



University of Washington Bothell

# The CROW

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## LETTER FROM THE EDITORS

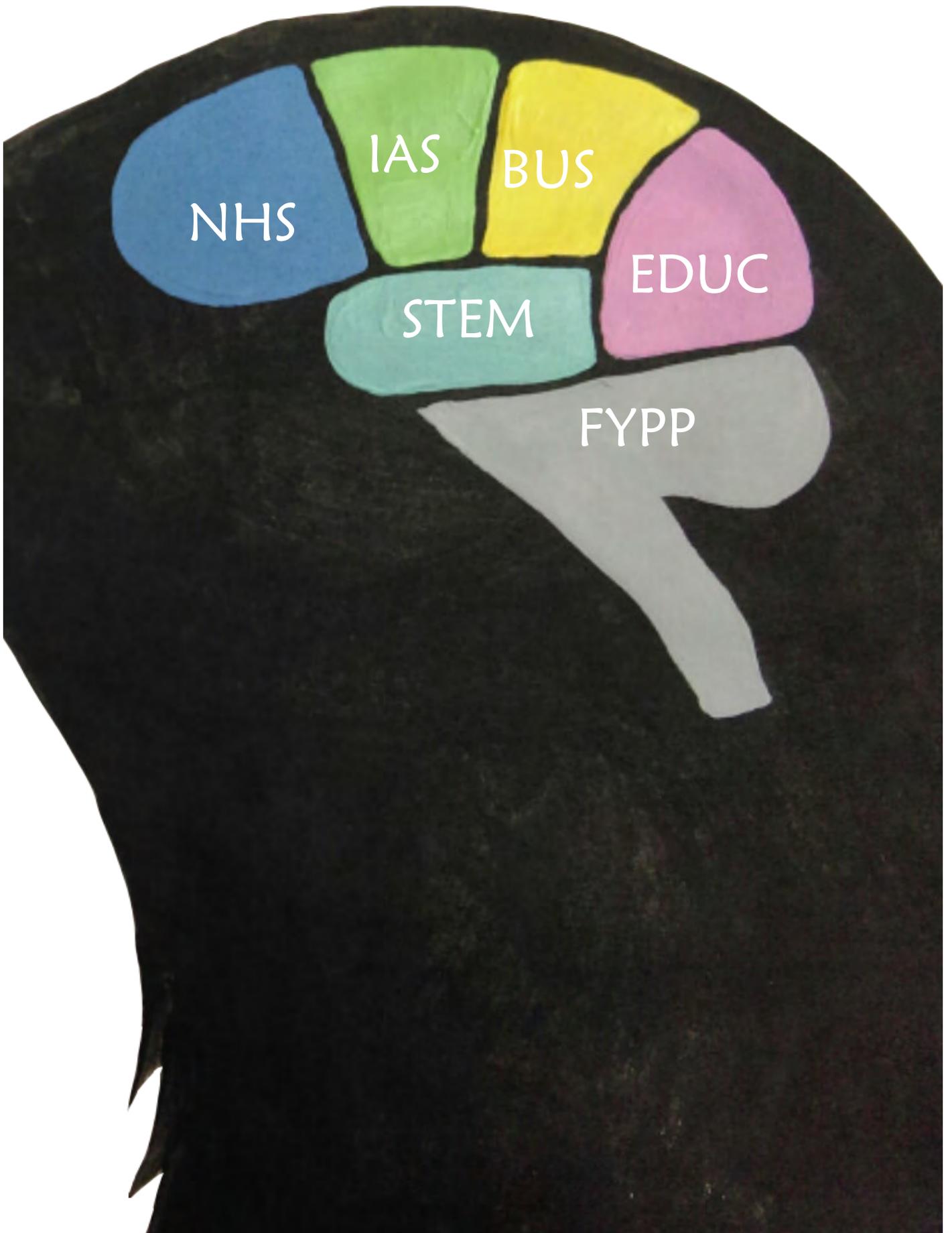
The Eighth Edition of *The CROW* was composed and published in a time when the COVID-19 global pandemic began to shift to the past, and we students continued re-establishing our lives as in-person learners and learning communities. During this time, members of the University of Washington Bothell community continued to feel the impact of this transition in every aspect of our lives while still pursuing our education. Simultaneously, this time has been shaped by global events, fueling a generation of young adults dedicated to addressing our planet's persistent issues. This board feels it necessary to acknowledge the hardship and loss these past few years have brought to students, faculty, support staff, and everyone we are connected to, near and far. We acknowledge the effort it takes to be involved in changing our world and lives, so thank you foremost for being here a part of this work.

With this edition, *The CROW* continues to highlight the incredible dedication of students at UW Bothell as they conduct, analyze, and synthesize their own research investigations in topics ranging from science and technology, interdisciplinary arts, health studies, and everything in between. Conducting research is a high-impact learning practice that engages students outside the classroom and allows them to think more critically about the topics they wish to discover. By taking the initiative to submit their work for review by a board of their peers, the authors in this journal have taken steps towards becoming active contributors to academic discourse that values inclusion, expansion, and critical thinking.

The University of Washington Bothell is situated on the ancestral lands of the Coast Salish peoples, including the Duwamish and Snohomish tribes. We acknowledge this land's deep historical, cultural, and spiritual significance to Indigenous communities. We recognize the ongoing harm caused by colonization and affirm our responsibility as a student-led research publication to engage in decolonization efforts. *The CROW* seeks to create an inclusive and equitable publication that values Indigenous experience, knowledge, and culture, and fosters justice.

We would like to extend special recognition and gratitude to our student authors. In spite of fears of rejection, or perceived possible judgment by your peers, our authors showed great appreciation and care for the extensive editing and publication process, all during a difficult time for students making their publication all the more extraordinary. We know submitting was difficult, and we appreciate your patience and effort. We are so excited to share the 2023 Edition of *The CROW*!

Your friends on the Editorial Board: Annie, Bentley, Daniel Grace, Layla, Sakshi, & Sidra.







# THE EFFECT OF ADVANCED AGE AND ALZHEIMER'S DISEASE NEUROPATHOLOGY ON LEVELS OF THE TIGHT JUNCTION PROTEIN OCCLUDIN IN THE BRAIN MICROVASCULATURE

*Ali Mirzazadeh*

*ABSTRACT: The Blood-Brain Barrier (BBB) is a physiologic interface between the bloodstream and the brain. The BBB has tight junction proteins (TJPs) that restrict blood and toxins from entering the brain and allow important nutrients and biomolecules, like glucose and amino acids, to diffuse through the membrane and supply energy for neural processes. This interface plays an important role in the health of our brains and helps protect against an array of neurodegenerative diseases. However, it is possible for diseases like Alzheimer's Dementia (AD) to impact this interface and cause it to be less functional as a barrier. In recent studies, we found a significant increase in the TJP, occludin, located in microvessels (MVs) isolated from the parietal lobe of female subjects of advanced age with Alzheimer's Dementia (AD) relative to age-matched females (F) without Alzheimer's Dementia (NAD) (n=8 AD, n=8 NAD; age range: 79-99; mean: 93 years for both groups). There were no significant differences in occludin between MVs of male subjects with and without dementia, who were of a much younger average age (mean: 74 years old). To further evaluate this finding, we examined MVs in cross-cuts of the superior parietal lobes of a separate group of F subjects, both AD and NAD, via immunohistochemistry (IHC) techniques (n=12 AD, age range: 82-93; n= 5 NAD, age range: 83-98). We additionally measured levels and distribution of occludin in isolated MVs from the original group of female subjects with AD and NAD (n=8) utilizing immunofluorescence (IF) techniques. Preliminary analysis of IHC was not able to detect differences in occludin levels, but initial IF studies suggest that higher levels of occludin in MV derived from F AD subjects. Current studies are evaluating occludin localization in both groups of brain MVs. In summary, our data suggested that occludin is increased in brain MVs from female subjects of advanced age with AD, relative to those NAD participants. Ongoing studies with IHC and IF confirm differences in levels and determine localization. The increase of occludin in F AD MVs is an unexpected finding and could reflect a compensatory mechanism within brain MV in the context of both advanced age, and Alzheimer's Dementia. Based on our findings, we could potentially develop methods to create therapies that mimic the compensatory mechanism used to protect our BBB and preventative care for patients.*





# UNEARTHING THE ENVIRONMENTAL CONSEQUENCES IN SEATTLE'S NEW HOLLY NEIGHBORHOOD

*Ishika Nayyar*

*ABSTRACT: Seattle's New Holly neighborhood is home to a diverse community facing numerous environmental challenges. Due to historical redlining and systemic inequality, this community has been disinvested in and exposed to hazardous pollutants, putting them at risk of health issues and displacement. New Holly has some of the least clean air quality in one of America's most polluted cities, and its residents are disproportionately affected by environmental contamination. The lack of efforts and resources to clean up the community puts them at risk of developing health issues and diseases. Transit in the neighborhood also contributes to poor air quality and poses hazards to pedestrians and vehicles due to inadequate safety measures. New developments and projects in the area encourage gentrification and displacement of low-income families. While community members and organizations have been trying to address these issues, systemic and historical factors make public efforts necessary to advocate for change and create an equitable and healthy community.*

In the heart of Seattle, the New Holly neighborhood's vibrant diversity belies the environmental challenges faced by its low-income, minority residents, putting them at risk of health issues, displacement, and exposure to hazardous pollutants. Environmental injustices due to historical redlining, which was the practice of limiting services to specific neighborhoods, and systemic inequality have meant disinvestment in this community. This has led to poor air quality, dangerous public transit intersections, and "green gentrification", which is the implementation of green spaces causing exclusion or displacement of residents already residing in the area. These families are disproportionately affected by environmental contamination in comparison to other communities. It is a newer neighborhood within Rainier Valley, having been redeveloped throughout the past 50 years, it is considered a community at a disadvantage as it faces more than one socioeconomic burden (Council on Environmental Quality, n.d.). Some burdens are due to environmental contaminants in this neighborhood from housing, including metals in soil, industrialized chemical pollutants from

gentrification, lack of green space, hazardous waste facilities, and transportation, all of which have a significant effect on the well-being of those that live in this neighborhoods (Chen, 2008).

New Holly is one of Seattle's neighborhoods that have the least clean air quality in one of America's most-polluted cities and was a community that was redlined with a low grade in the past. When redlined in the 1930s, today's New Holly was one of the communities highlighted to be "D-minus rated" or otherwise not worth investing in. Redlined neighborhoods experience more exposure to poor and contaminated air quality (Turner, 2022). Harmful emissions and increased temperatures expose residents of New Holly to poor air quality because these areas are considered investment risks, increasing nitrogen dioxide emissions from industrial facilities, cargo ships, and vehicle exhaust (Wamsley, 2022). Seattle is one of the most-polluted cities in America, not only due to climate change and wildfires which heighten the ground-level ozone, but also due to oil spills, gas spills, and carbon emissions



## Nayyar

from fossil fuels (Harvey, 2019). King County contains hundreds of sites with environmental contaminants, and while efforts are being made for the clean-up to open space for more affordable housing, the area still contains chemicals, such as metals in the groundwater and soil (Flores, 2022). The hazards New Holly residents are exposed to, and the lack of efforts and resources to clean up the community puts them at risk of possible development of health issues and diseases for this population.

Due to the redlining of this neighborhood, there is less regard for interest in investing in the New Holly community. There is also the contribution of transit in this neighborhood, particularly the Link light-rail (LLR), which serves to reduce carbon emissions and make transportation more accessible. The light-rail stretch of Columbia City Station on Martin Luther King Jr. Way, runs through this community, is one of the most hazardous areas of the LLR, because it is a revealed section of tracks that anything can cross such as pedestrians and vehicles. It's not built to safely prevent individuals from accidentally coming into contact with oncoming trains, as this stretch has the highest number of collisions compared to all other parts of the light-rail (Lindblom, 2022). While developed to accommodate the increase of people on foot, it also accounts for the increase in foot-traffic, accidents, and fatalities.

Due to the increase in migration to the Seattle area, there have been many new developments and projects to accommodate the rush, while still encouraging more people to move here. This is great for the city economically, but it puts low-income families at risk of displacement due to the area's development and gentrification. The land is being taken over by big corporations and companies, raising rents or starting new projects, causing displacement. While the redevelopment project's efforts to make the New Holly neighborhood less hazardous and polluted and more resident-friendly, individuals moving to New Holly are not the original audience the

projects were for. Newly migrated residents are leading the tearing down of green spaces and encouraging the gentrification of neighborhoods through projects such as adding green spaces. Without accounting for the community that lives there causes "green gentrification" by increasing the cost of living, since the intent is to make the area more appealing and safer (Cole, 2020). Going down MLK Way are many new projects and apartments, all less affordable and accessible to those already residing in this community.

Critics may argue addressing the environmental injustice this community faces is not the sole problem, and rather the responsibility of community members and organizations to address these issues. Still, the New Holly community has been trying, yet systemic and historical factors that caused disinvestment. There needs to be public-wide efforts to advocate for change in cleaning up the community to better the environment for all individuals.

The New Holly neighborhood's burdens are consequences of environmental contaminants stemming from various sources. Sources include gentrification, lack of green space, hazardous waste facilities, and transportation, all of which impact the well-being and health of those that live in these affected communities. It is essential that immediate action be taken to tackle these issues, not only the responsibility of community members, as New Holly residents have already made attempts to address them. Government organizations and volunteers from surrounding communities must also take responsibility to create an equitable and healthy community. By working with the community to identify issues, advocating for environmental justice, and using tools to clean up and support this community can help to solve this problem facing Seattle's New Holly neighborhood.



# Seattle's New Holly Neighborhood

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# FROM VIRTUAL TO REALITY: AN ECONOMIC ANALYSIS OF THE CLOUD KITCHEN INDUSTRY

*Mariam Badr*

*ABSTRACT: Cloud kitchens have grown to a market size of \$63.9B USD in 2022. The COVID-19 pandemic led to a surge in the market for these facilities as they proved to be a cost-effective option for restaurants to continue operating and meet the rising demand for food delivery. Cloud kitchens offer a range of economic benefits, including reduced costs, increased profitability, and decreased barriers to entry for new restaurant businesses. They also provide greater flexibility in food production and menu selections to meet the fluctuating customer demand. With the shift towards takeout and delivery likely to remain prevalent in the food service industry, cloud kitchens are expected to continue being an innovative and efficient way to meet the growing demand for online food ordering and delivery.*

Cloud kitchens, also known as ghost kitchens or virtual kitchens, have become increasingly popular among entrepreneurs and consumers, growing to a market size of \$63.9B USD in 2022. These are commercial facilities that cater to pick-up and delivery food orders only, offering kitchen spaces to multiple restaurants without the overhead costs associated with traditional restaurants. During the COVID-19 pandemic, cloud kitchens became an acclaimed option for restaurants to continue operating and meet the rocket demand for food delivery services. Statewide stay-at-home orders led to increased demand for food delivery services, prompting a surge in the market. The standard cloud kitchen business model proved more cost-effective, allowing restaurants to focus on food preparation, quality assurance, and delivery. In a post-pandemic world, cloud kitchens have demonstrated their dominance in the food service industry due to their enticing business model.

The main economic advantage of cloud kitchens is the potential to reduce costs associated with traditional restaurants, thus increasing profitability for food delivery businesses. Costs

that would normally be anticipated, such as rent, utilities, maintenance, servers, and custodians, are all excluded from a cloud kitchen business model. With lower fixed costs, cloud kitchens can be more competitive with pricing and offer lower prices to customers. The average profit margins for traditional restaurants range between 3-6%, whereas a cloud kitchen can offer a wider profit margin with a range of 15-20%.<sup>1</sup>

For incoming restaurant owners, they provide decreased impediments of entry for new restaurant businesses, allowing them to start operating a cloud kitchen with a lower initial investment cost. Restaurant startups can cost between \$175,500 to \$750,000<sup>2</sup> to lay the groundwork and commence operations. A significant fraction of this cost is attributed to the cost of investing in real estate to acquire an attractive space, factored by location, pricing, appearance, and more.<sup>3</sup> In comparison, a cloud kitchen startup would launch in about six to eight weeks with an average \$30k initial capital investment – and break even within six months.<sup>4</sup> It costs about 185% more to open a traditional restaurant than a cloud kitchen-based restaurant.

<sup>1</sup>Sharma, Mehul. "Future of Cloud Kitchens in India." *ETHospitalityWorld.com*, 6 May 2022

<sup>2</sup>Felt, Mary. "How Much Does It Cost to Start a Restaurant Business?" *CloudKitchens*, 10 Aug. 2022

<sup>3</sup>Larkin, Tom. "8 Factors for Choosing a New Restaurant Location." *FSR Magazine*, 1 Sept. 2017

<sup>4</sup>Felt, Mary. "How Much Does It Cost to Start a Ghost Kitchen: A Complete Guide." *CloudKitchens*, 8 Aug. 2022



## Badr

Cloud kitchens can also offer greater flexibility in food production, enabling restaurants to adjust production levels and menu offerings to meet changing customer demand. For example, a cloud kitchen could quickly ramp up production of a particular dish during peak hours or in response to a high volume of orders, without the constraints of seating and staffing capacity. This can help restaurants maximize their efficiency and profitability while reducing food waste. Without the undertaking of maintaining a dining space, cloud kitchens can focus exclusively on the production of food. With food production flexibility comes menu flexibility. Without the need to maintain a physical menu, cloud kitchens can easily adjust their offerings to meet changing

customer preferences, dietary restrictions, or seasonal availability of ingredients. This can help restaurants stay agile and responsive to customer demands, without the need for costly and time-consuming menu redesigns.

Restaurants around the country have picked up on this upward trend, and are investing in the reorientation of their business model to focus on drive-throughs and online ordering systems. The leading global fast food chain, McDonald's, remodeled a location in Texas with "no tables or seats" but instead a "conveyor belt that routes food to drivers who order ahead", fully discarding the option for customers to dine in. Likewise, Chipotle opened a new location in



Ohio that only takes digital orders. Taco Bell is doubling its drive-through from two to four total lanes.<sup>5</sup>

As the food service industry continues to evolve and adapt to changing consumer preferences, cloud kitchens are likely to remain a relevant and important part of the industry, providing innovative and efficient ways to meet

the growing demand for online food ordering and delivery. Despite having left the global pandemic behind, the shift towards takeout and delivery is likely to come with us into the future.

<sup>5</sup>Haddon, Heather. "Americans Are Gobbling up Takeout Food. Restaurants Bet That Won't Change." The Wall Street Journal, Dow Jones & Company, 28 Jan. 2023



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# WHEN GROUP BOUNDARIES BLUR: THE IMPACT OF SOUTHEAST ASIAN REPRESENTATION IN FILM AND TELEVISION

*Anika Gopez*

*ABSTRACT: Representation of minorities in the media is a frequently touched upon topic, especially regarding racial minorities. While the media has made strides in increased representation of minorities over the years, the overall quantity and quality of representation in television and film is still lacking. This is especially true when it comes to the representation of Southeast Asians in media, as both media platforms and the general populace are too quick to group Southeast Asians, South Asians, and East Asians into a singular racial category. This research paper analyzes sources implicating the impact that the lack of quality representation in media has on Southeast Asians, to build an argument about media being a powerful tool that should be used in ways that will lead us to a more accepting and diverse world.*

## Introduction

This research project's goal is to discuss the impact that representation, or a lack thereof, in television and movies has on Southeast Asians. Southeast Asia includes the countries of Vietnam, Myanmar, the Philippines, and Indonesia, among others. Throughout the research process, it was found that the effects of lack of quality representation of Southeast Asians in media on Southeast Asians include divisions between them and others, a sense of isolation, mental health and self-image issues, internalized racism, and colorism.

## Methodology

At first, the topic of this research paper was about the broader issue of how media representation impacts all people of color, so the keywords used during the first search through the Gale Virtual Reference Library included "media" and "race." While those keywords were useful for finding relevant sources within the database of the Gale Virtual Reference Library, such broad keywords were not as helpful when searching through databases for academic articles. Many of the academic articles found were focused on a specific demographic or a specific type of media, which forced me

to narrow down my focus, as well as use more specific keywords. The next place I searched through was Project Muse, a multidisciplinary database, using keywords such as "media representation" and "Southeast Asians." After filtering out results that were not journal articles, a few relevant sources were found, though not as many as was hoped. I also tried using the multidisciplinary database of Academic Search Complete with the same keywords and filters, but found similarly disappointing amount of relevant results. The next places that were searched through were subject-specific databases such as CommunicationSource, Sociological Abstracts, and PsycInfo, where the most relevant results were found by using keywords such as "representation," "Southeast Asian," "media," "film," and "television," as well as by using filters. Not only were more relevant and reliable sources found by filtering out results that were not peer-reviewed, it was also useful to filter sources by subtopics such as "Asian Americans" or "mass media." Out of all the databases used, the most results were found through Sociological Abstracts, and the largest amount of relevant journal articles were from the *Journal of Asian American Studies*.



## Gopez

### **Divisions Between Southeast Asians and Others**

One effect that the representation of Southeast Asians in the media has been that it leads to divisions between Southeast Asians and other Asians. According to Dr. Jana K. Lipman, an Assistant Professor of History at Tulane University, American media after the Vietnam War portrayed mixed race Vietnamese-Americans in a positive light and welcomed them as Americans, but often overlooked their full Vietnamese relatives (Lipman 49). This clear difference in the portrayals of Vietnamese-Americans and their families may potentially lead to fractures within their relationships. In addition to these potential personal conflicts within families, the difference in media portrayals of Southeast Asians compared to East Asians may cause conflicts between these two groups. Dr. Kevin L. Nadal, a Professor of Psychology at City University of New York, documented a criticism of the 2018 movie *Crazy Rich Asians* that, “in the film, the presence of Brown Asians was either minimal or stereotypical (e.g., Brown Asians were only portrayed as servants, and Filipino actors were cast as East Asian characters)” (Nadal 6). Most of the portrayals of Asians on the screen are of East Asians, rather than Southeast Asians. Media that East Asians celebrate as representative of Asian-Americans in general may fail to include other Asian demographics such as South Asians and Southeast Asians, as proved by the example in the previous sentence. In these instances, even mass media that supposedly represents all Asian-Americans actually lack in both the quality and quantity of Southeast Asian portrayals. Liann Yamashita, an Equity, Diversity, and Inclusion Trainer, noted that many of the Southeast Asians that she interviewed “felt that common depictions of Asian Americans were not only unrepresentative of their experiences but predicated upon quiet neglect which eschewed [Southeast Asian-American] issues by amalgamating refugees with East Asians” (Yamashita 261). In addition,

according to Alana J. Bock, a graduate student of American Studies at the University of New Mexico, the struggle to assert and define these feelings of being overlooked can lead to itself, and thus can lead Southeast Asians to perpetuate racism against other minorities (Bock 256). This is yet another example of how lack of representation can indirectly lead to strife within relationships between Southeast Asians and others. This portrayal of Southeast Asians in media can lead to disharmony within both the personal and intergroup relationships of Southeast Asians, even within the Asian-American community.

### **Feelings of Invisibility and Isolation**

Another negative effect of the portrayal of Southeast Asians in media is that it enhances one’s feelings of being invisible or an outsider. A study of Southeast Asian refugees in Canada found that “Canadian education and frequency of use of Canadian media were both directly related to the level of perceived discrimination” (Beiser, et al.). The correlation between the refugees’ exposure to Canadian media and the amount of discrimination they are aware of points to a lack in quantity and quality of representation found in Canadian mass media. While one could argue this finding might instead signify racist attitudes and viewpoints present in movies, televisions, and newspapers, the lack of quality Southeast Asian representation likely plays a part as well. This effect is not exclusive to Canada, however, it is also prevalent in the United States. Asian-Americans as a whole have already been historically underrepresented in American television (Beaudoin 1429), and Southeast Asian-Americans, as an ethnic subgroup of Asian-Americans, are even more so. Bock argues that “the Filipinx [gender-neutral form of Filipino] body is rendered illegible through the contradictions between the image of the United States as a liberal nation-state and its imperial reality” (Bock 249). While this quote mainly alludes to the politics and general culture of the United States playing a part in the



## When Group Boundaries Blur

reduced visibility of Filipinos, this fading of Filipino identity can also be partly attributed to the lack of Filipino representation in American media such as film and television. A 2011 survey found that there are over one million Southeast Asians living in Canada (Ferzacca), while there are around two-and-a-half million Southeast Asians living in the United States (Constante). These examples of the experiences of Southeast Asians in both America and Canada further prove that the lack of quality and quantity in representation can lead to a sense of isolation.

### **Mental Health and Self Esteem Issues**

The lack of Southeast Asian representation in media can also lead to issues in the mental health and self-esteem of Southeast Asians. According to Wong et al., exposure to the “model minority” stereotype of Asian-Americans can lead to damaged self-esteem when Asian-American youth do not meet those expectations, especially if they themselves believe the stereotype to be true (113). Even though Southeast Asians may not usually come to mind when one hears the term “Asian-Americans”, the stereotypes about Asian-Americans are still likely to affect them. Through interviews with multiple Southeast Asian-Americans, it was found that some Southeast Asians were expected by their peers to conform to the model minority stereotype and were insulted or had their racial identity invalidated when they did not (Yamashita 258). This can cause mental health issues and stress. In fact, a study found that both Korean-Americans and Filipino-Americans were more likely to rate events as challenging compared to their Caucasian peers (Bjork et al. 436). This may be a sign of prolonged stress, since even everyday occurrences can be exhausting when one is facing constant stress. Another issue that impacts self-esteem, and thus, mental health, is one’s perceptions of their own attractiveness. A study of Asian-American men, including Southeast Asian men, discusses how Asian-American men find it harder to meet the American masculinity standard of being tall and

muscular, and how this may lead to “feelings of hopelessness, psychological emasculation, and unattractiveness among the participants” (Liao et al. 339). Both the pressure of model minority stereotypes due to stereotypical representation and the body image issues, which arise from underrepresentation of certain groups but overrepresentations of others, can lead not only to reduced self-esteem among Southeast Asians, but also to mental health issues.

### **Internalized Racism and Colorism**

Lack of quality representation of Southeast Asians can also lead to internalized racism and colorism. A study on the self esteem of Asian-American men found that a significant amount of the men surveyed regarded features typical of European Americans as necessary for attractiveness (Liao et al. 338). These ideals of masculinity are partly fueled by the overrepresentation of Caucasian “hypermasculine men” in Western media, as well as the lack of more traditionally masculine Asian men within movies and television. According to Whitney Hua and Jane Junn, many Asian-Americans deal with internalized racism not only due to American culture viewing whiteness as the norm, but also since the media often promotes the idea to be American is to be white (Hua and Junn 23). This phenomenon of internalized racism and colorism among Southeast Asians is not exclusive to men or those living in the United States.

In Asia, women often feel coerced to apply face whitening creams because they are very popular, and one can often find advertisements for them on television. While this study focuses on Southeast Asia, it is important to note that internalized racism and colorism are rampant in other Asian countries as well. Doctor Madhusmita Das and Professor Sangeeta Sharma noted that advertisements for skin-whitening creams are popular in India (Das and Sharma 124). A study found that skin-whitening creams were some of the biggest advertisement



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categories in both China and Korea (Yu et al. para. 28). Even in Southeast Asian countries such as the Philippines, the effects of the colorism and internalized racism perpetuated by the media is evident, with one example of this being the popularity of face-whitening creams and other skin-whitening products, partly due to media influence advertising these products (Mendoza 230). Dr. L. Ayu Saraswati, a professor in the Department of Women, Gender, and Sexuality Studies at the University of Hawaii, observes that many of the dark-skinned Indonesian women she interviewed feel shame and a lack of confidence when it comes to their skin color (Saraswati 127). While this may partly be a result of the long history of colorism and colonialism in Indonesia, there are other, more modern factors that may play a role in creating these feelings. As mentioned earlier, skin-whitening cream advertisements are popular in Asia, which may play a part in the colorism, both internalized and external, that these Indonesian women experience. The external colorism also plays a part. Saraswati notes that “dark-skinned people in today’s Indonesia are perceived as “scary,” “criminal,” “smelly,” “dirty,” and “weird-looking”” (120). Internalized colorism is already a part of many cultures that Southeast Asians live in, and the media in both Southeast Asia and abroad only further perpetuate this.

### Conclusion

During my research process, not only were the direct effects made evident that current Southeast Asian representation in movies and television can have on the self-esteem and mental health of Southeast Asian individuals, but it was also shown how it can indirectly affect the relationship between Southeast Asians and other Asian minorities. It was also demonstrated how the lack of quality and quantity in Southeast Asian representation in media is only part of the problem; it works in tandem with the culture around an individual to cause its negative effects. Originally, the conclusion reached was that

simply adding more positive representations of Southeast Asians in media would be an effective solution, but now it is clear this is only part of a solution. In order to fully eradicate the negative effects mentioned in this paper, such as rifts in relationships with others, feelings of isolation, decreased self-esteem, and internalized racism, we must also work towards eradicating the racism and colorism that are deeply ingrained within not only American culture, but other cultures as well.

One of the ways this can be rectified is through more education about racism and biases. Throughout my research, I have realized how little scholarly research there is about Southeast Asians, especially concerning the representation of Southeast Asians in media and how lack of quality representation negatively affects Southeast Asians. However, implementing more education on such issues is easier said than done. It may not be possible to ever remove prejudice fully from any society, not to mention that ethical questions may arise from attempts to remove even negative aspects of cultures. This does not mean that we have to be complacent, however. Although movies and television may only be a piece of the problem, and therefore only a piece of the solution, they are still an important part of many cultures and an excellent place to start when one wants to affect change within the world. Therefore, the original solution that was concluded is not enough; not only should we improve both the quantity and quality of Southeast Asian representation in movies and television moving forward, but we should also utilize movies and television as platforms where we can ask the viewer to confront the racial biases within their environment, as well as within themselves.



## When Group Boundaries Blur

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# DOMESTIC VIOLENCE: LAWS AND REGULATIONS ARE DISCOURAGING WOMEN FROM REPORTING

Amy Walesby

*\*Content Warning – this paper covers domestic violence topics that may be triggering for some audiences.*

*ABSTRACT: The statistics show that in the United States, rates of domestic violence against women have not decreased over the years, and globally, the statistics look very similar. Every year, more research emerges causing the current laws around domestic violence to become outdated. Without evaluating these, the likelihood of women continuing to not report domestic violence instances will continue to grow. We must look at the laws around domestic violence and see where change can be made so that women, and men, and all people, feel comfortable to come forward in domestic violence situations.*

*Keywords: domestic violence, intimate partner violence, reporting, laws, United States*

## Introduction

**Are the laws and regulations in the United States, in regard to domestic violence, preventing women from reporting acts of violence?**

In the United States, approximately 25-30%, or roughly 1 in 4 women, experience some level of domestic violence in their lifetime. Yeardeley Love, a senior at the University of Virginia, was one of those women who sadly experienced the most extreme degree of domestic violence. On May 3, 2010, Love’s lifeless body was discovered by her roommate. The subsequent investigation revealed that her ex-boyfriend, George Huguely, had beaten and murdered her. Although at the time of her death, Love and Huguely were not together, they had recently exited the relationship. Both Love and Huguely were a part of UVA’s women’s and men’s lacrosse teams and were in similar friend circles because of this. The news of Love’s passing, while shocking, was not surprising to her friends as they had noticed, or even witnessed, some of the violent and controlling actions against

Love. It is a tragic story, and everyday women experience such violence.

Domestic violence as defined by The United States Department of Justice: “is a pattern of abusive behavior in any relationship that is used by one partner to gain or maintain power and control over another intimate partner. Domestic violence can be physical, sexual, emotional, economic, psychological, or technological actions or threats of actions or other patterns of coercive behavior that influence another person within an intimate partner relationship. This includes any behaviors that intimidate, manipulate, humiliate, isolate, frighten, terrorize, coerce, threaten, blame, hurt, injure, or wound someone.”

From there, the Department of Justice goes on to further define the different forms of violence and what they may look like case to case. There are too many cases similar to Love’s, too high of statistics showing the number of women and men suffering at the hands of their intimate partners’ to not examine the United States laws in regard to domestic violence. In this paper I will argue that the laws in the United States do not sufficiently protect domestic violence victims



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because of the lack of understanding, learning, and curiosity that goes into the formation of the laws. Over the history of America, we have seen many different laws around domestic violence, from men having the “right” to correct his wife’s behavior to mandatory arrest laws which require law enforcement to arrest who they assume to be the perpetrator in a domestic violence call. Laws, such as the latter, do not always help in domestic violence cases and can, in fact, harm them. In the case of Love, her friends did not say anything to authorities because they were concerned for the closeness of the two lacrosse teams. To truly help those experiencing domestic violence, it is important for laws to be written with intention and understanding that the victims require a specific kind of support.

### Methods

When beginning the research for this project, I had to work on narrowing down the main topic of my question. As domestic violence is a broad topic, I needed to decide the angle of which I would answer my question. Once I had done this, using my preexisting knowledge around violence against women and domestic violence, I searched for articles and resources that would support my paper. First using the campus library and then Academic Search Complete (EBSCO), I was able to find scholarly articles. These sources provided me with the necessary background information I needed around the United States history and laws surrounding domestic violence. From here, I turned to the internet to look for a variety of domestic violence hotlines and resources that I later reference. I also took advantage of different government websites, such as Washington State and the FBI. These sources provided me with current laws that are in place.

In addition to this academic research, I interviewed Karina Tamayo, the University of Washington Bothell’s violence preventionist. The interview provided me the opportunity to ask clarifying questions and fill the holes of

which I had from my previous research. With a collection of audio and written documents, my research began to fill out a large picture which I was mod-podging together. Focusing on qualitative data, which is the meat of my paper, I also have some quantitative and statistical data. All of the research I have relates back to my question and thesis statement, with a focus of presenting my research in a way that is factual, but still interesting for those who read it.

### Interdisciplinary Statement

This paper focuses on domestic violence, or the historical act of a man holding power over a woman. One of the United Nations 17 goals, achieving gender equality and empowering all women and girls is number five on their list. And as a part of their goal, target 5.2 is to eliminate all forms of violence against women, public and private (“Goal 5”). Domestic violence, or as the UN refers to it as intimate partner violence, falls into that category. As a global issue, domestic violence is a complex construct and a part of an even larger structure. Looking at the fine details and the definition of the term, only two people are involved, two people in an intimate relationship. If you widen the scope, then friends and family are involved, and you can get even larger. From law enforcement, to state law, to the federal government, all the way to the UN, this is not an individual problem, but that of the masses.

Domestic violence, a situation where a person can feel the loneliest, is truly one of the greatest connections. Nowhere in history can you point to a time where domestic violence has not occurred; nowhere in the world can you point to a place where domestic violence does not exist. You can point to the woman who knows at least one friend who has been verbally or physically abused by their partner and you can point to the lack of education in the school system that does not teach young children about violence. It is very easy to pinpoint a moment in time that can



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wind itself back into the structure that is a part of the domestic violence web.

### Literature Review

During my research, I compiled a list of different sources, those being sections from encyclopedias, government documents, podcast episodes, and a variety of domestic violence hotlines and coalitions. These sources cover the history of domestic violence laws in the United States, statistics, current laws, and information on abused partners leaving their domestic partners. Here is a walk-through of that information.

Domestic violence is not new to anyone. It has always existed; it is just the laws that change and the awareness that grows around them. In the “Violence in American Society: An Encyclopedia of Trends, Problems, and Perspectives,” the history of domestic violence in America is evaluated. The first domestic violence policy on record dates back to the seventeenth century Massachusetts Bay Colony and Plymouth Colony where the religious Puritans thought it sinful to harm women and children (147). One century later, another impactful case appeared in which a man went to the Massachusetts supreme court, *Bradley v. State*, because he believed it was his “right” to discipline his wife with violence (Richardson, 148). Sadly, this is the theme that follows America’s history. Domestic violence was a private affair that was not discussed or punished. In the twentieth century, a change began to appear. With feminism on the rise, by the 1960’s and 70’s, research was being done on the prevalence of domestic violence. At that turning point, definitions had changed, there had been ample studies done on who was most affected by domestic violence, and much more.

The importance of that research continues to reveal itself with every publication. One of those said publications is a part of the *Encyclopedia of Multicultural Psychology*, in which the authors Catherine Koverola and Cristin Murtaugh cover

the impacts, theories, and role of culture and ethnicity in domestic violence. Their research states “[a]pproximately 25% to 30% of women in America are victims of domestic violence during adulthood” (155). It is important to note that this was published in 2006, but the statistics have not varied much since. “Addressing violence against women: a call to action”, published in 2015, states “30% of women who have ever been in a relationship worldwide have experienced [intimate partner violence]” (García-Moreno, et. Al.) These statistics show that the laws in place between 2006 and 2015 have not improved the situation.

In Washington state, there is a mandatory arrest law which “requires a police officer responding to a domestic violence incident to make an arrest if the officer has probable cause to believe that a domestic violence offense was committed within four hours prior” (“What Happens in Cases of Domestic Violence”). And Washington is not the only state. According to the American Bar Association Commission on Domestic Violence, 25 states have a “Mandatory Arrest” law, while many others are at “Officer’s Discretion” or “Pro-Arrest.” It is important to note here that laws and definitions are always changing at the state and federal level. Looking more closely at Washington State, Chapter 10.99 RCW covers definitions, law enforcement training, duties, policy, sentencing, and other important topics regarding domestic violence. Key points are “[t]he criminal justice training commission shall develop and update annually an in-service training program to familiarize law enforcement officers with the domestic violence laws” (RCW 10.99.030.3) and “[t]he criminal justice training commission shall implement by July 28, 2019, a course of instruction for the training of law enforcement officers in Washington in the handling of domestic violence complaints” (RCW 10.99.033.2). These two specifications in the law show the intention of updating training programs to keep up with new research and data.



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### Defense of Thesis

The response to domestic violence has changed over the course of history, not just in America, but also the world. Turkey has recently seen a change in which intimate partner violence is being taught in schools (Erten et al.). At the point “For Better or for Worse?: Education and the Prevalence of Domestic Violence in Turkey” was published, many improvements could be seen already – “increase in education among rural women led to an increase in self-reported psychological violence and financial control behavior” (Erten et al.). But these improvements came from reevaluating previous laws and updating them to fit current research available. Thought must go into the formation of laws for them to matter. I specifically want to highlight the mandatory arrest law. While each domestic violence related law is important, the mandatory arrest law speaks to me as one that could simply change. This change would affect at least 25 states and the women who live in them.

Many people, not just women, experience domestic violence and when thought and care is not taken into consideration of such laws, the worst case scenarios, such as Yeardeley Love’s, occur. It is important to note that not all domestic violence situations end in death. According to NCADV, “nearly 20 people per minute are physically abused by an intimate partner in the United States.” Statistics such as these add to the weight of why laws must be changed, such as the mandatory arrest law.

This next example of change to laws I want to draw your attention to is that of the old definition of rape the FBI used and the updated version that is currently in affect. This is proof that correct thought can go into laws and change them to make them better. Before we start, rape is a separate action from domestic violence, but it can also be apart of it; think about how squares can be rectangles, but rectangles are not squares – according to the National Coalition Against

Domestic Violence, 1 in 10 women have been raped by their intimate partner. Before 2013, the Federal Bureau of Investigation’s definition of rape was “the carnal knowledge of a female forcibly and against her will” (“Rape”). At the beginning of 2013, the definition was changed to “penetration, no matter how slight, of the vagina or anus with any body part or object, or the oral penetration by a sex organ of another person, without the consent of the victim” (“Rape”). This change in definition allows for two different things. One, to clearly define what rape is, and two, to allow for that clarity to better represent cases of rape for everyone, for women and men alike.

Women and victims of domestic violence have struggled with coming forward and sharing their experiences throughout history. Once a private matter, domestic violence victims still struggle with being believed because of the stigma that emerged from old beliefs and lack of education. Because of this, it is the duty of law makers and enforcers to provide proper help for these people. We must encourage women to come forward and ask for help. Domestic violence is not something that should be kept behind closed doors, the proper support should be available. This is why the proper understanding, learning, and curiosity needs to go into the creation, formation, and rewriting of laws pertaining to domestic violence.

### Counterarguments

A clear counterargument that I can point out which challenges my thesis is that of “why do women not just leave their abuser?” This thought challenges my thesis by completely disregarding laws with the belief that if women and victims of domestic violence just left their abusers before, or right as the violence began, then there would not even be a need for the laws. As amazing as it would be if women could just leave their abusers, then yes, there would be no reason for laws around domestic violence. However, this belief does not hold up



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if you look at the reasons why women do not leave their abusers. On the Los Angeles Police Department (“Reasons why”) website, there is an article dedicated to the reasons why domestic violence victims stay with their abusers. A long list, I want to highlight a few key points that are mentioned. The LAPD uses the term batterer in place of abuser.

“The victim loves the batterer... the batterer is not always violent.”

“Even if it is a neighbor who reports, the batterer may take it out on the victim. Often when the police come, the victim will not admit the battering.”

“Learned helplessness. The victim has been taught and believes to be powerless, and therefore the situation from that perspective.”

“The victim may be convinced that this beating will be the last” (“Reasons why”)

Each of these four reasons may be difficult for someone who has not experienced abuse to understand, let alone the others on the list. Just because we do not understand why, the psychological reasons keeping victims with their abusers is a challenging topic to comprehend. As there are studies to prove this reasoning, that is why my thesis stands up to the counterargument. Besides, as we learned from the story of Yeardeley Love and her ex-boyfriend, just because you have exited a relationship does not mean that you are safe.

### Conclusion

Domestic violence is a hideous act of which is experienced by too many women and men in our society and around the world. The statistics show that roughly 30% of women have experienced domestic violence in their life and that is not acceptable. The human race will not be able to achieve greatness until we have ended violence against women. This means that we must take care in the creation of laws. We must think about victims and what they experience;

we must think about what research shows and listen to what people have to say. We can learn from past mistakes and see what not to do. We must do our best to not repeat those actions and those mistakes. And we will not always be perfect. At one point, it made sense to have mandatory arrest laws because of what we knew and understood, but now we know better. The current research shows that we must update old ways of thinking and acting.

We must think about Yeardeley Love, her family, her friends, and all the other women who experience domestic violence. We must choose to listen to the uncomfortable to help change the future. Think about your daughter, your mother, your sister, your aunt, your friend. What would you do if you learned they had experienced domestic violence? Would you advocate for them and look for the holes in the justice system to help make changes for the next woman? I know I would. I would look for the services that are available and see how I could help. I would demand changes and study the research on domestic violence. That is what I am doing. This paper examines what is wrong with the laws in the United States, but only scratches the surface. There are many laws, policies, and regulations regarding domestic violence – too many to pick apart in a research paper. It is about educating yourself and others on the rights women have and the options there are.

**If you are experiencing domestic violence, know what resources there are for you:**

**Center for Prevention of Abuse Hotline  
(800) 559-SAFE (7233)**

**National Domestic Violence Hotline  
(737) 225-3150**



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# THE SOCIAL DETERMINANTS AND CULTURAL BARRIERS IN OBTAINING A MAMMOGRAPHY SCREENING FOR SOUTHEAST ASIAN IMMIGRANT WOMEN IN LOS ANGELES: AN EXPLORATORY SEQUENTIAL STUDY

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*ABSTRACT: Mammogram screenings are X-rays of the breasts used to detect early indicators of breast abnormalities such as cancerous bumps. According to the American Cancer's Society (2023), women starting from the age of 45 are urged to regularly conduct annual mammogram screenings. With the early detection of cancerous masses, patients are able to catch breast cancer in earlier stages before metastasis. The leading cause of cancer death in Asian American women is breast cancer. However, compared to all other racial groups, Asian Americans has the lowest rates of mammogram screenings. Without regular mammogram screenings, there is an increased risk of developing breast cancer undetected. When it is eventually detected, a late screening may result in the need for more invasive treatments and a severe diagnosis. In order to tackle the social determinants and barriers for Asian American women, to obtain regular mammography screenings, Asian Americans cannot be seen as a homogenous group. Often times research studies exclude populations of South East Asian ethnicities, the immigrant population from these countries, and generalize results to all existing Asian American ethnic groups. This solely focuses on the racial identity of patients, but glosses over several health determinants unique to each Asian ethnicity such as income, immigrant status, and education level. Through this exploratory sequential study, both qualitative and quantitative data will be collected to identify the social determinants and cultural barriers Southeast Asian Immigrant women, in Los Angeles, face. Results will set a foundational baseline for public health professionals, explore how to tackle these barriers, and increase mammography screening rates for Southeast Asian immigrant women.*

## Background and Introduction

According to the American Cancer Society (2022), breast cancer is the second leading cause of cancer death in American women; it is estimated that one in thirty-nine women will die from breast cancer. The main common treatment for breast cancer includes surgery, chemotherapy, hormonal, biological, and radiation therapy (CDC, 2022). Commonly a mammogram screening, breast ultrasound, and/or breast MRI will be referred by a primary care or a mid-level healthcare provider if there is suspicion of a tumor. If a mass is found, further testing will require a biopsy in order to determine if that mass is cancerous. Mammography scans have been proven to reduce deaths from breast cancer among women ages 40 to 74 years, with evidence showing the strongest benefit to women ages 50 to 69 (National Cancer Institute, 2022). With regular mammography scans, women can decrease

their risk of breast cancer by early detection of a cancerous mass.

Though Asian American women have been found to consistently have one of the lowest rates of breast cancer diagnoses compared to other ethnic groups overall, it is a leading cause of death among Asian American women. Gomez et al. (2010) found the present generation of certain subgroups of Asian Americans are experiencing unprecedented high rates of breast cancer. For example, in 2022, Asian/Pacific Islanders saw an overall annual 1.7% increase in breast cancer, but individual ethnic subgroups within showed varying differences. While there was no significant increase in breast cancer cases for Japanese women, Korean women saw an annual increase of 2.55% (Navarro et al., 2022). This, in turn, shows the problems with assuming homogeneity across all who identify as "Asian" in medical settings, further contributing to the "Model Minority" Myth.



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This myth consists of stereotypes that support the belief that all Asian Americans are all the same (Blackburn, 2019). The generalization of Asians having the lowest rates of breast cancer diagnoses glosses over underrepresented ethnic subgroups who are suffering; this contributes to a misunderstanding that the Asian community is somehow healthier than other Americans. One particular subgroup that gets overlooked are immigrant Asian American women. Immigrant Asian American women are not only found to have a higher risk of breast cancer than U.S.-born Asian American women (Morey et al., 2019) but additionally have worse survival outcomes (Gomez et al., 2010). The immigrant subgroup is consistently seen to have a worse outcome, leaving them even more vulnerable in a foreign country. The question of why still remains unanswered, though data suggests it may be due to higher rates of breast cancer detection among immigrant women (Morey et al., 2019).

Mammogram screenings utilize medical x-rays of the breast to detect any early breast changes before any physical symptoms, such as cancerous lumps, develop. The American Cancer Society recommends women ages 45 to 54, with no prior risk of breast cancer, to get mammograms every year, while women older than 55 are given the option to continue annual or switch to biannual screenings (American Cancer Society, 2022). Women who have regular screenings are able to catch breast cancer in the early stages and therefore need less aggressive treatment. While breast cancer is the leading cancer-related cause of death for Asian Americans and seen in higher rates of diagnosis in immigrants, screening rates for Asian Americans overall are the lowest. In 2021, breast cancer screening rates for Asian Americans were at 64.1%, while non-Asian Americans overall had higher rates at 72.4% (Richard et al., 2021). These statistics are concerning, as lower mammography screening rates increase the risk of each woman living with breast cancer undetected. A later-stage diagnosis leads to a higher chance of “metastasis” and consequently a high number of Asian women dying of breast cancer. Patients’ socioeconomic status and racial identity have been seen as a barrier to obtaining cancer screening or even treatment. A retrospective correlation study conducted by Qwaider et al. (2021) with the Massachusetts General Hospital database, found a diverse mix of patients who resided in the lower income areas of

Massachusetts tend to be screened less, received less chemotherapy treatment, leading to an overall worse outcome with their stage III of colorectal cancer diagnosis. This study showed a direct correlation between being lower income and an overall worse cancer treatment no matter which racial group patients belonged in. Further, Sadigh (2022), found that patients living in deprived neighborhoods and being either uninsured or on Medicaid, often were associated with high rates of early discontinuation of treatment. In Navarro et al.’s study (2022), they found an increased odds of surgical delay (30- and 90-day periods after diagnosis) for non-Hispanic Black, and Hispanic patients compared to their non-Hispanic White counterparts. There is a connection between the racial identity and socioeconomic status of patients, with the quality of treatment provided to patients. Studies from above and recent experiments have not specifically studied breast cancer rates in subgroups of Asian American immigrants; we can use the conclusions and infer the same of immigrants who fall in the same socioeconomic categories.

One might be tempted to blame only the social determinants of health for such outcomes. However, the generalization of the Asian category as a homogenous group leads to the overlooking of large cultural disparities across different Asian ethnic subgroups. For example, Asian households in 2019 overall had a higher median annual income (\$85,800), compared among all U.S. households (\$61,800), but only two Asian subgroups, Indians (\$119,000) and Filipinos (\$90,400), exceeded the higher annual income (Budiman & Ruiz, 2021). English proficiency also varies between ethnic groups, linked to the time each group arrived in the United States. Older ethnicities like the Japanese (85%), Filipinos (84%), and Indians (82%) were found to have higher proficiency rates compared to younger recently immigrated Asians, such as the Burmese (38%) and the Bhutanese (36%) (Budiman & Ruiz, 2021). These numbers show that the category “Asian” consists of a variety of ethnic subgroups with varying socioeconomic conditions; these which might explain differences in breast cancer screening rates between Asian ethnic subgroups. Therefore, differences may also be seen in the diagnostic rate, and survival rate in Southeast Asian American patients with breast cancer.



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There seemed to be additional cultural reasons, and factors connected to immigration which led to lower screening rates, something that cannot be measured by quantitative data concerning socio-economic numbers. For example, the participants' lack of knowledge and low-priority attitudes towards mammography screenings in Wu et al.'s study (2008) were connected to a lack of awareness of early cancer detection in their native countries respectively. Even after leaving their native country, there remained a residual lack of knowledge, and urgency towards breast cancer screenings that persisted in their residency as migrated U.S. citizens. Cultural differences can interfere with Asian Americans receiving necessary, and appropriate medical care. In Asian culture, "saving face" is the concept of maintaining social respectability, public family-image, and being self-sufficient through self-sacrifice (Kagawa-Singer et al., 1997). As cited in Kagawa-Singer (2010), the fear of "losing face" caused Chinese and Japanese American participants to hold back clarifying-questions for their doctors. Further, the burden of transportation costs and family caregiving has forced patients to pick more invasive treatment options over breast-conserving chemotherapy. Receiving care from medical professionals, therefore, is viewed as a potential risk for losing face and burdening others. At times the reason seems to be out of the patient's control, at such incidence that a 2015 study found that non-recommendation from a physician tended to be the main reason English-speaking Asian migrants were not screened for cancer, compared to their white counterparts (May et al., 2015). Overall, it has been established there are different ethnic subgroups in the Asian category, all with varying socioeconomic backgrounds and cultural features that may contribute to the low rate of breast cancer screenings among Asian American immigrants.

### Rationale and Significance

There is an urgent need for additional research into observed lower breast cancer screening rates in Southeast Asian American immigrants, as the data has established a connection leaving this population vulnerable with a higher risk of late-stage breast cancer diagnosis. The late-stage prognosis of breast cancer often means overall worse outcomes and the need for more invasive treatments. However, not as much is known about the important subgroup

differences due to National Surveys' data sample of Southeast Asian Americans/Pacific Islanders (AA/PI) women being too small and frequently aggregated, making available data also conflicting (Peek & Han, 2004). This indicates how Asian Americans tend to have an overall higher-median household income and education levels compared to other racial groups. This indicates that the social determinants of health do not fully explain for the health disparity observed in mammography rates seen in this population (Lee et al., 2021).

Most studies conducted towards Asian American women consist of women from solely East-Asia and major Southeast ethnicities. This leaves a big population of underrepresented Southeast Asian Americans that have not gotten the chance to have their own story told. This study will be conducted in the state of California, as it represents the largest population of Asian Americans to sample in the United States (U.S. Department of Health and Human Services, 2021). The location allows us to get access to the largest population of underrepresented Southeast Asian populations: Cambodian, Philippine, Thai, Vietnamese, Burmese, Malaysian, and Laotian. Using the gap of knowledge of reasoning to explain the health disparity in mammogram rates in immigrant Southeast Asian American women, the study will use a mixed method to explore the socioeconomic and cultural barriers to obtaining a mammography scan.

### Research Question and Hypothesis

Asian American women have the lowest mammogram screening rates compared to other ethnic groups, yet breast cancer is the leading cause of cancer-related death in this population. Non-regular screenings increase the risk of undetected breast cancer spreading into late-stage diagnosis and more aggressive forms of cancer to treat. Therefore, when treatment is eventually offered to them, there is a need for more invasive options. Our experiment strives to explore if a combination of socioeconomic factors and cultural barriers are the reasonings why Southeast Asian American immigrants have lower observed breast cancer screening rates, and consequently worsened survival rates in breast cancer patients. Determining an explanation why women are not seeking mammography scans is essential to the first steps in helping them overcome barriers to routine mammogram screenings and bettering the



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outlook of breast cancer survival in Southeast Asian immigrants everywhere.

### Design

An exploratory mixed-method study will be conducted on Southeast Asian American immigrant women in Los Angeles, California. Per the breast cancer screening recommendations from (HERE), we will only include individuals aged 40 to 65. Women included in the study must have immigrated to the United States from one of the following eligible countries: Cambodia, Philippines, Thailand, Vietnam, Myanmar, Malaysia, and Laos. This group is meant to indicate participating individuals represent those not born in the United States but have lived most of their life here. Ethnicities were chosen due to their large presence in the state of California, the state with the largest population of individual Asians. Participants will not be excluded from the study if they do not speak English; if participants only speak their native language, trained interpreters will be provided to help with the translation process. It is crucial that participants feel comfortable during the study in order to get accurate results. Any mammograms taken in the last 16 months will be immediate grounds for exclusion from the study. Lastly, the setting of the qualitative focus groups requires participants to have lived in the Los Angeles area for the last five years. All these requirements will ensure we can measure accurate data to learn some insight into why Southeast Asian American immigrants tend to have lower mammography screenings.

### Phase 1: Qualitative Data

In focus groups, participants will be answering open-ended prompt questions allowing us to observe the discussion between women of the same ethnic group and help us collect qualitative data. The goal of the qualitative section is to define some assessed bounds regarding what factors and reasonings could be behind lower mammography screening rates in Southeast Asian Americans. With open-ended questions, we can assess attitudes towards screenings, as well as insight to cultural barriers to increasing screening rates. Snowball sampling will be used to recruit the specific demographic for which we are searching. Since we are looking for a specific group of Southeast Asian immigrant women, it may be easier to recruit participants if recruited

from a friend or family member. After recruitment, participants will be grouped in focus groups by the origin of the country; each country will have three focus groups and each focus group will have ten women. This means we will have a total of thirty participants for each Southeast Asian ethnic group.

Adapted from Wu et. al's study (2008), one day prior to focus groups being conducted, participants will be asked to write down three barriers they've encountered or known about which have prevented them from getting regular mammograms. Both a bilingual-trained translator, and moderator will be provided for each focus group. Prior to starting, participants will be reminded they are being recorded on both video and audio for the study. Audio recordings will be used by trained appropriate bilingual researchers to produce transcripts of the focus group session. Coding analysis, conducted by bilingual associates and research analysts, will allow us to categorize frequent themes appearing during focus groups. The conversational analysis gives us a fuller-picture which coding analysis alone would not be able to provide us. Looks or pauses when a topic is brought up can be its own unsaid conversation. Themes will be considered relevant if they show up across cohorts in different ethnic groups, or consistently across cohorts within the same ethnic groups. If a theme shows up only within the same ethnic group, we can infer the theme is specific to the ethnic group due to specific cultural values that do not present in other Asian ethnic groups. If a theme shows up across all ethnic groups, we can infer the theme is a shared sentiment across Asian cultures.

### Phase 2: Quantitative Data – Cross Sectional

Results from the focus groups will be used to write the quantitative survey questionnaire. Questions will be written inspired by frequent themes that show up in phase 1. For example, if transportation costs are a frequent theme across all ethnic groups, a question regarding transportation costs will be written. The questionnaire will consist of close-ended questions available in all the participants' languages. Questions will be first written in English by the Principal Investigator and bilingual Research Associates. They will then be translated back into any Tagalog, Burmese, Khmer, Vietnamese, Thai, Malay, and/or Lao. A final translation to English will be done to check for accuracy. Sampling will be conducted through quota and convenience sampling; both types



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of sampling methods allow for surveys to be sent to the specific demographic needed for this study. Phase 2 sampling will be limited to the Los Angeles area where women for Phase 1 were recruited. Reaching out to local Asian community centers and health organizations to recruit participants in our study. When recruited, the participant is mailed a personalized packet including the following: instructions for the questionnaire and how to return it back to the researchers, the questionnaire itself, paperwork detailing the study's intent and goal, as well as consent forms. The packet will also include information for a website that includes a digital copy of everything. On the website, the participants will have to sign another digital consent form entailing they have read and understand the conditions of the study.

Participants will identify their ethnic identity by picking from either Cambodian, Pilipino, Thai, Vietnamese, Burmese, Malaysian, or Laotian. The questionnaire will also ask additional questions regarding their zip code, age (18-25, 26-35, 36-45, 46-57, 58-67, 68-70+), education (High school diploma/GED, Two year College/Associate's Degree, Four year College/Bachelor's Degree, Master's degree, PhD, Other:), income (< 30,000, 30,000-45,000, 45,000-60,000, 60,000- 90,000, 90,000-100,000+), marital status (single, married, divorced, widow), English proficiency (Check whichever one applies to you: can speak English, can read English, can write English), and participant's first language (fill in the blank option). The question will also ask the status of the participants' health insurance status. Is the participant insured? If answered yes, they will be asked if it is public or private insurance then the name of the company.

The surveys that are mailed back to the researchers will be collected and counted until a 70% response rate is reached (Mundy, D. (Ed.), 2002). Statistical analysis of the questionnaire responses will start using the SPSS statistical package for Social Sciences. Chi square analysis ( $p < 0.05$ ) and (CI 95%) will be conducted between ethnicity and each socioeconomic factor (i.e. zip code, age, education, insurance status, income, marital status, and English proficiency) found to be a barrier in getting a mammography scan. A bivariate logistic regression model will also be conducted between ethnicity and each socioeconomic factor. Specifically, we would

also be looking at how long participants have lived here and the age of immigration to see if it is a factor when perceiving the barriers to mammography scans. Lastly, a multivariate logistic regression model will be produced across ethnic groups and socioeconomic factors to determine if the patterns we see in each ethnic group are consistent across all the ethnic groups. With phase 2, we plan to determine if the themes and sentiments of mammogram scans felt by women in Phase 1, apply to the general population of Southeast Asian American immigrants in Los Angeles. Further, we plan to observe any statistical differences in themes quantitatively between different Southeastern Asian ethnic groups.

### Ethics

Since participants are all immigrants, we need to be mindful of the language barriers that will inevitably come with the cohorts. As stated above, there will be bilingual interpreters available on site for each cohort. Interpreters will have to obtain a Bilingual interpreter certificate in the appropriate language. There may be medical phrases in English that do not exist in the participants' home language. The translators will be able to fill in the dots where the researchers alone might not be able to. Consent forms will be provided to each participant in both English and the participants' home language; they can choose which form to fill out. Information on the goal of the study and the use of audio and video recordings will be disclosed. Though participants' information will be known to the researchers and associates involved in the study, all participants, most importantly undocumented, maintain confidentiality during and after the experiment. Every researcher and associate involved in the study is trained and required to obtain a Certificate of Confidentiality (CC); the CC ensures the protection of the privacy of the research subjects by prohibiting the disclosure of identifiable, sensitive information in the release of data (National Institutes of Health, 2019). Before the study starts, the study proposal will be sent to the IRB Board at the University of Washington to be IRB approved.

After the study is finished, participants will be emailed a link to a website containing educational materials regarding the importance of mammograms. Since the participants recruited for this study have not had a mammogram, and they are in the age group which suggests they should have one, we determined it was vital to provide them with



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educational materials. Giving them resources on mammogram scans and why scans are important to their health may lead this vulnerable population to seek a scan. The website will contain a video like the DVD intervention in Gathirua-Mwangi et al.'s study (2016); the video will go over the risk factors of not getting regular mammogram scans, using visual graphics to show the potential spread of undetected breast cancer. The website will also include guidance on finding the closest and affordable clinic providing scans near participants' houses.

### Discussion

#### Significance

Asian Americans are the least likely ethnic population to be diagnosed with cancer, it is the leading cause of death, and cancer screening rates consistently remain the lowest among the major racial groups (Kwong et al., 2005). These findings are alarming as they are also the largest, fastest-growing racial group living in the state of California. These low screening rates in Asian American immigrants show the importance of studying and making efforts to increase mammography screenings during the rapid increase of recent immigrants (Ryu et al., 2013). Our experimental design shifts to study not only the quantitative side of the social determinants of health but strive to collect qualitative data that will give insight on why low breast cancer screening rates in Southeast Asian Americans occur. Using our data, we can suggest and implement further policies to increase the rates of breast cancer mammogram screenings in this understudied population. Advocating for a required translator for patients as a policy could decrease Southeast Asian women's hesitation to reach for help if language barrier was a major barrier. Barriers and themes identified in this population can also be applied to other women belonging to different demographics concerning breast cancer and/or other cancer types.

#### Limitations

Limitations of this study should be noted. Due to the specific demographic and non-representative nature of the convenience and snowballing sample, our study findings may not be able to be generalized to the non related demographic (i.e., other racial groups that are not Asian). The participants involved in this study are immigrants from Los

Angeles, California and therefore might live at a socioeconomic level than other Southeast Asian American immigrants on a national scale. To overcome this obstacle, future experiments can build from this design to explore breast cancer screening rates from a larger, more representative sample. The explorative design of the study with the addition of bilingual research associates makes the experiment more complex, therefore harder to conduct, and more time consuming. Focus groups require the time of the participants, researchers, and interpreters for all sessions, risking a low retention rate from participants. Since we are asking women in a specific demographic, cultural barriers or responsibilities for their family may also contribute to a low retention rate. The survey questionnaire may be easily ignored and lead to a lower survey response than we expect.

#### Future Direction & Conclusion

With the data from this study, future intervention and patient navigation programs can be developed to aid Southeast Asian American immigrants to obtain a mammography. In an intervention by lay health advisors and senior aides, Margolis et al. (1998) found that low-income women, specifically Native American participants, were significantly effective in increasing the rates of mammography scans after a year. In Gathirua-Mwangi et al.'s study (2016), when given three intervention options, the DVD intervention was the most effective in mammography adherence rates in African American women; the DVD combined visual and audio aides to explain the spread of breast cancer in the body and how mammography can prevent such a spread. Using the previous studies and collected data as inspiration, we can build an intervention program that utilizes both visual and audio and cultural details from our Southeast Asian American participants. Not only can we increase the rates of mammogram screenings, but patient navigation programs can increase adherence rates of screenings in the primary care setting (Phillips et al., 2011). With the implementation of both patient navigation and intervention programs for Southeast Asian American immigrants, there is hope to increase mammography screenings and learn insight to suggest new policies to bring down barriers to get screened.



## Cultural Barriers in Obtaining a Mammography

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# ASPECTS OF MENTAL HEALTH AND THE AFRICAN AMERICAN COMMUNITY

*Yordanos Berhane*

*ABSTRACT: From institutionalized discrimination to stigma, the Black community have faced many challenges to receive much-needed support and treatment for their mental illnesses. The main question revolves around whether increased awareness and accessibility to mental health resources impacts the quality of life for African Americans. The proposed study addresses three main obstacles that hinder African Americans from seeking help: stigma around having mental illness, historical atrocities done to African Americans by the healthcare field and the effects these injustices have on African people Americans ' decision to receive care. The anticipated outcome is increased awareness will result in greater willingness to accept treatment quickly leading to an overall better quality of life.*

## **Section I: What I Know, Assume, or Imagine**

The topic of investigation in this paper I chose is mental health in communities of color and how stigma influences how the community receives help. Personal proximity to these social stigmas around mental health that people of color have. As a person of color who has lived in a culture that does not acknowledge any type of mental disorders, aside from complete mania, and perceives that the sole solution is holy water. Eritrea, my native country, recently gained its independence from Ethiopia in 1991, when the government was overturned by a dictator who implemented a law conscripting teenagers ages 16-18 into the military until death. There is no future for getting an adequate education, a dream that many had. As a result of the dictatorial government's mandatory enlistment, my parents and extended family were all destined to be soldiers when they turned eighteen. I listened to war stories as my parents relived the horror that is war. Consistent teaching that they are supposed to be strong has ingrained in them a fear

of weakness and a habit of ignoring their emotions.

Personally, it wasn't until the pandemic began that I learned about what mental stability and instability were. For some reason, taking care of one's mental health was always overlooked at my school. After a health class, I wanted to explore careers around mental health and learn more about this growing topic. I am aware that the constant discrimination and microaggressions the Black community is exposed to can cause a rapid deterioration of one's mental stability. I would like to find out if any POC-focused programs help with mental health awareness and what would be the best methods to increase accessibility in these communities. I assume that programs led by similar-looking people who have similar backgrounds would help with awareness. This paper studies whether improving access to mental health facilities and mental health awareness will help future generations seek help earlier rather than later, leading to improved quality of life.



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## **Section II: The Research Process and Discoveries**

### **Part A: The Search Methodology**

I began with the keywords “race”, “racial minorities”, and “mental health” while searching for reference sources in Gale Virtual Reference Library. I used the same keywords in the UW Library Search but encountered a problem. Before I filtered it to only peer-reviewed sources, the PsycInfo database I used gave results that were mainly personal narratives and many were from the American Psychological Association. I could not use the personal narratives since they were not peer-reviewed, and the American Psychological Association’s target audience is the public. Since my keywords were broad the results they yielded were varied. I chose the Web of Science database and added the keywords “mental health disparities and racial minorities”, “access and racial minorities”, and “health disparities and access” which yielded more specific results but there was a problem with whether these sources were peer-reviewed. From there, I moved on to a subject database (PubMed) because the articles published were peer-reviewed and relevant to my subject. I continued to add the keywords “discrimination and mental health” and “mental health and racial minorities.” I have used Sociological Abstracts for information regarding the cost of mental healthcare services using the keyword “cost of healthcare.” I also used Sociological Abstracts for my subtopic on stigma using the keywords “stigma in healthcare” and “stigma and mental health and African Americans.”

### **Part B: Discoveries**

#### **Racism and Discrimination in Mental Healthcare**

The main barrier that causes African Americans to hesitate before seeking mental health services is the countless injustices that the healthcare system has caused in the community. Sirry Alang, a professor of Psychology at Lehigh College, stated that a Black participant said “They treat us bad in school, at work, and on the streets. If I’m not dying, I’m not going to the hospital. They’ll treat us bad there too. You want them to give you medications for mental health? That stuff can mess with you real good” (346). This quote helps to highlight the idea of experienced racism and how Black people start to perceive that the healthcare system would not be any different. This participant expresses mistrust toward the healthcare system which is supported and reflected by this finding which shows that Black patients do not go to hospitals due to the mistreatment they receive and how the treatment that they receive can be dangerous to their health rather than aiding in their recovery or lessening the symptoms. Both of these support the idea that there could be negative behavior changes in care-seeking by African Americans. A group of researchers at the University of Lisbon conducted a study to identify health-related stereotypes about Black people that healthcare providers had and found that “being Black was more strongly associated with being less intelligent, less cooperative, and less compliant than White patients. In another study on treatment decisions, Sabin and Greenwald found that the higher the provider level of bias was, the less likely they were to prescribe postsurgical pain medication for a Black (vs. White) patient”(Filipa Madeira et al. 3). This quote displays how stereotypes that come from racism influences how providers



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treat Black people and how the stereotypes have a negative impact on their health. Historically, misconceptions that people of African descent can take pain better than their European counterparts are exemplified in this quote, which states how providers are less likely to prescribe African American patients painkillers after surgery (Filipa Madeira et al. 3). In brief, due to historical discrimination in the healthcare system, African Americans are less likely to seek professional help for their mental illnesses and these findings from these studies support the idea that there could be negative attitudes toward the healthcare system and lead to many African Americans dealing with their mental illness alone, leading to poorer quality of life.

### **Institutional Mistrust**

The second barrier that Black people face regarding receiving mental health services is the institutional mistrust that is a result of the centuries of atrocities that the medical community has performed on African Americans. Researchers from the Wake Forest School of Medicine's Department of Psychiatry, found that although the disorder is more prevalent in White Americans than African Americans "the chronicity of disease was higher for African Americans (56%) than it was for Caucasian patients (38.6%)"(605). In addition, Professor of Psychiatry and Biobehavioral Sciences Jeanne Miranda, describes how "After entering care, minority patients are less likely than Whites to receive the best available treatments for depression and anxiety"(395). African Americans are less likely to receive the best available treatment which is supported and reflected by this large finding, which showed that mental disorders in the African American community last

longer and worsen over time compared to those of White Americans. Both of these findings support the idea that the lack of equal and non-discriminatory mental health treatment leads to Black patients becoming more hesitant when seeking mental health services which results in a decrease in quality of life. Elizabeth Sparks, a Psychology professor at Boston College, states that "It has been found that 12% of African Americans, compared to 1% of Caucasians, feel that a doctor or health provider judged them unfairly because of their race or ethnic background"(22). This quote demonstrates that African Americans do not feel that using mental health resources is beneficial due to how the providers in the mental health care system mistreat them. Also, it shows that providers are not without their biases and that healthcare professionals need sufficient training when it comes to treating all of their patients equally and being aware of the history between minorities and the healthcare system. This mistrust toward health providers and professionals leads to untreated mental disorders, which can decrease the quality of life for Black individuals and future generations to come.

### **The Stigma around Mental Illness**

The third main cause of unequal access and treatment is the stigma around mental health. Stigma has caused many to believe that receiving treatment is for completely mentally unstable individuals. This public stigma can change into an internalized stigma in which the patient feels ashamed about their mental disorder and does not seek help. Researchers from the University of Pittsburgh Department of Psychiatry have found that "African American older adults endorsed higher levels of internalized stigma and less positive attitudes toward



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seeking mental health treatment than their White counterparts”(Conner et al. 543). This high level of internalized stigma stems from the public stigma which is supported and reflected in this finding that in the African American community that mental health services are associated with the mentally insane. This highlights the idea of how public stigma turns into internalized stigma, which causes African Americans to not seek help for their mental disorders when they need it. Researchers at the University of Maryland School of Medicine conducted a study where African American participants gave input about their thoughts on mental health/illness in their community. Stigma was one of the main themes that were discussed and one of the participants states that “...Socially, if a person in your family had a mental disorder it was looked upon as something went awry or for the love of superstition or revenge kind of thing.” They looked upon it like it was a curse from above or somebody in their family sinned and lost his honor. So people shunned people. Not just the individual but people related to them”(Mishra et al.123). This quote describes how the fear of being labeled negatively affects one’s family image and is greater than receiving professional help. Because of the stereotype that people with mental disorders are “cursed” or “lesser than others” along with the association of being a social outcast is not a desirable outcome, and individuals with mental disorders choose to suffer in silence. These negative attitudes toward receiving help may cause their mental illness to worsen to the point that it becomes unmanageable. Overall, stigma plays a major role in whether a Black individual is willing to utilize mental health services therefore destigmatizing

mental illness will improve attitudes toward treatment which in turn improves the quality of life for that person.

As I began and continued my research, I was surprised by the new information the sources brought to light. In the beginning, my main focus was on methods that could be used to increase the number of Black people who seek mental health resources. I assumed that more mental health awareness would improve the quality of life for the next generation of African Americans. I also had personal experience with how untreated mental illness, generational trauma, and stigma around mental health negatively impact a community. Overall, I was searching for solutions rather than acknowledging and understanding the obstacles people of color, especially African Americans, face to receive the help they need. During my research, I was able to identify the numerous barriers that hinder Black folks; racism and discrimination being the main reasons. I was surprised that there were providers that still use stereotypes to diagnose their patients and a health care system that does not seem to care about the well-being of all its users. Institutional mistrust of the healthcare system is the result of centuries of injustices done to African Americans by the medical field as well as the rest of society. This vicious cycle of needing mental treatment but knowing the institutions that are supposed to treat you will work against you, is the biggest obstacle. Although it is not a shocking piece of information, internalized stigma is also a reason that many African Americans do not wish to get help for their mental illness; community stigma that states that people who receive treatment are mentally insane has caused many to hide their illness or



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find dangerous ways to cope. The financial burden that comes from receiving help also needs to be acknowledged since it is a big part of the problem. Possible solutions to alleviating the stress is training healthcare providers in the cultural and historical contexts that African Americans come with and ensuring that the providers understand the implicit biases they may hold against them. It would help if there were programs for the African American community that highlight how receiving treatment is not only essential but wise. Finally, government funding to increase healthcare accessibility for disadvantaged groups and financial aid for mental health visits would improve the quality of life for many African Americans who struggle with mental illness.

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# RENAL CELL CARCINOMA: THE IMPACT OF PATIENCE EXPERIENCE WITHIN THE DIAGNOSIS PROCESS, A QUALITATIVE STUDY

*Isabella M. Humphries*

*ABSTRACT: Cancer is known to be the second leading cause of death in the United States of America. More often than not, uncommon types of cancer are overlooked. Renal Cell Carcinoma (RCC) occurs in fewer patients than well-known cancer types such as breast cancer or colorectal cancer. However, RCC is a brutal cancer that results in a minuscule number of survivors and takes lives away from loved ones far too early. Although RCC is less frequent than other forms of cancer, no effective screening methods have been implemented to diagnose RCC prior to a metastatic stage. The lack of a screening method could be attributed to the survival rates RCC has. This research proposal will explore the patient experience of RCC patients. Cancer patients are usually viewed as their disease first and not as a person first. Except, the patient knows themselves the best. Our research was designed to humanize cancer patients to better understand how traditional medicine may have failed them prior to diagnosis. RCC patients cannot advocate for themselves in a system that is not currently made to support the detection of their disease. Our end goal for this research is to create a tool that will be better at detecting RCC while the cancer is in its early stages.*

## Introduction & Background

### Overview

Cancer is the second leading cause of death in the U.S. (Siegel et al., 2022) and is expected to take the life of 609,360 people annually in 2022 (Siegel et al., 2022). All types of cancer are brutal and unrelenting disease that has taken many years to understand. Research has supported the creation of intervention and screening methods for common cancer types to reduce deaths. However, there are groups of people that have uncommon cancer types that are still suffering from a lack of screening methods and underfunded research. The consequences of not having proper screening tools can be detrimental to the overall survival of patients.

Every patient with cancer is someone's spouse, child, sibling, or parent; they have a life outside of their disease. Medicine tends to strip humanity from illness because it is easier to view a patient as that illness than their life interwoven with their symptoms. Every patient, regardless of their illness, should have the ability to be screened before their cancer is

detrimental to their life and beyond the point of successful intervention. Without enough money and a reduced call to action for populations with rare cancer forms, adequate screening methods have not been created or implemented.

### Cancer Statistics in the U.S.

As communicated above, it is predicted that in 2022 cancer will take 609,360 people's lives, which translates to roughly 1700 deaths per day (Siegel et al., 2022). However, it is estimated that there will be 1,918,030 new diagnoses of cancer in 2022 (Siegel et al., 2022). Meaning the overall predicted death rate of cancer in 2022 is 31.77% (Siegel et al., 2022). Breast cancer, melanoma (skin cancer), and prostate cancer will have the highest survival rates seen within all stages of cancer (Siegel et al., 2022). Prostate cancer is determined to have a survival rate of 98%, alongside melanoma which is estimated to have a survival rate of 93% among all stages (Siegel et al., 2022). However, breast cancer will have a survival rate of 90%, and the death rate of breast cancer has been 1% in recent years (2013-2019) (Siegel et al., 2022).



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The impact cancer has on individuals is shocking and even disheartening. However, it cannot be overlooked how money is attributed to how each cancer is treated in the U.S. and how those findings may even correlate with survival rates. Regardless of cancer type or stage, cancer will leave an impact on all of those affected. It is a scary disease to fight. These numbers and shocking results should not be overlooked. Beyond these findings, another fundamental statistic for cancer in the U.S. is the amount of money each branch of cancer receives annually. As of August 1st, 2021, breast cancer received 153 grants which translates to 102,914,200 funded dollars, of which 71,483,945 dollars were used (“Current grants by cancer type, 2021). During the same time frame, prostate cancer received 53 grants, a total of 41,650,102 funded dollars (“Current grants by cancer type”, 2021). It could be assumed that the amount of money each cancer type receives highly influences how the cancer is treated and could even be attributed to survival rates. The remainder of this proposal will highlight specifically Renal Cell Carcinoma (RCC), which is much less common. As of August 1st, 2021, RCC received 13 grants and 8,612,500 funded dollars (“Current grants by cancer type”, 2021). It is important to keep these comparative statistics in mind during this proposal as issues about RCC come to light.

### Renal Cell Carcinoma

Renal Cell Carcinoma is a rare cancer that has flown under the radar due to insufficient screening techniques, despite how brutal the prognosis is for the patient. This cancer is found within the kidneys and develops from renal tubular epithelial cells (Hsieh et al., 2017). RCC is roughly seen twice as much in males than in female patients (Wallen et al., 2007). RCC is a male-focused cancer, however, both men and women will be diagnosed the same as one another. RCC is an uncommon form of cancer that occurs within about 4.1% of cancer cases in the U.S. (Bethesda n.d.). Even though that

percentage may seem small, that little percentage is equivalent to 79,000 patients (Bethesda n.d.). RCC has other subtypes, but the most common is Clear Cell Renal Cell Carcinoma (ccRCC) at 75% in all kidney cancers (Petejova & Martinek, 2016). Beyond RCC and ccRCC, it is important to note that there is a hereditary version of this cancer that occurs in every 1 in 30,000 RCC patients. The genetic form of RCC can be caused by the mutation of the von Hippel-Lindau (VHL) gene (Maher, 2018).

70% of RCC patients are diagnosed through accidental findings and are either advanced within the local area or already metastatic (Chen & Uzzo, 2011). This occurs because only 10% of patients present with the “Classic Triad” (Padala et al., 2020), which is defined as hematuria (blood in the urine), flank pain (pain within the mid/side of the back), and palpable masses (masses that can be felt through abdominal examinations) (Padala et al., 2020). Diagnosing RCC can be difficult due to the typical set of diagnostic markers being present in such a small number of patients. It is important to note that most of the time, a suspicion of RCC isn’t the reason an imaging procedure will be performed. We must take into consideration the survival rates RCC has during this proposal. Even though there appears to be a good chance of survival, the public may not be aware of what different stages implicate for survival rate. A patient with stage 1 RCC has a 5-year survival rate of about 84% (Rossi et al., 2021), but most patients are not diagnosed this early. The majority of patients are diagnosed closer to a metastatic stage which presents with a 5-year survival rate of 6% (Rossi et al., 2021). This cancer is a killer by nature. With the no effective screening methods and late-stage discovery being normal, patients diagnosed with this cancer have little to no chance of beating this from the start.

### Current Screening Techniques for RCC

Out of a plethora of literature being reviewed, only one piece of literature had the intention of



discussing the expansion of screening methods. It reviewed what patients' thoughts on current screening method options would be, which follows our "Classic Triad" (Padala et al., 2020). Most patients, from the literature, only wanted to take the option of blood or urine screening methods, as it was perceived that CTs may be too invasive (Freer-Smith et al., 2021). However, blood and urine tests do not do an efficient job of indicating an issue within the kidneys. Typically, after these tests have been completed, doctors would be prompted to look deeper through imaging tests. However, most patients do not have the three most common symptoms let alone even one of them. These patients' tumors are found by accident while performing a CT or ultrasound. Our current practices are inefficient, and though imaging can be viewed as intimidating, it would be the most effective test we have today. Relying on uncommon symptoms to appear to indicate an uncommon problem is only letting the cancer progress further. Hence the reason when it is finally found by accident, it is usually an advanced form of cancer beyond treatment for eradication.

### **Importance of Cancer Screening Techniques**

In this proposal, we have displayed what screening techniques exist for RCC. However, in order to create a more efficient method for RCC, it is important to discuss what already works for other cancer types. Due to research and time, we are able to detect certain types of cancer before it reaches a point of detriment. Over the years, multiple screening methods have been introduced for a plethora of cancer types. In this section, we will be reviewing methods that have specifically been implemented for colorectal cancer and cervical cancer.

A study done in Japan tested the effectiveness of immunological fecal occult blood tests (Nakama & Kamijo, 1994). The research involved collecting data from current CRC patients with varying stages of cancer, healthy

individuals, and a mass screening technique of individuals. It was found that these tests were an effective method of screening for CRC after an extensive study. Even though early colorectal cancer screening methods were developed in the late 1960s (Smith, 2020), annual fecal blood testing was not implemented in high-risk groups until 1974 (Smith, 2020).

Pap smears were developed in 1957 (Smith, 2020) to help diagnose cervical cancer and were encouraged to be done annually by the American Cancer Society (ACS) (Smith, 2020). A qualitative study researched what it was like for women to receive an abnormal pap smear result to determine how much they knew and why they chose to partake in the screening process. It was found that most individuals related screening to being a healthy individual, and some had personal experience with cervical cancer in their family or friends, which led them to take action (Er Güneri & Şen, 2019).

When looking at new screening methods, researchers need to be aware that patients of different backgrounds and situations may approach screening differently. Part of finding an effective screening method is adapting it to be accessible and learning from groups that may struggle more than others. For example, a study was done to learn how patients in highly deprived areas who were at high risk for lung cancer responded to possible screening methods or medical treatment (McCutchan et al., 2019). An effective screening method will take both accessibility and effectiveness into consideration while the tool is being developed.

### **Gaps in Knowledge & Significance of Proposal**

As of right now, there is no definitive screening method that will help catch RCC before it is metastatic. With a lack of education and public knowledge, this cancer will continue to take the lives of more patients. Since there is no effective screening method for RCC



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currently, it is difficult to find literature that only supports RCC. Methods have been tested, and social opinions have been recorded, and yet none have been implemented as an actual efficient screening method. This leaves a large amount of room for researchers to learn. However, it is difficult to declare specific data that supports this research proposal. Most of the literature reviewed was based on other forms of cancer and the methods/screening tools created for other types of cancer. Some literature had very specific populations in which actual cancer patients may not have been involved, and that can skew literature in a direction that is not entirely helpful to this research proposal. Most of our answers will lie within the lives of the people who experienced this cancer firsthand. There is still so much left to learn, and with an obvious lack of quantitative statistics, the best approach is to view this cancer in a qualitative manner in hopes of urging for the development of quantitative data.

Beyond that, every patient knows their body better than anyone else and is more likely to feel or notice a problem before blood or urine tests (Freer-Smith et al., 2021) demonstrate measurable symptoms. This cancer is deadly and has no true treatment. If patients were encouraged to look for telltale signs of this cancer, just like women are encouraged to perform self-breast exams for breast cancer (Smith, 2020), more people may be able to survive. Just because this cancer cannot be seen within a large percentage of the general population does not mean that it carries any less significance among those who watch family members get diagnosed and ultimately die of this cancer.

### **Research Question and Hypothesis**

This proposal was created to humanize RCC patients and to understand their experience with their RCC diagnosis. The intent of the study is to determine if there were similar symptoms, trends with miscommunication and disinformation, and

a lack of urgency among healthcare providers that the patients underwent. Patients are the best at knowing what is wrong with themselves. If doctors were to be aware of specific factors that are not always detectable via standard tests, there may be a way to reduce how many patients are falling into the metastatic 6% survival rate category (Rossi et al., 2021). Information for the patient and more attention from medical staff could be the difference between life and death. These ideas prompt the question of this research: How could a patient's experience leading up to their diagnosis and knowledge of their own body influence the recognition of RCC in an earlier stage of development?

This proposal will follow a qualitative manner of research to identify themes amongst patients who were diagnosed with RCC. Though predicted results may be different than a true outcome, it is expected that there will be commonalities among RCC patients' experiences throughout their diagnosis process. We anticipate seeing some similar symptoms patients felt before diagnosis, such as extreme fatigue and pain in the body. As well as we expect to see a trend of miscommunication among doctors and patients during this study. Already, it is likely that most patients will express that the identification of their cancer came from an incidental finding since research has proven 70% of patients are diagnosed this way (Chen & Uzzo, 2011). Due to the rate of incidental findings, as stated above, naturally, there will be a wide range of data collected. It is important to note that this study will likely be broad at first, although we can hypothesize which experiences may overlap between patients, there is no guarantee they will. Our mission for this research is not to reiterate this statistic, but rather to promote the ideology that there may be a factor that doctors are missing, but patients notice. The hope is that the answer to this specific research question will begin to open doorways to finding an effective method of screening for future RCC patients.



## Research Approach

### Research Design

As stated above, the study will take a qualitative research approach, specifically survey qualitative research. It was imperative to choose this method as this research will turn words and experiences into data via one-on-one interviews. Although statistics are an important aspect of research, they are not all-encompassing of emotional feats some may have experienced. For these reasons, the research will collect data that will undergo thematic coding. Our target group is current RCC patients who have had a range of experiences through their diagnosis. As mentioned previously, we are specifically looking for miscommunication between doctors and patients and similar symptoms felt between our patients. A variation of diagnoses is welcome to make our proposed screening tool the most comprehensive of RCC patients that it can be. This study was designed to be different, as there is not much to build off of since RCC screening research is limited. Though experiences may not seem like the most effective method to determining a screening tool, it will help doctors and other healthcare professionals understand what these patients experience. In order to convey the importance of RCC and shine a light on our current screening flaws, this research design was the best layout.

### Study Population and Sampling

This study will be enrolling participants from Fred Hutch Cancer Center (FHCC) in Seattle, WA. Enrollment will be between 15-20 RCC patients. Within this study, convenience sampling will be used. Patients within the population of FHCC will be easier to find and access. Preferably, this study would include patients of any stage of RCC and have any subtype of RCC, such as ccRCC. In this study, it would be optimal for at least one of the patients to have the VHL gene and at least one patient to have been diagnosed in the local RCC stage. This study will be voluntary. Our

team will provide fliers inside the facility and ideally be able to speak to patients at the Seattle, WA, location. However, researchers will not be permitted to persuade the patient into this study. The researcher will not be able to tell patients they may be ideal for this study. The research team will be able to elaborate on the mission and answer questions about the study for the patient. Patients may be referred to join the study via provider. However, the provider will not be permitted to enroll the patients in the study. All patients will need to undergo screening via the researcher to qualify for this study. This will allow for patients to join on their own terms and ensures that the patient will not be manipulated into joining this research study. The goal is to create a welcoming environment for RCC patients to disclose their experiences with a researcher who has the intent to create a functional screening method for future RCC patients.

### Operationalization and Measurement

This chart will help define what different stages of RCC imply for this research. For example, this proposal speaks about advanced or metastatic RCC vs local RCC. In order to reduce confusion so this study could be done in other places again, these stages will be defined in Figure 1. Due to the nature of this study, there are no measurable variables. This study will be using words as data. The data will be collected via our individual interviews. This study will be conducted with the hope to create an efficient screening tool in the future.

### Data Collection

After participants have been enrolled via voluntary sign-ups and have been screened, this study will collect data via one-on-one individual interviews. These interviews can be done either virtually with a research lead or in person. This is to allow patients to feel comfortable within their environment. Each participant will be interviewed with the same 10-12 open-ended questions that will build the foundation



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Figure 1 – RCC Staging Definitions

Stage 1	The tumor is less than 7 cm and is still within the kidneys (Atkins, 2022). This is considered Local RCC.
Stage 2	Tumor has grown beyond 7 cm but only remains in the kidneys, and there is no spread to outer lymph nodes or organs (“ <i>Kidney cancer stages: Renal cell carcinoma staging</i> ”, 2020). Alternatively, the tumor has extended into the renal vein or vena cava but has not extended into the adrenal gland (“ <i>Kidney cancer stages: Renal cell carcinoma staging</i> ”, 2020). This is still considered Local RCC
Stage 3	At this point, the tumor may be any size, it may be outside the kidney in nearby lymph nodes (“ <i>Kidney cancer stages: Renal cell carcinoma staging</i> ”, 2020). However, at this point, it has not left the local region, meaning there are no new spots seen in outer lymph nodes or organs (“ <i>Kidney cancer stages: Renal cell carcinoma staging</i> ”, 2020). This is still considered Local RCC.
Stage 4	The tumor has progressed into the outer layer of the kidney tissue and adrenal glands (Atkins, 2022). Or cancer has spread to other lymph nodes both close to the origin or far away, or tumors are found in other organs (Atkins, 2022). This is considered Advanced or Metastatic RCC.

for possibly finding similar symptoms or miscommunication patterns. Please see Figure 2 to see examples of the study’s intended research questions. Their responses will be consensually recorded by the researcher, and notes will be taken during the interview. All documents will be held under confidentiality laws and no specific details of the person’s identity, such as name, birth date, etc., will be revealed in the data analysis. Individual interviews are the best research design for this study as they will allow patients to have their own personal time to express their moments clearly to the researcher.

### Data Analysis

This study will gain its data using coding and thematic analysis from the interview transcripts and notes taken by the researcher. Each individual transcript will undergo a coding process for the researchers to identify themes. After this has been completed, each coded transcript will be compared with other transcripts in order to reveal if the hypothesis is true and

if common themes, such as miscommunication and symptoms, can be seen between our patient’s stories. It is important to note that his study is not limited by stage or subtype, which creates a wide variety of RCC patients. This research was designed to include different stories or experiences. Each story should be taken into consideration for a potential screening method. An exception to data collection will be determined if a patient has to withdraw from the study and we have only collected partial data via interview. Their data will be removed from the study, and a new participant may be needed. It is imperative that we have full interview notes and transcripts to code as the designed open-ended questions layer on top of each other to find key thematic elements in an efficient manner. If our hypothesis is correct, we anticipate seeing a theme of miscommunication between doctors and patients prior to or during their diagnosis. We also anticipate seeing a higher noted rate of fatigue in these patients’ compared to healthy individuals prior to diagnosis.



# Renal Cell Carcinoma

Figure 2 – Research Question Example

Themes	Preliminary Question Outline
<u>Patient Background</u>	<ol style="list-style-type: none"> <li>1. What was your occupation prior to diagnosis?</li> <li>2. Did you have any risk factors for RCC prior to diagnosis?</li> </ol>
<u>Miscommunication</u>	<ol style="list-style-type: none"> <li>1. How many doctors did you see before the final diagnosis, and what was that process like?</li> <li>2. Did you feel heard during your doctors' appointments prior to diagnosis or during diagnosis?</li> </ol>
<u>Symptoms</u>	<ol style="list-style-type: none"> <li>1. How were you feeling, physically, prior to the diagnosis?</li> <li>2. Did you have any notable symptoms that seemed out of the ordinary from day to day?</li> </ol>

## Ethical Considerations

This study will obtain IRB approval in order to protect the participants throughout the duration of the research. All participants will be protected by HIPAA, a federal law that protects sensitive patient health data from being distributed without knowledge or consent (“Health Insurance Portability and accountability act of 1996 (HIPAA)”, 2022). In order to allow for consideration, all participants will be given direct information about the intentions of the study via paperwork. The patients will be able to ask any questions before they are admitted into the study and may continue to do so for the rest of the study’s run time. Each participant will need to sign paperwork indicating informed consent after the distribution of this information and time for questions has been allocated. This study may become emotionally taxing as re-evaluating the patients’ diagnosis could be especially triggering. At any point during the study, if the participant chooses to withdraw, they will be able to exit the study immediately. The physical and mental health of the participants is

of utmost importance and will be protected for the duration of the study.

## Discussion

### Significance

Renal Cell Carcinoma may not take up a large portion of the general population’s mind, but it does not make this cancer or its effects any less real. RCC is a killer. There may only be 79,000 (Bethesda n.d.) patients who die annually from this cancer, however, every single one of those people was important to someone else. Without more information on this cancer, RCC will remain a silent killer, one that takes loved ones with little to no warning and under everyone’s nose. A cancer that kills patients due to insufficient screening methods should be a center of focus and researched significantly more. Researchers have clearly devoted disproportionate amounts of money to other cancers to find effective screening methods. For example, as explored above, breast cancer patients are expected to have a 90% survival rate with a death rate of 1% and 153 grants donated



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by August 1st, 2021 (“Current grants by cancer type, 2021). As for RCC, it is holding steady at a 6% survival rate (Rossi et al., 2021) and has lower funding per year via grants with a total of 13 (“Current grants by cancer type, 2021). RCC may not impact as many patients as breast cancer, but RCC does not allow a patient to fight cancer due to its nature. The U.S. has roughly 2.5 million breast cancer survivors (Bodai & Tusso, 2015), whereas RCC will kill the person they were and the patient they have become before the patient gets a chance to become a survivor. Screening methods and techniques will improve the amount of lives lost to this cancer, but time and money must be devoted to the cause first and foremost.

### Limitations

Currently, there are no efficient screening methods present for RCC. Without a backbone of science, the study is building itself. A study that involves the observation and analysis of a patient’s emotions can be risky. There may not be enough volunteers to sign up for the study and go through with the data collection process. Though the intention of the study is to regulate a safe environment where patients can be heard, and their frustrations can be taken into account, there is still a chance what we hope to see is not produced. Another limitation of this study is the precision of the location. Out of convenience, this study will take place in Seattle, WA. However, these results will not be accurate for the general population. For more results, this same study would need to be conducted amongst RCC patients in multiple cities and states of the USA at other cancer facilities.

### Future Directions

As said previously throughout this research proposal, currently, RCC does not have a screening method that correctly identifies this cancer before it is too late. Ideally, this research would open the door to creating an efficient and important screening method for RCC. The hope

is that the experiences of the patients will allow doctors to create a method for seeing potential RCC signs before it is too late. Medical professionals use screening methods that are easy for patients to use frequently in daily practice. For example, mental health screens for Major Depressive Disorder (MDD) uses the PHQ-9 form, and General Anxiety Disorder (GAD) uses the GAD-7 form (Pranckeviciene et al., 2022). Both forms were created to help doctors detect MDD and GAD via a questionnaire by the patient (Pranckeviciene et al., 2022). If the results from this qualitative research study were able to create a questionnaire for patients to detect symptoms sooner, we may be able to detect their RCC before it is metastatic and beyond removable.

This proposal was also created with the hope that some attention will be brought to this cancer. In this lifetime, it would be wonderful to see an effective quantitative screening method created. But, for now, a qualitative approach will hopefully start the conversation and create some screening tools until a quantitative answer can be found.

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# AN INTERVENTION ON FREE AND ACCESSIBLE PRENATAL CARE FOR BLACK MOTHERS IN LOW-INCOME NEIGHBORHOODS

*Sinit Ogbagaber*

*ABSTRACT: Inequities in maternal healthcare, especially for Black and Hispanic women, are a serious issue that is killing many lives. The United States has a relatively high prevalence of negative maternal mortality; 700 women pass away during pregnancy or within a year of giving birth, and two out of every three of these deaths might have been avoided. The socioeconomic status, lack of access to prenatal care, poor medical care, underlying health issues (such as obesity, diabetes, and heart disease), socioeconomic level, and persistent stress this population endures all contribute to its increased vulnerability. Some women decide against getting prenatal care because there are barriers that make it harder for them to get it. Since few people are aware that this is an issue that is happening, our community may take action to try and lower these statistics by first raising awareness to the issue. We would achieve this by considering potential laws that would ensure that everyone received the same level of treatment. This study aims to ascertain how having optimal care prior to, during, and after pregnancy may affect the maternal mortality rate.*

## **Introduction**

Maternal mortality rates are a persistent problem in the United States, specifically affecting women of color. In the U.S., Black women and their infants are three to four times more likely to die from pregnancy-related complications than White women (Womack et al, 2020). Health disparities are actual, systemic, and preventable variations that put some people at a disadvantage in terms of mortality rates and medical care based on their race, socioeconomic background, religion, or disability (CDC, 2019). This group's vulnerability is increased by a number of variables, including their socioeconomic status, lack of access to prenatal care, inadequate medical care, underlying health problems (such as obesity, diabetes, and heart disease), socioeconomic level, and ongoing stress (Simons et al., 2020). In this study, we will use a multivariate analysis to

look at how socioeconomic status, access to prenatal care, and underlying health conditions affect maternal health.

## **Barriers to Accessing Care**

Due to obstacles that make it difficult for them to acquire prenatal care, some women choose not to receive it. Lack of transportation, difficulty finding childcare, inflexible appointment scheduling, lengthy wait times for appointments, and conflicting work schedules are some frequent obstacles to receiving prenatal care (Heaman et al., 2014). Many of these problems can be handled by providing accessible no-cost care, especially to people whose health is being negatively impacted as a result. A different option would be to make them more easily accessible. Having a doctor's appointment online so that the mothers may do it from their homes or other convenient locations without worrying about childcare or transportation. In 2011, a Mayo Clinic



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team created a model of care called the OB Nest, which offered moms direct support from a nursing team who would visit them as needed to assist them (Ridgeway et al., 2015). This model included in-home monitoring equipment, asynchronous communication with nurses, an online community for patients and nurses, and proactive calling. According to a small review that was conducted, there are additional elements that affect a mother's decision to seek prenatal treatment, in addition to her perceptions of the staff and providers of general health care (Heaman et al., 2014). Another barrier was the lack of education (Heaman et al., 2014). Many moms are unaware of the advantages of receiving prenatal care and how going without can affect both their lives and that of their unborn children. To ensure the health of both the mother and the unborn child, prenatal care is crucial. Without prenatal care, mothers are at risk of failing to detect health issues that could lead to a high-risk pregnancy which could have a fatal outcome for both mother and child (Office on Women's Health, 2019).

### **Pregnancy-Related Health Issues**

One of the main risk factors for the low maternal death rate among Black mothers is poor health. For Black women giving birth, the most common underlying causes of death are pre-eclampsia, embolisms, and hypertension (MacDorman et al., 2021). Pre-eclampsia is one of the main causes of maternal morbidity among all medical conditions. Pre-eclampsia affects 2-8% of women, and it causes about 63,000 deaths in women worldwide each year (de Arajo et al., 2020). Hypertension, also known as high blood pressure, contributes to higher maternal mortality rates among Black

mothers. According to the "weathering" hypothesis, hypertension has been linked to the stress people experience throughout their lives (Geronimus, Hicken, Keene, & Bound, 2006). This hypothesis suggests that the "challenges and frustrations of living in a disadvantaged neighborhood likely accelerate biological aging" (Simons et al., 2020). According to Simon et al., they also discovered that living in disadvantaged neighborhoods, having low education, and experiencing high unemployment rates, all contributed to their early aging. The American Journal of Public Health (2006) conducted an experiment to determine whether or not stress exposure led to early health issues in Black people. The experiment came to the conclusion that racism and discrimination had a "weathering" effect on them. Their aging process was accelerated and their health was negatively affected by growing up in a racist society where they had to deal with discrimination all their life (Simons et al., 2020). These findings demonstrate that Black women will have to include racism on their list of risk factors for poor maternal health outcomes in addition to the other health issues we talked about.

### **Racism Experienced by Black Communities from the Medical Field**

Unfortunately, racism and prejudice still exist in our culture. Additionally, it affects how people feel physically. Black Americans have higher rates of impairments, diseases, and mortality, which are early indicators of health degradation. This is thought to have been a reaction to their surroundings. As a result, this minority faces obstacles due to systemic racism (Geronimus, Hicken, Keene, & Bound, 2006). According to Lockhart (2018), "Black women are



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disproportionately likely to face these complications, and they are also more likely to fall victim to America's ongoing maternal mortality crisis." According to the Centers for Disease Control and Prevention (CDC), 55.3 non-Hispanic Black women died for every 100,000 deaths in 2020. Based on the findings, it was 2.9 times more likely for non-Hispanic white women to die (Wang et al, 2020). Many women who reported feeling ill and expressing pain or other symptoms to hospital staff discovered that they were simply rejected by them and assumed to be overreacting by healthcare professionals (Ellison, 2019). It would be essential to develop anti-racism training and policies in healthcare settings and to educate people about biases and prejudice so that they can recognize them in themselves in order to combat these instances.

### **Community and Public Policy Level Interventions**

There are a variety of approaches we may take to reduce maternal death rates and health disparities among Black women, but one of them is to implement a community-level intervention. Community-level intervention examines what may be done to improve the health of everyone living in the community. This might be accomplished through strengthening communities, such as those of employees and their environment, and health systems to enable more monitoring and programming for healthcare facilities (Black et al., 2017). A public or local law created by the government as a means of enhancing community health is known as a public policy intervention. Having access to prenatal care is something that can be done about this. Prenatal care is a form of medical attention you can receive while you are

expecting. Prenatal care comprises a variety of services, such as checkups, advice from doctors to promote healthy lifestyles, and early detection of health issues that could improve results (Medline Plus, 2019). The closing of planned parenthood clinics, a provider of reproductive health care, had a negative impact on all women, increasing death by 6% to 15%, according to a study done to see what kind of effect it had on maternal mortality rates (Hawkins et al., 2020). Every woman should have access to prenatal care, and it should be free of charge. This is especially true for those who are unable to receive it due to cost, distance from home, or lack of knowledge about how it might benefit them. In light of this, our study will concentrate more on how maternal health among Black women living in underprivileged areas is influenced by prenatal care accessibility.

### **Gaps in Knowledge**

We do not know how much the various comorbidities we stated have an impact on maternal health in relation to prenatal care accessibility. This is one area where our study has knowledge gaps. Another gap is that there is no other group or race to compare the findings with; our study primarily examines Black women living in poor neighborhoods. We aim to examine how lack of childcare, inflexible doctor's visits, and lack of transportation affect maternal health. We can infer that prenatal care does improve maternal health, but how does access to all of the mentioned barriers work to improve both mother and child's overall health? We want to do this study to discover if expanding access to prenatal care by lowering the obstacles would cut death rates specifically among Black women,



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because there have not been many studies that have examined it in this way.

### Research Question and Hypothesis

Maternal healthcare inequities, particularly for Black and Hispanic women, are a severe problem that is taking many lives. Negative maternal mortality rates are relatively high; in the United States, 700 women die during pregnancy or within a year of giving birth, and two out of every three of these fatalities could have been prevented (Centers for Disease Control and Prevention, 2019 ). When you consider these figures, Black women are three times more likely to pass away from preventable pregnancy-related illnesses (Bibbins-Domingo et al., 2017). There are numerous factors that contribute to these discrepancies, including socioeconomic status, access to medical care, underlying health issues including diabetes and obesity, and many others (Bibbins-Domingo et al., 2017). There are many strategies to lower the chance of death, including making clinics easily accessible and offering free

prenatal care. There is not enough data to determine if free and easily accessible prenatal care will improve maternal health outcomes, particularly for Black women in underprivileged areas. Although we can assume that prenatal treatment is effective, there are several obstacles that hinder women from receiving prenatal care, including lack of transportation, inability to take time off work, difficulty in finding childcare, and a multitude of other things. In this study, we will utilize quantitative approaches to examine the effects of expanding access to maternity care by demonstrating how free services like childcare, flexible appointment times, and free transportation can help improve the maternal health of Black women. We believe that when we conduct this experiment, moms with access to prenatal care facilities including clinics, doctor’s offices, and other types of care will experience fewer complications than those without.

### Research Approach

#### Research Design

Week 4 to 28 of pregnancy	Going for a check-up every 4 weeks, a total of 6 times
Week 28 to 36 of pregnancy	Going for a check-up every 2 weeks, a total of 4 times
Week 36 to 41 of pregnancy	Going for a check-up every 1 week, a total of 5 times

(Figure 1, Prenatal checkup schedule)

Check-ups	Measuring belly	ultrasound	Glucose screening	Tdap vaccination	Group B strep test	Pelvic exam
week	20	18-20	24-28	27-36	35-37	37

(Figure 2 cont., Checkup schedule)



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Check-ups	Measuring belly	ultrasound	Glucose screening	Tdap vaccination	Group B strep test	Pelvic exam
week	20	18-20	24-28	27-36	35-37	37

(Figure 2 cont., Checkup schedule)

A prospective randomized control trial (RTC) will be used for this research. We chose this approach because we want to look at the outcomes of our intervention during our study period and see if access to prenatal care reduced bad maternal health outcomes. Using this study, we will evaluate the effects of free prenatal care on maternal health, which includes access to clinics and medical professionals as well as regular, required checks. The birth weight, preterm, infant mortality, pre-eclampsia, and blood pressure of the child and mother will next be examined to determine whether a mother's maternal health had been positively influenced (Svikis et al., 2022). Our information will be gathered throughout the mother's whole pregnancy as well as 12 weeks postpartum. We will be evaluating how she is doing physically during the data collection. This includes physical examination checks, blood, blood pressure, urine, and other tests (March of Dimes, n.d.). In order to determine whether or not our intervention was successful, we will measure the outcomes for the women who are receiving the intervention and compare the data that is already out there for women who aren't. If the outcomes are promising, we will be able to test it out again on a different population.

### Study Population and Sampling

Our participants in this study will include cisgender Black women from disadvantaged neighborhoods in Seattle, Washington.

More specifically, those who are older than 24, which was the average age of African American moms in the US, will be included (Mathews & Hamilton, 2016). We will not include moms who have a history of drug use because it may affect their general well-being. In this study, mothers who visit an obstetrics and gynecology clinic for their first prenatal checkup will be recruited. We will seek out mothers by "using daily patient rosters to identify those eligible" (Svikis et al., 2022), who have undergone screening and show evidence of their vulnerability to poor maternal and infant outcomes. We will use a simple random sampling method to choose 200 mothers from this group. The participants will then receive an email asking them to confirm their interest in taking part in the study. We will provide them with a calendar of the times we will be meeting with them whether it be a private clinic or the same one (whichever is more comfortable for the mother) for their prenatal care checkups after we receive the letter from them confirming they want to participate. We will be using the schedule from Figure 1 for this research because this is the recommended schedule for pregnant women (March of Dimes, n.d.).

### Operationalization and Measurement

We will examine if Black women would benefit from having free and readily available prenatal care as well as how it affects their overall maternal health to determine if this is the case. When discussing maternal health,



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it is important to consider the mother's overall health, including whether she has put on excessive weight or developed other problems like high blood pressure or hypertension while carrying the baby. And if so, how has receiving prenatal care aided them? Did it stop it completely or just stop it from becoming worse? In the study, our independent variable is providing moms with easily accessible prenatal care, and our dependent variable is how positively this has affected a mother's health. The skinfold clippers and the Likert scale will be used to calculate the outcomes at the conclusion of the prospective randomized control trial (RTC). The skinfold clippers will be used to calculate the total body fat percentage (Maastricht UMC, 2019), and we will also send the participants surveys and questionnaires using the Likert scale to gauge how they're feeling on a numerical scale. All of the data will be used for analysis and comparison with already existing data.

### Data Collection

Age, education level, race/ethnicity (which will be African American for this study), body fat, insurance coverage, and other underlying health conditions are some characteristics of the participants that will be gathered through medical records. For further information, such as how important certain things are to them, we will rely on self-reported results (Ridgeway et al., 2015). We will send out a patient satisfaction survey to find out how many of these there are. The 6-item Likert scale subscale used for this form's evaluation will have ratings ranging from "extremely important" to "not important" on a 5-point scale. We will inquire about the importance of transportation, childcare, and late-night

appointments as part of this survey. To determine how prenatal treatment is working throughout the mothers' term, information from their medical records and obstetrics appointments will also be used. This evaluation will take into account significant medical outcomes including pre-eclampsia, infection, or pregnancy loss (Ridgeway et al., 2015). After the intervention is complete, we will continue to check up on them until 12-weeks postpartum so we can see how the mother and child are doing.

### Data Analysis

For analysis we will use an outline of a study that was conducted similarly to this one. The results of all participants' surveys and medical reviews will be analyzed quantitatively and reported using means and standard deviations. This will also include variables that we can categorize, such as the mothers' symptoms, their health conditions, their age, and their body fat (Ridgeway et al., 2015). With interview and focus group data, as well as with analyzing documents from medical data we will use the data to measure our results. The first step would be identifying the key ideas and beginning to construct a framework using the surveys, transcripts, and medical information. We will then organize it using that framework and convert it to coded data (Ridgeway et al., 2015). We will use pre-established criteria for missing data when figuring out the outcomes of patient-reported surveys. The results will be regarded as significantly different between the data obtained for the study and the data we will be comparing it to at a P value of 0.05 (Ridgeway et al., 2015). The impact of prenatal care on the health of the mother will then be evaluated using these data. To determine if we had



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an impact, we will compare the results to current maternal health data for women in Seattle, Washington, using the data we just discovered.

### **Ethical Considerations**

We need IRB approval before we can move further with this study. If it is authorized, we will conduct a study to determine the impact of free prenatal care on the health of moms and their unborn children. As a result, we must make sure that participants express both verbal and written consent and are fully aware of the terms of their participation. We will conduct a quantitative experiment to examine the facts on how free prenatal care, including regular checkups, assistance for encouraging healthy lifestyles, and early diagnosis of health issues, affects maternal health for Black women. A randomly selected sample of moms from a National Institutes of Health study on the Pregnancy Risk Assessment Monitoring System (PRAMS) will be included in the population. According to the Office of Research on Women's Health, this study examines "population-based data on maternal attitudes and experiences before, during, and shortly after pregnancy" (National Institutes of Health, n.d.). We will give them free prenatal care because we want to see if it improves the health of the mother. We will offer a secure area for the women to visit for frequent data-necessary check-ups, and we will make sure to protect confidentiality. In an effort to decrease the negative impacts on maternal health brought on by inadequate prenatal care, we will share some of our findings with the public, while respecting patient confidentiality. In the event that the information is made public,

the moms' identities would remain private and anonymous.

### **Discussion**

#### **Significance**

The link between the rising number of maternal deaths among Black women and public health is mostly explained by systemic racism and healthcare disparity, as well as by socioeconomic position, inadequate education, and accessibility (CDC, 2019). Black women and women of all backgrounds should be treated equally and with respect, just like White women. The level of treatment someone receives and the death rates shouldn't be influenced by a person's race or socioeconomic background. The concept of intersectionality can help explain the simultaneous experience of various categories people fall in like race and gender that lead to discrimination or repression (Smith, 2016). Black mothers' chance of having a poor maternal outcome is significantly higher than that of other women, in addition to racism, limited access to healthcare before and during pregnancy, prenatal care, and other factors (Lockhart, 2018). According to University of Washington research, since COVID-19 has become widespread, up to 15% of pregnant women have required hospitalization for COVID-19-related respiratory problems (Lokken, 2020). "Pregnancy is considered a higher-risk state in the context of many infections, and pregnant women face various uncertain[ies]," the authors of this study wrote (Lokken, 2020). Even though pregnant women are already at high risk, adding additional factors makes their risk even higher. Since not many people are aware that this is happening, we as a community may act to attempt to lower these statistics



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by first bringing attention to this significant problem of maternal health disparities. We would do this by determining how we might put regulations into place to guarantee that everyone receives equal care. The purpose of this project is to determine the influence receiving appropriate treatment before, during, and after pregnancy may have on the maternal mortality rate.

### Limitations

Since we are only looking at a small sample of Black mothers from Seattle, Washington, several sampling restrictions may make this study's results less representative of the entire community. But if the findings of this study are encouraging, it would enable us to test this further in more contexts to obtain more precise data. Since this is a quantitative study, a more detailed examination of the findings in relation to the participant's experiences is not possible. Doing a quantitative method also means that we get numerical data that is more accurate and precise. This investigation will take a lot of effort, cost a lot of money, and necessitate numerous updates. Due to this, some participants may decide to leave before it is finished.

### Future Directions

We can run this study again and test it with a different group to compare the results. We would then be able to aid all women from different demographics if the study was conducted, we got data, and they showed good results. We may try this again and again in various Black, Indigenous, and People of Color (BIPOC) communities in many U.S. cities and states, as well as in other countries. If the results of the second study indicate that there is a positive correlation

between the availability of prenatal care and a mother's health, we can attempt to implement it at the community level or even as a public policy. To ensure that all women have this free/affordable access to prenatal care, we would create a policy stating that women shouldn't have to pay for prenatal care. Another suggestion would be to open more clinics so that pregnant women, who don't receive care because it's difficult to access, might go and get prenatal care on their own.

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# EATING DISORDER SYMPTOMS ASSOCIATED WITH CULTURAL SHIFTS IN EAST ASIAN CULTURES VERSUS WESTERN CULTURE

*Mary Kapitonenko*

*ABSTRACT: This essay discusses the presentation of Anorexia Nervosa (AN) symptoms in Chinese and Japanese cultures versus North American culture. It highlights the importance of recognizing eating disorders in more diverse populations than previously studied and understanding how sociocultural factors influence the development of these disorders. The symptoms of AN are explored through a cultural lens while comparing the varying symptoms against the Diagnostic and Statistical Manual of Mental Disorders. Noticing the symptomatic differences of AN in each culture shows that the DSM-5 diagnostic criteria of Anorexia Nervosa is not universal in all countries or cultures. The compulsion for thinness and body dysmorphia is a western-bound cultural symptom of Anorexia Nervosa that is not found in Chinese or Japanese sufferers. There is an increased need for mental health and medical professionals to acknowledge cultural influences when diagnosing and treating eating disorders.*

## Introduction

For the longest time, eating disorders (ED) were concentrated among adolescent, white females in wealthy Western nations, however, today they are globally diagnosed (Pike & Dune, 2015). There is increasing evidence that eating disorders are present among ethnically diverse populations, and researchers have suggested that investigations in this area may inform the field's understanding of how sociocultural factors are related to the development of eating disorders (Cummins et al., 2005). Acculturation has primarily been defined as "the process of psychosocial change that occurs when a group or individual acquires the cultural values, language, norms, and behaviors of a dominant society" (Pike & Dune, 2015). There is some proof for acculturation to Western culture being the fault of increased ED risk, though more research needs to be done. Western countries, specifically America, follow the diagnosis guidelines of

the most recent version of the Diagnostic and Statistical Manual (DSM-V), to put a label on an array of psychiatric disorders. EDs in America vs those in Asian countries have differences that vary between cultures. EDs often go unrecognized in ethnic minority groups or are only acknowledged once the disorder has progressed to a dire stage. EDs, especially Anorexia Nervosa, are among the most lethal of psychiatric illnesses with an estimated mortality rate of as high as 20% (SCDMH, 2006). Although the importance of studying eating disorders among non-White and non-Western populations has been recognized, little has been written about the best approaches in investigating how sociocultural factors influence the development of disordered eating in diverse groups (Cummins et al., 2005). The medical etiology of EDs is complex and requires competency of the relative culture that the EDs evolve in, so as to not apply Western based values where they don't belong.



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This paper will investigate the ways in which, specifically, Anorexia Nervosa (AN) symptoms present themselves in East Asian versus Western cultures. This paper defines western culture through beauty standards that are common in North America or Europe. There is often a strong emphasis on thinness and a certain idealized body shape, particularly for women. This ideal is perpetuated by the media, fashion industry, and advertising, which promote thinness as a desirable and attractive trait. It will seek to understand how culture may motivate changing symptomology and may overlap with those found in Western society. The paper focuses only on AN for the sake of brevity and clarity. This topic is relevant to cultural psychology because globalization is an unstoppable force that spreads like a virus and partly makes up the malleable fabric of culture, and in it, the shifting nuances in psyche.

### **Anorexia Nervosa Expression in the United States**

The National Association of Anorexia Nervosa and Associated Disorders estimates that 28.8 million people in the United States will suffer from an eating disorder at some point in their lifetime. Even more concerning, eating disorders are considered among the deadliest mental disorders, coming in second only to opioid addiction, consequently killing an average of 10,200 people each year (Trotter, 2022).

The 5th edition of the Diagnostic and Statistical Manual outlines the criteria for an individual to be diagnosed with AN as follows:

A) Restriction of energy intake relative to requirements, leading to a significant

low body weight in the context of the age, sex, developmental trajectory, and physical health.

B) Intense fear of gaining weight or becoming fat or persistent behavior that interferes with weight gain.

C) Disturbed by one's body weight or shape, self-worth influenced by body weight or shape, or persistent lack of recognition of seriousness of low bodyweight.

D) Must have engaged in abnormal behavior for at least 3 consecutive months.

There is an unprecedented rise of EDs in America, that comes with the dominant narrative that it is the fault of an individual's own pathology (Lee, 1995). Yet with alarming statistics such as 1 in 200 women (SCDMH, 2006) being affected by AN, it is difficult to conclude that the disorder begins and ends within the individual itself. Sandra Lee Bartky (1990) describes AN as a modern-day form of hysteria, arguing that these pathologies are "the crystallization in a pathological mode of a widespread cultural obsession" (66). Hysteria, like EDs, are situated in a cultural and historical context that cannot be overlooked. When we position EDs as a symptom of cultural obsession, it becomes clear that the compulsion of thinness equating to beauty, is not an individual pathology but a result of an entrenched cultural anxiety. To "treat" EDs, we must examine the cultural patterns that permeate into the minds of affected individuals.

Taking a step back, let's examine the cultural onset of AN in Western societies. How did eating disorders, specifically



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AN, become such a well-known and an acceptable signal of emotional distress? Physicians Charles Lasegue and Jean-Martin Charcot from France became well-known by discovering the novel manifestations of what was at the time a “quintessential illness of womanhood”, known as Hysteria (Watters, 2010). Historian Janet Oppenheim looked at popular 19th-century mental health and medical literature, and found that hysteria was extremely pervasive and influential during the Victorian era. There was a period of long debate between medical scholars as to why there were common eating disorder behaviors within hysterics and how it affected such a large population at once. Finally in 1873, AN got its formal recognition. Initially called “hysterical anorexia”, the current name change solidified what it is today, Anorexia Nervosa. Edward Shorter, a Canadian scholar, believed that it was Lasegue’s paper on diagnosing AN that first caused public interest and wide-spread awareness of the disorder. Soon after the official title of AN, the rates at which people began to suffer from it dramatically increased (which raised questions for Shorter). Was this apparent increase of AN the result of conditions going unnoticed before the formal label became known, or some patients’ subconscious attempt at expressing their psychological suffering through latching on to a legitimate, culturally acknowledged signal of distress? Shorter argues, “patients unconsciously endeavor to produce symptoms that will correspond to the medical diagnostics of the time...this sort of cultural molding... happens imperceptibly and follows a large number of cultural cues that patients simply are not aware of” (Watters, 2010, p.32). Patients may unknowingly try to exhibit

symptoms that align with the prevailing medical diagnoses of their time. This can happen subconsciously and is influenced by cultural factors that patients may not even be aware of. In other words, patients may be unconsciously influenced by cultural cues that shape their behavior and symptoms, which can affect their diagnosis and treatment.

### Emergence of EDs in Asia

#### China

For a long time, Anorexia Nervosa (AN) was considered a disorder specific to Western women, as the first studies were mostly based on North American and Western European data samples. Although Asia is the world’s largest and most-populous continent, there has been far less research done in this area, and therefore doesn’t paint the full picture of the etiology and burden caused by EDs. Previous studies on EDs in Asia—like those of other non-Western societies—have often highlighted Westernization as a major contributor to the increasing prevalence of EDs. However, the emergence of EDs in some parts of Asia prior to Western influence challenge such theories. Highlighting the unique phenotypic expressions of EDs that may emerge in the absence of societal factors that emphasize shape and weight concerns—for example, non-fat-phobic AN (Kim et al., 2021). Dr. Sing Lee, China’s preeminent researcher on eating disorders, as well as the first person to publish a research paper on EDs found in Hong Kong, was curious about the low incidences of AN in China.

Dr. Sing’s first paper on the topic, titled “Anorexia-Nervosa in Hong Kong: Why Not More Chinese?” (1989) was determined



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to explore why AN was a rare disorder in Hong Kong at the time. Historically, there was less Chinese stigma surrounding larger body types. Popular Chinese beliefs are that “being able to eat is to have luck”, “gaining weight means good fortune”, and “fat people have more luck” (Sing et al., 1989). Hong Kong, a country that was governed by British rule between 1841- 1997, seemed like it would be primed for this disorder considering that the country has integrated many Western values and ways of dress. Chinese culture places high value in eating, and particularly the idea of sharing food with others which symbolizes strong bonding among Chinese citizens and communities. In fact, the act of refusing food would signal a person in distress. But this wasn’t the case. Triggers for AN that had been identified in Western culture existed in China, yet EDs remained uncommon. What other cultural factors could be at play here?

Dr. Lee noticed symptomatic differences between his anorectic Hong Kong patients and Western diagnostic criteria, that his patients did not express a fear of being overweight, nor report distorted perceptions of their emaciated bodies; two key points to validate someone suffering from AN. The deviations from Western diagnosis criteria were similar in all of the anorectic Hong Kong patients Dr. Lee treated. They similarly, “denied any fear of being fat or intending to lose weight to become more attractive” ,they often spoke of wanting to get back to their normal body weight. (Watters, 2010, p. 18). When patients were asked why they would go long periods without eating, they ascribed their behaviors to “physical causes such as bloating, blockages in their throat or digestion, or

the feeling of fullness in their stomach and abdomen” (Watters, 2010, p. 18). Chinese people endorse somatization as a powerful metaphor to express a social response to illness. Somatization refers to the expression of psychological distress or emotional pain in the form of physical symptoms. People who experience somatization often have difficulty identifying or expressing their emotions and may use physical symptoms as a way to communicate their distress. Anorectic Chinese patients tended to blame their physical bodies for not allowing them to eat, rather than ascribing an emotional suffering as a result to their disordered eating patterns such as is common in Western anorexics.

### Japan

Recently, an investigative study by Nakai et al., 2021, conducted a systemic scoping review of the changing profile of EDs and related sociocultural factors in Japan between 1700 and 2020. ED symptoms can persist in the absence of Western influence and sociocultural factors—such as gender-specific stressors and family dynamics—may contribute to EDs in Japanese populations. Patients with the historical diagnoses of Fushoku-byo and Shinsen-ro during the Edo period in Japan (1603–1868) would now be recognized as having had unspecified feeding or eating disorder according to the DSM-V, however, the presence or absence of fat-phobia and disturbed body image remains unclear. It’s evident that people have been able to arrive on their own while exhibiting disordered eating patterns without the influence of Western culture, and the 2021 Nakai study reveals that restrictive EDs were present



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as early as the 18th century prior to any western influence.

Few reports of EDs were found between 1868 and 1944, a period of rapid Westernization. In the wake of post WWII westernization, Japanese doctors began diagnosing patients with anorexia nervosa (AN). During this time, patients self-reported experiencing “fatphobia” but did not engage in restriction for achieving slimness. This shifted, however, after the 1970s, when Japan experienced a rise in patients with AN engaged in restrictive practices to achieve thinness.

In 1967, Japanese beauty standards began to shift after Twiggy, a British model known for her extraordinarily thin figure, visited Japan. After this event, many women’s magazines began to feature more Western-oriented fashion trends and beauty ideals, including an emphasis on a slim physique as the standard of beauty for women (Nakai et al., 2021). These ideal beauty standards continued to be pushed forward in the form of television shows and movies. By the 1970’s, thinness became the dominant beauty standard for Japanese women, and dieting became socially encouraged as an acceptable and even standard form of weight loss. Now, in modern day Japan, AN has increased in both physical, and psychological severity over the past thirty years (Kim et al., 2021). The shifting of beauty standards to more westernized ideals exacerbated the incidence of AN in Japanese people, but it is not believed to reach proportions seen in western societies.

### **Anorexia Nervosa as a Culture-Bound Syndrome**

Medical agreement upon classification of EDs like AN is not firm, however, it could be categorized as a culture-bound syndrome. They are defined in the DSM-V as an array of symptoms categorized as a disease or a dysfunction specific to a certain culture and has yet to be experienced in any other cultures. A Western CBS is a culture-bound disorder that, thus far, has only been recorded in Western civilizations. AN is characterized by the DSM-5 as having an emphasis on thinness; an obsession over weight loss, as well as having a distorted image of their condition. These specific qualities of AN are most commonly seen in Western societies, and unlikely found in Asian cultures as exemplified by Dr. Lee’s research in self-reporting from AN patients in this paper. “Anorexia Nervosa is considered to be a Western culture-bound syndrome in many respects because of the Western emphasis on thinness and Western culture’s body-oriented entertainment and media” (Yslas, 2016). These specific diagnostic points are only relevant to AN sufferers because of their specificity to western culture and context. “Western psychiatrists have endorsed “fat-phobia” as being a critical part of the Anorexia-Nervosa diagnosis but have failed to see the full historical and cross-cultural significance of self-starvation in other cultures. Through delegitimizing other reasons for non-eating, it can negatively impact the understanding of a patient’s experience as well as diagnosis” (Sing, 1995). The DSM should consider these symptoms regarding its cultural fixations because the symptom-pool of AN is not universal. Western ideals play a critical role in understanding the



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etiology, diagnosis, and treatment planning of a particular disorder.

### Conclusion

In the United States, before there was Anorexia Nervosa (AN), there was Hysteria; which attributed symptoms so pervasively that it was referred to as the “quintessential illness of womanhood” during the Victorian era. Upon AN gaining formal recognition from the medical community, the incidence rate of AN diagnoses increased dramatically, and was almost immediately accepted by society due to popular relevance. This research points to the suggestion that the knowledge spread of an acceptable, culturally-acknowledged symptom has significant influence over shifting the psyches of what a legitimate signal of distress within a culture may appear as. United States has a cultural pursuit of thinness and a fat-phobic attitude that Asian countries, such as Japan and China do not share (Source? Lee? Nakai?). The globalization of western values has marked a new surge in disordered eating patterns in China and Japan, that wasn't seen before in these countries prior to its westernization. Despite these shifts, the symptomology which AN clinically presents to Japanese and Chinese patients still doesn't fully coincide with what the diagnostic criteria states in the DSM-V and these differences remain crucial to acknowledge and understand the role of cultural differences in EDs.

Eating disorders do not discriminate against who they affect. The knowledge of having developed an ED, or that a loved one may be suffering with a diagnosis might not be obvious because of the nuanced expression that an ED has within its given culture. Further, reasons why someone

might have an ED could vary additionally within the context of their culture, as well as affect how symptoms are displayed based on one's cultural background. Given the negative consequences of EDs and the rising population of ethnic minorities in America, it is critical to know what culturally-specific ED behaviors, and treatment look like.

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# PANTHERA LATITUDINAL RANGES INCREASE OVER TIME

*Molly Elise Biedscheid*

**ABSTRACT:** *The explanations for the latitudinal diversity gradient (LDG), the increase of species from the equator to the poles, have long been debated by scientists for over a century. How this has affected different genera is still not highly researched. To inspect this concept further, the correlation between the big cat genus Panthera's fossil age and the latitudinal range was examined to see if the hypothesis that the older a fossil is, the longer its latitudinal range will be due to the "out of the tropics" theory that species disperse from the tropics over time and several other hypotheses. A linear regression test was performed to determine the correlation coefficient and the significance level between data points. The results of the linear regression test were found to be significant, meaning that as Panthera fossils' age increases, so do their latitudinal ranges. These tests further support the "out of the tropics" theory, meaning the LDG does indeed exist.*

**Keywords:** *Panthera, Latitudinal Diversity Gradient, Latitudinal Ranges, Linear Regression, Out of the tropics*

## Introduction

Diversity amongst species across the planet is not equal across the latitude (Hillebrand, 2004; Mittelbach et al., 2007; Rolland, Condamine, Beeravolu, Jiguet, & Morlon, 2015). The latitudinal diversity gradient is a process of species diversification and abundance around the equator and decreases as the latitude expands north or south (Mittelbach et al., 2007). Although this latitudinal diversity gradient has been a known fact for decades, no definitive research as to why it exists has been determined (Hillebrand, 2004; Mittelbach et al., 2007; Rolland et al., 2015).

Several hypotheses have come forward to explain this gradient across the Earth. One of the most popular hypotheses includes the "out of the tropics" theory, elucidating how the tropics are a biodiversity engine (Jablonski, Roy, & Valentine., 2006). The meaning of this hypothesis is that as time carries on, the likelihood of a species dispersing from the tropics increases. From the research that Jablonski and their team did on this model, they stated this hypothesis was supported by two other hypotheses: the tropics are also a

museum, meaning low extinction rates exist as older species reside in the tropics, and a cradle, meaning high diversification rates exist as more and more species are born in the tropics (Jablonski et al., 2006). This research is highly debated amongst scientists with other theories being climate change, altitude changes, or simply one of the three hypotheses stated above without the other two to tag with it (Lewin, 1989).

There have been many studies on the "out of the tropics" hypothesis, studying large groups of animals such as Carnivora, the mammalian class of carnivorous animals, in order to study how they exist in the latitudinal diversity gradient (Hillebrand, 2004; Rolland, Condamine, Jiguet, & Morlon, 2014). However, making large assumptions about research can be detrimental and may lead to missing important outliers in the data that could exist (Jablonski et al., 2006). Large groups of animals cannot be an indicator of all genera or species in how they exist in the latitudinal diversity gradient.

While there are many studies as mentioned before on the latitudinal diversity of large groups of animals such as Carnivora, there



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are none on small clades such as *Panthera* (Hillebrand, 2004; Rolland et al., 2015). *Panthera* consists of the big cats that we know today such as the lion, the tiger, and the jaguar (Davis, Li, & Murphy, 2010). Their origination occurred less than 11 million years ago, during the Miocene, an epoch of the geological time scale (Davis et al., 2010). By focusing on this smaller clade, *Panthera*, more evidence may come forward for the “out of the tropics” theory to further support this hypothesis. This will help us scientists understand the reasoning behind why the latitudinal diversity gradient exists. Additionally, by focusing on a carnivorous genus, we may be able to attach this study to the gradient of the animals *Panthera* may see as prey (Davis et al., 2010; Rolland et al., 2015).

In this paper, the hypothesis that will be tested is whether *Panthera* latitudinal ranges increase over time. It is predicted that the older a *Panthera* fossil is, the larger its latitudinal range will be, due to the “out of the tropics” theory.

### Materials and Methods

The data of all mammals was downloaded from the Paleobiology Database on September 23, 2022 (<https://paleobiodb.org>) into an Excel file. Then, I extracted the genus *Panthera* from this file. The geographic information kept was the minimum and maximum latitudes. From this, the midpoint of the latitudinal ranges was calculated for use in this study. The age of the following fossils of the species within the genus *Panthera* were also averaged: *Panthera blytheae*, *Panthera gombaszoegensis*, *Panthera leo*, *Panthera onca*, *Panthera pardus*, *Panthera tigris*, and *Panthera uncia*. Their ages range from the Miocene to the current epoch, the Holocene.

One species, *Panthera uncia*, was missing latitudinal data, and another species, *Panthera blytheae*, stood as an outlier in the data by severely skewing the trendline due to its age range that was not representative of the population, so they were both omitted from this

linear regression test. This left just the *Panthera* species from the Paleocene to the Holocene. As for the outliers within the graph itself, their data did not stand out severely by having an unreliable age as *Panthera blytheae* did.

A linear regression was performed in Excel, comparing the latitudinal range and age of fossils against each other. A significance level of 0.05 was chosen because this is not a high-risk test. In other words, this significance level will tell us whether the data occurred by random chance. For the linear regression graph, the independent variable is denoted as the age, and the dependent variable is denoted as the latitudinal range. The null hypothesis is that there will be no correlation found between the age of a *Panthera* fossil and its latitudinal range.

### Results

The linear regression supports the research hypothesis that the age of *Panthera* species fossils is directly correlated with their latitudinal ranges. The linear regression performed gave a p-value of 0.0005, suggesting that the correlation of these data points is statistically significant. The null hypothesis can be rejected. Figure 1 displays the linear regression performed between the *Panthera* species fossils and their latitudinal ranges. As for the R<sup>2</sup> value of 0.275, this gives the meaning that about 27.5% of one variable point is explained by its correlating variable point. The low R<sup>2</sup> value still carries significance to the study because real-world models with organisms are harder to predict than controlled physical processes thus explaining the lower R<sup>2</sup> value.

The average age generally increased alongside the latitudinal ranges. The oldest species, *P. gombaszoegensis*, at an average age of 2.67235 million years had a latitudinal range of 57.32° latitude. The second oldest species, *P. leo* and *P. pardus*, at an average age of 2.6665 million years had latitudinal ranges of 89.05° latitude and 86.81° latitude, respectively. The third oldest species, *P. onca*, at an average age of

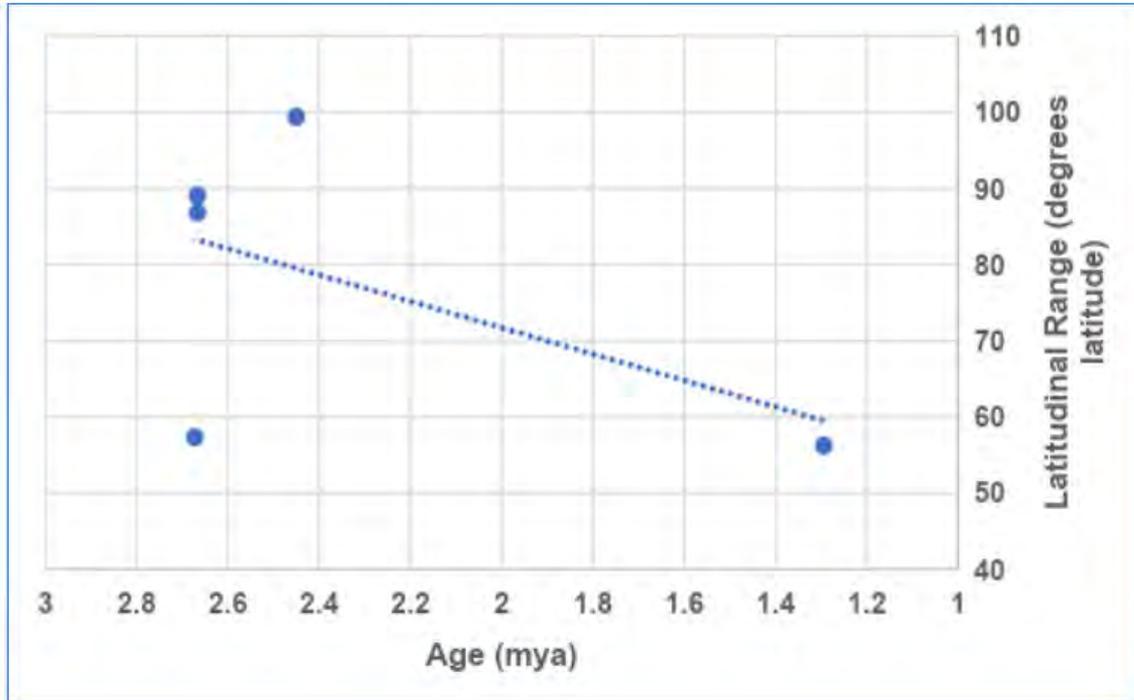


## Panthera Latitudinal Ranges Increase Over Time

2.45 million years had a latitudinal range of 99.38° latitude. The youngest species, *P. tigris*, at an average age of 1.294 million years had a latitudinal range of 56.23° latitude.

### Discussion

Based on the results of the linear regression test, the research hypothesis is accepted. There



*Figure 1. The correlation between the age of Panthera species and their latitudinal ranges. After completing a linear regression, the results indicate a high correlation between the age of Panthera species fossils and their latitudinal ranges. The p-value of 0.0005 indicates that there is a statistically significant correlation between the ages of Panthera species fossils and their latitudinal ranges. The older a Panthera species fossil is, the further its latitudinal range will be. As for the R2 value of 0.275, this gives the meaning that about 27.5% of one variable point is explained by its correlating variable point.*

is a statistically significant correlation between the age of *Panthera* fossils and their latitudinal ranges, meaning that the older a *Panthera* fossil is, the larger its latitudinal range will be. As shown in figure 1, the correlation between the age of the fossils and their latitudinal ranges is visible. This is likely due to the dispersal of species from the tropics over time per the “out of the tropics” theory.

### Out of the Tropics

One of the most popular and well-cited explanations for the latitudinal diversity

gradient, as mentioned previously, is the “out of the tropics” hypothesis (Jablonski et al., 2006; Jansson, Rodríguez-Castañeda, & Harding, 2013; Mittelbach et al., 2007; Rolland et al., 2015; Rolland et al., 2014). As time goes on, species will disperse from the tropics. The “out of the tropics” theory is supported by the two other theories as Jablonski and their team have stated.

The rate of diversification and the rate of extinction in the tropics contributes strongly to the “out of the tropics” theory (Jablonski et al., 2006). Jablonski is stating how the tropics



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maintain this cradle and museum, which drives species to disperse from the tropics over time (Jablonski et al., 2006). However, Jablonski and their team acknowledge the potential of other hypotheses such as climatic change (Jablonski et al., 2006).

### Pliocene and Pleistocene

The fossils examined during this study were from the Pliocene and the Pleistocene, two important markers in time due to major climate events such as the warming period during the Pliocene (Jablonski et al., 2013). Jablonski states that because of the warming period during the Pliocene, animals, such as the *Panthera* in this study, were able to disperse from the tropics to higher latitudes (Jablonski et al., 2013). This is due to the surrounding areas of the tropics, such as what we know as temperate zones in the present day, being more adaptable for the animals dispersing from the tropics such as the genus studied in this paper, *Panthera* (Jablonski et al., 2013).

As for the Pleistocene, this was the time of the ice ages (Jablonski et al., 2013; Mittelbach et al., 2007). This ice age has been known to contribute significantly to the movement, diversification, and extinction of a multitude of species (Mittelbach et al., 2007). This could be another climatic change that could factor into the dispersal of species from the tropics.

### Other Theories

One idea that emerged in the 80s was that the latitudinal diversity gradient was simply due to the climate changes mentioned previously (Lewin, 1989). Animals were better able to adapt to the warming climates around them, so they dispersed (Lewin, 1989). Scientists argued it had nothing to do with the idea that the tropics are a museum or a cradle or both (Jablonski et al., 2006; Lewin, 1989). However, this statement has little scientific backing (Jablonski et al., 2006). It is shown by several studies that the latitudinal diversity gradient is due

to a multitude of factors, not just a single one (Jablonski et al., 2013; Jablonski et al., 2006; Jansson et al., 2013; Mittelbach et al., 2007; Pyron, 2014; Rolland et al., 2015; Rolland et al., 2014).

A combination of several hypotheses such as high speciation rates, low extinction rates, high dispersal rates, climatic conditions, and more all lead to the latitudinal diversity gradient (Jablonski et al., 2013; Jablonski et al., 2006; Jansson et al., 2013; Mittelbach et al., 2007; Pyron, 2014; Rolland et al., 2015; Rolland et al., 2014). This statement is highly supported by all the evidence gathered by scientists over the decades, showing how there are multiple reasons behind why the latitudinal diversity gradient exists (Jablonski et al., 2006).

Additionally, since this study focused on one specific genus rather than a multitude of them, the “out of the tropics” theory is further supported by the data that was collected in this analysis. By focusing on just *Panthera*, we have more research points that can be used when studying the diversification, extinction, climatic changes, predation, and other factors that affect the latitudinal diversity gradient.

### Limitations and Future Work

In spite of the fact that all known fossils for the genus *Panthera* from the Paleobiology Database were used in this study, there is still the possibility that bias has occurred. By restricting the data down to a genus, a small sample size was used to assess the hypothesis. If more fossil samples were available in the Paleobiology Database, then a more accurate and precise result may have been generated for this project from the data.

Missing data in the *Panthera* genus also affected this study, resulting in fewer samples to use and less accurate results. Outliers in the data were also excluded from this study due to how they severely skewed the data. If the outliers could be separately studied or somehow



## Panthera Latitudinal Ranges Increase Over Time

accounted for in the data, then more results for this hypothesis would be potentially available.

While this study examined the possible effects that climate events may have had on the data, this study didn't account for climate changes at certain points in history (Lewin, 1989). By separating fossils individually from their ages due to the points in the geologic time scale that they existed in, more accurate results with further explanations would have been found for this research.

Diversification rates as well as extinction rates were not examined in this study either. Rather than using general data from articles that discuss the high diversification rates and low extinction rates in the tropics that support the dispersal of species from the tropics, a direct study of this data would have been beneficial. By having this data, more evidence to support this museum and cradle hypothesis of the tropics would have been present (Jablonski et al., 2006). From the data in this study, more evidence to support the idea that the tropics are a biodiversity engine found that as time goes on species will disperse from the tropics.

Future studies should examine the diversification rates and the extinction rates of the *Panthera* genus in order to examine their relation to the "out of the tropics" hypothesis supported by this research paper. More *Panthera* fossil samples should be included in the data as well to gather a more accurate result that can further prove the hypothesis that the older a *Panthera* fossil is, their latitudinal ranges will be larger.

### Acknowledgments

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# THE PROGRESSION OF HIV AND AIDS

*Brittany Howell*

*ABSTRACT: Since HIV was contracted by a human from a chimpanzee in the 1800s, more than 84.2 million people have been infected with HIV and 40.1 million have died from AIDS (5). Though this virus is powerful and has shown its ability to take over a portion of the population around the world with continuously increasing rates, different steps like PrEP and PEP have been shown to decrease the rates as a preventive step. PrEP and PEP are both medications that can be taken for either pre-exposure or post exposure to HIV. With the evolution of medicine and the virus continuing to shift with science over time, the goal is to one day create a cure to prevent HIV and AIDS.*

## Introduction

**H**IV began with the cross contamination of blood between a chimpanzee and a human, known as the cut hunter hypothesis (4). SIV, also known as Simian Immunodeficiency Virus, is a zoonotic disease that spread from chimpanzees to humans in Central Africa in the late 1800s (4). It has been hypothesized that a hunter in Africa killed an infected chimpanzee and its blood passed into the hunter creating HIV, or Human Immunodeficiency Virus (4). As time progressed, the virus eventually spread throughout other humans in the continent of Africa before making its way overseas to the United States in the 1970s (4). HIV and AIDS has spread all around the world from chimpanzees to humans in the late 1800s and migrated to the US in the 1970s.

HIV and AIDS does not discriminate against ethnicity or gender; if someone has the virus and both parties are not practicing safe sex, anyone can transmit the virus. It can also be transmitted by accident through the transmission of blood from a site as small as a paper cut to an accidental needle prick. It is very important that people who do have HIV or AIDS and are aware of their diagnosis inform people when doing anything that could possibly transfer the disease, like in healthcare settings, when sharing needles, and with sexual partners. Being able to educate people on HIV and AIDS and all the different

ways that the disease can be transmitted is very important for all community levels.

## What is HIV and AIDS?

HIV is a disease that affects the immune system and is vital to be followed by a doctor to keep track of a patient's CD4 levels and viral load. A CD4 is a glycoprotein that works in the bloodstream as a receptor to T-cells. The viral load is important to track because it looks at how much of the virus is in a single drop of blood, while the CD4 cell level tests help gauge a person's stage in HIV depending how low the levels are. As CD4 levels continue to drop, it becomes harder for the body to protect itself and fight off infections. Someone who has a normal range of CD4 levels would normally be able to fight off infections easier with the assistance of their helper T cells. As the virus progresses it can stage into what is clinically diagnosed as AIDS or Acquired Immunodeficiency Syndrome, which usually occurs when the CD4 level drops below 200 cells per milliliter of blood (2).

## Epidemiology

HIV and AIDS has spread all around the world from when it was first spread from chimpanzee to humans in the late 1800s and migrated its way to the US in the 1970s. HIV and AIDS has increased around the world so much, for example in 1990 the world population of people living with HIV was 7,828,846 versus



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in 2019 the population of people living with the virus grew approximately 371%, to 36,848,154 people (11). The areas that saw the most growth would be the continent of Africa by 20 million plus people throughout each country between the 29 years, which is a change of 371%, and the United States which saw a growth of just over 820,000 people which is a change of 89% (11). With a lot of the people globally eventually progressing to AIDS within the first 10 years of living with their HIV diagnosis (9). These rates over time have proven to show a steady increase in large spikes throughout the world and continue to grow by the second.

### Health Disparities

HIV is a disease that tends to affect some demographics more than others while another part of it has to do with lack of education and resources. Though these two diseases do not discriminate it does have a higher rate of infection among African Americans followed by Hispanics, more than other ethnicities infection rate (14). For perspective, the rate of infection in the year of 2020 had African Americans make up 12% of the population in the United States while at the same time making up 42% of the population who were infected with HIV, with 51% of the infections coming from the Southern states in the United States (14). Risk for developing either diagnosis is amplified depending on your geographical location.

### Demographics and Gender

As mentioned earlier, HIV and AIDS does not discriminate against ethnicity or gender. However in the Southern states a spike in the rate of minorities who have shown an increase of HIV contraction has to do with the resources that are provided. A large portion of African Americans that live throughout the South are living in poverty stricken areas and these areas are also lacking proper education and medical access to provide proper resources. Though this is the case for Southern states, as well as throughout the United States and different parts

of the world, the advances in science continue everyday. The average life expectancy for people living with HIV and AIDS has continued to increase more and more over time. In fact, in 2010 the death rate for people living with AIDS decreased for women by 57% and 47% for men (5).

## Healthcare

### Immunocompromised

Connections are made in so many different ways in relation to HIV and AIDS, whether it be in relation to other medical disorders, demographically, looked at in a statistical standpoint, or geographic location. Autoimmune disorders work in the body by attacking healthy cells or tissue in the body until the virus/disease has won the battle in over taking the body and weakening the immune system from being able to fight other illnesses. HIV and AIDS are both immune disorders that affect the immune system by attacking itself, which defeats their ability to fight off other infections for diseases. For instance people who live everyday with HIV or AIDS are more susceptible to TB, also known as Tuberculosis, which is a medical condition that affects the lungs (1). TB is a germ that is spread through the air by someone that is already infected with the disease (1). With HIV and AIDS patients already having a weakened immune system, getting medical treatment for TB is crucial. Not only can other medical diagnoses be a risk for people with HIV and AIDS but demographically they could be more at risk.

### History of HIV Treatment

Though HIV and AIDS continues to spread and grow throughout the world, it has progressed from when it first came out in the United States in the 1970s. Medicine and science has done its best to keep up with the virus creating different treatment options through all stages of the virus, whether it be HIV or AIDS. Though medications have not always been available,



## The Progression of HIV and AIDS

one of the medication options they have now for someone who lives with HIV, has the ability to make their viral load undetectable to decrease the rate of transmission of HIV to others (14). Antiretroviral therapy, which can make your HIV cell replication suppressed, has advanced so much with medicine over time that in 2019 it was reported that in the United States, 56.8% of HIV patients were undetectable or showed a suppressed viral load (14).

### Treatment Access

Access to these treatment options continues to expand into different areas and communities around the world. In 2021 28.7 million people were able to access different assistance programs for antiviral treatment (5). One resource that people can use is the Ryan White HIV/AIDS program; which is used to support people who live in lower income areas with HIV to assist financially with prescriptions, medical treatments, and different support options for people (7). Programs like Ryan White have helped assist over 500 million people each year living with HIV and AIDS (7). New programs to help with assistance and progression in medicine are happening everyday and have helped with how HIV and AIDS has evolved around the world.

### Treatment as Prevention

Treatment options are very important to have when partaking in behavior that puts oneself at greater risk for contracting HIV infection. An option for treatment for people who are HIV negative but partake in sexual activity that might increase their chances of contracting HIV is called PrEP. PrEP, also known as Pre-Exposure Prophylaxis, has a 99% reduction rate against HIV contracted sexually and a 74% reduction rate from intravenous drug use contraction (3). For people who may have been exposed to someone who does have HIV there is an antiretroviral drug called PEP, which is Post-Exposure Prophylaxis, and works only within 72 hours of exposure to HIV (3).

### What the Future Holds

#### Recent Advancements & Research Priorities

The decrease in the rates of deaths, as mentioned earlier, goes hand in hand with the continuous research that is being conducted everyday to improve medicine and the lives for people living with HIV and AIDS. In conjunction with the National Institute of Allergy and Infectious Diseases, current research is being conducted looking into making a vaccine to prevent HIV (12). Another set of research being conducted is run by the National Institutes of Health looking into developing immune cells that are resistant to HIV and an immunotherapy that would induce HIV cure (13). Research is also being conducted looking into the HeLa cell line to see how the HIV virus interacts with T cells to fight off infection and show resistance (8). As research continues to improve the lives of people with HIV and AIDS, their lives will continue to grow longer.

#### Can HIV be Cured?

As research continues to advance over time there has been a case where someone has been cured of HIV. Known as the Berlin patient, Timothy Ray Brown, he was a Seattle native and was currently living in Berlin and with HIV for 11 years. While living abroad he was diagnosed with acute myeloid leukemia with no resolution with chemotherapy he received a bone marrow transplant (6). Brown's oncologist, Dr. Hütter, was able to find a transplant donor that carried a mutation gene that damages a receptor on the white blood cell; with the donor's mutation after the transplant Brown's white blood cell level went back to normal as someone who did not have HIV (6). What Dr. Hütter found is very important for someone like Timothy who lives with HIV because a damaging link to the white blood cell receptor essentially shuts off Brown's HIV cells which make him cured. Research like this is very hard to replicate for other HIV patients because of how much it costs to perform the procedure and the testing



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that would be involved to find people who also carry this genetic mutation of the white blood cell. Though Timothy's case was rare it was a look into how advanced medicine and research has come over time to make him no longer HIV positive.

### Possibilities with Gene Therapy

He Jiankui, a biophysicist from China, was found to have reworked the genomes on a set of twins which deactivated the cells ability to contract the HIV receptor. However, this edit raises the risk of development for other infections (10). This study is problematic with ethics because it not only puts the babies at risk for later health issues, but also for the mother carrying the baby. An ethical issue that has to be taken into place is the risks that it places on the mother of these children while she's carrying and also the long term effect post pregnancy of editing these babies embryos. The babies already are at a higher risk for developing other infections, but they could also have a long term effect with their immune system. Being able to provide patients or participants complete information of possible risks and what the research is about is very important so people have the ability to accept or decline their participation in the study.

### Moving Forward

HIV and AIDS has played a role in so many people's lives all around the world from either being diagnosed with it or knowing someone who has been diagnosed with the disease. While the disease does not discriminate against who it infects, it does show an increase with African American men. Different resources like the Ryan White Project and medicine like antiretroviral therapy in the world have helped increase the life expectancy for people living with HIV and AIDS over the years around the world. With medicine continuing to grow with new advancements everyday to hopefully find a cure or some type of medicine to stop the infection of HIV, some of the research pushes

some boundaries with the proper practice of ethics.

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# A CLIMATE CHANGE ADAPTATION ASSESSMENT OF THE STATE OF WASHINGTON: INDUSTRIAL HEMP & BUILDING THE EVERGREEN STATE OF OUR FUTURE

*Loren Herrera*

*ABSTRACT: This Adaptation Assessment of the State of Washington is intended to highlight the great potential of industrial hemp as an agronomic defense powerhouse against climate change, helping humanity transition away from the long-exhausted use of fossil fuel. In theory, Washington with its total cropland considered, has the potential to sequester over 28 million tonnes of CO<sub>2</sub>e annually. That is, if Washington were to incorporate industrial hemp into its already existing crop cycles, statewide. Furthermore, industrial hemp has a myriad of known uses and potential uses, including both hemp-based plastics and fuel. However, given the public perception of hemp and its controversial history in the United States, there simply remains a lack of research in this field of study and consequently the potential of industrial hemp remains yet to be fully recognized, let alone realized. Washington can potentially change that (if it can meet the moment) but it must start from the top down with good policy, and urgent implementation.*

## Introduction

Now is the most important time for humanity, and particularly the State of Washington, to go all in on large scale industrial hemp agronomy, that is with the passing of the 2018 Farm Bill and the long underappreciated existential threat that is climate change. It is one of the oldest domesticated crops in the history of civilization, and yet for the greater part of a century, hemp (*Cannabis sativa* ssp. *Sativa*) has been ‘demonized’ for zero legitimate reasons. In a time before the United States’ exhaustive thirst for oil, hemp was a colonial cash crop, and even our Founding Fathers, Thomas Jefferson and George Washington were both hemp farmers. In fact, even in the worst times (e.g., in times of war) it recurrently becomes our patriotic duty to grow industrial hemp on a large scale, though only utilizing a modicum of its colossal potential—that is, its some

25,000 uses and counting. This assessment aims at cultivating a proper climate change adaptation plan for the State of Washington, one that favors a carbon-negative result. Thanks to the industriousness of hemp and its innate ability to sequester incredible amounts of CO<sub>2</sub>e (carbon dioxide equivalent) in a brief period of time, and the potential to fertilize even the most vulnerable, arid soils in its undertaking.

Hemp is more than just a remedy for soil. A sustainable economy is within the United States’ grasp, if we can only seize upon it. Washington is often regarded as ahead of the curve in terms of its ‘smart’ infrastructure, sustainability, and progressive policies, being that it is a tech hub for some of the biggest companies in the history of the world, but this paints a rather incomplete and misleading picture, as this paper will assert. In the grand scheme of things, Washington’s adaptation plan is insubstantial and its



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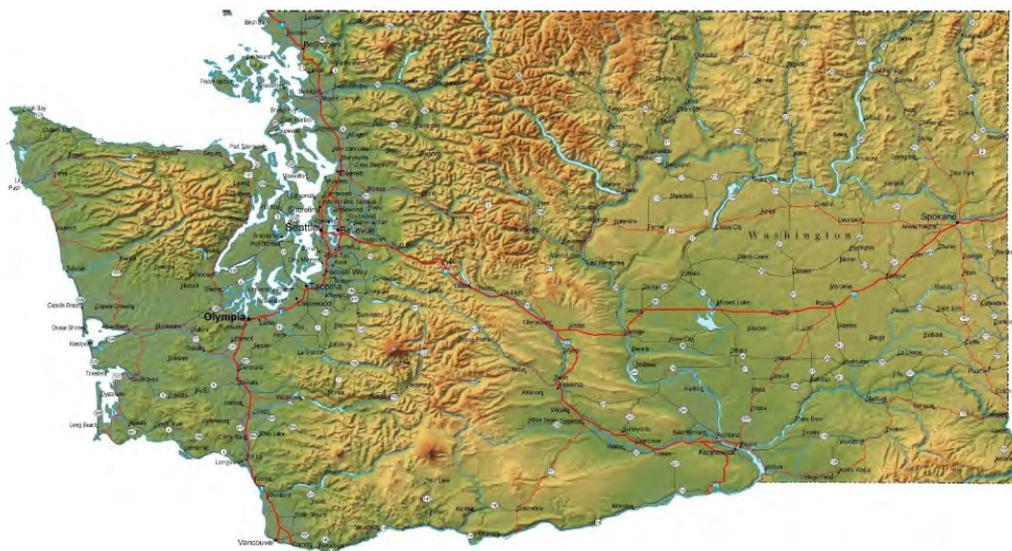
implementation is meager when compared to a ‘greener’ potential. Perhaps above all, without first addressing Washington’s notoriously regressive state and local tax system, its historically racist zoning laws, and/ or without comprehensive community and stakeholder inclusion and involvement, any kind of equity-driven climate change adaptation plan will be off to a comical non-starter. Appreciating the fact that the near-lost tradition of hemp cultivation in the United States goes as far back as Jamestown in 1616. As contested as it may be, it’s very likely that the early drafts of the Declaration of Independence were indeed written on hemp paper, before ultimately being completed on animal parchment in 1776 (Ministry of Hemp, 2019). With one of the greatest known existential threats ever known to humanity (global warming) this adaptation assessment aims to plot out a roadmap for building a genuinely holistic, eco-centric, and hemp-based climate change adaptation plan for the State of Washington, and one that has the potential to be a beacon for the world; that is, if implemented.

## Method

### The Roadmap to a Vital Hemp-Based Adaptation Plan

The key objectives in this hemp-based climate adaptation plan are to: (1) Invest in education, research, community engagement, and expanding infrastructures for developing a comprehensive, inclusive, and equitable state hemp agronomy program that is ultimately carbon negative. (2) Integrate hemp into already existing crop cycles on Washington’s agricultural land. (3) Sequester >20 million tonnes of CO2e, annually by growing hemp using a no-till style method of polyculture. (4) Regenerate soil health; (5) produce and manufacture hempcrete, plastics, paper, fuel, automobile parts, and food and medicine, etcetera. (6) Create less waste, pollution, herbicides, pesticides, logging, and deforestation; (7) use hemp byproduct as fuel for power plants that can provide power to whole towns, or for desalination plants, perhaps. (8) Alleviate ecosystems of the negative aspects of human behavior and activities;

Figure 1. Detailed Map of the State of Washington (state-maps.org, 2007 – 2022)





## A Climate Change Adaptation Assessment

(9) improve the quality of life in the state of Washington for all of its people, including Nature; (10) have it be replicable.

If Washington omits industrial, polyculture hemp agronomy from any kind of climate change adaptation plan, then it necessarily must go back to the drawing board, because humanity can no longer afford to ignore or put off the regenerative qualities of hemp. On either side of the Cascade Mountain Range, hemp could flourish, hypothetically, but it's in golden Eastern Washington where hemp can truly make a fundamental shift in Washington's agronomic priorities, bolstering both state and national levels of economy in its wake. Pictured above, in Figure 1, is a well-detailed map of the State of Washington. According to Farmland Information Center, Washington has a total land area of 43,279,500 acres. Out of this land area are 15,398,200 acres of agricultural land; and out of this acreage, there are 6,749,800 acres of cropland, as of 2016 (American Farmland Trust, 2022). Only about 142 acres of cropland in Washington were being used for growing hemp, as of 2018, according to Vote Hemp (2021). By comparison, Oregon had grown about 14,196 acres of hemp in 2020; Colorado had 27,092 acres of hemp in 2020, down from about 52,275 acres in 2019; California, 3,332 acres in 2020, down from about 21,844 acres in 2019; Arizona, with 1,386 acres in 2020, down from 5,432 acres in 2019; Kentucky, 5,000 acres in 2020, down from 26,500 acres in 2019; and, Illinois, with a meager  $\frac{1}{4}$  acre of hemp in 2020 (Vote Hemp, 2021). Washington is lagging behind, but it is moving in the right direction, nevertheless.

### **An Unprecedented CO<sub>2</sub>-to-Biomass Conversion Tool**

In one recent study conducted by Ifeoluwa Adesina et al., it was found that integrating hemp into the crop rotation would drastically improve the health of the soil, and that, "the hemp cropping system is suitable for crop rotation, cover cropping, and livestock integration through animal waste applications (2020). Hemp also has significant environmental benefits since it has the potential to remediate contaminated soils through phytoremediation, convert high amounts of atmospheric CO<sub>2</sub> to biomass through bio-sequestration, and as hemp biomass for bioenergy production (Adesina et al., 2020). This has significant implications for both air and soil quality regeneration wherever hemp is grown and integrated into crop cycles, as opposed to simply continuing to exhaust the soil by way of monoculture practices. According to the European Industrial Hemp Association (EIHA), one hectare of industrial hemp can potentially absorb 15 tonnes of CO<sub>2</sub> per hectare, and that "hemp's rapid growth makes it one of the fastest CO<sub>2</sub>-to-biomass conversion tools available, more efficient than agro-forestry" (EIHA, 2019). Another figure from the same author, Catherine Wilson, board advisor of the EIHA, reveals that no-till hemp farming potentially enables 10.5 tonnes per hectare a year of carbon to be sequestered from the atmosphere, while also contributing to the overall restoration of soil health (2019). With Washington's approximate 142 acres of hemp, this sequesters perhaps 861, 981 tonnes of CO<sub>2</sub>e, according to my own calculation:



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1 acre = 0.404686 hectare,

142 acres = 57.4654 hectares,

15 tonnes of CO<sub>2</sub>e per hectare of hemp,

57.4654 hectares × 15 tonnes = 861,981 tonnes of CO<sub>2</sub>e (sequestered).

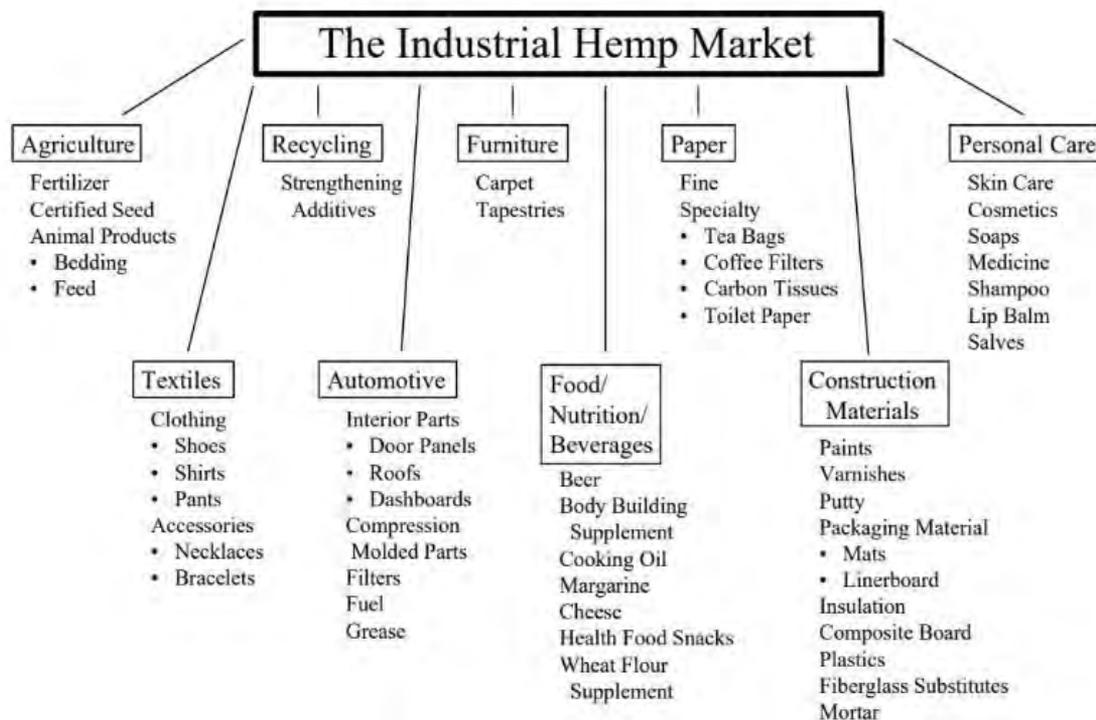
Exploring this further, if Washington were to hypothetically integrate hemp into its crop cycles, then its 2016 figure of 6,749,800 acres of cropland has the potential to sequester approximately 28,681,245 tonnes of CO<sub>2</sub>e, annually.

6,749,800 acres = 2,731,547.148 hectares,

10.5 tonnes × 2,731,547.14 hectares = 28,681,245 tonnes of CO<sub>2</sub>e (sequestered per year).

If the calculation is correct, this figure is astounding. To think of the dramatic, positive effects this would have on Washington's ecosystems: The money saved in healthcare costs, the amount of pesticides and herbicides eliminated, the amount of plastics removed from reaching the Great Pacific Garbage Patch, and the fossil fuel it can help bury back into the Earth. Humanity has this great opportunity to utilize already existing infrastructures to cultivate industrial hemp on a grand scale as we transition to more sustainable, alternative energies, such as nuclear fusion,

Figure 2. Hemp as an agricultural commodity (Kraenzel et al., 1998).





## A Climate Change Adaptation Assessment

which may lie just around the corner. Now, I wonder how many tonnes of CO<sub>2</sub>e the United States as a whole could sequester per year by integrating industrial hemp into its crop cycles? This question is worth finding an answer for. This plan won't be able to address in detail of how hempcrete has the ability to absorb CO<sub>2</sub> out of the atmosphere, over its some 100 (+) year lifespan; or that growing hemp is 24 times more efficient than growing cotton, and it requires less chemicals, as well (Wilson, 2019). A viable solution could not be more clear.

### **Raising Awareness & Cultivating Community Engagement**

On the subject of industrial hemp, people are aware of its goods and benefits, but perhaps not to the extent being offered in this assessment. On a general level, citizens of Washington might not be completely aware of the full historical context of this traditionally sacred plant. In the ancient Hindu text, Atharvaveda, hemp is referred to as 'sacred grass'. Many civilizations of the world have been using hemp for millennia, and it was only until the early 20th century when a racially motivated anti-cannabis campaign in the United States led to the passing of the Marihuana Tax Act of 1937, where hemp was taxed alongside marijuana. According to the USDA:

The industrial hemp world market consists of over 25,000 products in nine submarkets: agriculture, textiles, recycling, automotive, furniture, food/nutrition/beverages, paper, construction materials, and personal care. These products are made or manufactured from raw materials derived from the industrial hemp plant: fiber, hurds, and hemp seed/grain (Kraenzel et al., 1998).

And of hemp's myriad of ways to be commoditized:

The best way that hemp can draw awareness to itself is through its plethora of uses. Hemp straw can even be used for door panels (Shen et al., 2022). It can be used to make biofuel. According to Doug Fine, author of *Hemp Bound*, hemp byproduct can be used as a power plant fuel source (Fine, 2014). Therefore, what could next be envisioned is the development of a closed loop system, in which the industrial hemp we grow can also be used to provide the fuel for hemp power plants. Subsequently, being used to power rural towns or cities, or to power desalination plants that provide irrigation water, as an example. The plastics that we use in Washington could be grown, processed, manufactured, and recycled right here within our own state, cutting out petrol-based plastics for good if we wanted to.

### **Equity & Justice**

In the age of smart cities, AI, automation, and biotechnology, there seems to be an ever-widening socio-economic gap between the working class and the wealthiest people in the United States. A lot of this has to do with the systemic racism and classism that have been built into the zoning laws of urban and rural areas in the U.S., alike, even in Seattle, of all places. The zoning laws that existed in Seattle's early history still shape daily life in the city today, including on Amazon Prime delivery routes (Jung, 2022). In the mid-1800s, Chief Si'ahl (Chief Seattle), personally brought American settlers to his homeland, but to this day arguably the oldest inhabitants of Washington, dx<sup>w</sup>dəwʔabš, the Duwamish Tribe, have yet to be federally recognized (Buerge, 2017). In the State of Washington,



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the conditions of the treaties with Native American groups were either plainly unfair, or they were hardly even met by the United States government. It's a travesty of justice that in the city of Seattle, the Duwamish Tribe, who shared their land and waterways, are still not officially recognized by the U.S. government to this day.

The significance of hemp, and the great meaning it brings to people worldwide, is all the more reason to cultivate it in reverence with the land and its ecosystem. Growing industrial hemp involves the creation of new jobs, education, and systems of agriculture and manufacturing. Therefore, "Change must come from the top, and it must be so systemic that it begins to reform the entire assemblage" (Romero, 2022). Without systemic change occurring at the top level, we are doomed to repeat the same tribulations, as we have been for a long time. At a time when 'environmental personhood' and panpsychism is gaining ground in popular culture, industrial hemp stands to be the ultimate transitional tool toward a sustainable, eco-centric future humanity is moving toward in capitalism, come hell or high water.

### Discussion

#### A WSU Assessment

After the passing of the I-502 Initiative, Washington State University published a report concerning the opportunities and challenges of growing industrial hemp in this state. However, this was published during a time when hemp was still listed as a Schedule 1 controlled substance, "Despite recent changes in state laws, industrial hemp is still classified as a Schedule I controlled substance under federal drug

policy, and as such is regulated by the U.S. Drug Enforcement Administration (DEA)" (Fortenbery, 2014). Nonetheless, the report, itself, is quite useful in gauging where institutions and academia stood on large scale industrial hemp in Washington at that time. It's unclear whether or not students taking courses through WSU during that time were even able to ask direct questions regarding the cultivation of hemp. For example, this is indicated even in 2022, with this Washington State Department of Agriculture (WSDA) statement regarding WSU's Cultivating Success course. "Instructors cannot provide cannabis-specific information or answer cannabis-related questions," for students wanting to learn how to grow hemp (WSDA, 2022). If this climate change adaptation plan for the State of Washington is to succeed in helping save our planet, and by extension ourselves, then our attitude on hemp must change. Which may be possible only through the pragmatic investment of educating people on the facts and wonders of industrial hemp, because only then can we build the sociopolitical momentum to revolutionize current agricultural systems and practices.

### Conclusion

This assessment began with a lofty hemp-based climate change adaptation plan that could be shaped and molded to fit the needs of any peoples, for all relevant stakeholders, especially those who have been historically underrepresented. The surprisingly triumphant passing of the 2018 Farm Bill has successfully removed hemp from being misclassified as a Schedule 1 controlled substance; therefore, the dynamic State of Washington can make up for years of lost time on hemp-oriented research. In addition to this, ESB 5372 Hemp Processing Registration & Extract Certification was recently signed by Governor Jay Inslee



## A Climate Change Adaptation Assessment

in April of 2021. This is a promising step forward. Then, of course, this adaptation assessment falls short in many ways, in that it is not comprehensive enough. However, it does in fact begin to envision and construct a brighter, more biodiverse future. With some basic methodology and formulas to be replicated wherever this adaptation plan may help people resist climate change worldwide, by efficient and fiscally responsible agronomic strategy.

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# SYSTEMATIC ANALYSIS OF THE QUASAR PROPERTIES AND VARIABILITY OF EXTREMELY-HIGH VELOCITY OUTFLOW QUASARS IN THE SLOAN DIGITAL SKY SURVEY

*Easton Pierce, Mikel Charles, Cora DeFrancesco, Veronica Powell, Rachel Reese, Anish Rijal, Tzitzu Romo Perez, Lorena Sanabria, Alex Vong, & Abby Wang*

*ABSTRACT: Active Galactic Nuclei host a super massive black hole surrounded by in-falling gas in the form of an accretion disk. The most luminous of them, called quasars, regularly present outflowing winds, observed as absorption in their spectra. These winds may play a large role in galactic and black hole evolution. Extremely High Velocity Outflows (EHVOs), which are outflows with speeds of  $> 10\%$  the speed of light, are the least understood type of these outflows.*

*We present the preliminary results on the first systematic study on EHVO quasar properties and variability of these extreme outflows in the 16th data release (DR16) of the Sloan Digital Sky Survey. Of the 98 quasars with EHVOs discovered in the DR16, 51 cases were inspected for variability because they had multiple observations in other data releases. We find that 47% of them show variability. Velocity and depth changes were both observed via the shifting of our absorption and the disappearance and appearance of EHVOs respectively. Of the 98 quasars with EHVOs, we have values of physical properties, such as bolometric luminosity, black hole mass and Eddington ratio, for 69 cases. We find that quasars with EHVOs exhibit larger values of their bolometric luminosity and Eddington ratio when compared to Broad Absorption Line Quasi-Stellar Objects (BALQSOs) and non-BAL parent sample quasars, while the black hole mass parameter does not show significant differences.*

*Definitions:*

- **BALQSO:** Broad Absorption Line Quasi-Stellar Object. A quasar that exhibits a Broad Absorption Line (BAL) in its spectrum.
- **BAL:** Broad Absorption Line. Caused by a gas cloud around the black hole absorbing a large range of wavelengths and is identified by an absorption trough or dip that is at least  $2000 \text{ km s}^{-1}$  in width.
- **Continuum:** The distribution of energy at different wavelengths of light. Quasars follow a power law continuum, where the intensity of light instead follows a power law which skews higher intensity towards the shorter wavelengths. The continuum is used as a baseline to measure absorption and emission, i.e. dips below the continuum are measured as absorption and peaks above are measured as emission.
- **EHVO:** Extremely High Velocity Outflow, gas outflowing from around the quasar at more than  $10\%$  the speed of light. These outflows can be identified by absorption of CIV in their spectrum; this CIV absorption shows up as a trough in the continuum shifted at least  $10\%$  the speed of light from the CVI emission line.
- **Flux:** The amount of light energy our instruments receive per second.
- **Parent sample:** A larger group or sample from which a smaller group or sample is drawn. A parent sample of BALQSOs would be quasars, as all BALQSOs are quasars but not all quasars are BALQSOs. BALQSOs are a subset of quasars.
- **Quasar:** Extremely luminous objects caused by the friction of gas falling into a black hole.



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## 1. Introduction

Quasi-stellar radio sources, or “quasars” as coined by astrophysicist Hong-Yee-Chiu, were named as such because these mysterious objects look to us like stars but show very different spectra and sometimes emitted radio waves. Located at the centers of galaxies, quasars are some of the most luminous objects found in the universe. The luminosity of an object is measured by how much electromagnetic energy (what we commonly understand as light) is emitted over time. For instance, the luminosity of the sun, also known as solar luminosity, has a value of  $3.846 \times 10^{26}$  watts (or  $3.846 \times 10^{33}$  ergs per second). In comparison, the luminosity of an average quasar is about  $10^{40}$  watts, roughly  $2.6 \times 10^{13}$  times that of the sun (Ryden 2016). In fact, quasars are a subtype of regions at the centers of galaxies that have higher-than-normal luminosities, known as Active Galactic Nuclei (AGN). Today, it is generally believed that the high luminosities of quasars, and AGNs in general, are powered by supermassive black holes (SMBH).

However, a black hole does not emit observable light since not even light can escape a black hole’s gravitational pull. Then, how do we observe quasars? With mass that is millions or billions of times the mass of the Sun, a super massive black hole creates an enormous gravitational pull that powers the quasar by attracting matter and forming an accretion disk (Dunbar 2007). The emissions we observe are from these environments surrounding the black hole..

A subset of BALQSOs, known as Extremely High Velocity Outflows (EHVOs), present winds moving faster than 10% the speed of light. Figure 1 shows an example of the spectrum of a quasar with an EHVO. These EHVOs are still poorly understood, but they play a role in galaxy formation, due to their enormous energies that are able to disperse large amounts of gas and disrupt the star formation processes in the galaxy around them (Di Matteo et al. 2005).

It is also hypothesized that these EHVOs help accelerate the mass growth rate of supermassive black holes. This is because these outflows “steal” angular momentum from the accretion disk, increasing the efficiency of in-fall mass rate (Emmering et al. 1992; Konigl & Kartje 1994).

The spectrum of a celestial body is the result of the light as it passes through a prism or a spectrograph and the light is dispersed in its

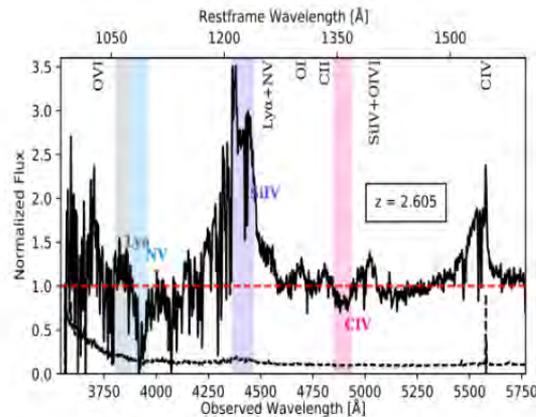


Figure 1: Example spectrum of an EHVO quasar at redshift  $z = 2.605$  displaying flux (solid) and error (dashed). The EHVO is identified by the CIV absorption (highlighted in pink) centered at approximately  $1370 \text{ \AA}$  in rest-frame wavelength (shown at the top). Absorption features caused by other ions in the same outflow and similar speeds are also outlined in their respective colors: Ly- $\alpha$  (gray), NV (cyan), SiIV (blue). A red-dashed line is graphed at the normalized flux of 1, representing where the flux fits the continuum. Both x-axes are measurements of wavelength, one at the rest-frame (from 1000-1600  $\text{\AA}$ ) of the quasar (top) and the other as we observed it (from approximately 3500-5800  $\text{\AA}$  - bottom), both in units of angstroms  $\text{\AA}$  (10-10 meters). The y-axis is a unitless normalized value of flux. Locations of emission lines are also highlighted along the top of the graph for CIV, SiIV+OIV, CII, OI, and Ly- $\alpha$ +NV.



# Systematic Analysis of the Quasar Properties

wavelengths. It provides information about the chemical composition of the object thanks to the fact that each element in the periodic table has specific energy levels that the electrons can inhabit (Knight 2016). These levels are unique to each atom. When an electron drops in energy level, it emits the difference in the form of light. These energies are inversely proportional to the wavelength of light emitted. These emissions create a signature that is observable in the quasar's spectrum as an emission line. Electrons are also able to jump up in energy level by absorbing light, which shows up as an absorption trough or dip in the spectrum. The study of these emissions and absorptions allows for the understanding of the nature of the elements present in the environment of the quasar, such as carbon, hydrogen, silicon, etc.

Due to the expansion of the universe, the quasar spectrum is shifted towards longer (redder) wavelengths. The magnitude of this redshifting is given a value “z”. Astronomers always give the prefix “rest-frame” when talking about properties from the perspective of the object. Thus, the wavelength of light as it was emitted, before being redshifted, is called the rest-frame wavelength. This z- value is defined as  $(\lambda_{\text{observed}} - \lambda_{\text{rest-frame}}) / \lambda_{\text{rest-frame}}$ . The EHVOs in this paper ranged from  $z = 1.914$  to  $4.479$ . In Figure 1 we show an example of a quasar at redshift  $z = 2.605$ , the rest-frame wavelength ( $\lambda_{\text{rest-frame}}$ ) is indicated at the top of the spectrum and what we observe on Earth at the bottom ( $\lambda_{\text{observed}}$ ).

This paper is a research-in-progress update covering two projects both analyzing different features of the 98 new EHVO cases identified in Rodríguez Hidalgo et al. (in prep). The variability project aims to identify how EHVOs change over time, and how often this change occurs. The quasar properties project aims to identify whether EHVOs have distinct physical properties when compared to BALQSOs and the parent sample, which also includes non-BALQSOs.

In this paper we describe the data we use in Section 2, analysis and discussion of variability in Section 3, analysis and discussion of quasar properties showing EHVOs in Section 4, and Section 5 is a summary.

## 2. Data

All of the data presented in this paper originates from the Sloan Digital Sky Survey (SDSS), whose observations were taken with the 2.5m telescope located at Apache Point Observatory in New Mexico. This archival data is regularly released in batches called Data Releases (DR), the most recent of which DR16 was made public on Dec 9th, 2019. Each quasar observation is identifiable by three numbers: plate, MJD, and fiber. To observe multiple objects simultaneously, the 2.5m telescope utilizes specially manufactured aluminum plates. These plates contain hundreds of holes each including an individual optical fiber, whose location corresponds to where in the focal plane of the telescope the objects are observed. A Modified Julian Date (MJD) is a convention mainly used in astronomy that counts the number of days since midnight on November 17th, 1858. This makes tracking large date changes easier, as the difference in MJD between two dates is simply the number of days between them. Previously 40 EHVOs quasars were identified in DR9 (Rodríguez Hidalgo et al. 2020), with an additional 98 having been confirmed from DR16 (Rodríguez Hidalgo et al. in prep). This current study focuses on the latest findings.

Of the 98 cases, we find that 51 have observations at multiple epochs (observations at different times) which are discussed in Section 3. When measuring quasar properties, we have data for 69 of these cases, which are discussed in Section 4.

## 3. Analysis and Discussion of Results of Variability of Extremely High Velocity Outflows.

### 3.1 Previous studies in Variability.



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EHVOs, like BALQSOs, sometimes exhibit variability in their absorption profiles (e.g., Rodríguez Hidalgo 2011; Rogerson et al. 2016). This manifests as depth changes in BAL troughs, or speed changes between observations. Depth changes, i.e., absorption strength changes, can be observed ultimately as appearance or complete disappearance of absorption altogether. If the speed of the outflow increases then the trough would shift to a shorter wavelength, and vice versa for a speed decrease.

Previous studies on variability in EHVOs have focused on specific quasars, as in the case of J023011.28+005913.6 (Rogerson et al. 2016) or have been more broadly studying the slower BALQSOs. This is the first systematic study of variability in EHVOs. The causes of variability in EHVOs is currently unknown but, as EHVOs are a subset of BALQSOs, the mechanism behind their variability might be related. There are two prevailing theories as to the origin of observed variation in BALQSOs. The first assumes that all the difference in absorption features observed can be explained purely by the transverse motion of gas clouds in or around the accretion disk, blocking our sightline to the quasar (Boroson et al. 1991). The underlying absorption parameters of the gas are unchanged (energies, ionization, etc.) and any new absorption features are caused by the light's absorption by this new cloud. The second assumes that the absorption changes are caused by actual changes in the ionization parameters of the outflow gas (Barlow et al. 1992). This implies a dimming or brightening of the continuum flux (decrease and increase in energy). This difference in energies results in different levels of ionization in the present atoms, causing different absorption features. For example: if more ionizing radiation is present, instead of finding CIV (carbon where 3 electrons have been removed by the incident light) we might find CV (carbon where 4 electrons have been removed). If all of the absorption features present at different speeds, and therefore likely at different distances from the source, change in

unison, known as coordinated variability, then we most likely have a change in the underlying ionization parameters, as a gas cloud passing between us and the quasar cannot account for absorption changes across the entire continuum.

Studying variability can grant us greater insight into the nature of the outflow environment. We can use variability to place a constraint on the density and distance of the absorbing gas from the black hole (Hamann et al. 1995). If we assume we are in an ionization equilibrium, i.e., the number of gas particles being ionized per second is the same as the number of gas particles recombining per second, then the equation can

$$n \approx \frac{1}{\alpha * t_{recombination}}$$

be used to find the density ( $n$ ), where  $\alpha$  is the ionization parameter (a constant specific to each ion), and  $t_{recombination}$  is the recombination time. If the time between observations in the rest-frame is the upper limit for  $t_{recombination}$ , then a lower limit can be placed on the density of the gas. If the bolometric luminosity  $L_{bol}$  (see Section 4) is also known, then the distance between the black hole and the absorbing gas ( $R$ ) can be constrained using where  $U$  is the ionization.

$$U \approx \frac{L_{bol}}{n * R^2}$$

If the cause of variability is assumed to be the transverse motion of a gas cloud, and we assume that the speed of this gas cloud has reached the speed of our outflow, then the lower limit on the distance of the cloud can also be constrained via Kepler's equations of orbital motion.



# Systematic Analysis of the Quasar Properties

## 3.2 Our Results.

As mentioned previously, 51 EHVOs had observations at different epochs. For each case, two or more epochs were graphed against each other to compare their absorption profiles. These graphs were plotted between the rest-frame wavelengths of 1225-1600 Å, as this region contains our EHVO CIV absorption whenever present. For our report in progress, these graphs were unnormalized. This normalization process aims to fit the parts without absorption and emission with a power law through the use of an algorithm developed by our team previously (Charles et al. 2022). This normalization algorithm chooses 3 anchor points, each in a region where no absorption or emission features are present. This allows the program to be confident in fitting the power law continuum instead of absorption or emission features. The spectra is then divided by this power law, and the result is the normalization flux. Because normalizing makes the comparison of absorption features easier between the epochs, there is a certain degree of uncertainty in measuring variability in the unnormalized graphs. This paired with poor signal-to-noise ratios in older observations and missing flux data in certain epochs resulted in variability being classified into three groups: confirmed, uncertain, or none. All cases were visually inspected for variability, with measurements to follow in a future report. Time differences between observations varied from those made on the same day and differences of 5573 days in our reference frame. Because these objects experience time slower the further away they are. The rest-frame time between observations is the MJD difference / (z + 1), which results in time differences of less than a day and 1772 days, respectively, in the rest-frame of our quasars.

Of the 51 cases, 47% (24/51) were confirmed to exhibit some degree of variability. Our team observed all three manifestations of variability outlined previously. Figure 2 shows the appearance of an EHVO in the quasar

J103800.50+582343.0 between MJD 52428 and MJD 56661 ( $\Delta t_{\text{rest-frame}} = 1143$  days) via an increase in CIV absorption (shown in pink) centered at 1360 Å in the rest-frame.

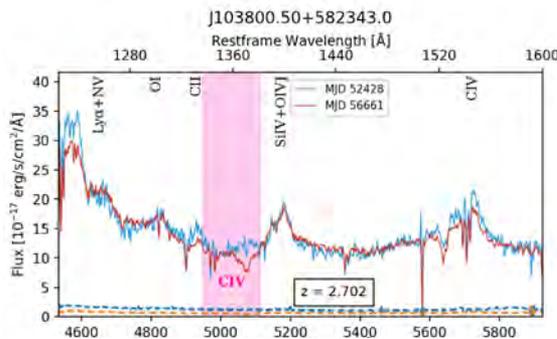


Figure 2: Appearance of an EHVO in J103800.50+582343.0 with redshift  $z = 2.702$ , between the observations MJD 52428 (blue) and MJD 56661 (red) via the emergence of CIV absorption centered around 1360 rest-frame wavelength. As with Figure 1, both x-axes are measurements of wavelength, with different rest-frame and observed limits, from 1225-1600 Å and from approximately 4500-5900 Å respectively. The y-axis is a flux value scaled by the wavelength observed in units of  $\text{erg/s/cm}^2/\text{Å}$ . The location of our CIV absorption is outlined in pink. Locations of our emission lines are also highlighted along the top of the graph for CIV, SiIV+OIV, CII, OI, and Ly- $\alpha$ +NV.



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Figure 3: Disappearance of an EHVO in quasar J004300.26+045718.6 between MJD 55867 (blue) and MJD 58082 (red) with redshift  $z = 2.362$ . Axes and labels are similar to those in Figure 2.

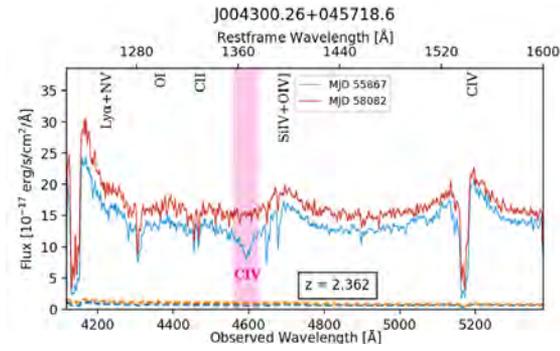


Figure 3 shows the disappearance of an EHVO was observed in quasar J004300.26+045718.6 via the loss of CIV absorption between MJD 55867 and MJD 58082 ( $\Delta t_{\text{rest-frame}} = 658$  days).

Our team also observed speed changes as exemplified in J000022.93-022716.4 (see Figure 4), with a possible outflow acceleration of approximately 5200 km s<sup>-1</sup> between MJD 55810 and 57713 ( $\Delta t_{\text{rest-frame}} = 527$  days).

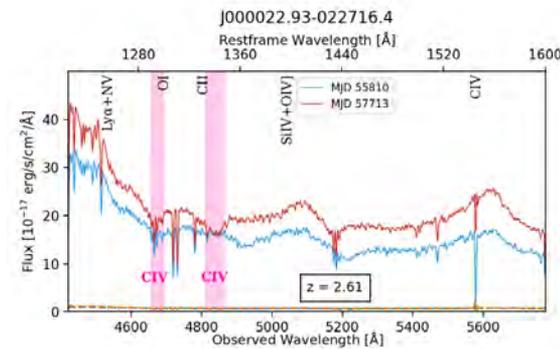


Figure 4: Shifting of CIV absorption from approximately -36500 km s<sup>-1</sup> to -41747 km s<sup>-1</sup> suggests potential acceleration of the EHVO in the quasar J000022.93-022716.4 between MJD 55810 (blue) and 57713 (red). Axes and labels are similar to those in Figure 2.

A further 20 out of 51 cases (39%) are likely to show some variability but our results are still uncertain since we will need to normalize the spectrum to classify them appropriately. Our team observed no variability in 7 of the 51 cases (14%).

Our results indicate that EHVOs show more frequent variability than BALs at lower speed. Filiz et al. (2013) showed that approximately 57.9% BALQSOs were found to have CIV variability. Using the potential changes in ionization, shorter recombination times will require larger densities of the gas. Assuming all other parameters are similar, this would imply that EHVOs are at closer distances to the ionizing source than BALQSOs. However, as noted in Section 4.2, EHVO quasars show larger bolometric luminosities than BALQSOs, and therefore this will affect the distances as well, likely mitigating the larger densities.

### 3.3 Future Work in Variability:

To measure quantitatively how much these absorption profiles have varied and be able to compare them to previous studies in BALQSOs, we are in the process of normalizing our spectra via the method outlined in Charles et al. 2022. Once the spectra are normalized, we will quantify the variability via three values: the equivalent width (EW), which is defined as the width of a rectangle with height from the continuum line to zero containing an equivalent area as the absorption line, the average depth of our absorption troughs, and lastly the changes in velocity.

A region of the spectrum known as the Lyman alpha (Ly- $\alpha$ ) forest is of particular interest to our team. This is the region below a rest-frame wavelength of 1216 Å and coincides with the energy required to excite hydrogen to its first excited state. Each time light from the quasar interacts with a hydrogen gas cloud along its journey, part of the spectrum is absorbed by that hydrogen and re-emitted in a random direction. The likelihood of the re-emission direction lining



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back up with its original direction is functionally zero, which results in a narrow absorption line, as the light is effectively eliminated from our spectrum. However, as the light encounters different galaxies with different redshift values on its journey toward us, the narrow hydrogen absorption line appears at different wavelength values in the spectrum, resulting in dozens to sometimes hundreds of narrow lines spread across the Ly- $\alpha$  region. This is a larger issue with high redshift objects, as objects further away have significantly more lines obscuring our spectrum.

This region is important to study because we can look for ions that are shifted into that part of the spectrum. This allows for the identification of EHVOs at higher outflow speeds, because as the speed of an outflow increases, the more shifted towards the blue our absorption features are. This tends to push absorption features of high speed EHVOs into the Ly- $\alpha$  forest. Furthermore, CIV absorption on its own still leaves a large uncertainty in the ionization parameters of the quasar, each successive ion we observe absorption in allows us to hone in on a more accurate view of the conditions of the gas in our system.

In the future we will remove the Ly- $\alpha$  lines with code developed previously by our team. The Ly- $\alpha$  code is open-source software designed to filter out Lyman-alpha forest lines from multi-epoch observations of quasars with EHVOs while leaving the underlying absorption intact. Using results from Bosman et al. 2022 we are able to normalize the Lyman-alpha forest region of the quasar's spectra. This normalization technique is tailored for the Ly- $\alpha$  region and thus distinct from the one outlined in Charles et al. 2022. Because the Ly- $\alpha$  absorption caused by the hydrogen gas clouds don't usually vary at the timescales we observe EHVO variability, multi-epoch observations help identify intervening absorption caused by the hydrogen gas versus intrinsic absorption caused by our EHVO. We model individual intervening absorption lines

with Gaussian curves. The continuum is modeled with the layering of multiple curves called a cubic spline. Following a simultaneous fit, the absorption features are denoised, revealing a high-precision reconstruction of intrinsic features not attained before. This method allows us to analyze EHVO intrinsic absorption lines that have been shifted into the heavily absorbed Lyman-alpha forest region, including absorption due to multiple ions and their variability.

## 4. Analysis and Discussion of Results of the Physical Properties of EHVO Quasars.

### 4.1 Description of Quasar Properties in Our Study

To study the characteristics of the quasars that show EHVOs in their spectra in comparison to other quasars like BALQSOs, we analyze the properties of quasars with EHVOs, such as bolometric luminosity, black hole mass and Eddington ratio, and compare them to those in the populations of BALQSOs and the parent sample.

We do not compute the measurements of these physical properties and instead rely on previously calculated measurements by other research groups. A recent paper (Wu and Shen 2022) includes measurements for these properties in the DR16, however they do not apply Coatman's correction described below. Rankine et al. 2020 has measured these values including this correction but they were not published in the literature; she graciously provided them to us.

The bolometric luminosity ( $L_{\text{bol}}$ ) is the luminosity of an object across all wavelengths. It is often measured relative to the solar luminosity and provides the amount of energy the quasar is releasing. The method of obtaining the bolometric luminosity without having to integrate data at all wavelengths is to use previously tabulated corrections anchored in particular values of the quasar spectrum. This is called bolometric corrections (BC). The values



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provided by Rankine include the BC corrections described in Shen et al. (2011): for quasars with  $z > 1.9$ , they used the monochromatic luminosity at 1350 Å in the rest-frame of the quasar and applied a correction of  $BC = 3.81$ .

The black hole mass ( $M_{bh}$ ) is estimated through measuring the width of the CIV emission line. A standard measurement of the width of emission lines is to compute the full width half maximum (FWHM) which, as the name indicates, is the value of the width calculated at half value of the maximum height of the emission line. If the line is just produced by the movement of gas around a black hole, the width should correlate directly with the mass of the black hole, as more massive black holes will result in faster material around and therefore broader emission lines. However, if the emission includes some material outflowing, the width of the line would be larger and the calculated FWHM would also be artificially large. The result of this is overestimated values of black hole masses. The values from Rankine et al. (2020) have been corrected for this effect using the work of Coatman et al. (2017). However, for cases where this effect is small, the scattering in the measurements does not provide good results and those cases need to be discarded.

As expected, the values provided by Amy Rankine result in more moderate estimates of the black hole mass measurements for EHVO quasars, compared to previous calculations, since the outflow component is not included. Previously in Rodriguez Hidalgo et al. 2020 we used instead black hole mass values provided in Shen et al. 2011 that do not account for the correction, and we observed larger values of black hole mass for quasars with EHVOs relative to the parent population. This makes sense since in Rodriguez Hidalgo and Rankine (2022) our team found that EHVO quasars show larger outflows in the CIV emission line.

The Eddington ratio is defined as a dimensionless ratio of bolometric luminosity

over Eddington luminosity ( $L_{edd}$ ). Eddington luminosity predicts the theoretical maximum luminosity an object can emit. The Eddington ratio is calculated as the ratio between the bolometric luminosity and the black hole mass, both explained above. The Eddington ratio indicates the mass accretion rate of the SMBH in a quasar: a quasar that has a larger Eddington ratio is accreting mass at a faster rate. This clarifies whether EHVO quasars are distinctive when compared to BALQSOs and versus their parent sample.

The challenge in studying DR16 quasars is that Rankine et al. (2020) had only measured the values of quasar physical properties in DR14, so we do not have measurements for all the DR16 EHVO quasars. However, since the data release 16 includes the cases in previous data releases, we do have values for all those quasars that were already in the data release 14. Therefore, our group used a cross-correlation process between the Rankine et al. (2020) DR14 measurements and our quasars. To do so, we developed our own software to match the `plate, MJD, and fiber numbers between the two data releases. These numbers act like serial numbers, allowing us to trace the same quasars from both DR14 and DR16. As described in section 2, the total number of identified EHVO quasars is 98 cases, and there are 69 cases with physical property information in the DR14. Other quasar groups such as the parent sample and BALQSOs also lose cases through the cross-correlation process. The resulting numbers of each group are then 69 EHVO quasars, 14004 cases of parent sample, and a total of 1866 cases of BALQSOs.

## 4.2 Our Results.

Figures 5 and 6 show a set of two scatter plots with corresponding histograms of the physical properties of all three quasar groups. Both sets of figures include our EHVO quasars in magenta. Figure 5 includes the parent sample's values in blue, and Figure 6 the BALQSOs in two shades of blue: those BALs with minimum outflow



## Systematic Analysis of the Quasar Properties

velocity less than 10,000 km/s are in light blue and those with minimum outflow velocity in between 10,000 km/s and 25,000 km/s region appear in darker blue: Each

Figure set includes (a) a comparison between  $M_{bh}$  and the Eddington ratio, while (b) shows  $L_{bol}$  versus Eddington ratios.

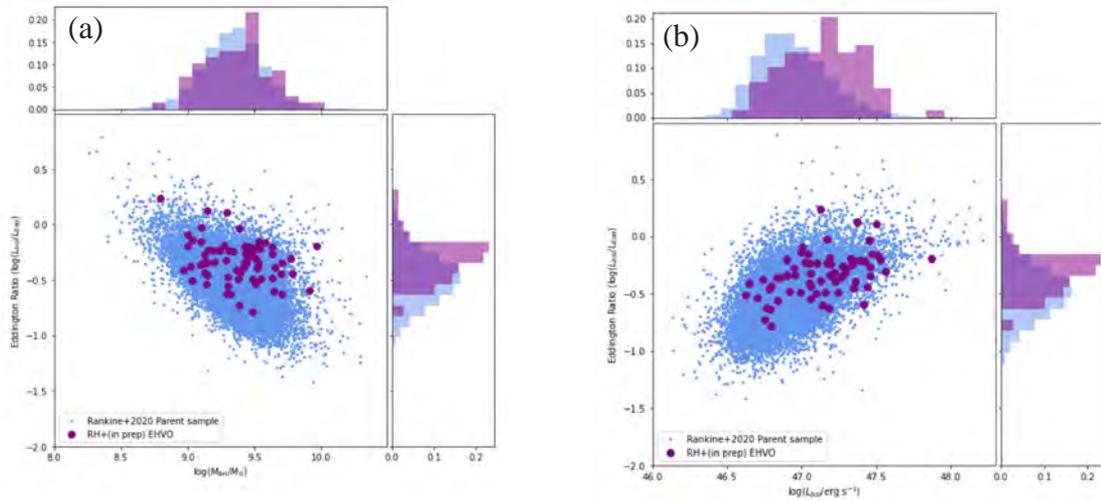


Figure 5. The two plots (a) and (b) include scatter plots at the center and histograms (top and right) of  $M_{bh}$  (top),  $L_{bol}$  (bottom), and Eddington ratio (right). We plotted the parent sample (blue) vs EHVO quasars (magenta). Scatter plot (upper) shows Eddington ratio against  $M_{BH}$  in comparison. The  $M_{BH}$  of the EHVOs and parent samples are similar. However, EHVO quasars show larger Eddington ratios than the parent sample. Bottom plot shows Eddington ratio against  $L_{bol}$ : we find that the EHVO quasars are more luminous than the quasars in the parent sample.

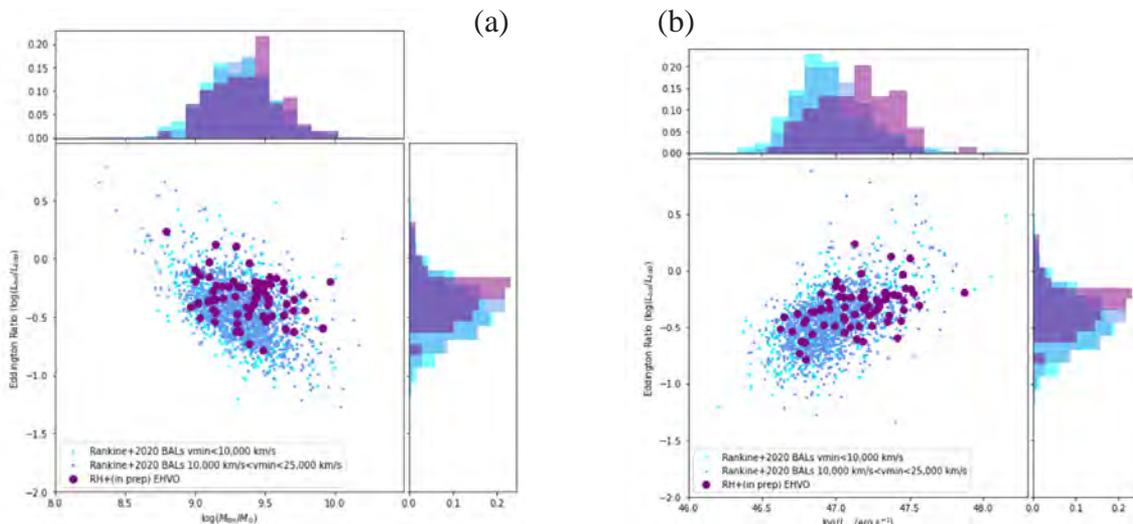


Figure 6. Plots (a) and (b) have the same layout as in Figure 5, but now we plot EHVO quasars and BALQSOs at different speeds. BALs with minimum velocities less than 10,000 km/s appear in light blue, BALs with minimum speeds in between 10,000 km/s and 25,000 km/s in ocean blue, and EHVOs in magenta. The plots show that EHVO quasars have larger bolometric luminosities and Eddington ratios than the BALQSOs at both speeds.



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For the histograms we chose the optimal bin size using a method called Knuth's rule (Knuth 2013). This is a method that is based on the data collected, instead of asserting strong prior assumptions about the data, such as assuming the data exhibits a normal distribution. Thus, it is optimal for plotting histograms with complicated data sets. In our case, since we are comparing an uneven number of data points for sets of the parent sample, BALQSOs and EHVOs, we decided to utilize this method to represent the histograms more accurately.

The result of our analysis finds that the black hole mass distribution of the EHVO and parent sample quasars are largely similar. Inspecting Figure 5a (top histogram), where the horizontal axis shows the EHVO and parent sample's  $M_{bh}$  distribution, suggests that the shapes of the two histograms are overall matching, meaning there is no significant difference between the two. We see that in Figure 6 (a) the mass distribution histogram (top) for BALQSOs vs EHVOs also does not show significant differences. Given the three groups, quasars with EHVOs, BALs and the parent sample, show similar distributions of black hole mass, we conclude that this is not a parameter that influences the presence or speed of an outflow.

Figures 5b and 6b (top histograms) show that EHVO quasars are the most luminous: both the parent sample's and BALQSO's luminosity distribution trail behind the one that EHVO quasars display. Figure 5b's top histogram represents the parent sample and EHVO's bolometric luminosity distribution. We can see that the distribution of  $L_{bol}$  values for EHVO quasars clearly peaks at a larger value than for the parent sample. This conclusion holds true when looking at the top histogram in Figure 6b. Thus, quasars with EHVOs are significantly more luminous than both the parent sample and BALQSOs. The luminosity parameter is therefore likely the reason why these extreme outflows are present in these quasars' spectra.

The distribution of values of Eddington ratios in both figures suggest that the EHVO quasars also show larger values than the other two populations. This is unsurprising because as mentioned previously:  $L_{bol}$  correlates with the Eddington ratio. Since values of the bolometric luminosity are larger for EHVOs, while all three quasar groups' black hole mass distributions remain similar, it was expected that EHVOs would also show larger Eddington ratio values. In both Figures 5 and 6, the right histogram shows this relationship clearly, where the peak of the EHVO Eddington ratio is at a significantly larger value than the other two groups. With this information, we find that the quasars with EHVOs accrete mass at a faster rate than both the parent sample and BALQSOs. The Eddington ratio parameter is for the same reason as  $L_{bol}$ , influencing the presence of EHVOs.

## Summary:

In the first systematic variability study on EHVOs, our preliminary results show that they vary more often than BALQSOs. We observed a large range of variability cases: appearances, disappearances, and large speed changes. Almost half of cases (24/51, 47%) show variability. Of the remaining cases, 20 need the application of further processing techniques to be reclassified, and 7 are confirmed as non-variable.

We find that quasars with EHVO are a distinct class by themselves when compared to BALQSOs and the parent sample of quasars. Two out of three quasar physical parameters are shown to be impactful on the presence of these extreme outflows: EHVOs show larger values of  $L_{bol}$  and Eddington ratio relative to the other studied populations, while the  $M_{bh}$  parameter does not seem to have any influence on the presence of EHVOs.

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**Alex Vong** is a senior Physics student at the University of Washington Bothell. He is currently working on capstone projects with Dr. Rodriguez Hidalgo in astrophysics. Previously, he has been involved in a particle physics research project that involves doing data analysis on FASER neutrino detector; he also briefly participated in LIGO gravitational wave detection research. He will graduate with a B.S. degree in physics in the summer of 2023. His main passions are the foundation of physics and astrophysics.

**Ali Mirzazadeh (he/him/his)** is in his senior year. He is currently studying Biology and minoring in Behavioral Neuroscience. He intends on taking his MCAT and applying to medical schools after he graduates in Spring 2023. He currently is a TA for BBIO 200, a research assistant at the REED lab, a cope health scholar, and has worked as a rehabilitation aide. He is hoping to improve his skill of public speaking and sharing his knowledge to better students academic careers. He enjoys spending time with his closest friends, learning about different cultures, and working on his research outside of school.

**Amy Walesby (she/her/hers)** is a junior at the University of Washington Bothell, majoring in Psychology and minoring in Gender, Women & Sexuality Studies. She currently works as a Peer Health Educator (HERO) for the Health and Wellness Resource Center (HaWRC) and as a dance teacher for the Activities & Recreation Center (ARC) Fitness Instructors. Amy loves to plan events for students on campus and to create a space in which students can thrive, get to know one another, and learn more about themselves. In her free time, Amy loves to spend her time baking and cooking for her friends and family and going on hikes.

**Anika Gopez (she/her/hers)** is a Filipina American undergraduate student at the University of Washington Bothell with an intended major of Psychology. In high school, she interned under Lorna Gilmour at the Issaquah School District Equity Office. Anika is passionate about intersectional social justice that considers all minorities. In her free time, she enjoys writing, drawing, and singing.

**Anish Rijal (he/him/his)** is a fourth-year undergraduate student at the University of Washington Seattle, pursuing a Bachelor of Science in Mechanical Engineering. He has been a part of the Quasar Research Group since September of 2021. He has also participated in the UWB Physics REU in the summer of 2022, under the mentorship of Dr. Paola Rodriguez Hidalgo. In his free time, he has recently taken an interest in writing and producing music and also enjoys working out and playing football.

**Brittany Howell** is a senior undergraduate student at the University of Washington Bothell, who will be graduating in Summer 2023 with a Bachelor in Health Studies. After graduating, she plans to continue with college at the University of Washington School of Medicine, specializing in Rheumatology. She has always been passionate about the medical field and started an early career working in medicine in high school. She helped run an COVID-19 vaccine clinic at Evergreen Health Infectious Disease clinic, ensuring patients got vaccinated and educated about the importance of the COVID-19 vaccine. In her free time, Brittany likes to spend time with her family, dog, friends, traveling, and expanding her knowledge on different medical studies.



**Cora DeFrancesco (she/her/hers)** is a first year Masters student in Electrical and Computer Engineering and NSF Graduate Research Fellow. Currently, she works for the Advanced Radar Research Center at the University of Oklahoma; she completed her Senior Capstone remotely with the Quasar Research Group at UW Bothell. Cora graduated in December 2022 with B.S. degrees in Astrophysics and Math, and she is an active member in the OU women's ultimate frisbee team.

**Easton Pierce (he/him/his)** is a senior graduating in spring with a B.S. in physics at UWB. He currently studies variability in Dr. Paola Rodriguez Hidalgo's quasar research group, and will present more up-to-date findings at the Mary Gates undergraduate research symposium. He plans to take a year exploring internships in the industry before potentially applying to graduate programs in the winter. Easton spends his free time reading, gaming, and recently picked up climbing.

**Isabella M. Humphries** is a third-year undergraduate student at the University of Washington. She will graduate with a Bachelor of Arts in Health Studies in the summer of 2023. Following graduation, she intends to continue her education to become a nurse. Isabella discovered a passion for taking care of patients after working in a clinical laboratory in 2022. She has learned how to advocate for and support patients and is excited to use those skills in her future endeavors. Isabella would like to give a special thanks to Dr. Stefanie Iverson-Cabral and Dr. Bryan White for all the support and encouragement they have given to her throughout her academic career. Isabella would like to dedicate her research proposal to her inspiration, role model, and mom, Lori Humphries.

**Ishika Nayyar** is a Senior graduating in Spring 2023 from UW Bothell, majoring in Health Studies and minoring in Global Health. Driven by her passion for healthcare, math, and science, she aspires to attend medical school to become a pediatrician, specializing in sports medicine. In her free time, she enjoys cooking, attending concerts, watching and playing sports, and spending time with her family and friends. She plans to learn more about the factors that influence health and dismantling health barriers for individuals worldwide.

**Lorena Sanabria (she/her/hers)** is originally from Colombia, and is a student at Embry Riddle Aeronautical University, pursuing a Bachelor of Science in Astronomy and Astrophysics with a Russian Studies minor. She has participated in a variety of research projects topics that include gyrochronology, active galactic nuclei, and extremely high velocity outflows. She will continue her studies pursuing a Master's Degree in Data Science and is set to graduate with her Master's in 2024. In her free time, she enjoys lifting weights and staying active in the gym.

**Loren Herrera** studies Science, Technology, & Society (STS) and is a senior at University of Washington Bothell. He is also a member of the Tau Sigma National Honor Society for transfer students and a UW Bothell Study Abroad Ambassador. Loren is a musician and filmmaker, with a deep interest in philosophy. Professionally, he serves as both an Administrative Assistant and a Preservation & Museum Specialist at the Burke Museum of Natural History and Culture in Seattle, Washington.

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**Mary Kapitonenko** is an undergraduate student at the University of Washington who will graduate in 2024 with a Bachelor of Arts in Psychology and a minor in Policy Studies and Human Rights. She intends to pursue Industrial and Organizational Psychology for graduate studies and entertains the option of a PhD. Her passion for psychology has been a long-time interest and she hopes to create positive change in the world through her knowledge of human psychology.



**Mikel Charles (she/her/hers)** recently graduated from UWB, majoring in Mathematics with a minor in Physics. She is currently a graduate student at The Ohio State University pursuing a PhD in Physics. In her free time she enjoys painting, attending concerts, and spending time outdoors.

**Molly Elise Biedscheid (she/her/hers)** graduated in the Winter of 2023 from the University of Washington with a major in Biology and a minor in Chemistry. Growing up in the Puget Sound area has taught her to love nature and the people surrounding it. She plans to pursue research in Toxicology to help diverse communities and wildlife. She loves spending time with her friends, kayaking, and exploring new sights.

**Rachel Reese (she/her/hers)** graduated with Honors in December 2022 with a Bachelor of Science in Physics. Throughout her undergraduate career, Rachel conducted research in multiple astronomical fields including Active Galactic Nuclei, Broad Line Absorption Quasars, and Comet Sublimation. Rachel currently works at the Thomas Jefferson National Accelerator Facility in Newport News, VA in the Experimental Nuclear Physics Department. She was hired as a Magnet Engineer and is currently learning how to design, manufacture, and assemble accelerator magnets. In her spare time, Rachel enjoys cooking, photography, and hiking.

**Saajidah Abideen (she/her)** is a senior graduating in June 2023 with a major in Biology and minors in Health Studies and Health Education and Promotion. Currently, she works as a peer writing consultant at UWB'S Writing Center and Communications Center. She also works as a research assistant in the Headley Lab at the Fred Hutchinson Cancer Center. Saajidah intends to obtain a PhD in Immunology, researching the complicated mechanisms of infectious diseases and cancer cells.

**Sinit Ogbagaber (she/her/hers)** is a junior at the University of Washington Bothell, majoring in Health Studies with a minor in both Global Health and Health Education & Promotion. After graduation, she plans on continuing her education and pursuing a master's in Public Health at the University of Washington. She hopes to use the skills and knowledge gained from her education to figure out ways to tackle public health disparities and inequalities. In her free time, she likes hanging out with friends and family, trying new food, and watching tv shows.

**Tzitzit Romo Perez (she/her/hers)** is a 4th year, graduating from UWB, majoring in Community Psychology. She has worked as a research assistant for Dr. Rodriguez Hidalgo in the Quasar research group for about a year. With mentorship and guidance, Tzitzit was able to follow her deep passion for astronomy and astronomy education. After graduation, she intends to apply to psychology graduate programs to reach her goal of becoming a therapist. In her free time, she enjoys astrophotography, poetry, and ceramic painting.

**Veronica Powell (she/her/hers)** is a senior majoring in Physics at the University of Washington Bothell. She is currently working on her senior project in Physics Education Research with Dr. Alanna Pawlak, leading up to graduation in Spring of 2023. Prior to this, she worked in Dr. Paola Rodriguez Hidalgo's Quasar research group during the UWB Physics REU in the Summer of 2022. She is the Vice President of the UWB Physics & Astronomy club, and she takes special interest in astronomy, climate change research, and making physics more accessible to everyone. Always ready to pick up new hobbies, she has explored watercolor painting, photography, blacksmithing, skiing, and various other interests.

**Yordanos Berhane** is a first generation college student of Eritrean descent. She is an undergraduate student at University of Washington who will graduate in 2025 with a Bachelor's in Health Studies. After graduating, she plans on continuing her education in the hopes of becoming a family practitioner or clinical therapist, specializing in mental illness or childhood trauma. In her free time, she likes to read, visit art museums, and watch historical K-dramas.





## ABOUT THE EDITORIAL BOARD

**Annie Nguyen (she/her/hers)** is in her senior year. She is currently studying Health Studies and minoring in Health Education and Promotion. She intends on getting her CHES license after she graduates in Spring 2023. This is her first year working with The CROW editorial board. She is hoping to improve her writing and create meaningful connections. She enjoys catching up with friends, reading, singing, and writing poetry in her free time.

**Bentley Artison (he/him/his)** is in his senior year. He is following a pathway towards a major in Health Studies and a minor in Science, Technology and Society (STS). Being a Seattle native, he plans on attacking a career in public health that will shed more light on the health disparities being faced between communities here in King County. Besides his involvement with the CROW, he can be found enjoying time with his family, making music, traveling, and working out, and oh yeah movies... lots of movies. As this is his first year working with the CROW, he is glad to see this journal gain its altitude and take flight!

**Daniel Curtin (he/him/his)** is a third-year undergraduate student majoring in both Health Studies and Biology, with a minor in Biochemistry (and a self-described lab rat). He plans to pursue a career in biomedical research, with intentions of attending medical school to pursue a career in pathology or toxicology. He is a strong advocate for health equity, particularly among Indigenous and LGBTQ+ communities, where his passion for research and advocating for his communities lies. He lives in Lake Forest Park with his partner and their spoiled dog, Hafiz. This is his first year on the CROW Editorial Board, and he is very excited to delve into great undergraduate research.

**Grace Woods (she/her/hers)** is a third year transfer student in the Community Psychology program with a Policy Studies minor. In a previous edition of her life, she lived on Orcas Island where the ravens knew her by face, and now enjoys that familiarity with the crows along the Snoqualmie river. There, she lives with her partner, his son, and their furry and scaled family members. Together they enjoy connecting with the natural world and dismantling the corporate dominating narrative. Though English is her only well-known language, she enjoys breaking and expanding its confines and rules, both academically and amateurly. Spring '22 was her first quarter as a board member.

**Layla Youssef (she/her/hers)** is a senior undergraduate double majoring in Global Studies and American Ethnic Studies with a minor in Diversity. She is passionate about cultural research and understudied histories, which led to her interest in joining the CROW. After graduation, she plans to attend graduate school to study museology and work towards ethical collection processes within museums. She currently works as a Tutor at the UWB Writing and Communication Center. In her free time, she enjoys writing stories, watching movies, and doing spontaneous deep dives into any random topics of interest that come to mind.

**Sakshi Bhise (she/her/hers)** is a senior graduating in spring 2023 with a double-major in Media and Communication Studies and Law, Economics, and Public Policy. She loves the writing process because with every piece of new writing, the author goes through a journey. This unique journey for every author makes her passionate about writing. She currently works at the Writing and Communication Center at UWB as a Lead Peer Consultant. In her free time, she likes to read books, paint, and even dance.

**Sidra Yousaf (she/her/hers)** is a fourth year undergraduate student currently majoring in Community Psychology, as well as Biology, and minoring in neuroscience. She intends on going to medical school and specializing in neurology. This is her third year on the CROW board. She is passionate about social justice issues, especially those that take place in healthcare. Her passions also include psychology and behavioral neuroscience. She currently works as a Lead Peer Consultant at the Writing and Communication Center at UWB. In her free time, she enjoys hanging out with her friends and painting, as well as watching movies.

