in a lack of understanding of the needs and experiences of the other gender, which can, in turn, lead to exclusionary policies and practices that limit opportunities for engagement and participation.

One consequence of gender-based data bias in public participation is that it can result in limited opportunities for women to be heard and have their needs addressed. For example, a study by the World Bank found that gender-based data discrimination can result in a lack of understanding about the specific needs and constraints faced by women, which can lead to policies and practices that are not responsive to their needs (World Bank, 2019). This position can result in women's lack of engagement and participation in decision-making functions, which can further perpetuate gender inequalities.

Additionally, gender-based data bias can lead to a lack of understanding about the experiences and perspectives of non-binary and gender non-conforming individuals, who may be excluded from data collection and analysis

altogether. This can limit opportunities for engagement and participation for these individuals, who may face unique barriers to access and inclusion.

Another consequence of gender-based data bias in public participation is that it can perpetuate harmful stereotypes and biases, further limiting engagement and participation opportunities. For example, if data on women is biased towards traditional gender roles and expectations, it can perpetuate stereotypes that limit their opportunities and restrict their choices (Datta, 2019). This can result in policies and practices that are not inclusive or responsive to the needs and aspirations of women, further perpetuating gender inequalities.

To address these consequences of gender-based data discrimination in public participation, it is important to prioritise the collection and analysis of gender-disaggregated data, as well as data that includes non-binary and gender non-conforming individuals. Additionally, policies and practices must be designed to be responsive to the needs and experiences of all genders in order to promote greater engagement and participation by all members of society.

Disability and accessibility

Disability and accessibility are important considerations when addressing gender-based data bias. People with disabilities are often excluded from research studies, and when they are included, their disability is often not considered a variable of interest (Shakespeare & Watson, 2002). This can lead to a lack of understanding of the unique experiences of individuals with disabilities, particularly those who are also marginalised due to their gender identity.

For example, women with disabilities are more likely to experience domestic violence and sexual assault than non-disabled women (Brownridge et al., 2006). They may also face barriers to accessing healthcare, including a lack of accessible facilities and transportation (Jasinski, 2011). Women with disabilities who are also members of other marginalised groups, such as women of colour, may face additional barriers to healthcare and other services (Krieger et al., 2011).

In addition to healthcare, accessibility is important in other areas of life, including education and employment. Women with disabilities may face barriers to accessing education and training programs and may be excluded from certain types of work due to their disability (Shakespeare & Watson, 2002). These barriers can significantly impact their economic well-being and overall quality of life.

It is important to recognise and address how gender-based data bias intersects with disability and accessibility. By doing so, we can work to create more inclusive and equitable policies and practices that address the unique experiences of individuals with disabilities.

When data on people with disabilities is not collected, or when their disability status is not taken into account, it can lead to inaccurate assumptions and policy decisions that fail to meet their needs. This can exacerbate existing inequalities and leave individuals with disabilities more vulnerable to discrimination, poverty, and exclusion.

Furthermore, accessibility is not just about physical access to spaces and services but also about accessing and understanding information. Individuals with disabilities, particularly those with cognitive or sensory

impairments, may face barriers to understanding and using data that is presented in ways that are not accessible to them. For example, if data is presented in a format that is difficult to comprehend or presented without assistive technology, individuals with visual or cognitive impairments may have difficulty accessing and interpreting the information.

It is important to recognise that disability intersects with other factors such as race, ethnicity, and gender identity and that these intersections can compound discrimination and marginalisation. For example, women with disabilities who are also members of racial or ethnic minority groups may face additional barriers to accessing healthcare and other services due to systemic racism and ableism (Krieger et al., 2011).

To address gender-based data bias in the context of disability and accessibility, it is important to ensure that data collection efforts are inclusive and accessible to individuals with disabilities. This includes ensuring that data is collected on disability status and that this information is used to inform policies and practices that address the unique needs and experiences of individuals with disabilities. Additionally, data should be presented in accessible formats compatible with assistive technology, such as screen readers or text-to-speech software, to ensure that individuals with visual or cognitive impairments can access and interpret the information.

Conclusion

In conclusion, gender-based data bias is a pervasive and complex issue with far-reaching implications for women's lives. Across sectors, data collection, analysis, and interpretation can perpetuate gender-based inequalities, limiting our understanding of the experiences and needs of women and reinforcing gender-based discrimination. As we have seen, this bias can seriously affect women's health, economic opportunities, social status, and public participation and limit progress towards gender equality.

Addressing gender-based data bias requires a multifaceted approach that considers the diverse ways bias manifests in different contexts. Strategies for addressing this issue might include:

- Engaging in more diverse and inclusive data collection, analysis, and interpretation practices that account for the experiences and needs of diverse groups of women. For example, this might involve incorporating more diverse perspectives into data collection methods, such as including more women and gender minorities in survey samples or collecting data on the experiences of women with disabilities.
- Incorporating intersectional perspectives that account for how gender-based bias intersects with other forms of bias and discrimination, such as racism and ableism. This might involve developing more nuanced data collection methods that take into account the unique experiences of women from diverse racial, ethnic, and cultural backgrounds or accounting for how gender-based bias impacts women with disabilities differently than non-disabled women.
- Promoting greater transparency and accountability in data practices, including efforts to monitor and report on gender-based data bias and its impact. This might involve developing more robust data governance frameworks that prioritise transparency, accountability, and ethical considerations or establishing oversight mechanisms to ensure that data practices are fair and equitable.
- Encouraging greater collaboration and dialogue across sectors to share knowledge and strategies for addressing gender-based data bias. This might involve convening cross-sectoral working groups

or partnerships that bring together researchers, policymakers, civil society organisations, and other stakeholders to share best practices, identify gaps in knowledge, and develop collaborative solutions.

Ultimately, addressing gender-based data bias requires a sustained commitment to equity and inclusion, both in data practices and in broader social structures. By working together to identify and address this issue, we can move closer towards a more just and equitable world for all.

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