

Sociotechnical Factors Contributing to the Inequalities in Visual Impairments Across Genders

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

Mary DeSimone

Spring 2022

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Bryn E. Seabrook, Department of Engineering and Society

STS Research Paper

Introduction

Visual impairments, blindness, and visual degradation are serious and prevalent issues. Globally, blindness affects over 50 million people, “two-thirds of whom are women, and ninety per cent of whom live in poorer countries” (Courtright & Bassett, 2003). Some authors tend to argue that because women live longer on average than men, this accounts for the discrepancy in their likelihood to develop eye problems. However, even when accounting for age, studies show that blindness is approximately “40% more common in women compared to men” (Courtright, 2009). One of the leading causes of blindness is cataracts; roughly 20 million people are blind from cataracts in the world, which is curable if given the appropriate treatment (Foster, 1999). Blindness caused by cataracts is entirely avoidable, given that people can obtain access to cataract surgery, and yet of those with cataracts, the proportion who go blind ranges from thirty-six to eighty-nine percent in some countries (Murthy et al., 2012). With this information, coupled with the fact that women are slightly more likely to develop cataracts, women should account for sixty to sixty-five percent of all cataract surgeries. Yet statistically, men are still more likely than women to undergo cataract surgery (Courtright & Lewallen, 2009). Given all of this information, the question becomes: what sociotechnical factors lead to women being more likely to suffer from visual impairments, such as cataracts and blindness, than men? To answer this research question, the Wicked Problem framework is used to better understand the complexity of the situation.

Methods

To answer the research question, the following research methods are used: literature review, documentary analysis, and ethical analysis. Through literature review, government

journals and peer reviewed research articles will be used. Using these, documentary analysis will be performed on these pieces of literature. Finally, an ethical analysis of the research results will be done and then discussed. When looking for resources to provide evidence for this question, the keywords consist of phrases like “gender and vision loss,” “cataracts and blindness,” “women and visual impairments,” as well as “vision loss statistics.” The research is organized by providing background information on blindness both globally and within the United States, including technical information on cataracts, and the role that cataracts plays in blindness and major vision loss.

Background

Over 1.02 million people are legally blind in the United States alone, with an additional 3.22 million people suffering from visual impairments as of 2015. These values are projected to double by 2050 (Varma et al., 2016). Blindness and low vision are estimated to affect over 3.89 million people over the age of 45 in the United States alone, as of 2017 (Chan et al., 2018). As the elderly population increases due to growing average life spans, the issue will only become more prevalent in time.

There are many inequalities when discussing blindness and visual impairments, including socioeconomic class, gender, and geographical region (Ulldemolins et al., 2012). Among white people, the leading cause was macular degeneration (54.4% of cases), whereas among black people, it was cataracts and glaucoma (60%) (Congdon et al., 2004). Currently, “cataracts are the leading cause of blindness... but surgical intervention can effectively restore visual impairment” (Wang et al., 2017). The number of people who are blind from cataracts is also estimated by the World Health Organization to increase to 40 million in 2025 as the global

population ages. Studies have shown that there is a clear, linear correlation between surgery for cataracts and gross domestic product and gross national income (Wang et al., 2017).

Globally, over 50 million people are affected by blindness, and of those, 64.5 percent are women (Abou-Gareeb et al., 2001; Courtright & Bassett, 2003). Inability to access healthcare and lack of childcare make it difficult or impossible for many women to seek care for their decreasing eyesight at all stages of life (Courtright & Lewallen, 2009). Up to 20% of women forego care because of issues in finding alternative people to care for their child while they go to appointments (Gaur et al., 2020). These factors all play into how women are less likely than men to receive care for eye concerns, including surgery for cataracts. Many women are forced to continue to suffer because of a lack of healthcare, childcare, and finances.

Wicked Problem Framework and Gender Inequality

The Wicked Problem framework provides an in-depth review of the inequalities between men and women, while still maintaining that such a complex issue cannot have a simple solution. This framework allows the problem to be clearly articulated, and it shows how intertwined the issues involved in global blindness for women are. The research question can be defined as a wicked problem, because these problems are “large scale social challenges caught in casual webs of interlinking variables spanning national boundaries that complicate both their diagnosis and prognosis” (Reinecke & Ansari, 2016).

The Wicked Problem Framing technique developed by Seager is used for gathering evidence on the inequality between genders in terms of blindness and vision loss (Seager et al., 2012). Seager’s methodology supports this research because the framework will allow for a closer look at the breakdown of problems surrounding women’s lack of eyecare. Some authors,

such as Nick Turnbull and Robert Hoppe, argue that this theory is flawed. Turnbull and Hoppe argue that the concept of wickedness fails to properly conceptualize policy problems. Instead, they argue for the re-conceptualization of wickedness as “problematicity,” a measure of the political distance between analysts' view of a problem. Turnbull and Hoppe argue that addressing issues through the lens of problematicity is more practical and effective than using wickedness (Turnbull & Hoppe, 2019).

Results and Discussion

The sociotechnical factors that play into the disparities across genders when it comes to visual impairments are due to a multitude of factors, including lack of access to eyecare, lack of access to childcare, discrimination, and poverty. This research question has no simple solution, which further supports the connection to a clear Wicked Problem. The lack of solutions to this problem is due to the fact that each one of these factors has subsequent issues of its own, and that each of these issues need to be addressed, in order to find a solution to the inequality between men and women. This paper investigates a number of these factors, such as poverty and a lack of access to healthcare in developing or rural communities, discrimination against women, and a discussion of reversible blindness due to cataracts.

One of the biggest barriers to women's health has to do with access. The barrier of access includes access to education, healthcare, income, legal rights, and more (Ojanuga & Gilbert, 1992). Women face many cultural and societal limitations, particularly in rural or developing nations. Discrimination against women is perpetuated through laws, traditions, and cultural norms. In addition to these barriers, inability to access healthcare and lack of childcare make it difficult or impossible for many women to seek care for their decreasing eyesight at all stages of life (Courtright & Lewallen, 2009). Up to 20% of women forego care because of issues in

finding alternative people to care for their child while they go to appointments (Gaur et al., 2020). One of the issues women face for childcare include not being able to afford the expense of babysitters, nannies, or daycare. After hearing from affected parties in this situation, for many parents, leaving children in the care of relatives is not an option, and finding someone that you trust to take care of children can be challenging. These are just a few of the many reasons parents will forego their own health and treatment for the benefit of their children.

Many women are forced to continue to suffer medically because of a lack of healthcare, childcare, finances, and more. All of these factors have severe impacts on women being able to receive care for visual degredation and eye problems. Even when trying to fix these issues, governmental programs and strategies can only go so far as having “women continue to be excluded from access to resources and employment and are denied basic human rights” (Jütting & Morrisson, 2005). In order to fully understand why women are at a disadvantage to receiving care for their visual impairments, it is important to keep in mind how the distribution of resources is also unequal and can perpetuate these problems. Discrimination against women and other minority groups is extremely prevalent when looking at an issue such as this one, as it is a widespread practice in some places. Many women and people of color struggle with being taken seriously when discussing health concerns with doctors, which leads to them schedule such visits infrequently. Studies have shown that in east Baltimore, people of color had suffered from vision loss at a 75% increase from cataracts than white people did (Stone et al., 2018). Among Latino men and women in Los Angeles, “insurance status and income were both found to be independently associated with decreased access to eye care” (Stone et al., 2018). The intersectionality of race and gender for women of color trying to receive care for cataract surgery

is a severe problem, and it is important to look at how this affects access to eyecare and makes it more difficult for women of color to receive these procedures.

Beyond barriers to access, other problems perpetuate lack of eyecare. Not having any close hospitals and healthcare for underprivileged and rural communities can prolong a cycle of ill health and poverty, where “poverty leads to ill health and ill health maintains poverty” (Peters et al., 2008). The issue of poverty is a clear branch of the Wicked Problem at hand, as there is no way to break the cycle without dismantling and restructuring many economic inequities. In addition to lack of access, there is a huge shortage of healthcare professionals globally; however, “nowhere is the worldwide shortage of health professionals more pronounced than in rural areas of developing countries” (Strasser et al., 2016). Especially during the pandemic, concerns such as eye problems can take the backseat as many people fear entering hospitals out of concern of contracting another illness. Healthcare professionals have been stretched very thinly as they must work more and more to deal with the pandemic and its fallout, which only makes matters worse for individuals looking for eyecare. The lack of health professionals makes it extremely difficult for those in rural communities to receive care for any condition. Without equal access to basic human rights, such as healthcare, many women go blind from curable ailments such as cataracts. The next section will go into depth about cataracts, including their causes, impacts, and corrections.

Across the world, there is estimated to be over 38 million people who are blind, with an additional 110 million who are at substantial risk and vulnerable to becoming blind (Thylefors et al., 1995). One of the main causes of blindness is cataracts, which is the leading cause of reversible blindness. It is especially prevalent in “populations with low socioeconomic status and in developing countries [more so] than in developed countries” (Lam et al., 2015). An estimated

33.4% of all cases of blindness and 18.4% of moderate and severe visual impairments cases are caused by cataracts (Khairallah et al., 2015). Cataracts occur when the opacity of the lens of the eye impacts vision and lens transparency, and it mostly arises due to increased age of the individual; this usually begins around ages 45 to 50 (Alshamrani, 2018). Cataracts are fully reversible if given access to surgery; however, there are many barriers, including financial, geographical, lack of support, service awareness, and more, to receiving surgery (Finger, 2007). These obstacles become an extreme issue in some developing countries, as even beyond the previously discussed barriers to access, women face even more additional barriers. These obstacles also lead to cataracts being 40% more common in women than men. If women were able to receive access to cataract surgery at the same rate as men, an estimated 11-12% decrease of all blind individuals due to cataracts would occur (Courtright, 2009). This problem is one that should be easily solvable with an increase in awareness of cataract surgery and correction; however, this is not the case.

Overall, the issue concerning the increased likelihood of blindness in women than men is a clear wicked problem. Considering there are factors such as a lack of access to eyecare, a lack of access to childcare, a lack of access to funds, and in some cases cultural norms, the web continues to grow larger and larger showing how women are at a disadvantage for receiving care. Each of these few issues have concerns of their own, and each of those has problems as well. This problem continues to grow outwards, and it is important to look at each of these concerns as factors into the situation. This issue will unfortunately remain a wicked problem for a long time, because there can be no straightforward way to solve this for all women globally. Using the wicked framework to view and understand this problem allows the research to be fully fleshed out and show all the numerous discriminations women face in treatment for eye problems.

As an example of how this problem is a Wicked Problem, each initial branch will be broken down for the problems surrounding women's access to eyecare. Beginning with the biggest ones, the gender disparity in vision loss is caused by poverty, discrimination, and education. When looking at poverty, the issues of geographical isolation, socioeconomic status, and lack of healthcare arise. With geographical isolation, there are not enough hospitals or doctors in range of where individuals live, making it difficult to receive any care. Socioeconomic status can be a generational problem, with debts passing down between families making it difficult or impossible to receive healthcare. Without solid financial stability, many individuals cannot afford healthcare and instead are forced to pay out of pocket when serious problems occur; this creates even more financial instability when faced with large hospital bills and debts. When looking at the discrimination branch of this wicked problem, this raises the issue of race, cultural or societal norms and traditions, and women being expected to be primary caregivers. With women often being put into the role of primary caregivers, this leads to an inability to leave the home without someone to watch the individuals they take care of, leading them to forego their access to care. For women of color, their race becomes an additional factor that can make it difficult to receive care, as discrimination in the medical field is a profoundly serious problem. When it comes to cultural or societal norms in some locations, women are unable to leave their homes following puberty, making it impossible to leave for treatment. Some societies also have a strong distrust and fear of going to hospitals to receive care, which is another issue that can be faced. Finally, when looking at the barrier of education, many women are unable to receive access to an education, leading to misinformation and miscommunication surrounding eyecare and eye health. It is clear to see that this problem continuously grows and expands and there is no limit to the edges of the issue.

Limitations

There are some limitations of this project, as this cannot be a fully exhaustive list of all the issues surrounding the lack of eyecare for women. As this is a wicked problem, each barrier to access for women globally contains more and more barriers, so it would be exceedingly difficult to pinpoint every issue surrounding the gender disparity. Additionally, there are some limitations to how up to date some of the data is. One thing researchers insist is that as the average lifespan increases, the number of people who suffer from visual impairments and blindness will only continue to increase, so having up to date data on the number of individuals dealing with moderate to severe visual impairments becomes even more critical. It can be difficult to gather this information however, especially given the fact that some communities have little to no access to hospitals to have their health concerns recorded for consensus purposes. Another limitation occurs when considering that most of the data was sourced from developing nations where the disparity between men and women is a lot more apparent. In the United States and Europe, the difference between men and women in receiving access to eyecare is slimmer, yet it still exists.

Additionally, some of the data available, specifically data about people of color, is hard to find on a larger scale than a city-to-city basis. This is a limitation because it is harder to get a national or global understanding of how blindness affects women of color. The final limitation lies with relying on scientific journals exclusively for research. More sources could have been included, such as case studies and newspaper articles that could have provided additional information on barriers that individuals face to receiving access to eyecare. If more sources had been included, a more well-rounded definitive answer could have been achieved.

Differently in the Future

If this research were to be continued, future studies/analyses should dive deeper into how to correct some of these problems, including getting more healthcare into rural and impoverished communities. Research should be conducted on what has been done to correct this problem, and the pros and cons of the current attempts. Additionally, more research should be done to fully round out all the issues surrounding the gender inequality for blindness. Each subsection contains its own problems, and these should be researched in more depth. Finally, some more research should be conducted between age groups, specifically for those younger than 50 years old, as this was something that was not fully discussed throughout the course of this research paper. All of this additional research should include a larger scope of methods used to gather the information. Specifically, through case studies, this could show how blindness and cataracts affect individuals on a much smaller basis and allow a closer look at specific issues rather than trying to understand all the inequalities and problems faced by women who suffer from visual impairments at once.

Conclusion

There is no shortage of sociotechnical factors that surround the inequalities between men and women when it comes to visual impairments. Some of which include discrimination, lack of access to healthcare or eyecare, inability to leave children without alternative care, poverty and more. Some key takeaways for this research are that, consequently, this is a Wicked Problem, and there may be no clear or straightforward way to solve this inequality. Due to the fact that each concern and branch of this Wicked Problem branches into other problems, there may be no way to ever solve this issue fully. There are many ways to hopefully alleviate the problems however, including “[drawing] upon the expertise of communities to identify community-specific health priorities and should build capacity to enable the recruitment and training of local students from underserved areas to deliver quality health care in rural community settings”

(Strasser et al., 2016). While this is a good start, even this will not be enough to decrease the disparity between genders when it comes to health and eyecare. Cultural and legal discrimination against women needs to be addressed, and many traditions and norms need to be challenged. For now, simply increasing awareness surrounding this issue will be an effective way to begin.

Works Cited

- Abou-Gareeb, I., Lewallen, S., Bassett, K., & Courtright, P. (2001). Gender and blindness: A meta-analysis of population-based prevalence surveys. *Ophthalmic Epidemiology*, 8(1), 39–56.
<https://doi.org/10.1076/oep.8.1.39.1540>
- Alshamrani, A. Z. (2018). Cataracts Pathophysiology and Managements. *The Egyptian Journal of Hospital Medicine*, 70(1), 151–154. <https://doi.org/10.12816/0042978>
- Chan, T., Friedman, D. S., Bradley, C., & Massof, R. (2018). Estimates of Incidence and Prevalence of Visual Impairment, Low Vision, and Blindness in the United States. *JAMA Ophthalmology*, 136(1), 12. <https://doi.org/10.1001/jamaophthalmol.2017.4655>
- Congdon, N., O'Colmain, B., Klaver, C. C. W., Klein, R., Muñoz, B., Friedman, D. S., Kempen, J., Taylor, H. R., Mitchell, P., & Eye Diseases Prevalence Research Group. (2004). Causes and prevalence of visual impairment among adults in the United States. *Archives of Ophthalmology* (Chicago, Ill.: 1960), 122(4), 477–485. <https://doi.org/10.1001/archopht.122.4.477>
- Courtright, P. (2009). Gender and blindness: Taking a global and a local perspective. *Oman Journal of Ophthalmology*, 2(2), 55–56. <https://doi.org/10.4103/0974-620X.53032>
- Courtright, P., & Bassett, K. (2003). Gender and blindness: Eye disease and the use of eye care services. *Community Eye Health*, 16(45), 11–12.
- Courtright, P., & Lewallen, S. (2009). Why are we addressing gender issues in vision loss? *Community Eye Health*, 22(70), 17–19.
- Finger, R. P. (2007). Cataracts in India: Current Situation, Access, and Barriers to Services Over Time. *Ophthalmic Epidemiology*, 14(3), 112–118. <https://doi.org/10.1080/09286580601114967>
- Foster, A. (1999). Cataract - a global perspective: Output outcome and outlay. *Eye*, 13(3), 449–453.
<https://doi.org/10.1038/eye.1999.120>

- Gaur, P., Kuo, M., & Kho, K. A. (2020). Demonstrating Lack of Child Care as a Barrier to Health Care for Women in Parkland Health & Hospital System [04H]: *Obstetrics & Gynecology*, 135, 82S. <https://doi.org/10.1097/01.AOG.0000664992.39926.41>
- Jütting, J. P., & Morrisson, C. (2005). Changing Social Institutions to Improve the Status of Women in Developing Countries. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.871445>
- Khairallah, M., Kahloun, R., Bourne, R., Limburg, H., Flaxman, S. R., Jonas, J. B., Keefe, J., Leasher, J., Naidoo, K., Pesudovs, K., Price, H., White, R. A., Wong, T. Y., Resnikoff, S., & Taylor, H. R. (2015). Number of People Blind or Visually Impaired by Cataract Worldwide and in World Regions, 1990 to 2010. *Investigative Ophthalmology & Visual Science*, 56(11), 6762. <https://doi.org/10.1167/iovs.15-17201>
- Lam, D., Rao, S. K., Ratra, V., Liu, Y., Mitchell, P., King, J., Tassignon, M.-J., Jonas, J., Pang, C. P., & Chang, D. F. (2015). Cataract. *Nature Reviews Disease Primers*, 1(1), 15014. <https://doi.org/10.1038/nrdp.2015.14>
- Murthy, G., Shamanna, B., John, N., & Pant, H. (2012). Elimination of avoidable blindness due to cataract: Where do we prioritize and how should we monitor this decade? *Indian Journal of Ophthalmology*, 60(5), 438. <https://doi.org/10.4103/0301-4738.100545>
- Ojanuga, D. N., & Gilbert, C. (1992). Women's access to health care in developing countries. *Social Science & Medicine* (1982), 35(4), 613–617. [https://doi.org/10.1016/0277-9536\(92\)90355-t](https://doi.org/10.1016/0277-9536(92)90355-t)
- Peters, D. H., Garg, A., Bloom, G., Walker, D. G., Brieger, W. R., & Hafizur Rahman, M. (2008). Poverty and Access to Health Care in Developing Countries. *Annals of the New York Academy of Sciences*, 1136(1), 161–171. <https://doi.org/10.1196/annals.1425.011>

- Reinecke, J., & Ansari, S. (2016). Taming Wicked Problems: The Role of Framing in the Construction of Corporate Social Responsibility: Taming Wicked Problems. *Journal of Management Studies*, 53(3), 299–329. <https://doi.org/10.1111/joms.12137>
- Seager, T., Selinger, E., & Wiek, A. (2012). Sustainable Engineering Science for Resolving Wicked Problems. *Journal of Agricultural and Environmental Ethics*, 25(4), 467–484. <https://doi.org/10.1007/s10806-011-9342-2>
- Stone, J. S., Fukuoka, H., Weinreb, R. N., & Afshari, N. A. (2018). Relationship Between Race, Insurance Coverage, and Visual Acuity at the Time of Cataract Surgery. *Eye & Contact Lens: Science & Clinical Practice*, 44(6), 393–398. <https://doi.org/10.1097/ICL.0000000000000443>
- Strasser, R., Kam, S. M., & Regalado, S. M. (2016). Rural Health Care Access and Policy in Developing Countries. *Annual Review of Public Health*, 37(1), 395–412. <https://doi.org/10.1146/annurev-publhealth-032315-021507>
- Turnbull, N., & Hoppe, R. (2019). Problematizing ‘wickedness’: A critique of the wicked problems concept, from philosophy to practice. *Policy and Society*, 38(2), 315–337. <https://doi.org/10.1080/14494035.2018.1488796>
- Thylefors, B., Négrel, A. D., Pararajasegaram, R., & Dadzie, K. Y. (1995). Global data on blindness. *Bulletin of the World Health Organization*, 73(1), 115–121.
- Ulldemolins, A. R., Lansingh, V. C., Valencia, L. G., Carter, M. J., & Eckert, K. A. (2012). Social inequalities in blindness and visual impairment: A review of social determinants. *Indian Journal of Ophthalmology*, 60(5), 368–375. <https://doi.org/10.4103/0301-4738.100529>
- Wang, W., Yan, W., Fotis, K., Prasad, N. M., Lansingh, V. C., Taylor, H. R., Finger, R. P., Facciolo, D., & He, M. (2017). Cataract Surgical Rate and Socioeconomics: A Global Study. *Investigative Ophthalmology & Visual Science*, 57(14), 5872. <https://doi.org/10.1167/iovs.16-19894>