



# VIA SCHOLARIUM

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A COLLECTION OF HONORS COLLEGE  
STUDENT THESES

UNIVERSITY OF WEST GEORGIA  
HONORS COLLEGE

VOLUME 3

# VIA SCHOLARIUM

A Collection of Honors College Student Theses



University of West Georgia  
Honors College  
Volume 3



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## A FEW WORDS FROM THE DEAN

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The University of West Georgia's Honors College houses a community of scholars who work with faculty and staff to cultivate their individual transformative life experience. We center our work both inside and outside of the classroom on enriching these students to enhance the BEST of who they are. Part of their BEST is being a scholar who contributes to this Honors community. Much of the students' collegiate BEST is their research theses presented in this volume. These projects demonstrate academic curiosity, intelligent pursuit of questions and answers, perseverance, and hard work. This volume shows what matters to our current students and what their future entails. Their instructors and I are encouraged and astounded by the original research into an array of topics including neuroscience, social media, biological and chemical effects, recidivism, literary themes, and business financials. We share this volume with you, inviting you to study, learn from, and celebrate our Honors students' impressive minds and accomplishments!



Karen L. Owen, Ph.D.  
Dean, Honors College





**SUMMER 2022**





# TESTING THE VALIDITY OF A LINEAR CORRELATION MODEL TO DETERMINE OLFACTORY SENSORY NEURONS EXPRESSING THE M72

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AMANDA CLAY

Previous research into the physiological processes of olfaction and chemosensitivity have commonly been hindered by the time-consuming nature of manually counting olfactory sensory neurons (OSNs). The process of manually counting OSNs is a tedious endeavor performed under a microscope. To properly study olfaction, a detailed understanding of odorant receptors and the subsequent odorant receptor neurons expressing them is imperative. Ascertaining the number of OSNs in the main olfactory system is an important piece in understanding the facets of chemosensitivity.

Recent studies have suggested that glomerular volume may be proportional to OSN numbers, therefore eliminating the manual technique for counting OSNs. During our ongoing research project, we counted the number of OSNs expressing the M72 Odor receptor in serial sections of mice ( $n=11$ ). We then calculated the predicted volume of M72 glomerulus based on the previously published linear correlation model ( $625,298 \text{ } \mu\text{m}^3$ ). To validate the correlation model, we compared the mean number of OSNs expressing the M72 receptor with that of published research. The mean number of M72-expressing OSNs is  $5599 \pm 1403$  (mean  $\pm$  SD). Our mean was in the range of the previously published model (5599 vs. 5265), but the standard deviation was slightly lower in the previous study (1403 vs. 906), which was mostly likely due to OSNs being manually counted by different individuals in our data set.

Our current experiments involve measuring glomerular volume to test the linear correlation model to predict the total number of OSNs. Following these measurements of glomerular volume, this data will be compared with the OSN hand count to ascertain any linear relationships.

## LITERATURE REVIEW

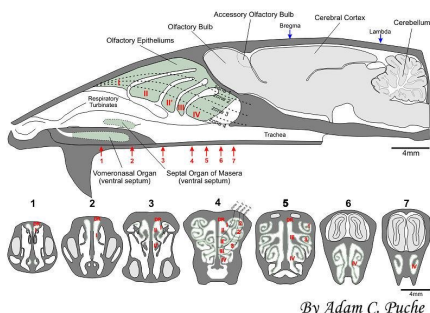


Figure 1: Diagram structure of the olfactory system

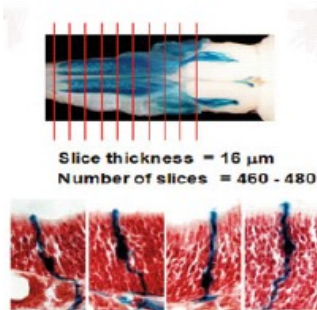


Figure 2: Image of OSNs

Olfactory sensory neurons are located in the nasal epithelium, which is inside the nasal cavity (Bressel, et al, 2016). Their purpose is to transmit and detect odorant information, which is then sent to the central nervous system (Bressel, et al, 2016). There are more than 1,100 populations of OSNs in the MOE (Brussel, 2016). It is not currently known the pattern of distribution, spatial expressions, or specific number of zones inside the MOE (Brussel, et al, 2016). It is also not known whether this pattern of expression manifests as heterogenous or homogenous (Bressel, et al, 2016). The process of olfaction is dependent upon the neuron's ability to form neuronal connections inside the olfactory bulb and to express receptor and signaling molecules that are specific for these functions (Bressel, et al, 2016).

The study of chemosensitivity and olfaction uncovers a significant amount of information regarding an organism's ability to adapt to its environment and respond to various stressors. An organism's sense of smell is vital to its ability to respond to its environment, sense danger, find food and water, and react to various psychological needs. A previous study done in 2010 discovered that the mice were able to vary the number of olfactory sensory neurons (OSNs) in their olfactory bulb based on various environmental and physiological changes, therefore modifying odor perception via changes in the signal-to-noise-ratio (Cavallin, et al, 2010). Neuron regulation in response to environmental and physiological changes is altered based on the activity of the mitral cell activity in the OB (Cavallin, et al, 2010). Aging, odor deprivation, and odor enrichment are all factors that decrease the number of olfactory sensory neurons in WT mice in some OSNs expressing certain genes, while others, such as P2-expressing OSNs are resistant to age-related changes (Cavallin, et al, 2010).

Other studies have examined the effects of whether lipids and amino acids have any effect on modulating olfactory sensory sensitivity to adjust feeding behavior to metabolic processes inside the body (Julliard, et al, 2017). It has been demonstrated that glucose levels are elevated in the olfactory areas of the brain during odor stimulation, rising when the brain is working to process olfactory information (Julliard, et al, 2017). This dysregulation of glucose sensing markers could induce an increase in olfaction sensitivity leading to hyperphagia and metabolic disorders, which in term alters the food intake of the organism (Julliard, et al, 2017).

Other studies highlight the importance of understanding OSN numbers due to the relationship between animal survival and chemosensitivity. The ability of an animal to smell is crucial to its survival, in tasks such as avoidance of ingesting harmful substances, mating, finding food, avoiding predators, and finding food (Mombaerts, 2004). It is imperative to evaluate these important practical scenarios of chemosensitivity in organisms that researchers have a better understanding of the entire structure of the olfactory system, especially the number of OSNs.

The purpose of the 2010 Cavallin, et al study was to determine whether gene-tar-

geted deletion of predominant shaker potassium channel Kv1-3 in the mitral cells of olfactory bulbs decreases the number of presynaptic odorant receptors in the main olfactory epithelium (MOE) and alters the nature of post-synaptic connections to mitral cell targets (Cavallin et al, 2010). This change in the gene-targeted potassium channel is a change in psychological state that researchers theorized would lead to a change in the number of neurons (Cavallin et al, 2010). Changing mitral activity by gene-targeted deletion of voltage-gated potassium channels kv1.3 was theorized to alter the number of synaptic convergence of OSNs in the glomeruli of the olfactory bulb (Cavallin, et al, 2010).

The study was performed by breeding homozygous P2- or M72-IRES-tau-LacZ mice with homozygous Kv1.3-/- mice of different age ranges and species (Cavallin et al, 2010). The species were wild type and KO mice (Cavallin et al, 2010). Researchers exposed the mice to various different smells, psychological changes, and different environments during the experiment (Cavallin, et al, 2010). Prior to observing the changes, researchers needed a baseline for the number of neurons present in the mice prior to the changes (Cavallin et al, 2010). Undergraduate students were responsible for hand counting all 35,000+ neurons under the microscope, which was a huge undertaking (Cavallin, et al 2010). Following the count, researchers observed that the changes in OSN amount is influenced by the activity level of the mitral cells in the OB. Odor enrichment, odor deprivation, and aging all decreased the number of OSNs in WT mice (Cavallin, et al 2010).

One of the variables of the study was the subjectivity and length of time it took to count all of the neurons inside of the MOE. The hindrance to many studies involving OSN counts involves the time involved in hand counting OSNs, as well as the subjectivity of having multiple counters in the lab. The process of counting olfactory sensory neurons is a subjective process in nature. The counter must ensure that what they are viewing under the microscope is indeed a neuron since staining dye often smears the surrounding tissues and presents as the same color as the stained neurons.

There have indeed been many attempts in previous literature to solve this issue by ascertaining the relationship between OSN numbers and TGV volume to develop a more effective way of counting neurons. These two factors could potentially play a role in developing an easier way of counting neurons. The TGV volume is the area of each glomerulus within the olfactory bulb. If the area of each glomerulus within each section of mouse tissue in the olfactory bulb can be measured and averaged, this will provide the average TGV per section. In a previous research study, TGV volume has been hypothesized to be proportional to the number of neurons in the olfactory bulb. Researchers at the Max Planck Research Unit in Germany were able to do just this—they analyzed 15 strains carrying a specific gene targeted mutation in one of the 11 OR genes that resulted in the expression of fluorescent protein to determine how this could be linearly correlated (Brussel et al, 2016). The researchers began by counting all of the neurons manually by hand. They then used the same sections of mice that were manually counted to measure the area of the glomeruli within the bulb, and derive their TGV by averaging all of the areas of each individual section (Brussel et al, 2016). They derived a linear correlation equation that makes the mathematical calculations for this linear relationship easier to calculate and analyze. This mathematical calculation, derived from the graph, is the equation that we will be using to determine our individual correlations.

## METHODOLOGY

The study involves three parts: manually counting OSNs, measuring the area of the glomeruli on each serial section and averaging all sections, and the comparison stage. Pre-prepared serial slides of mouse brain tissue were arranged in 16 sections on a slide. Each section on the slides is manually inspected under a light microscope using 10X and 40X magnification. The averages of all neurons will be counted and then average to determine the total neuron count per mouse. As previously mentioned, these numbers can be highly subjective and will vary depending on the individual counting, although the numbers should present within a reasonable range of each other.

Following this hand count, the area of the glomeruli of each neuron in the bulb is measured with computer software known as ImageJ. The software is capable of taking measurements of neuron images taken with a special microscope. Using tools within the software, the image of the neuron taken with the microscope will be traced around the borders of the neuron bulb, which allows the software to generate measurement numbers. This process is repeated with all neurons in the mouse and the area taken will be taken. This area of the measurements will then be compared with the hand count to determine a linear correlation.

### ANALYSIS OF RESEARCH DATA

Our research involves two steps, one of which was completed previously while the other is ongoing. The project involved using manually counting wildtype mice that express the specific M72 odorant receptor across serial sections of mice. Next, we compared the actual OSN count to the theoretical count, which is compared with the numbers of the author in the Max Plank study. Our equation is derived from the authors of the Max Plank study, and in order to produce accurate mathematics, our OSN number should be in the same range as the number that they counted. In comparing the actual OSN count to the count from in the Max Plank study, we can determine the validity of this equation. The graphs and OSN numbers are shown in figure 3 and 4 and 5.

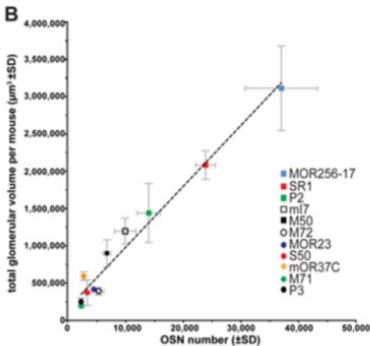


Figure 3

- Mean number M72-Expressing OSNs:  $-5599 \pm 1403$  (mean  $\pm$  SD)
- Mean number compared to previously published study:  $-(5599 \text{ vs. } 5265)$
- Standard deviation compared to previously published study:  $-(1403 \text{ vs. } 903)$

Figure 4

Equation<sup>1</sup>  
 $y = 81.55x + 168,700$   
 $r^2 = 0.97, p \leq 0.0001$   
 $x = \text{OSN number}$   
 $y = \text{glomerular volume}$

Figure 5

In figure 5, the y values correspond to the TGV volume, and x the OSN number. We were able to derive our y value by inputting our x, and solving for y. The data shows that our actual OSN count is consistent within the range of the Max Plank study. By inserting our OSN count into the equation, the result provides a TGV consistent with the theoretical. The mean number that we gathered was consistent and in range. However, the standard deviation compared to the previous study was slightly lower than the theoretical (figure 3). This was most likely due to variability in the OSN counting due to the volume of students in the laboratory. Counting OSNs is a subjective process made difficult by the staining that is used to color the OSNs for easier visualization (figure 2). The methylene blue stain can stain non-neuronal tissues, and the counter must make a judgment call regarding whether the object in front of her is indeed a neuron, or smeared stain. Two different counters can get different results.

Following the success of the first step, the area of all serial sections of mice that were manually counted can then be averaged to derive the total glomerular volume (TGV). We can then compare the TGV value to the number of neurons to determine if these correlate to a linear proportional relationship.

## CONCLUSION

Our research project is ongoing, and we hypothesize that the TGV volume will be linearly correlated to the manual OSN hand count. The current stage of our research is the measurement analysis using ImageJ. The first part of the study showed that our data was consistent with the Max Plank study and provided numbers consistent with the theoretical count, which gives us one more piece of data that is consistent with our hypothesis.

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# CORPORATE ANALYSIS OF LUMEN TECHNOLOGIES

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*ALAN HUSTON*

In this paper, I will show a complete company analysis of Lumen Technologies, Inc. through various types of analysis. The paper will use a basic risk and return analysis, financial statement analysis, and valuation of the stock. Using the information from the initial analysis there will be a Weighted Average Cost of Capital computation (WACC), capital expenditures review, and then coming up with real options for the firm based on the data. Using various public sources released by the company I will look at the company's past performance and data to see how the company is doing and see what possible decisions the company can make based off of my analysis. I believe that Lumen Technologies is overvalued and financially struggling which I plan on showing through their data, and from this I will show potential options it has to turn around its current trajectory, such as divesting and fielding for a buyout.

## **PART ONE – RISK AND RETURN**

### **COMPANY INFORMATION**

100 CenturyLink Drive  
Monroe, LA 71203  
United States  
318 388 9000  
<https://www.lumen.com>

Sector(s): Communication Services  
Industry: Telecom Services  
Full Time Employees: 36,000

Lumen Technologies, Inc., a facilities-based technology and communications company,



provides various integrated products and services under the Lumen, Quantum Fiber, and CenturyLink brands to business and residential customers in the United States and internationally. The company operates in two segments, Business and Mass Markets. It offers compute and application services, such as cloud services, IT solutions, unified communication and collaboration solutions, colocation and data center services, content delivery services, and managed security services; and IP and data services, including VPN data network, Ethernet, internet protocol (IP), and voice over internet protocol. The company also provides fiber infrastructure services comprising high bandwidth optical wavelength networks; and unlit optical fiber and related professional services. In addition, it offers voice and other services, including private line services, a direct circuit or channel specifically dedicated for connecting two or more organizational sites; a portfolio of traditional time division multiplexing voice services; and synchronous optical network-based Ethernet, legacy data hosting services, and conferencing services. As of December 31, 2021, the company served approximately 4.5 million broadband subscribers. The company was formerly known as CenturyLink, Inc. and changed its name to Lumen Technologies, Inc. in September 2020. Lumen Technologies, Inc. was incorporated in 1968 and is headquartered in Monroe, Louisiana. (Yahoo.com, 2022)

**WHAT BETAS WERE CALCULATED USING VARIOUS INDICES?**

A five-year monthly regression was used to calculate the beta coefficient ( $\beta$ ) for Lumen relative to three select indices: the S&P 500, the NYSE Composite, and the NASDAQ Composite. Beta is a way of measuring a stock’s volatility compared with the overall market’s volatility. The results are illustrated in Figure 1a: Lumen vs: S&P 500, NYSE Composite, and NASDAQ Composite; and Figure 1b: NASDAQ vs. S&P 500.

Figure 1A	
Index	Lumen Technologies, Inc. Beta ( $\beta$ )
S&P 500	0.96
NYSE Composite	0.94
NASDAQ Composite	0.78

Figure 1B	
Index	NASDAQ Composite Beta ( $\beta$ )
S&P 500	1.09

**WHY WERE THEY DIFFERENT?**

There was a clear variance in the beta coefficient between LUMN vs the 3 indices. The structure and composition of the indices are responsible for the variation between the betas. The S&P 500 is composed of the 500 largest corporations by market capitalization. The S&P 500 is generally broader, hoping to have a more significant representation of companies from various sectors and industry groups. The top 3 sectors by weight are Information technology, health care, and consumer discretionary. The S&P 500 is usually favored, as it follows most of the largest companies quoted on the NASDAQ and other indices. The NASDAQ Composite is a large market-cap-weighted index of over 2,500 stocks with a high concentration of technology stocks (roughly 50%) which makes it sensitive to changes in its primary industry and the high-growth companies that comprise it. The ten largest companies in the NASDAQ make up roughly half of the index weight. Lastly, the NYSE Composite lists over 2,000 companies and about one-third of its market cap is represented by international firms. the NYSE Composite measures the per formance of all stocks traded on the NYSE using market capitalization to calculate the weight of the firm within the composite.

**WHICH INDEX DID I FEEL IS MOST APPROPRIATE TO USE WHEN CALCULATING BETA FOR THE STOCK WE ARE CONSIDERING?**

Out of the three indices used in the analysis, I believe the most appropriate index to use when calculating the beta coefficient for LUMN is the S&P 500 Index. I believe the S&P 500 Index is the most appropriate for calculating LUMN's beta since LUMN is a part of the S&P 500, it is a large cap company, and it has a relatively low volatility and a similar beta to the S&P 500. However, despite being classified as a large cap company LUMN is on the lower end of the market cap range for S&P 500 companies with a market cap of \$11 billion. LUMN is a technology-based company, and the NASDAQ is heavily composed of technology-based companies, though the NASDAQ has a relatively low weight diversity, and the volatility of the few largest companies would have a large impact on the overall beta making the NASDAQ composite the worst choice.

### HOW DID MY BETA CALCULATIONS COMPARE WITH THOSE OF THE PUBLISHED SOURCES?

Previous Close	11.34	Market Cap	11.908B
Open	11.37	Beta (5Y Monthly)	1.02
Bid	11.42 x 21500	PE Ratio (TTM)	6.04
Ask	11.70 x 1400	EPS (TTM)	1.91
Day's Range	11.31 - 11.58	Earnings Date	May 04, 2022
52 Week Range	9.31 - 15.45	Forward Dividend & Yield	1.00 (8.77%)
Volume	7,846,898	Ex-Dividend Date	Mar 07, 2022

Yahoo Finance has calculated a beta of 1.02 which is 0.06 more than the 0.96 beta I calculated above against the S&P 500 index. The reason the beta on Yahoo Finance is different from my calculated beta is due to the difference in period of the collected data. Yahoo also uses a 5-year monthly average although it uses monthly data and has an extra three months of data from February 1st, March 1st, and April 1st. The beta of NYSE Composite was similar to the S&P 500 Index with the 0.94 beta of NYSE Composite being only 0.08 lower. Compared to the other indexes the NASDAQ Composite Index beta was much lower than the other indices.

### COMPARING YOUR COMPANY TO THE NASDAQ INDEX, WHICH HAS HIGHER:

#### *Total risk*

NASDAQ's monthly standard deviation is 5.39% vs. Lumen's monthly standard deviation of 10.13% as shown in Figure 2. With standard deviation being a measure of total risk, Lumen has a higher total risk than the NASDAQ due to the lack of diversification when comparing one stock versus a portfolio of stocks.

Figure 2		Total Risk (Standard Deviation)
NASDAQ Composite		5.39%
Lumen Technologies		10.13%

#### *Risk per unit*

The coefficient of variation, which is the risk per unit of return for the NASDAQ Composite Index and Lumen are shown in Figure 3. The coefficient of variation allows investors to determine how much volatility or risk is assumed compared to the amount of return expected from investments. The NASDAQ's coefficient of variation is 337.21% and the coefficient of variation for LUMN is -2,298,339.08%.

Figure 3	Risk Per Unit of Return (Coefficient of Variation)
NASDAQ Composite	337.21%
Lumen Technologies	-2,298,339.08%

### Systematic risk

Systematic risk aka “un-diversifiable risk” or “market risk” is defined as the risk inherent to the entire market or entire market segment. With systematic risk, it impacts the market in total and is incapable through diversification. The market risk of a stock is quantified by its beta ( $\beta$ ). A beta equal to 1.0 is determined to be of equal risk as the market. Beta  $>1$ , indicates the stock is riskier than the market and a beta  $<1$  is less risky. In Table 4A, the beta coefficients for Lumen are displayed. In Table 4B the beta for NASDAQ is displayed for the S&P 500 Composite. We are using the S&P 500 to signify the market. These beta coefficients indicate that the NASDAQ Composite is riskier than the market beta  $>1$ . Though Lumen has a lower beta in the NASDAQ composite than NASDAQ has in the market, Lumen, has a higher beta in the market than NASDAQ; therefore, the required return for Lumen’s stock should be more than the required return from the NASDAQ.

Figure 4A	
Index	Lumen Technologies, Inc. Beta ( $\beta$ )
S&P 500	0.96
NYSE Composite	0.94
NASDAQ Composite	0.78

Figure 4B	
Index	NASDAQ Composite Beta ( $\beta$ )
S&P 500	1.09

### DOES THE COMPANY HAVE A HIGHER EXPECTED RETURN THAN THE OVERALL STOCK MARKET? WHY? WHAT CAN YOU SAY ABOUT THE EXPECTED RETURN FOR THE COMPANY AND ITS RELATION TO ITS PAST RETURN?

Historical data of monthly average returns from the last 60 months are displayed in Figure 5 for Lumen, NYSE Composite, NASDAQ Composite, and the S&P 500.

Figure 5			
Expected Returns			
Lumen	S&P 500	NYSE Composite	NASDAQ Composite
-0.00	1.18%	0.83%	1.60%

In comparing these values, the Lumen has the lowest return, NYSE has the second lowest return and NASDAQ had the highest return. In finance theory, the expected returns can be calculated by examining the systematic risk/beta of Lumen versus the market, which as we saw previously in Table 4a has a beta higher than 1. If markets are efficient, then securities with betas higher than one have higher expected/required returns when compared to the market portfolio. Due to this firm having the second highest risk, it is expected that it would have the second highest return. Instead, it has the lowest return, thus the realized returns are not in line with the expectations for the firm. We will analyze further the potential causes for this under Financial Analysis. The inverse is true of the NASDAQ, which has a higher risk than Lumen and therefore a higher expected return.

## PART TWO – FINANCIAL ANALYSIS

## MARKET TO BOOK VALUE

Market value is the company's worth based on the total amount of its outstanding shares in the market or its market capitalization. Market value tends to be greater than a company's book value since market value captures non-tangible, as well, as future growth prospects.

Latest Capitalization (Millions of USD)	
<b>Currency</b>	<b>USD</b>
Share Price	\$11.88
Shares Out.	1,023.9
<b>Market Capitalization</b>	<b>12,163.9</b>
- Cash & Short Term Investments	635.0
+ Total Debt	30,150.0
+ Pref. Equity	-
+ Total Minority Interest	-
- Long Term Marketable Securities	-
<b>= Total Enterprise Value (TEV)</b>	<b>41,678.9</b>
Book Value of Common Equity	11,183.0
+ Pref. Equity	-
+ Total Minority Interest	-
+ Total Debt	30,150.0
<b>= Total Capital</b>	<b>41,333.0</b>

Figure 6

Lumen Technologies has a market value of 41.679 billion and a book value of 41.333 billion. Lumen's book value of equity is 11.183 billion, while its book value of debt is 30.150 billion, meaning that the company is financed with approximately 27.1% equity on the books. Lumen has a significant amount of debt when compared to its book value and market capitalization.

## TREND ANALYSIS

### Balance Sheet and Income Statement Trends Analysis

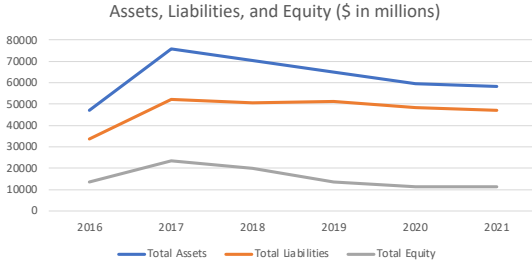
#### Balance Sheet

Balance Sheet	Dec-31-2016	Dec-31-2017	Dec-31-2018	Dec-31-2019	Dec-31-2020	Sep-30-2021
Balance Sheet as of:	USD	USD	USD	USD	USD	USD
<b>Currency</b>						
<b>ASSETS</b>						
Cash And Equivalents	222.0	551.0	488.0	1,690.0	406.0	635.0
<b>Total Cash &amp; ST Investments</b>	<b>222.0</b>	<b>551.0</b>	<b>488.0</b>	<b>1,690.0</b>	<b>406.0</b>	<b>635.0</b>
Accounts Receivable	2,003.0	2,517.0	2,429.0	2,281.0	1,937.0	1,590.0
Other Receivables	65.0	298.0	103.0	55.0	98.0	71.0
Notes Receivable	-	-	-	-	-	96.0
<b>Total Receivables</b>	<b>2,068.0</b>	<b>2,815.0</b>	<b>2,532.0</b>	<b>2,336.0</b>	<b>2,035.0</b>	<b>1,717.0</b>
Inventory	134.0	128.0	120.0	105.0	105.0	103.0
Prepaid Exp.	295.0	294.0	307.0	274.0	290.0	294.0
Restricted Cash	-	5.0	4.0	3.0	3.0	2.0
Other Current Assets	2,532.0	401.0	389.0	360.0	337.0	8,950.0
<b>Total Current Assets</b>	<b>5,162.0</b>	<b>4,194.0</b>	<b>3,820.0</b>	<b>4,768.0</b>	<b>3,176.0</b>	<b>11,701.0</b>
Gross Property, Plant & Equipment	39,194.0	51,204.0	53,267.0	57,111.0	59,653.0	42,953.0
Accumulated Depreciation	(22,155.0)	(24,352.0)	(26,859.0)	(29,346.0)	(31,596.0)	(22,937.0)
<b>Net Property, Plant &amp; Equipment</b>	<b>17,039.0</b>	<b>26,852.0</b>	<b>26,408.0</b>	<b>27,765.0</b>	<b>28,057.0</b>	<b>20,026.0</b>
Long-term Investments	-	150.0	160.0	-	-	-
Goodwill	19,650.0	30,475.0	28,031.0	21,534.0	18,870.0	15,987.0
Other Intangibles	4,328.0	12,773.0	10,779.0	9,567.0	8,219.0	7,160.0
Deferred Charges, LT	-	-	260.0	254.0	218.0	166.0
Other Long-Term Assets	838.0	1,167.0	808.0	854.0	874.0	2,368.0
<b>Total Assets</b>	<b>47,017.0</b>	<b>75,811.0</b>	<b>70,256.0</b>	<b>64,742.0</b>	<b>59,394.0</b>	<b>58,308.0</b>
<b>LIABILITIES</b>						
Accounts Payable	1,179.0	1,555.0	1,933.0	1,724.0	1,134.0	829.0
Accrued Exp.	1,093.0	1,287.0	1,465.0	1,317.0	1,299.0	1,102.0
Cur. Port. of LT Debt	1,563.0	443.0	614.0	2,265.0	2,401.0	2,501.0
Cur. Port. of Leases	-	-	38.0	451.0	405.0	389.0
Cur. Income Taxes Payable	301.0	370.0	337.0	311.0	314.0	280.0
Unearned Revenue, Current	672.0	892.0	832.0	804.0	753.0	624.0
Other Current Liabilities	601.0	310.0	312.0	386.0	328.0	2,575.0
<b>Total Current Liabilities</b>	<b>5,349.0</b>	<b>4,857.0</b>	<b>5,531.0</b>	<b>7,258.0</b>	<b>6,634.0</b>	<b>8,300.0</b>
Long-Term Debt	18,185.0	37,283.0	35,213.0	32,209.0	29,143.0	26,908.0
Long-Term Leases	-	-	196.0	1,527.0	1,672.0	382.0
Pension & Other Post-Retre. Benefits	5,527.0	5,178.0	4,319.0	4,594.0	4,556.0	3,980.0
Def. Tax Liability, Non-Curr.	3,471.0	2,413.0	2,527.0	2,918.0	3,342.0	3,732.0
Other Non-Current Liabilities	1,086.0	2,389.0	2,642.0	2,766.0	2,885.0	3,853.0
<b>Total Liabilities</b>	<b>33,618.0</b>	<b>52,120.0</b>	<b>50,428.0</b>	<b>51,272.0</b>	<b>48,232.0</b>	<b>47,125.0</b>
Common Stock	547.0	1,069.0	1,080.0	1,090.0	1,097.0	1,031.0
Additional Paid-In Capital	14,970.0	23,314.0	22,852.0	21,874.0	20,969.0	19,235.0
Retained Earnings	(1.0)	1,103.0	(1,643.0)	(6,814.0)	(6,031.0)	(6,506.0)
Treasury Stock	-	-	-	-	-	-
Comprehensive Inc. and Other	(2,117.0)	(1,995.0)	(2,451.0)	(2,680.0)	(2,813.0)	(2,577.0)
<b>Total Common Equity</b>	<b>13,399.0</b>	<b>23,491.0</b>	<b>19,828.0</b>	<b>13,470.0</b>	<b>11,162.0</b>	<b>11,183.0</b>
<b>Total Equity</b>	<b>13,399.0</b>	<b>23,491.0</b>	<b>19,828.0</b>	<b>13,470.0</b>	<b>11,162.0</b>	<b>11,183.0</b>
<b>Total Liabilities And Equity</b>	<b>47,017.0</b>	<b>75,811.0</b>	<b>70,256.0</b>	<b>64,742.0</b>	<b>59,394.0</b>	<b>58,308.0</b>

Figure 7

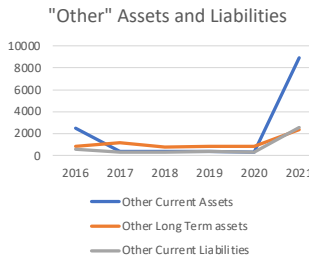
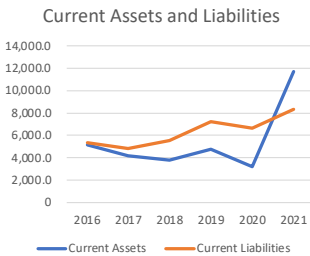
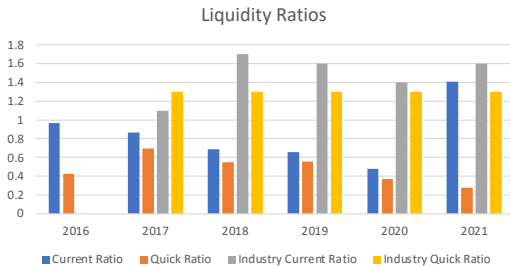
A five-year analysis (2016 – 2021) was created utilizing data from Lumen’s balance sheet and income statement as provided in Figure 7.

Looking at the balance sheet there was a spike in total assets, total liabilities, and total equity from 2016 to 2017 followed by a slight decline in liabilities and noticeable decline in total assets and equity. This increase in total assets was due to a rise in long term assets and intangibles, primarily gross property, plant, & equipment as well as goodwill and other intangibles. This asset increase was met with an increase in long-term debt and additional paid in capital.



**Current Ratio and Liquidity**

The ratios shown reflect the company’s ability to generate enough cash to pay off current debt obligations without raising external capital. The company’s current rate has been below 1 leading up to 2021, this generally shows that a company will struggle to cover its current obligations, however, in 2021 Lumen’s current ratio jumped up significantly to 1.4. Looking at Lumen’s quick ratio I see that it has remained under 1 during the period and interestingly it ended lowest in 2021 at about 0.3, this stood out because in 2021 Lumen’s current ratio was at its highest. Lumen reported a huge increase in current assets listed as “other current assets.” This extremely low quick ratio may be a big problem for Lumen if it is unable to meet its current obligations. Over the period Lumen appears to have been struggling with a low liquidity. During the period Lumen had a lower current ratio and lower quick ratio when compared to the industry average.



## Income Statement

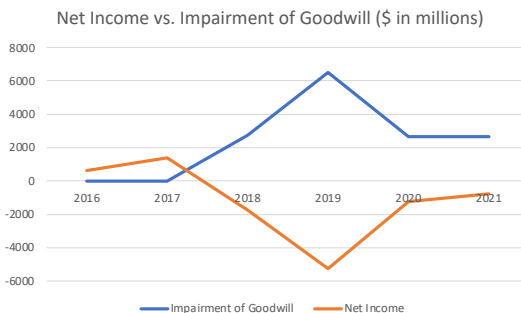
	2016	2017	2018	2019	2020	2021
<b>Common Dividends Paid (In Millions)</b>	\$1,167	\$1,453	\$2,312	\$1,100	\$1,109	\$1,106
<b>Dividends Per Share</b>	\$2.16	\$2.16	\$2.16	\$1.00	\$1.00	\$1.00

Income Statement						
For the Fiscal Period Ending	Reclassified 12 months Dec-31-2016 USD	Reclassified 12 months Dec-31-2017 USD	Reclassified 12 months Dec-31-2018 USD	Reclassified 12 months Dec-31-2019 USD	12 months Dec-31-2020 USD	LTM 12 months Sep-30-2021 USD
<i>Currency</i>						
Revenue	17,470.0	17,656.0	22,580.0	21,458.0	20,712.0	19,965.0
Other Revenue	-	-	-	-	-	-
<b>Total Revenue</b>	<b>17,470.0</b>	<b>17,656.0</b>	<b>22,580.0</b>	<b>21,458.0</b>	<b>20,712.0</b>	<b>19,965.0</b>
Cost Of Goods Sold	7,774.0	7,653.0	9,999.0	9,134.0	8,934.0	8,633.0
<b>Gross Profit</b>	<b>9,696.0</b>	<b>10,003.0</b>	<b>12,581.0</b>	<b>12,324.0</b>	<b>11,778.0</b>	<b>11,332.0</b>
Selling General & Admin Exp.	3,377.0	3,844.0	4,165.0	3,785.0	3,323.0	2,866.0
R & D Exp.	-	-	-	-	-	-
Depreciation & Amort.	3,916.0	3,936.0	5,120.0	4,829.0	4,710.0	4,319.0
Other Operating Expense/(Income)	-	-	-	-	-	-
<b>Other Operating Exp., Total</b>	<b>7,293.0</b>	<b>7,780.0</b>	<b>9,285.0</b>	<b>8,614.0</b>	<b>8,033.0</b>	<b>7,185.0</b>
<b>Operating Income</b>	<b>2,403.0</b>	<b>2,223.0</b>	<b>3,296.0</b>	<b>3,710.0</b>	<b>3,745.0</b>	<b>4,147.0</b>
Interest Expense	(1,318.0)	(1,481.0)	(2,177.0)	(2,021.0)	(1,668.0)	(1,546.0)
Interest and Invest. Income	-	-	-	-	-	-
<b>Net Interest Exp.</b>	<b>(1,318.0)</b>	<b>(1,481.0)</b>	<b>(2,177.0)</b>	<b>(2,021.0)</b>	<b>(1,668.0)</b>	<b>(1,546.0)</b>
Currency Exchange Gains (Loss)	-	-	10.0	8.0	30.0	(3.0)
Other Non-Operating Inc. (Exp.)	30.0	74.0	56.0	66.0	30.0	60.0
<b>EBT Excl. Unusual Items</b>	<b>1,115.0</b>	<b>816.0</b>	<b>1,185.0</b>	<b>1,763.0</b>	<b>2,137.0</b>	<b>2,658.0</b>
Restructuring Charges	(16.0)	-	(15.0)	(95.0)	(172.0)	(165.0)
Merger & Related Restruct. Charges	(52.0)	(271.0)	-	-	-	-
Impairment of Goodwill	-	-	(2,726.0)	(6,506.0)	(2,642.0)	(2,642.0)
Asset Write-down	-	-	-	-	-	(18.0)
Other Unusual Items	(27.0)	(5.0)	(7.0)	72.0	(105.0)	(19.0)
<b>EBT Incl. Unusual Items</b>	<b>1,020.0</b>	<b>540.0</b>	<b>(1,563.0)</b>	<b>(4,766.0)</b>	<b>(782.0)</b>	<b>(186.0)</b>
Income Tax Expense	394.0	(849.0)	170.0	503.0	450.0	578.0
<b>Earnings from Cont. Ops.</b>	<b>626.0</b>	<b>1,389.0</b>	<b>(1,733.0)</b>	<b>(5,269.0)</b>	<b>(1,232.0)</b>	<b>(764.0)</b>
Earnings of Discontinued Ops.	-	-	-	-	-	-
Extraord. Item & Account. Change	-	-	-	-	-	-
<b>Net Income to Company</b>	<b>626.0</b>	<b>1,389.0</b>	<b>(1,733.0)</b>	<b>(5,269.0)</b>	<b>(1,232.0)</b>	<b>(764.0)</b>
Minority Int. in Earnings	-	-	-	-	-	-
<b>Net Income</b>	<b>626.0</b>	<b>1,389.0</b>	<b>(1,733.0)</b>	<b>(5,269.0)</b>	<b>(1,232.0)</b>	<b>(764.0)</b>

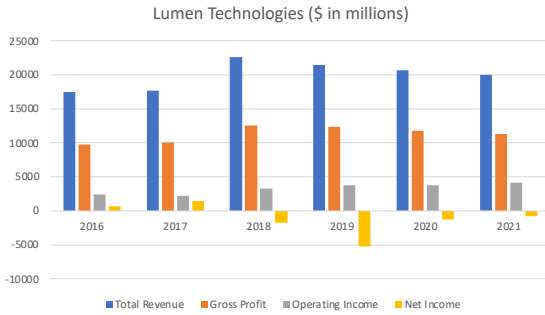
## RATIO TRENDS ANALYSIS

### Trend/Historical Ratio Analysis

The line graph below was created to analyze important trends in the income statement for Lumen Technologies. I noticed an inverse relationship between the net income and the impairment of goodwill expense. This expense had a major impact on the income statement and Lumen's profits.



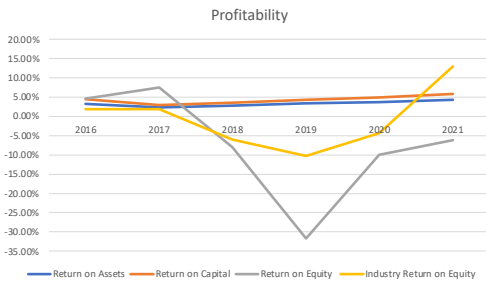
There were large differences between total revenues and net income. Lumen's thin margins faced a major hit from 2018 to 2021 due to the impairment to goodwill expense.



## BENCHMARK/COMPETITIVE RATIO ANALYSIS

### Profitability Ratios

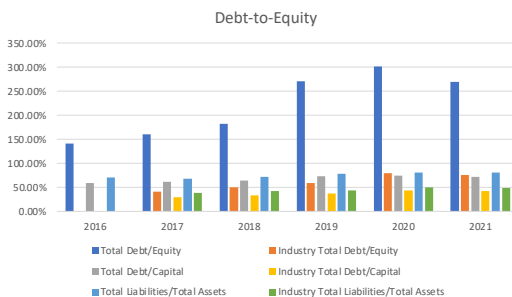
Profitability ratios show the combined effects of liquidity and asset management on operating and financial results. It is an overview of the firm's operations.



	2016	2017	2018	2019	2020	2021
Return on Assets %	3.2%	2.3%	2.8%	3.4%	3.8%	4.3%
Return on Capital %	4.5%	2.9%	3.5%	4.4%	4.9%	5.9%
Return on Equity %	4.6%	7.5%	(8.0%)	(31.6%)	(10.0%)	(6.1%)

Lumen Technologies returns on assets and capital remained relatively stable within a range of 2% to 6% over the period and close to the industry average. The firm's return on equity dropped significantly from 2017 to 2019, the entire industry had a drop in equity during this period although Lumen's loss was much more pronounced, and it didn't experience a strong recovery into a positive return on equity that the industry average showed.

The chart below shows the debt-to-equity ratios for Lumen Technologies. The debt-to-equity ratios for Lumen were consistently above industry averages. This shows that Lumen is financed primarily through long term debt and has kept its level of debt considerably high year to year.



**STATEMENT OF CASH FLOWS TRENDS ANALYSIS**  
(brief discussion of their major sources and uses of funds)

Cash Flow	Reclassified						LTM 12 months Sep-30-2021 USD
	12 months Dec-31-2016 USD		12 months Dec-31-2017 USD		12 months Dec-31-2018 USD		
	12 months Dec-31-2019 USD		12 months Dec-31-2020 USD				
For the Fiscal Period Ending							
Currency							
<b>Net Income</b>	<b>626.0</b>	<b>1,389.0</b>	<b>(1,733.0)</b>	<b>(5,269.0)</b>	<b>(1,232.0)</b>	<b>(764.0)</b>	
Depreciation & Amort.	2,691.0	2,666.0	3,339.0	3,089.0	2,963.0	2,855.0	
Amort of Goodwill and Intangibles	1,225.0	1,226.0	1,781.0	1,740.0	1,747.0	1,464.0	
<b>Depreciation &amp; Amort., Total</b>	<b>3,916.0</b>	<b>3,992.0</b>	<b>5,120.0</b>	<b>4,829.0</b>	<b>4,710.0</b>	<b>4,319.0</b>	
Other Amortization	2.0	-	-	-	-	-	
(Gain) Loss From Sale Of Assets	-	82.0	-	-	-	-	
Asset Write-down & Restructuring Costs	13.0	44.0	2,746.0	6,506.0	2,642.0	2,660.0	
Stock-Based Compensation	80.0	111.0	186.0	162.0	175.0	144.0	
Provision & Write-off of Bad debts	192.0	176.0	153.0	145.0	189.0	132.0	
Other Operating Activities	33.0	(926.0)	529.0	368.0	471.0	591.0	
Change in Acc. Receivable	(266.0)	31.0	25.0	(5.0)	115.0	169.0	
Change in Acc. Payable	109.0	(123.0)	124.0	(261.0)	(543.0)	(458.0)	
Change in Inc. Taxes	(45.0)	54.0	75.0	20.0	27.0	(55.0)	
Change in Other Net Operating Assets	(54.0)	(852.0)	(193.0)	185.0	(30.0)	(71.0)	
<b>Cash from Ops.</b>	<b>4,608.0</b>	<b>3,878.0</b>	<b>7,032.0</b>	<b>6,680.0</b>	<b>6,524.0</b>	<b>6,576.0</b>	
Capital Expenditure	(2,981.0)	(3,106.0)	(3,175.0)	(3,628.0)	(3,729.0)	(2,810.0)	
Sale of Property, Plant, and Equipment	30.0	1,529.0	158.0	93.0	153.0	124.0	
Cash Acquisitions	-	(7,289.0)	-	-	-	-	
Divestitures	-	-	-	-	-	-	
Invest. in Marketable & Equity Secur.	-	-	-	-	-	-	
Net (Inc. / Dec. in Loans Originated)/Sold	-	-	-	-	-	-	
Other Investing Activities	-	-	-	-	-	-	
<b>Cash from Investing</b>	<b>(2,994.0)</b>	<b>(8,871.0)</b>	<b>(3,078.0)</b>	<b>(3,570.0)</b>	<b>(3,564.0)</b>	<b>(2,673.0)</b>	
Short Term Debt Issued	-	-	-	-	-	-	
Long-Term Debt Issued	2,161.0	8,433.0	275.0	3,707.0	4,361.0	2,160.0	
<b>Total Debt Issued</b>	<b>2,161.0</b>	<b>8,433.0</b>	<b>275.0</b>	<b>3,707.0</b>	<b>4,361.0</b>	<b>2,160.0</b>	
Short Term Debt Repaid	-	-	-	-	-	-	
Long-Term Debt Repaid	(2,502.0)	(1,963.0)	(1,936.0)	(4,457.0)	(7,415.0)	(6,335.0)	
<b>Total Debt Repaid</b>	<b>(2,502.0)</b>	<b>(1,963.0)</b>	<b>(1,936.0)</b>	<b>(4,457.0)</b>	<b>(7,415.0)</b>	<b>(6,335.0)</b>	
Repurchase of Common Stock	-	-	-	-	-	(909.0)	
Common Dividends Paid	(1,167.0)	(1,453.0)	(2,312.0)	(1,100.0)	(1,109.0)	(1,106.0)	
<b>Total Dividends Paid</b>	<b>(1,167.0)</b>	<b>(1,453.0)</b>	<b>(2,312.0)</b>	<b>(1,100.0)</b>	<b>(1,109.0)</b>	<b>(1,106.0)</b>	
Special Dividend Paid	-	-	-	-	-	-	
Other Financing Activities	(10.0)	339.0	(60.0)	(61.0)	(87.0)	(56.0)	
<b>Cash from Financing</b>	<b>(1,518.0)</b>	<b>5,356.0</b>	<b>(4,023.0)</b>	<b>(1,911.0)</b>	<b>(4,250.0)</b>	<b>(3,746.0)</b>	
<b>Net Change in Cash</b>	<b>96.0</b>	<b>363.0</b>	<b>(69.0)</b>	<b>1,199.0</b>	<b>(1,290.0)</b>	<b>157.0</b>	

Using the table below to look at Lumen Technologies cash flows I noticed significant changes in cash from operations and cash from investing between 2016 and 2018. From 2018 to 2021, cash from operations and cash from investing remained relatively stable.

	2016	2017	2018	2019	2020	2021
<b>Cash from Ops.</b>	<b>4,608.0</b>	<b>3,878.0</b>	<b>7,032.0</b>	<b>6,680.0</b>	<b>6,524.0</b>	<b>6,576.0</b>
<b>Cash from Investing</b>	<b>(2,994.0)</b>	<b>(8,871.0)</b>	<b>(3,078.0)</b>	<b>(3,570.0)</b>	<b>(3,564.0)</b>	<b>(2,673.0)</b>
<b>Cash from Financing</b>	<b>(1,518.0)</b>	<b>5,356.0</b>	<b>(4,023.0)</b>	<b>(1,911.0)</b>	<b>(4,250.0)</b>	<b>(3,746.0)</b>
<b>Net Change in Cash</b>	<b>96.0</b>	<b>363.0</b>	<b>(69.0)</b>	<b>1,199.0</b>	<b>(1,290.0)</b>	<b>157.0</b>

The table below looks at cash from financing. Lumen issued a significant amount of long-term debt in 2017, this was the only year in the period where it issued more debt than it repaid. Lumen's dividend payout also varied noticeably during the period. Total dividends paid increased strongly from 2016 to 2018 and experienced a large drop in 2019, where it has since remained.

Short Term Debt Issued	-	-	-	-	-	-
Long-Term Debt Issued	2,161.0	8,433.0	275.0	3,707.0	4,361.0	2,160.0
<b>Total Debt Issued</b>	<b>2,161.0</b>	<b>8,433.0</b>	<b>275.0</b>	<b>3,707.0</b>	<b>4,361.0</b>	<b>2,160.0</b>
Short Term Debt Repaid	-	-	-	-	-	-
Long-Term Debt Repaid	(2,502.0)	(1,963.0)	(1,936.0)	(4,457.0)	(7,415.0)	(6,335.0)
<b>Total Debt Repaid</b>	<b>(2,502.0)</b>	<b>(1,963.0)</b>	<b>(1,936.0)</b>	<b>(4,457.0)</b>	<b>(7,415.0)</b>	<b>(6,335.0)</b>
Repurchase of Common Stock	-	-	-	-	-	(909.0)
Common Dividends Paid	(1,167.0)	(1,453.0)	(2,312.0)	(1,100.0)	(1,109.0)	(1,106.0)
<b>Total Dividends Paid</b>	<b>(1,167.0)</b>	<b>(1,453.0)</b>	<b>(2,312.0)</b>	<b>(1,100.0)</b>	<b>(1,109.0)</b>	<b>(1,106.0)</b>

## PART THREE – STOCK VALUATION

To determine the value of Lumen stock, I will apply two models: the constant growth Model and the supernormal (non-constant) growth model. To apply this model, there are three required types of inputs: estimated dividends, growth rates, and required rate of return.

To compute the required rate of return, I am using my beta as computed using the S&P 500 Index. This was the beta that I determined to be the best estimate of beta for Lumen.



## DETERMINE THE DISCOUNT RATES USING THE CAPITAL ASSET PRICING MODEL (CAPM)

$$r_{RF} = 2.5\%, R_{Pm} = 5.5\%, \text{beta (b)} = 0.96$$

$$r_s = r_{RF} + R_{Pm} \cdot \text{beta} = 2.5\% + (5.5\% \cdot 0.96) = 7.78\%$$

## DETERMINE THE GROWTH RATE

Growth Estimates	LUMN
Current Qtr.	4.50%
Next Qtr.	-6.50%
Current Year	-27.20%
Next Year	-22.30%
Next 5 Years (per annum)	-19.70%
Past 5 Years (per annum)	-18.64%

To determine the growth rate, I used analyst earnings forecasts. In this situation, the forecasted five-year growth rate was -19.70% and the past five-year growth rate was -18.64%. Both values are lower than the expected return of 7.78% so I chose the past five-year growth rate of -18.64%.

## STOCK VALUATION USING THE:

### Constant Growth Model

Previous Close	<b>11.34</b>	Market Cap	<b>11.908B</b>
Open	<b>11.37</b>	Beta (5Y Monthly)	<b>1.02</b>
Bid	<b>11.42 x 21500</b>	PE Ratio (TTM)	<b>6.04</b>
Ask	<b>11.70 x 1400</b>	EPS (TTM)	<b>1.91</b>
Day's Range	<b>11.31 - 11.58</b>	Earnings Date	<b>May 04, 2022</b>
52 Week Range	<b>9.31 - 15.45</b>	Forward Dividend & Yield	<b>1.00 (8.77%)</b>
Volume	<b>7,846,898</b>	Ex-Dividend Date	<b>Mar 07, 2022</b>
Avg. Volume	<b>14,937,573</b>	1y Target Est	<b>10.45</b>

$$P^0 = (D^0 (1 + g)) / (r_s - g) = (1.00(1 + (-18.64\%)) / (7.78\% - (-18.64\%))) = \$3.08$$

As of the market close the stock price was \$11.53, and I computed a value of \$3.08 so according to this valuation method, the stock is overvalued by 374.35% or \$8.45 per share.

### Supernormal (Non-Constant) Growth Model

For the supernormal growth model, I used the following inputs: Dividend at time 0 remained \$1.00. My expected growth rate from year 0 to 1 was -27.20%, years 1 to 2 is -22.30%, and the long run growth rate remained at 3.34%.

$$D1 = \$1.00(1 + (-27.20\%)) = \$0.728$$

$$D2 = \$0.728(1 + (-22.30\%)) = \$0.565656$$

$$P2 = \$0.5657(1 + (-18.64\%)) / (7.78\% - (-18.64\%)) = 0.4603 / 0.2642 = \$1.74$$

Calculation of the net present value (NPV):

$$NPV(\text{rate}, 0, \{D1, D2 + P2\})$$

NPV (7.78%, 0, {0.728, 0.5657+1.74})

NPV=\$2.47

An NPV of \$2.47 indicates that Lumen's stock is overvalued by 466.80% or \$9.06 per share according to this valuation.

### OVERVALUED OR UNDERVALUED

Regarding my confidence in the models, my estimates are about 73% and 79% lower than the current stock price of \$11.53. This significant difference between my estimates and the current price could very well be because I am using different required return and growth rate assumptions than those being used by participants in the market. Both the past five year and next five-year growth rates were between -18% and -20%. The estimated growth rates had a considerable effect on both the constant and supernormal growth models. If the next five years growth estimate had been 0% then the constant growth and supernormal models would show the price as undervalued at \$12.85 and \$11.92.

Overall, I am fairly confident that Lumen Technologies is overvalued, I would be more likely to buy puts for LUMN over shares, though I am not confident enough to risk my own money on my estimated prices, unexpected management decisions or news could shift the future growth estimates and completely change the models.

## PART FOUR – HONORS WORK

### WEIGHTED AVERAGE COST OF CAPITAL (WACC) COMPUTATION

WACC	
Market Risk Premium (Rm - Rf)	14.5%
Multiplied by: LUMN Bottom-Up Beta	0.841
Adjusted Market Risk Premium	12.2%
Add: Risk-Free Rate of Return (Rf)(1)	0.4%
Add: Size Premium	0.0%
<b>Cost of Equity</b>	<b>12.5%</b>
Multiplied by: LUMN E/(D+P+E)	25.4%
Cost of Equity Portion	3.2%
LUMN Cost of Debt (Rd) - Average of Last 5 Issued Bonds	4.6%
Tax Rate (5 Year Average)	24.7%
<b>After-Tax Cost of Debt</b>	<b>3.4%</b>
Multiplied by: LUMN D/(D+P+E)	74.6%
Cost of Debt Portion	2.6%
<b>LUMN Cost of Preferred (Rp)</b>	<b>0.0%</b>
Multiplied by: LUMN P/(D+P+E)	0.0%
Cost of Preferred Portion	0.0%
<b>WACC</b>	<b>5.7%</b>

Looking at the WACC of Lumen and similar companies/competitors (such as AT&T and Verizon) in its industry Lumen was relatively close to the industry average, although it is higher than the industry average. The WACC can also be used to show the required rate of return, so investors should expect a return of 5.7%.

### ANALYSIS OF CAPITAL EXPENDITURES

	2016	2017	2018	2019	2020	2021
<b>Capital Expenditure</b>	<b>(2,981.0)</b>	<b>(3,106.0)</b>	<b>(3,175.0)</b>	<b>(3,628.0)</b>	<b>(3,729.0)</b>	<b>(2,810.0)</b>
Sale of PPE	30.0	1,529.0	158.0	93.0	153.0	124.0
Cash Acquisitions	-	(7,289.0)	-	-	-	-
Cash from Investing	(2,994.0)	(8,871.0)	(3,078.0)	(3,570.0)	(3,564.0)	(2,673.0)

Capital Expenditures made up a majority of cash from investing expenses, except for 2017 where Lumen's largest investment was in cash acquisitions, and it sold a noticeable amount of property, plant, and equipment.

I looked over Lumen's 10K reports to find its capital expenditure reports. In 2016, Lumen's (then known as CenturyLink) central capital expenditure was its acquisition of the telecommunications company Level 3 Communication. Lumen took on Level 3's long-term debt which was worth \$10.9 billion. In 2016 Lumen also finished the sale of 57 data centers to BC Partners, Inc. and Medina Capital. The sale gave Lumen around \$1.6 billion, which it used to partly fund its acquisition of Level 3 Communications. The sale of the data centers and acquisition of Level 3 were completed by mid-2017. 2018's 10K report again makes a primary mention of the acquisition of Level 3 and sale of data center, this report also adds an impairment to goodwill expense of \$2.7 billion related to the consumer segment. Looking at the 2019 and 2020 10K reports, Lumen's capital expenditures for each year were around \$3.6 billion and were spent on capital investment in property, plant, and equipment. In 2020, the company went through a major rebranding by having its primary business listed under the name Lumen. In 2021, Lumen's primary capital expenditure revolved around major divestment in its Latin American operations which provided around \$2.7 billion for Lumen, and major divestment within 20 Mid-western and Southern states which Lumen would receive \$7.5 billion for. Lumen has consistently spent a lot on maintaining an updated product line, acquisitions, and property, plant, and equipment. Lumen currently has a large amount of debt compared to its equity and assets.

### **REAL OPTIONS FOR THE FIRM**

Lumen is in a tough spot. In its most recent annual report, it discussed its upcoming plans to heavily divest in various regions. This can free up cash for Lumen to meet its short-term debt obligations and can be used to cut down on some of its long-term debt. From 2018 to 2021, Lumen ended with a negative income. In 2018, 2020, and 2021, if Lumen hadn't paid a dividend, then they would have had a positive net income. Lumen is projected to lose value over the next five years based on various analysts rating. There are a few real options that I believe Lumen has based on the data.

Lumen has a very high level of debt compared to its market capitalization. Lumen has divested in several markets and stands to earn around \$10 billion from the divestment, if Lumen were to cut its dividends it should end with around \$11 billion in cash, this could be used to get rid of around one-third of its total debt. However, if Lumen were to cut its dividend this would more than likely scare away investors and lead to a drop in its share price. If Lumen were to talk to one of its much larger competitors, such as Verizon, or AT&T, or Comcast, it could try to convince one of the big players in its industry to buyout Lumen and take on its debt. Getting bought out would probably be one of the best-case scenarios for Lumen given that in the past four years Lumen has had decreasing revenues, negative net income, increasing current liabilities vs. decreasing current assets, and a large amount of long-term debt.

Since 2017, Lumen has faced a large decrease in its intangibles which looks like a primary driver that led to its negative net income, this decrease in intangibles has appeared to slow in recent years which gives Lumen the opportunity to attain a positive net income in its next 10K report. With Lumen's heavy divestment plan that it laid out in its 2021 10K report, Lumen should have a healthy liquidity level though it is projected to lose more of its market share. To make up for this loss in market share and ability to reach markets it has divested from, I would recommend for Lumen to meet with different firms within the market to join in joint venture investments in regions it has a weaker presence in. A joint venture approach would lower the large cost it has experienced in investments of property, plant, and equipment and reduce the risk of breaching these markets.

The debt ratio Lumen has made it hard to find good practical options for the company since it has been paying billions in recent years to cover its current portion of long-

term debt. Debt mixed with a significant decrease in net income due to the goodwill impairment expense has made Lumen look like a risky company to invest in or lend to. If Lumen focuses on investments that reduce its goodwill impairment losses and working to decrease its overall debt level would make Lumen's financial statements look much healthier. Given that in the most recent period the overall industry has experienced favorable conditions and profits, Lumen has a chance to turn its current downturn around and achieve overall profitability.

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# A PLURALITY OF PLAGUES: HOW BO BURNHAM'S *INSIDE* EXPOSES THE CULTURAL PANDEMICS OF TWENTY-FIRST CENTURY AMERICA

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KARI WOOD

*"I had plague already, long before I came to this town and encountered it here. Which is tantamount to saying I'm like everybody else. Only there are some people who don't know it, or feel at ease in that condition; others know it and want to get out of it."*

—Tarrou, *Albert Camus's The Plague*, p. 245

In December 2019, life changed irreversibly with the report of the first Covid-19 case in Wuhan, China. Since then, our world has been plunged into a global pandemic at a scale unlike anything anyone in our lifetimes has experienced. Countries across the world shut down their borders and went into quarantine. Schools and business shut down, and many of us found ourselves stuck at home with nowhere to go. Hospitals were inundated with patients while medical workers risked their lives on the front lines of the pandemic. An entirely new vocabulary formed out of medical terms and trends surrounding the virus, and discussions formed around phrases like “social distancing” and “the new normal.” What we once considered unexceptional, such as coughing in public, suddenly became a cause for alarm. What we once took for granted, like seeing someone’s face without a barrier or facial covering, became a luxury. The pandemic itself proved to be a catalyst for reckoning as racial tensions peaked, political divides deepened, and lives were lost. Divisions formed between maskers and antimaskers, vaxxers and antivaxxers, believers and nonbelievers. Amid the chaos and confusion, a comedy emerged.

In 2021, after spending months isolated in an AirBnB, comedian Bo Burnham released his Netflix comedy special and his first comedic work in six years, *Inside*. Burnham created the special over the course of a year entirely within the confines of a small rental after the pandemic dismantled his plans to return to live comedy performances. He wrote, directed, and starred in the special alone, with little outside help with song mixing and editing the footage. *Inside* is unique, then, both in its conception and circumstances. Burnham merges art and creativity with the pandemic experience in the sub-two hour, genre-defying hybrid that constitutes *Inside*. Burnham blends film, musical, and comedy

while cataloguing what life looked like during the Covid-19 stay-at-home mandate in many different states. The special clearly resonates with audiences; it has been met with critical acclaim, winning three Primetime Emmys and several other awards for its music, cinematography, and comedic writing. But *Inside* transcends genre in more ways than one: it also functions as a piece of plague literature, both in a literal sense and a figurative sense. Through *Inside*, Burnham articulates the cultural anxiety of the Covid-19 pandemic experience and calls attention to our cultural pandemics of virtual panopticism, rampant consumerism, and mental health, which have already been plaguing us.

### INTERNET SURVEILLANCE AND PANOPTICISM

Within the first few minutes of *Inside*, Burnham sets up the theme of surveillance by revealing how internet entertainment becomes a loop that feeds into itself and becomes a surveillance system. The creator gives themselves up to be surveilled by their audience, and the audience surveils the creator by consuming content, forming a strange symbiotic relationship: The creator benefits from revenue and the audience from the entertainment. Burnham sets the tone of the special by revealing his life in quarantine through song. Burnham then catalogs his preparations of his recording set-up in a montage, and the screen captures a front-on shot of a camera lens just after the third minute mark.



Figure 1: Still from Burnham, *Inside* (00:03:13).

This shot (see fig. 1.) makes the viewer aware of what Burnham sees during the process of content creation. The camera lens watches, even scrutinizes Burnham as he performs in front of it. Yet the process requires participation: it only records when he tells it to. He can turn the camera off whenever he wants. He authorizes the surveillance process. Additionally, the camera embodies the viewer. Just as Burnham spends much of the duration of the special staring into the camera, the camera stares back at him in an almost personified way. By making the camera an active participant in the content creation process, Burnham implicates his audience also. The void of the camera lens resembles a black hole. It consumes all light that enters, suggesting that the audience, too, is an all-consuming, content-hungry force. Neither the creator nor the audience can be considered innocent, then; Burnham recognizes both himself and his audience in an act of surveillance. He records himself for others to watch, allowing his actions and words to be exposed for scrutiny, and his viewers surveil by consuming the content that he produces.

Thus, the nature of internet exposure creates panopticism, as the unknowable but nevertheless certain audience traps the consciousness in an imagined prison cell that both isolates from and exposes to the public eye. Burnham sings “Don’t Wanna Know” about the internet’s unceasing stream of criticism. He poses questions within the song that begin as surface-level inquiries of his audience and gradually become increasingly desperate:

Is there anyone out there?

Or am I all alone?  
It wouldn't make a difference  
Still, I don't wanna know (00:50:20-00:50:33)

Burnham's burning questions evoke panopticism and the sense of being watched by a force that is both "visible and unverifiable" (Foucault 184). Though he knows he has an audience of potentially hundreds of thousands because of the figure of the camera in front of him, he cannot possibly know exactly how many or who observes him. This blurs the line between isolation and surveillance, subjecting Burnham to panopticism, "perfectly individualized" by the figure of the camera yet rendered "constantly visible" (Foucault 182). He indicates a pervading sense of loneliness in spite of being surrounded by people through his lonely questions. Thus, the internet fosters a virtual panopticon that isolates users from each other while simultaneously subjecting them to an unknowable audience. Burnham explores this sense of panopticism through *Inside*. Though he reaches out to his audience, he adds "I don't wanna know" because the knowledge of how many millions of eyes on him comforts him no less than the uncertainty. After all, the human mind can hardly fathom the scale of an audience that large. Although he would rather be ignorant, ignorance in turn enables the panopticon. The very nature of internet fame, then, lends itself to panopticism, as the expanse of even a modest audience may be beyond comprehension.

The panopticism of Burnham's internet fame and seemingly ever-present surveillance come with consequences: He must remain in the public eye should he want to further his career, but the public eye proves to be a plague in and of itself. Near the conclusion of the special, Burnham strips down to his underwear and performs "All Eyes on Me" as if he is in front of a live audience. Vocal effects distort and deepen his voice, and fake applause punctuates the song itself. The pre-chorus and chorus specifically address the artificial audience: "We're goin' to go where everybody knows / Everybody knows" (1:13:22-1:13:28). The pre-chorus promises some place or circumstance in which "everybody knows," but Burnham never explicitly states what exactly everybody is supposed to know. The vague nature of this line suggests a sense of panopticon-induced paranoia that everyone knows or understands something that he does not, isolating him in his ignorance. In the chorus, Burnham demands that his audience gives him their full attention: "Get your fuckin' hands up / Get on out of your seat / All eyes on me, all eyes on me" (1:13:38-1:13:45). Burnham's pleas contradict his anxious state of mind. He describes retreating from stage performances after having panic attacks on-stage, then proceeds to demand for his perceived audience to stand and look at him. These lines highlight the irony of his role as a content creator constantly demanding attention. Though the line "all eyes on me" takes the form of a command, it also suggests a cry for help: on-stage performance mandates that he has all eyes on him, but being watched only serves to exacerbate his anxiety. The song itself sounds like a pop anthem, but the lyrics of and imagery in "All Eyes on Me" point to Burnham's underlying struggles with paranoia and anxiety both relating to and stemming from his live performances.

Burnham brings the theme of internet surveillance into conversation with cancel culture, parodying the controversial trend in his song "Problematic." He does so not in defense of his own past actions, but in order to bring awareness to the exceedingly high standards that come with internet fame and difficulty taking accountability for mistakes. In the song, Burnham describes a sheltered childhood and alludes to his past of making controversial jokes for shock value: "Times are changing, and I'm getting old / Are you gonna hold me accountable?" (00:39:48-00:39:56). Burnham's question of accountability highlights his awareness of his audience's ability to criticize him for his actions. He satirizes this fear by sexualizing it in the song's performance—he dances suggestively, captures shots of skin and sweat—thereby suggesting a sense of masochism. But masochism in and of itself requires pain or humiliation; thus, Burnham highlights the process of public shaming and punishment associated with cancel culture. According to Eric Darier and Michael D. Mehta, the internet panopticon encourages users "to self-censure



their practices because of the other users' potential gaze and recourse to electronic disciplining techniques" (110). Though Darier and Mehta wrote on internet discipline prior to the conception of cancel culture, this analysis nevertheless applies to cancel culture as a form of social discipline because audiences wield it as a punishment for perceived mistakes. The issue arises in the subjectivity of cancel culture. In the second verse of "Problematic," Burnham confesses to having dressed up as Aladdin for Halloween as a kid, then talks about what he will do with it in order to show he has changed: "I'm gonna go home and burn it / Or not burn it. Is burning it bad? What should I do with it?" (00:40:05-00:40:18). He decides to burn his Aladdin costume as a form of atonement, but backtracks when he realizes the sacrilegious connotations of burning cultural symbols. Played off as a joke, these lines critique the lengths to which creators will go to show they have changed at first glance. However, Burnham also reveals the impossibility of meeting the standards of hundreds of thousands of people. Burnham refers to himself as "old," referencing how often audiences might consider age in the punishment of problematic actions. He fears that his age means audiences will be less forgiving of his mistake, thereby expressing the difficulty with making public mistakes beyond childhood, as if ignorance cannot follow one long into adulthood. Thus, by parodying cancel culture in "Problematic," Burnham uncovers what creators go through on the receiving side of this new form of social discipline.

Burnham draws a connection between social discipline stemming from surveillance and self-surveillance. In her analysis of self-surveillance in the internet age, Sarah Bay-Cheng writes that social media both relies on and encourages "participation in surveillance culture through continual self-disclosure and self-monitoring. In perhaps the very definition of hegemony, we seem quite willing, even enthusiastic, participants in these pursuits" (51). We see how social discipline can manifest self-surveillance in Burnham's reaction to "Intern." While this song concerns issues of human capital in a capitalist society, Burnham repurposes the song through his reaction and re-reaction to it. He analyses the song as it instantaneously loops, then reacts to his own reaction, and so on in an ever-increasingly overly-critical analysis:

I'm reacting to my own reacting, and I'm criticizing my initial reaction for being pretentious which is, honestly, it's a defense mechanism. I'm so worried that criticism will be levied against me that I levy it against myself before anyone else can. And I think that, "Oh, if I'm self-aware about being a douchebag, then it'll somehow make me less of a douchebag," but it doesn't. Self-awareness does not absolve anybody of anything. (00:28:32-00:29:00)

The instantaneous loop of the song, his reaction to the song, and so forth invoke the instantaneous nature of the internet. Burnham points out how self-reflection can be retooled for self-defense in light of criticism. The paranoia of social discipline turns to paranoia, which turns to self-surveillance so as to avoid social discipline altogether; however, self-surveillance in the internet era differs from growth and change. Burnham's commentary on self-awareness also highlights the differences between self-surveillance out of fear of social discipline and genuine self-reflection on the part of the creator. Self-reflection gives the individual time to perceive their actions differently. The demand for instant gratification requires that creators constantly put out content and without time for adequate self-reflection. As a result, self-awareness becomes meaningless. Burnham frames self-surveillance, then, as a last-ditch attempt to mitigate the effects of social discipline because the demand for instant gratification pushes creators to instantly self-reflect without the necessary time for growth.

Conclusively, Burnham draws out the inherent flaws in the internet panopticon, revealing the constant feed of unregulated voices on the internet as paradoxically both possible and impossible reliably surveil. Anyone can make their voice heard, and surveillance does not equate to screening for the most valuable insight; rather, even the most ignorant of influencers may find a willing audience. After performing "White Woman's Instagram," in which Burnham critiques consumerist habits in social media, the special cuts to a shot of Burnham sitting on a stool in front of a spotlight:



Figure 2: Still from Burnham, Inside (00:25:08).

“Is it necessary that every single person on this planet expresses every single opinion that they have on every single thing that occurs all at the same time?” he sarcastically muses (00:24:58-00:25:18). For this scene, Burnham draws on the fact that much of social media markets itself to the public as a way to obtain a platform and amplify voices. The difficulty arises when everyone amplifies their own voice. Eventually, there will be too much noise, creating a hyper awareness in society that we, as humans, probably never needed. Burnham suggests that not every voice needs to be heard; after all, anyone can say anything they want on social media, no matter how ignorant, arrogant, or misinformed. In their analysis of social media comedy, Rebecca Baruc and Rebecca Krefting argue, “As long as humans hold beliefs about social superiority and inferiority, those beliefs will pervade how social networking platforms are developed and manipulated by users” (138). That is, social media is still subject to flawed social power structures. Additionally, a spotlight isolates Burnham in the center of the screen and casts a distinct shadow on the wall behind him (see fig. 2.). The light calls attention to Burnham’s hypocrisy in the sense that he does exactly what he mocks by putting out his unsolicited opinion on the internet; however, this moreso drives his argument home than diminishes it. Thus, the internet produces unintended counter effects because by making every voice heard, no voices are heard. Furthermore, the voices are almost impossible to regulate due to the sheer subjectivity and volatility of cancel culture. The internet panopticon that we enable and participate in, then, merely feeds into a flawed system of false democracy.

## CONSUMER CULTURE

Burnham uses absurdity to challenge our understanding of brand awareness around issues of activism as a philanthropic cause rather than marketing strategy. By portraying a social brand consultant, he reminds his audience that brands are usually only looking out for themselves. Burnham pulls his hair back into a tiny ponytail and sits himself on a stool in front of a camera to satirize filming a commercial, describing himself as a “social brand consultant.” Inspirational music frames his monologue:

During this incredibly necessary and overdue social reckoning that we’re having in our culture, it is no longer acceptable for brands to stay out of the conversation. Customers want to know, “are you willing to use your brand awareness to effect positive social change?” Which will create more brand awareness. (00:18:47-00:19:09)

Though Burnham says that brands must enter the conversation regarding our culture’s “social reckoning” of 2020 and 2021, his use of irony makes it clear how absurd that statement actually sounds. While brands certainly can do good for social causes, they can also inflict harm by virtue signaling or distracting from real problems. Burnham also points out that publicity often fuels these sorts of positivity and social justice campaigns. The number one priority of a brand or company in a capitalist society will almost certainly be profit. Brands can garner more publicity by using their image to back a social

movement without actually having to do anything about it, and the public will eat it up. In her research on how the public perceives corporate ethics, Elizabeth Bradford Lightfoot found that “consumer activism is the most common way that citizens engage in political participation” (301). Brands are certainly aware of this fact and will use it to their advantage. Burnham’s repetition of the word “social” emphasizes the fact that these kinds of social campaigns do not always equate to tangible justice or activism. A brand can “co-opt such campaigns by advertising that they fit certain ethical consumer shopping preferences” without the actions to back up their advertised ethics (Lightfoot 305). The expectations for brands and companies to take stances on social issues plays right into their hands. Thus, the expectations for brands to have some kind of social or political platform only encourages brands to use activism as a marketing strategy, thereby distracting from the real issues at hand.

Burnham illustrates how the idealization of the privileged and wealthy can perpetuate consumerism at the expense of the economically disadvantaged. Burnham sings “Bezos I” about Jeff Bezos shortly after the “Unpaid Intern” song and his loop of self-reflection, continuing the trend of capitalist critique. He chants Bezos’s name and glorifies his achievements:

Come on, Jeffrey, you can do it  
Pave the way, put your back into it  
Tell us why, show us how  
Look at where you came from, look at you now (00:29:39-00:29:48)

Burnham intentionally uses language suggestive of the American Dream in his description of Bezos, almost conjuring up an image of American heroism. He emphasizes Bezos as a self-made man who changed the world, and not inaccurately. Bezos did change the world. Nevertheless, Burnham satirizes the glorification of both Bezos and the American Dream. Jeff Bezos is not a hero because he made himself exorbitantly rich; his wealth does not make him a good person. Nevertheless, we admire him because of his wealth, regardless of his behavior or ethics—and Amazon has not established itself as the most ethical of companies. The glorification of the American Dream also perpetuates the privileged belief that anyone can pull themselves out of difficult circumstances by sheer willpower and work ethic. Discrimination and prejudice still inhibits marginalized individuals, making them work harder for the same opportunities as the privileged, and Amazon has not been known to treat its employees kindly. Thus, Burnham illustrates how the belief that Bezos serves as an example to be imitated can be traced to the glorification of capitalism and the American Dream at the expense of marginalized groups.

However, the responsibility for consumerism does not fall solely on the shoulders of brands and corporations: Burnham uses the social media landscape of commodification to position consumers as active participants. He immediately follows the earlier social brand consultant skit with his next song, “White Woman’s Instagram.” Throughout the song, Burnham dresses up in clichéd outfits and poses from Instagram posts most often emulated by white women, all the while referencing captions and images that might be seen in posts such as this. In the third verse, he contrasts three different images: “Incredibly derivative political street art / A dreamcatcher bought from Urban Outfitters / A vintage neon sign” (00:23:30-44). Burnham critiques the political messages being conveyed by such Instagram posts, calling the street art “derivative.” This suggests that street art with political messages has become aestheticized and reduced to nothing more than a trend rather than challenging the status quo. If it were truly revolutionary, then the privileged white women of Instagram probably would not be the ones posting it. The line “A dreamcatcher bought from Urban Outfitters” critiques the cultural appropriation tied into consumerism. Dreamcatchers, which once held spiritual significance to some Native American cultures, have largely been commodified and appropriated for white consumers. Lev Manovich notes that “consumer and culture industries have started to systematically turn every subculture” into products to be sold to the masses, and with social media, “not just particular features of particular subcultures but the details of the everyday lives

of hundreds of millions of people” are thus commodified (324). The juxtaposition of these artifacts with a “vintage neon sign” suggests just how meaningless they are rendered by Instagram trends such as these. A vintage neon sign is just that; a trend for spreading a message—no matter how insignificant—in an aesthetically pleasing manner. Social media aestheticism, then, inadvertently trivializes politically and culturally significant messages and markers, instead feeding into commodification and consumerism by extension.

Burnham uses irony and absurdity to effectively call out the general public, himself implicated, for the devastating potential consequences of consumerism. Immediately after the Bezos song, we cut to a shot of Burnham lying under a blanket on the floor of his AirBnB with his head on a pillow, surrounded by the tangled mess of his equipment. He proceeds to briefly monologue about the ethics of consumerism:

I've been thinking recently that [...] allowing giant digital media corporations to exploit the neurochemical drama of our children for profit [...] was a bad call by us. Maybe the flattening of the entire subjective human experience into a lifeless exchange of value that benefits nobody except for [...] a handful of bug-eyed salamanders in Silicon Valley... Maybe that as a way of life forever... Maybe that's not good. 00:30:11-00:31:17.

Burnham makes it sound as though he makes casual conversation, when in reality he does not. He thereby emphasizes the absurdity of what he says. But in making his speech absurd, he also casts what has become a normal manner of life for the general American audience as absurd. Burnham rephrases seemingly innocuous behaviors, such as corporations finding ways to create entertainment that captures the attention of children, to expose the bizarre fact that we actually allow children to be exploited for profit just because it does not look like exploitation. As we get caught up in the everyday grind, we lose touch with the small absurdities we partake in. Children as an example of unchecked exploitation serves the argument in two ways. First, children immediately invoke sympathy, as they are the image of innocence and helplessness. Second, they also embody the compounding consequences of consumerism on future generations. And Burnham's accusations of the exploitation of children are not unfounded: A New Zealand study found that “[i]n 2017, Facebook offered advertisers targeted advertisements to 6.4 million adolescents and young people in Australia and New Zealand” based on when they would be in “emotionally vulnerable states” (Meates 54). Though this took place outside of the United States, Facebook is nevertheless an American company. Thus, Burnham illustrates how the general public in and of itself, while both an agent of consumerism, also enables exploitation by normalizing consumerism, which is merely one of many potential consequences of consumerism on American culture.

Burnham suggests that consumerism has a hand in the development of children to adults, and the technology we rely on may take a bigger toll on the mind than we can truly understand. Burnham sings a lament on turning 30 years old, appropriately titled “30,” voicing his despondency at reaching this milestone in quarantine and his lack of apparent adult accomplishments:

I used to make fun of the boomers; in retrospect, a bit too much  
Now all these fucking zoomers are telling me that I'm out of touch?  
Oh yeah? Well, your fucking phones are poisoning your minds. Okay? So when you develop a dissociative mental disorder in your late twenties, don't come crawling back to m-  
(00:45:11-00:45:29)

The generational contrast between “boomers” and “zoomers” constitutes more than just a joke about “kids these days.” It also calls attention to the experiential gap between even adjacent generations; the boom of entertainment and technology instantly accessible to children may be creating issues that are yet to be understood by older generations. We are still discovering the potential consequences of consumerism and internet consumption in those of us who have been raised with easily accessible technology. Hence Burnham's accusation that “phones are poisoning your minds.” Once again, Burnham satirizes the older generations that misunderstand technology, but simultaneously critiques our addiction to and consumption of the internet and our reliance on technology.

Burnham sarcastically blames phones for his own mental disorder, but the joke nevertheless prompts his audience to think about the consequences of this type of consumption on mental health. Phones merely play the role of a catalyst for the compounding pressures that the internet provides, such as surveillance and cancel culture, as well as the accessibility to limitless consumption proves destructive to the human experience.

### MENTAL HEALTH

Burnham frames the removal of our humanity from our everyday interactions in lieu of digital communication, as exacerbated by the pandemic, contributes to the increasing anxiety surrounding social interactions and division in our culture. Burnham sits on a stool, stripped down, in front of his projector as it beams images of the leafy shade of trees on the walls.



Figure 3: Still from Burnham, Inside 01:03:35).

Burnham conveys the lesson that Covid-19 taught:

I've learned that real-world human-to-human tactile contact will kill you, and that all human interaction, whether it be social, political, spiritual, sexual, or interpersonal, should be contained in the much more safe, much more real interior digital space. (1:03:07-1:03:27)

While obvious hyperbole, the statement reveals an anxiety stemming from the pandemic. The viral disease made us afraid of each other and forced us to find alternative ways to interact, such as the internet or social media. In 1998, Darier and Mehta already observed that “electronic communication is transforming human experience into a virtual experience” (112). The removal of our interactions from each other also indicates the removal of humanity from our interactions. The digital world sterilizes our interactions. No longer do we see each other as people, but as words on a screen, which in turn deepens the polarization we have found ourselves in. The leafy projection on the wall behind Burnham and the nature sounds that play in the background lend a false sense of nature to the scene, speaking to the artificiality in Burnham’s monologue about human interaction (see fig. 3). Removal of human interaction into the digital world must also mean removal from the natural world. By exposing the attitudes of antisocial interaction that the pandemic fostered, Burnham also exposes the sterilization and suspicion that has infiltrated our interactions, thus creating a cultural anxiety over real human contact and conflict.

Burnham suggests that the limitless potential of the internet actually limits human potential by crippling us with instant gratification and feeding into depression and anxiety. Burnham sings “Welcome to the Internet” as a love/hate letter to the internet itself and what it provides. After laying out everything the internet is capable of, from innocent DIY solutions to violence and pornography, the chorus proposes a sinister question: “Could I interest you in everything all of the time? / A bit of everything all of the time / Apathy’s a tragedy, and boredom is a crime” (00:58:10-00:58:19). In spite of the incredible advances we have made in technology, as well as the endless conveniences and efficiencies we

have developed through the internet, Burnham raises the question of what happens when people are given limitless access to apparently infinite information. The constant plague of instant gratification turns boredom into a crime as it pushes our minds to the farthest limit of what it can handle, destroying our capacity to slow down and be patient. While it may solve some problems, it exacerbates others. Though “apathy’s a tragedy,” depression and anxiety have skyrocketed in recent years, and the internet has done nothing to help; rather, it may hurt more than it helps. The internet may contribute to anxiety and depression by overwhelming them with the state of the world and everything wrong with it. Additionally, some studies have shown that “internet addiction was strongly associated [...] with mental symptoms, serious mental illness, and suicidality” (Guo et. al.). Thus, Burnham calls into question how much we rely on the internet to satisfy our needs and keep us entertained. Rather, he points to its potentially devastating effects on the human mind and mental health.

Burnham intertwines his underlying themes of climate change into his conversation on mental health by connecting it with our cultural anxieties, thus connecting it to the mental health epidemic that ravages an increasing number of Americans. Returning to “All Eyes on Me,” Burnham interrupts the repetitive, chanting lyrics of the song by switching it up in the third verse. The tone of the song changes; where he once demanded things of his audience, he begins to discourse with them: “You say the ocean’s rising like I give a shit / You say the whole world’s ending, honey, it already did” (1:15:50-1:16:00). Burnham brings up the rising sea levels that result from climate change, a frequent theme throughout *Inside*. He juxtaposes climate change with the end of the world. The prognosis of our planet does seem bleak and dystopic. Every year, we experience more natural disasters and decay. This has created a sense of cultural anxiety surrounding climate change, especially in younger generations, as it directly pertains to our future. While simultaneously highlighting the issue of climate change, Burnham seems to mock it. He sings “like I give a shit” as if he does not care at all, but he does not suggest it is not real; rather, he articulates a pervading sense of hopelessness by comparing it to the end of the world. Thus, the world is as good as ended already. He frames climate change as an unstoppable force that has already been set in motion. Thus, climate change, too, plagues our collective subconscious by creating anxiety about our future and the state of the world. Its inevitability makes us weak.

Burnham draws on the Covid-19 pandemic not as a cause, but a catalyst for the mental health pandemic that plagues many young American adults in the twenty-first century. In “That Funny Feeling,” Burnham draws countless parallels and contrasts between a culture of consumerism and instant gratification, social surveillance, and wanting to come back down to earth all at once. Towards the end of the song, however, Burnham narrows his focus from broad cultural phenomena to a localized individual experience:

Total disassociation, fully out your mind  
Googling “derealization,” hating what you find  
That unapparent summer air in early fall  
The quiet comprehending of the ending of it all (1:07:28-1:07:59)

In a moment of intimacy, without the veil of sarcasm or satire, Burnham offers his audience a window into his personal experiences with agoraphobia, or an anxiety disorder that manifests with the fear of being in crowded spaces or going out in public altogether. He reveals the crippling nature of the disorder with the irony of having “a book on getting better hand-delivered by a drone,” which suggests that he could not even go out and get help; but had to use technology to even do so. While Burnham details his own experiences, he also connects to his audience, as many of us experienced the fear and anxiety of the Covid-19 quarantine in 2020. Quarantine for many proved to be detrimental to mental health, and anxiety and depression were exacerbated by the pandemic: medical studies have found that “evidence from the COVID-19 pandemic reveals considerably elevated levels of adverse mental health symptoms compared with prepandemic years

[...] As early as April 2020, anxiety and depression symptoms in the United States were two to four times as prevalent as in 2019” (Czeisler et. al. 1590). In describing the experience of “googling ‘derealization,’” Burnham articulates something many people may relate to having experienced during quarantine as mental health issues were brought to the surface of the consciousness by being isolated from the outside world. Many people were alone with their thoughts and were forced to face the reality of mental illness. I argue that the pandemic did not create the mental health pandemic, but it revealed what was already lurking just beneath the surface, and was not revealed until everything else about our culture— consumerism, surveillance, and so on—had been stripped away.

Ultimately, *Inside* provides a space of reckoning through which Burnham articulates the diseases that plague our culture unchecked. The rise of the internet gives a platform to virtually limitless voices and individuals, but in doing so, has set into motion a flawed system of surveillance, submerging the individual in a sort of internet panopticon. Where the internet and social media provides a platform, it also subjects its users to the scrutiny of a potentially vast yet unknowable audience. This audience then drives the individual into a state of anxiety. Additionally, entertainment and social brands breed consumerism with endless technology and other grabs. Consumerism then serves as a plague by infecting audiences with a reliance on brands for social movements and entertainment at the expense of marginalized groups and yet unknown cognitive consequences. At the same time, Burnham reminds his audience that complicity in surveillance and consumerism feeds into these potentially destructive cycles, contributing to the overarching mental health pandemic that currently wrecks the United States.

We shape the world to be what it is. We participate in consumerism; brands only go on superficial social justice campaigns because we praise them for it and purchase the very products they are pushing on us. Audiences drive the constant stream of eye-catching entertainment that funnels into our heads from our phones and televisions. We choose what we worship by watching the advertisements, retweeting the hashtags, and worshipping the business entities. We funnel our money into the pockets of the “bug-eyed salamanders in Silicon Valley” and fill up landfills with every Amazon order and Facebook post (00:31:03). We put our voices out into the world, drowning out some and idolizing others. Burnham wants us to realize how much we have come to rely on these superficial things, as well as the damage they inflict on the human psyche. And though the realization of our complicity paints a bleak picture, not all hope is lost. As Rowan Williams theorizes “that to recognise complicity in this way, to name the moral risk of our shared world and the blood that is on our hands, is the beginning of whatever redemption can be imagined” (211). Using comedy, Burnham exposes the absurdity of our lifestyles, thereby begging the question: What do we want the “new normal” to look like? By convicting us of our complicity in these cultural plagues, Burnham challenges viewers to rethink the way we live and become agents of change. And though he may not be able to heal the world through comedy, in *Inside*, Burnham rips off the bandaid.

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**FALL 2022**



# MANAGING SUSTAINABLE ENTITIES

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*SANTIAGO FERNANDEZ*

**M**anagement is a crucial skill that the most successful people and groups have in the economic world. Besides being able to manage people and activities, it is basic that we do the same for our resources. Now more than ever do we need to assure that resources used to uplift companies are properly managed. There are not enough resources in the world for all entities to use deliberately, without properly allocating them. As we know, all groups are upheld to the social responsibility of making decisions that benefit society. If we disregard the immense damage that is being done by multinational companies in increasing the greenhouse gas emissions, there will be no need to continue economic activities. Current and future generations in the economic area see wrongdoing in previous activities from groups that have damaged and destroyed ecosystems on the mere basis of expanding their capital. There is an upcoming wave of economists, businesses, managers, and investors that want to redirect the economic model we see today, so it goes in hand with a green, efficient, and sustainable environment. This research divulges on the major points to manage a structured, successful, and sustainable business.

Former structures of businesses have been adapted to new necessary ways of managing themselves. Sustainability has been defined in various ways, but still holds the same essence when we speak about it. The World Commission on Environment and Development defined it as, “the ability to meet today’s global economic, environmental and social needs without compromising the opportunity for future generations to meet theirs.” The Dow Jones Sustainability Group Index defined sustainability as, “a business approach to creating long-term shareholder value by embracing opportunities and risks deriving from economic, environmental, and social developments.” Both these definitions tend to direct economic activities in a particular direction, but they can still be widely interpreted. A pioneer in the economic area regarding sustain ability was “The Natural Step”. This non-profit organization from Sweden was founded in 1989 and has been developing since then on viable sustainable options for companies. Their most recognizable proposal was “Backcasting from Sustainability Principles” which challenges the known discipline of business forecasting. Instead, management should look for

a desired future outcome and work towards achieving it. Because each company has different business practices, the proposed plan is one that adheres to all entities in the marketplace.

The fact of global warming on our planet is playing a part in how business is taking a sharp turn. All industries and companies conducting business to this day have a necessity to realize that their external environment is in a compelling situation. There is almost no perceivable uncertainty that the issue will cause change in business and its trends. Even though it is argumentative that companies should act upon this issue without speculating, it also entails their best interest to address carbon emissions for their company's sake. Sustainable business makes good economic sense because this produces critical enduring shareholder value.

### **ETHICAL AND SOCIAL DUTY**

To successfully implement a sustainable business, it is important to establish a concise mission and belief within a company. According to our book, *MGMT 10: Principles of Management*, businesses' ethical responsibility is to conduct operations without violating principles of right and wrong (85). As mentioned before, the new wave of professionals in the economic area feel to a high degree the necessity to attack the issue of carbon emissions. As these individuals rise to lead worldwide corporations and companies, the popular society will have the same view and ethical intensity regarding global warming (74). With this in mind, it is necessary for the head of the company to maintain a mission with an ideal value of sustainability. Said entity should demonstrate to its shareholders and stakeholders its consciousness about greenhouse gas emissions, all the while maintaining transparency in its business decisions. Social responsiveness refers to a company's form of handling stakeholders' economic, legal, ethical, and optional expectations (87). This is key to those involved with the company because it is critical to maintaining a competitive advantage. Therefore, it is in their best interest to devote the necessary attention and effort to becoming part of the solution and not part of the problem. Sustainability Ethics assesses relationships are necessary and there are three crucial relationships of human beings in this area. The relationship between humans and their contemporary, the relationship between currently living humans and future generations, the relationship between humans and nature (Becker 2011).

### **ORGANIZATIONAL CULTURE**

Part of creating and maintaining a sustainable company is establishing an organizational culture inside the business that goes along with necessities of our planet. The term Organizational Culture is relatively new. It emerged in the 70's and 80's and despite various definitions Linnenluecke mentions that Schein's breakdown of term is highly accepted, "the observable culture (the visible organizational structure, processes and behaviors), espoused values (strategies, goals and philosophies), and underlying assumptions (unconscious beliefs and perceptions which form the ultimate source of values and action).

The adaptability aspect of these industries to climate change will locate them in favorable or unfavorable positions in the long run. The United Nations has declared that carbon emissions need to be decreased by 50% by 2030 before there is an irreversible change caused to our ozone. Externally, profit blinded entities will suffer social defamation sooner than later. Advocacy groups behind this cause are becoming more aggressive in their pursuits. Media advocacy, which is defined as framing these issues in the public's best interest, will be clearer as time moves on. Boycotting products or services will also occur to the lingering companies that do not assume their responsibility to the environment. Every head of management can attest to the unpleasantness of suffering these acts from society and seeing the necessity for a change.

## INNOVATION AND CHANGE

Adapting to the future economic scenery in the coming years is what companies must do if they want to stay financially stable. Part of that process is recognizing inevitable change, all resistance to change will slow down any business and cause an organizational decline. The carbon emission impact on earth and its association to how much is coming from corporations, has changed the traditional thought of innovation. Companies need to nourish society rather than generate waste, so redesigning how most of them operate is necessary and possible. Revolutions in methods and practices are now unlikely to result solely from technological innovation and market incentives. Primarily, because resource allocation (before and after use in some cases) has shown great importance for shareholders and will increase to. The information presented of change and innovation is ideally used for companies that already perform business on a usual level. The terms provided in Dr. Williams Book, *MGMT 10* “unfreezing”, “change intervention” and “refreezing” institute what change for active companies should entail. Starting by getting people involved with the business to recognize the importance and need for change (unfreezing), implementing change in the most effective possible way (change intervention), and then reinforcing that change so it stays the same (refreezing). Part of an essential innovation to build a durable business is implementing a creative work environment throughout management. According to Jonathan Scott in his book *Sustainable Business* (2013), “When employees are excluded from decision-making, innovation, and idea creation they tend to withdraw from improvement processes, but when they are listened to and get involved, they can contribute significantly to productivity, retention and innovation” (pp. 68). The sustainable factor in various companies signifies change, therefore a creative work environment along with an organizational culture that is socially dependent helps institute that change.

Leaders in innovation constitute change beyond their own companies. For certain sustainable efforts market conditions have to be up to par for those projects to be effective. Leaders should aim to influence societal and market changes. In Schaltegger and Wagner’s article *Sustainable Entrepreneurship and Sustainability Innovation* they claim that “entrepreneurial activities aiming at sustainable development have to consider market issues and, in addition, aim at influencing market conditions”. With innovative intent, companies and executives should look to exceed expectations, because innovation and improvement cannot occur if performance is not at the highest level. Seeking incremental innovation is key to sustaining a competitive advantage. However, if the goal is merely economically motivated, companies will deter long-term improvements once those goals have been met. Changes do not need to be abysmal, but going in the right direction slowly is better than advancing and then staying in the same place.

## LEADERSHIP

Stakeholder satisfaction is dominant to any sustainable business. Leadership’s interaction with internal and external factors needs to demonstrate transparency. Not only does this attest to the stakeholder model, but it also relates to the organizational culture and creative work environment that is encouraged. As Dr. Rainey mentions in *Sustainable Business Development* (2006), “Active participation of the executive ranks provides the evidence of leadership and commitment and encourages managers and employees to reach beyond normal expectations and seek the extraordinary” (pp. 341). For the management department to work effectively, leadership style must be embedded with people that want to work together at each level to discuss strategic and tactical decisions. A team that recognizes and invests in collaboration, cooperation and relationships with its environment, reflects that growth mind-set that valuable investors appreciate.

It is fundamental that leadership commits fully to the organizational culture of its company. This is even more crucial for businesses that are having to change their traditional interactions and how they perform them. Which demonstrates why it is important to have a dedicated CEO, COO, CFO and so forth in a sustainable company. There is a

situational favorableness for sustainable companies that have ethical, visionary, strategic and charismatic leadership as well as capacity to implement consultative or group decisions within teams.

The importance of leadership must not be underestimated, because it is these individuals that link all the sections mentioned in this proposal. Employees must maintain a sense of fulfillment through their regular activities in a sustainable business in order to reach maximum efficiency and motivation. *Full-range leadership* is highlighted (by Galpin & Whittington, 2012) as an effective form to lead a company under sustainable branches. According to this theory transactional and transformational leadership go together to impose change in an organization and maintain a beneficial work environment. Commencing with transactional leadership, managers must dictate clear goals and the rewards for reaching those goals. Effectively, “when the leader consistently follows through with the rewards that are promised in exchange for that performance, trust and commitment emerge”, assures Galpin & Whittington (2012). Then in transformational leadership, the 4 I’s come into play; idealized vision, inspirational motivation, intellectual motivation, individualized consideration. The first “I” refers to role-modeling leadership taken by managers. Secondly, inspirational motivation is the sense of meaning and purpose behind the work employees are doing and the positive outcomes that lie in the future. Intellectual motivation lies in the responsibility of the leader to “question assumptions, reframe problems, and approach existing situations from a fresh perspective” (pp. 44). The final I (individualized consideration) affirms the importance of the leader’s ability to fulfill a mentoring role for employees and seek their growth as well as the company’s.

## GLOBAL FRAMEWORKS

Multinational corporations that want to be a part of change must apprehend international frameworks to gain social recognition. Various frameworks used are to report standards, performance, and socially responsible investment ratings (for stakeholders). Examples of these are the Global Reporting Initiative (GRI), the Organization for Economic Cooperation and Development (OECD), UN Global Compact, and INNOVEST. Some corporations view the standards as a challenge rather than an opportunity. Demonstrating intent to cooperate on a global scale attains important stakeholder interest, and ultimately rewards a competitive advantage. Implementing the standards to management and employees becomes decisive to maintain effective global consistency. An international company that embodies the characteristics mentioned before is Amazon.com, Inc. Its leadership style as well as global management is proving to be effective. The organization has pledged to meet the Paris Agreement and achieve 100% of net zero carbon emissions by 2040. Adhering to these shifts in business goes in hand with Amazon’s client satisfaction mission and helps build their sustainable value.

## COMMUNICATION

Communication is primal to sustainability reporting for companies. We mentioned previously the global frameworks to which entities can adhere to. Active communication needs to be external as well as internal. Theories in sustainability argue that there is a “positive influence of CSR on market capitalization value... (and) CSR negatively relates with the cost of capital” (Jianu, Turlea, Gusatu 2015). Therefore, the external communication of goals, strategies, and outcomes reaps advantages in seizing investors but in showing the genuine intent behind the organization. These sustainable businesses have to communicate results effectively to demonstrate that their sustainability efforts are not just a facade intended solely to quickly raise share and market value. We also see the importance communication has on marketing for sustainable organizations. It provides favorable perspectives on pricing strategy, brand, and online communication for stakeholders. Avid engagement demonstrating that the entity is aware of its carbon footprint can be a great advantage in attracting stakeholders.

The organizational culture of a company as well as its business style tends to rely heavily on communication. A lot of problems in management, Scott (2013) identifies, "... usually boil down to lack of communication. Poor communication results in employees not performing to the utmost of their ability and the organization as a whole not pulling in one direction." (pp. 36) Therefore, we can associate an effective communication structure with a successful sustainable company. One specifically that exploits communication on all levels, (Williams, 2017) downward, upward, horizontal and does it actively listening as well. Prior to conveying a message, management's feedback is key to keep the group heading in the right direction. Not only does it need to come from top leaders, but also members that are a part of the organization's processes. Reports from individuals involved in the business are prime to verify how communication or a change in communication process has affected the company and if there needs to be adjustments.

## CONTROL

The internal management of operations and how it meets its standards can define whether a company rises or plummets through the change of traditional practices in operating businesses or the implementation of sustainability in upcoming businesses. Proposals such as measurement reviews and program evaluations are tools that teams can use to assure that the organization is on a beneficial pathway. There are regulation costs when using these tools but the benefit achieved (in a stakeholder model view) is much greater. Organizational culture is a great part of a sustainable company's success. In some ways it must also be the benchmark when monitoring employees and outputs. Normative Control is embodied by management offices that maintain a company firm on its business ventures. It consists of (Williams 2017) regulating workers and activities through shared beliefs in the organizational culture. Although, managers must not hold on to the traditional value of control, because there is a paradigm shift in the idea of management. Loosening the exclusive control of the business opens the door to loyal customers, intelligent employees and innovative suppliers.

## CONCLUSION

One cannot expect to effectively manage a business in a sustainable manner if he/she does not possess the necessary motivation, desire, and understanding whilst doing so. Implementing this vision of sustainability must go beyond top leadership and be a root of determination for employees as well. The organizational culture is the method through which this is done and it stems out to other management practices. This paper highlighted the necessary attributes needed from management to precisely accomplish the goals set in recognizable frameworks. In hindsight, it consists primarily of recognizing the carbon emission impact coming from the profitable marketplace and addressing the issue in a collective manner.

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# GODS, KINGS, AND TEENAGERS: Y.A. FANTASY LITERATURE AS NARRATIVE THERAPY

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DOMINIC GRIMALDI

In an article from *Psychology Today*, psychologist Gregg Henriques claims that in the past 15-20 years, there has been a dramatic increase in mental health treatment for college-age adults. Rates jumped from 19% in 2007 to 34% in 2017. For lifetime diagnosis, rates again soared from 22% in 2007 to 34% in 2017. In 1980, one out of every ten students needed mental health care. A third of all college students in America receive mental health care (Henriques, *Psychology Today*). Emotional fragility and distress among young adults have increased in the past two decades. The exact cause remains debated, but a potential coping mechanism exists in YA fantasy literature. This thesis will demonstrate a plausible connection between YA fantasy literature and narrative therapy.

To accomplish this, current forms of art therapy will be defined and examined to investigate the protagonist's mental health and relationships in one primary young adult fantasy text and demonstrate that young adult fantasy literature significantly improves mental well-being and is thus worthy of consideration as narrative therapy. The primary text (*A Court of Silver Flames*) was selected because the main protagonist, Nesta Archeron, grapples with multiple mental health issues and can overcome them with assistance from significant relationships in her life. My research indicates a defined link between young adult fantasy literature consumption and the alleviation of anxiety and depression. This is accomplished by interaction with a transpositional narrative therapy in which the struggles of reality are re-interpreted in the environment of a new, fictional world. The critical distance maintained by this approach allows readers to process trauma as the characters they interact with, and the struggles and triumphs of the main protagonist can model the recovery process. This paper will report the findings, explain the link, and suggest young adult fantasy literature as a form of narrative therapy, potentially alleviating mental health symptoms.

To be considered young adult fantasy, the book must cater to an audience of 12-18-year-olds. In addition, the main characters are generally young adults grappling with typical themes such as romance and biological or intellectual maturing. This kind

of work is important, as the main characters often model the coming-of-age struggles endured by most adolescents, making them a relatable point of contact for one of life's most emotionally conflicting stages. Many young adults need extra help navigating this challenging part of life, and fantasy literature might contain a new way of addressing their heightened emotional stress. This extra help comes in the form of narrative therapy.

The APA defines narrative exposure therapy (NET) as "a treatment for trauma disorders, particularly in individuals suffering from complex and multiple trauma. It has been most frequently used in community settings and with individuals who experienced trauma due to political, cultural, or social forces." It is characterized by the recognition that people tell themselves stories about their lives and that these stories influence how they perceive themselves. For example, if someone defines themselves solely by their traumatic experiences, they will consistently feel traumatized. A patient goes through NET under the supervision of a therapist, intending to establish a chronological narrative of the patient's life, trauma and all. In the process of creating the narrative, "the patient fills in details of fragmentary memories and develops a coherent autobiographical story. In so doing, the memory of a traumatic episode is refined and understood" (apa.org).

This process of narrativizing the patient's life can be seen in fantasy literature, where young adults may process their trauma by watching their favorite main characters grapple with physical and mental adversity. In doing so, the reader engages in a kind of narrative therapy, able to explore and process trauma by uncovering buried truths through the distanced lens of an imaginary character in a fictional world. By transposing real trauma into a fictional world, readers are encouraged to grapple with their own as they follow the narrative structure of the characters. The characters and their struggles are real, but the environment they interact in is fictional, providing the reader with a critical distance to reflect on their own lives.

Richard Kearney, a philosopher, writes about the power of narrative in his book, *On Stories*. He holds that stories not only entertain us but deliver meaning to our lives and identities. Kearney argues that a story recounts "your present condition in the light of past memories and future anticipations" (Kearney). When we are asked to describe ourselves, we tell a story about who we are currently, what we are doing, and where we want to be. We represent ourselves as unfinished stories; therefore, narrative, or telling one's story in relation to others, should be seen as a fundamental principle of human existence. Storytelling goes back as far as the ancient Greeks with Aristotle and his poetic mythos, which focused on narration as a cathartic process where every story was open-ended. It becomes a kind of storytelling that "forever fails to cure trauma but never fails to try to heal it" (Kearney, "Narrative Imagination and Catharsis"). This is accomplished by converting pity into compassion and fear into serenity. A properly narrated story will allow the reader to relate to the story's pain through compassion but also maintain a healthy distance from the pain through serenity. This prevents the pain expressed in the story from fusing with the reader's own trauma.

Kearney draws on this ancient knowledge to support his claim that narrative is central to human experience. He claims that "the art of storytelling-defined as the dramatic imitating and plotting of human action- is what gives us a shareable world" (Kearney 28). Narrative is how we relate to each other, and is therefore fundamental to human expression. Through this primal relatability, the coping mechanisms of narrative and fantasy literature begin to emerge. Fictional narratives can provide a necessary level of cognitive dissociation from reality, where deep truths exposed by characters can be explored and interpreted by readers. Stories can retrieve psychic trauma in a way most formal disciplines cannot. Kearney claims, "People suffering from psychiatric or psychological disorders are more likely to get better when they believe their stories are being heard in addition to being 'treated' in a purely clinical or biochemical way" (39). The experience of being known or understood is rooted in an ancient desire for acceptance amongst our peers. Many fantasy novels (such as the ones I listed for study above) demonstrate how being understood can help a person endure some of the worst pain imaginable.

Another author who engages with fantasy literature as a form of therapy is the famed

J.R.R. Tolkien, who most would consider the founder of modern fantasy literature. He wrote during WWI and WWII, a time known for causing some of the greatest psychological distress in human history. It was a period of great unrest and disillusionment with the world, as many Europeans encountered horrific brutality and loss of life on an unimaginable scale. During these mentally insecure times, Tolkien insisted that fantasy literature was a healing balm. In his essay *On Fairy Stories*, Tolkien claimed that fantasy literature helped people cope with difficult situations through recovery, escape, and the happy ending.

The recovery, or regaining a clear view, was important to Tolkien. He argued that fantasy literature allows us to reorient ourselves during difficult circumstances. Because creative fantasy is “mainly trying to do something else [create a new story],” it “may open your hoard and let all the locked things fly away” (Tolkien 19). Young adult fantasy literature gives youth the space to recover through distraction. Immersing someone in a different world while they are enduring something difficult is essential to what fantasy works provide. The separation of another world with different concerns allows the reader to reorient and “breathe” in a way that is impossible when our reality is poignantly pressing.

Another important aspect of fantasy literature is the escape. In defense of this, Tolkien created the famous Escaping Prisoner Analogy, where he claims, “Why should a man be scorned if, finding himself in prison, he tries to get out and go home? Or if, when he cannot do so, he thinks and talks about topics other than jailers and prison walls? The world outside has not become less real because the prisoner cannot see it” (Tolkien 20). If someone feels trapped in a situation, why should they be forced to only think about what is troubling them? In fact, if we are willing to admit it, most people get through difficult situations by doing other things to distract them from the issue as they work through it. Reading young adult fantasy provides a healthy way to escape for a moment to find our resolve to press through adversity. Tolkien and other proponents of fantasy literature are often criticized for encouraging a kind of literary escapism in which people are encouraged to disassociate from their lives entirely. However, this is a misinterpretation of their intent. Escaping reality through a fantasy work is meant to provide a *temporary refuge* from present difficulty. It is not meant to excuse the participant from *all responsibility* for their life, only to give them a brief moment of rest to strengthen them in their journey. This is not a willful delusion, just a deliberate break to reorient.

The final and most important aspect of fantasy literature is the happy ending. Tolkien argues that this differentiates fantasy literature from any other kind of literature. “It is the mark of a good fairy story...that however wild its events, however fantastic or terrible the adventures, it can give...when the turn comes, a catch of breath, a beat and lifting of the heart, near to tears, as keen as that given by any form of literary art” (Tolkien 23). In other words, the happy ending, the “sudden joyous turn” despite all odds, is the essential marker of a fairy story (Tolkien 22). It is important to note here that the existence of a happy ending does not deny the reality of grief in our lives. What it does deny is a universal and final defeat from adversity. No matter how difficult it gets or what is sacrificed, the main character emerges victorious. This message of hope is designed to encourage the reader through whatever difficulty they are enduring in reality, as no matter how dark it gets, there will always be a way to move forward. This idea is central to narrative therapy, where the focus is to help the patient identify a narrative that goes beyond whatever trauma they have endured, preventing them from being solely identified by it. Fantasy literature is designed to do this through its critical distance from the reader and its encouragement to move forward as the reader watches characters grapple with serious obstacles and come out better on the other side.

A fellow author and contemporary of Tolkien, C.S. Lewis also extensively studied the impact of stories on life, drawing inspiration for his work from ancient Norse and Greek myths. In his critical work, *On Stories and Other Essays on Literature*, he examines why fantasy stories are such a potent form of communication and should not be devalued because of their target audience. In his essay “On Stories,” Lewis argues that the pleasure given by “children’s stories” has been overlooked and misunderstood. On

page 13, he claims that the function of art is to “present what the narrow and desperately practical perspectives of real life exclude.” The goal of art, and therefore literature, is to expose deep truths that are often ignored or numbed under the bustle of reality. The unrealistic nature of fantasy does not hide the harshness of life. In fact, “the happiness which it presents to us is in fact so full of the simplest and most attainable things- food, sleep, exercise, friendship, the face of nature, even (in a sense) religion” (Lewis 19). As for what it does to the reader psychologically, Lewis claims that “the whole story, paradoxically enough, strengthens our relish for real life. This excursion into the preposterous sends us back with renewed pleasure to the actual” (Lewis 19). As a reader interacts with a fantasy work, the unrealistic nature of the world, characters, and setting give the reader the strength to continue coping with reality. In fantasy, the character drives the plot. Immersive world-building is important to give the reader a critical distance from the difficulties the story will unpack. However, how the characters interact with the world and each other will ultimately determine the reader’s response. The characters serve as an ethical lay line for the reader. Through their actions and reactions, the reader may learn how to cope with difficulty and trauma in their daily lives. Stories can guide us toward a better picture of reality. Through fantasy literature, we can “catch in our net of successive moments something that is not successive” (Lewis 28). Young adult fantasy literature can help capture these moments, turning daily experiences into something beautiful, real, and permanent by transposing them into another world.

In his second essay, “Sometimes Fairy Stories May Say Best What’s to be Said,” Lewis argues that the fairy story might be one of the best ways to convey truth. Casting the truths of reality into an imaginary world could make stories appear in real potency. In such a manner, one could “thus steal past those watchful dragons [of reason and rationality]” (Lewis 70). Stories can present truth in a way that slips past our guard simply because it is a story. If the reader is convinced that the events are fictional, their guard is lowered, making them receptive to whatever message the story was designed to convey. In addition, he argues that “The inhibitions which I hoped my stories would overcome in a child’s mind may exist in a grown-up’s mind too, and may perhaps be overcome by the same means” (Lewis 72). Reserving fantasy literature specifically for children does everyone a disservice. Truth should be relevant no matter the age of the reader. Fantasy literature is uniquely capable of delivering truth in the following ways. Fantasy literature can generalize while also remaining concrete. It can present abstract concepts, experiences, or entire classes of experiences in an easily digestible format. Most importantly, fantasy can give readers experiences they have never had, enriching their lives as a result.

An example text will be provided to demonstrate this: *A Court of Silver Flames*, by Sara J. Maas. will outline the basic plotline and the mental hurdles given to the main character Nesta Archeron. While most of J. Maas’ work critically engages with mental health in some way, *A Court of Silver Flames* is the best portrayal of mental health struggles for study purposes. The main protagonist, Nesta Archeron, struggles with several mental issues, including recurring PTSD, depression, low self-esteem, and crippling guilt. One of the many reasons for this is the brutal death of her father at the hands of the enemy king in the previous book. Nesta did not have a great relationship with him due to his neglect during a phase of poverty. As a result, she feels terribly guilty that he died loving her while she hated him for his shortcomings. Throughout the book, Nesta practices many of the pro-mental health ideas supported by Lewis, Tolkien, and Kearney. In particular, Nesta relies on a strong network of family friends and a significant other to lift her out of her current slump.

Her journey with mental health is mapped out via a selection of important quotes from different periods of her mental health journey. The purpose of this is to demonstrate that Nesta began her journey broken and disillusioned and emerged not unscathed but healing with hope for the future. In providing hope for the future, fantasy literature gives the reader a simulated blueprint to follow. By following this blueprint, the reader who struggles with similar mental health issues can vicariously experience, and therefore learn from, Nesta’s triumphs and tribulations. From the beginning, it is clear that friendship is

important to overcoming mental obstacles.

The journey begins on page 505, where Nesta has decided that she is fundamentally worthless and does not have the strength to change who she is, though she sees the pain she causes her loved ones. Cassian responds,

“These tears mean you care. I am going to tell you that it is not too late, not for any of it. And I can’t tell you when, or how, but it will get better. What you feel, this guilt and pain and self-loathing—you will get through it. But only if you are willing to fight. Only if you are willing to face it and embrace it, and walk through it, to emerge on the other side of it. And maybe you will still feel that tinge of pain, but there is another side, a better side” (J. Maas).

Here, Cassian is modeling a supportive friend, encouraging Nesta to face her fears and come out on the other side as a better person. This mirrors Tolkien’s claim that fantasy retroactively helps readers work through trauma as they learn coping behaviors from characters grappling with similar issues. A reader could subconsciously absorb this, as Lewis claims, is bound to happen when encountering fairy stories and learn how to cope with mental health purely by watching the main character model it. Encased in this fictional story is a powerful message for struggling young adults. Difficulties can be overcome with persistence as long as you have strong support.

Later in her journey, Nesta is comforted by Amren, a close friend whose relationship soured as Nesta became more mentally unhealthy. Nesta can repair their friendship as time passes, earning a compliment and some advice from Amren. “That’s the key, isn’t it? To know the darkness will always remain, but how you choose to face it, handle it... that’s the important part. To not let it consume. To focus upon the good, the things that fill you with wonder” (J. Maas 633). This dialogue represents a pivotal moment in Nesta’s journey. After several months of fighting for her sanity, she finally emerged from the darkness. She is not unscathed, but she is ready to live as a healthy person once more. Once more, Nesta’s character models healthy ways to overcome mental struggles in a way that is easily absorbed and emulated by the reader. As Tolkien stated earlier, it is an essential aspect of fantasy literature that people are drawn away from everyday life to face their fears in a safe way. The reader becomes part of the fictional space while maintaining a presence in the physical world, creating a mirroring effect in which the character’s and readers’ experiences are shared.

The importance of friendship is essential in Nesta’s recovery. From the beginning, the book focuses on an enemies-to-lovers arc between herself and Cassian. In an underlying aspect, the book invites readers to watch Nesta build strong friendships with three other women who were victims of wartime trauma. As the story progresses, Nesta, and in turn, the reader, realize how essential companionship is to be lifted out of dark times. Nesta claims that “As long as she had Cassian at her side, her friends with her, she could do it. Face it. They wouldn’t let her fall back into that pit. Cassian would never let her fall again” (J. Maas 645). One of the key steps to overcoming depression and other mental health issues is forming a strong social support system.

By the end of the novel, Nesta recognizes that “we need [hurtful things] in order to appreciate the good. Some days might be more difficult than others, but... I want to experience all of it, live through all of it. With them” (J. Maas 734). Fantasy literature effectively communicates deep truth while maintaining a critical distance from the issues clouding the reader’s life. In reading YA fantasy such as *A Court of Thorns and Roses*, readers not only escape from difficult life circumstances, they can gain real advice in times of need. Characters like Nesta, who model good behavior, should be emulated. Readers can learn real human responses to mental health issues through the transpositional process. Nesta successfully demonstrates how to grapple with and overcome mental health struggles through her character journey.

In support of this, social psychologist Karen Dill-Shackleford provides extensive commentary on how reading fantasy literature shapes social life. The article attempts to answer the question, “Why do fictional narratives matter?” The short answer is that people gain insight into what makes life meaningful by engaging with fictional characters

and worlds through narrative. There is an extensive psychological inquiry into why meaningful fiction might be good at evoking memories in a safe way. According to Dill-Shackelford, “The basis of believable fiction is reality because it is written by real people to evoke real social thoughts, feelings, and behaviors” (3). In this line of thought, they argue that the key tenets of fictional narratives allow readers to engage with sensitive memories, learn social behaviors, grapple with difficult emotions, and even simulate social connection or belonging. The key to this engagement is the character, who lends a story its relatability through their connections to other characters and the world around them. This fictional social network is often based on reality, as real authors have created them. As a result, these fictional networks mirror real social networks by inviting the reader to engage in social behavior while fulfilling needs and gratifications.

These needs and gratifications are what readers experience by participating in Nesta’s journey as a parasocial relationship. That is, a one-sided relationship initiated by the reader that simulates a real-life social relationship with the character. Within this space, the character’s and readers’ experiences are shared, creating a simulated form of connection that might be as persuasive as a real social relationship. This is highly persuasive; in fact, “Many adults’ favorite story worlds are...worlds where they can experience trials and sorrows, but also triumphs and joy” (Dill-Shackelford et al. 636). By occupying a character’s world but still being part of our own, readers can safely engage with critical information to inspire them through adversity (just as Tolkien claimed earlier). Through Nesta’s experiences, the reader could learn to understand life better in ways that inform social thinking, feeling, and decision-making. In this case, a better understanding of how to grapple with trauma and the subsequent mental issues it brings. Immersion into a story allows the reader to think, feel, and act in simulated social contexts that are very similar to reality. This increases their ability to socially engage and express empathy, enabling readers to engage more successfully with real-life interactions and individuals.

In addition to improving social skills, fantasy literature provides an important function for mental health: empathy. Fictional characters like Nesta can simulate belonging. By reading about Nesta’s friendships and their growth over the novel, the reader simulates their friendships with the characters in response, generating belonging. It creates a group identity that satiates the social need for companionship. Companionship is an important part of recovering from trauma. The simulated companionship provided by Nesta and her relatable struggles will help the struggling reader seek out companionship in their life. As discovered by Dill-Shackelford, “Reading passages from fictional stories caused individuals to psychologically affiliate with the social groups presented in the narratives (640). Reading YA fantasy literature builds empathy and should be considered a viable form of narrative therapy.

Lastly, Dill-Shackelford argued that readers could receive benefits with coping and memory from reading fictional narratives, claiming that “meaningful fiction may be especially good at evoking memories” (Dill-Shackelford et al. 640). These memories evoked while reading create a deeply personal experience, allowing readers to utilize fictional narratives to battle difficult emotions. Nesta’s struggles with trauma and PTSD as a result of war and the death of her father may evoke memories in a person suffering similarly, allowing them to reinterpret these harmful memories with the assistance of narrative. This processing method is called dual empathy, in which the reader contains “simultaneous empathy for the character and empathy for the self” (Dill-Shackelford et al. 641). By processing these memories through the character and autobiographically at the same time, the reader can resolve trauma.

Engaging with fictional narratives and characters allows people to grapple with confusing emotions, ideas, and beliefs in a safe context, as the grappling is one layer removed from the real world. In *A Court of Silver Flames*, Nesta Acheron grapples with several mental health issues that are reported in young adults, such as depression, trauma, and PTSD. YA fantasy literature is the most widely read genre on the planet, and the meaning it brings to people’s lives should no longer be taken for granted. It is the perfect candidate for narrative therapy, which utilizes a therapist guiding a patient’s narrative

as they confront harmful past memories. YA Fantasy already accomplishes this through dual empathy, and it could only be enhanced under the guidance of a licensed therapist.

Dual empathy is represented by Kearney, Tolkien, and Lewis as one of the unique aspects of fantasy literature that makes it so effective at relating truth. Through Kearney, the ancient roots of the story as fundamental to the human identity were explored. Narrative was defined as central to human existence. Human beings are defined by the stories they narrate for themselves and others. From there, he argues that fictional narratives drive meaning, creating a safe space for readers to grapple with fundamental truth. Tolkien argued that fantasy literature set itself apart from all other genres through escape and the happy ending. Escape provides the reader with a necessary break from reality while allowing them to begin grappling with the truth they need to move forward. The happy ending gives readers a reason to keep on going. Through the essential power of the happy ending, readers are inspired to fight on through their physical and mental struggles by vicariously experiencing fictional characters as they do the same. From Lewis, the essential capacity of fantasy literature is to relate the truth. This is accomplished through the off-world setting that communicates truth without raising suspicion. This stealthy exposition of truth is what makes fairy stories uniquely equipped to convey deep truths to readers. Narrative therapy undertakes a similar process when the patient is asked to reinterpret their traumatic narrative with the help of a trained therapist. Fantasy literature serves as a potential vehicle for narrative therapy in that it already accomplishes most of what narrative therapy looks to do. Through the fictional narrative, readers are inspired to engage with their lives in a safe yet critical manner.

A character like Nesta who models a positive recovery from trauma could easily be used by the reader to help them overcome their own. Thus YA fantasy literature acts as a kind of narrative therapy already without being officially welcomed. The rising trend of mental health issues in young adults suggests that the current approach is not working, at least for the next generation. Traditional methods of therapy are no longer serving as they once did, and it is no accident that fantasy literature is so widely watched and read. Young people are searching for meaning, and the norms and morals they pick up in entertainment are filling the void. If there is a way to combine fantasy literature with a legitimate narrative therapy approach, young people may be engaged in a relevant and helpful way. The key is to find something relatable to connect beyond standard teen angst but to also find something that has real therapeutic meaning beyond simply the cathartic. YA Fantasy literature is massively relevant and has now proven to be therapeutically significant. The bones for future psychological studies are here. Clearly, YA fantasy literature qualifies as a form of narrative therapy and should be considered for future studies to treat the rising mental health crisis in young adults.

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# THE EFFECT OF MASS-PRODUCED ART NOUVEAU POSTERS IN 19TH CENTURY FRANCE ON THE ORDINARY CITIZEN: FUNCTION TO FINE ART

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*EVA MARCHBANKS*

**M**ass production of fine-arts posters during turn-of-the-century France has ultimately changed intrinsic relationships between graphic design and the individual. Graphic design, otherwise known as the study of typography, constantly shifts and evolves regarding artists' use of type and image, together or separately. Design changes based on the society and the cultural ideas that influence it, just as it equally wields the power to influence its surrounding culture and society. Art Nouveau originated in France in the 1890's to 1910's, where the art movement became the hotspot for graphic designers to react against previous 19th century academic art and to focus on the use of then-contemporary available materials and processes, such as lithography, which allowed mass poster production to take place. Through the study of individual reports, diaries, and study of iconography, one can examine the geographic, cultural, and societal effect of mass poster production during Art Nouveau to obtain a deeper understanding of the historical evolution of the individual in French society through the influence of the mass-produced poster. As the poster became a collectible item, it carved a relationship between the Art Nouveau poster and the middle-class citizen. This allowed mass production to influence French culture on a personal level at an equal scale as that of the more prominently studied, widespread societal changes happening during the turn of the 19th century because of the concentrated art movement. Due to the rapidly evolving means of production through use of lithography and the printing press brought about by the industrial revolution, "fine art," a broad term consisting of a creative and visual work, was now able to reach the hands of working- and middle-class individuals. Most importantly to this paper, this is the time that poster production becomes more frequent and the style of "New Art" is on the rise due to the technological advances allowing for mechanical reproduction of art, prints, and posters. As such, a correlation appears between the rise of production and the rise of individual collection, which will be studied further in this paper through examining diaries, individual reflections, analyses of societal changes,

and analyses of the most famous posters responsible for bringing about such change.

Art Nouveau in France is studied as an art movement that drew on the work of preceding art movements – a reaction to the preceding movements of the 19th century. In rejecting academic art (art influenced by standards set by the French Académie des Beaux-Arts), Art Nouveau focuses on modernizing illustration through its more stylistic choices in color, design, and process, in contrast to the perceived modernism represented through the Art Deco movement just preceding Art Nouveau. In addition to this, Art Nouveau also uses the methodical processes of the new movement to provide “a vehicle to challenge the artistic establishment” (Warren, 2) that enhances and changes the art world. One such process modernization is that of the previously-mentioned lithography, which involves printing from a flat surface (typically a limestone slab or metal plate). The artist applies the design directly onto polished limestone with an oil-based ink, after which the stone goes through a treatment process with a series of layers of powdered rosin, powdered talc, and gum arabic to create a chemical reaction between the treatment and the stone itself. The reaction ensures the actual markings will hold water and ink to be printed, while empty areas will repel water and ink. Once the stone has been treated, the stone is ready for ink application and to be run through the press (“Lithograph,” The Met). Because this process was simpler and more cost-effective than relief printing or etching, lithography played a major role in the ordinary person’s shift towards collecting art by allowing posters to be reproduced more swiftly and at a greater scale, in turn granting the ability for posters to be more readily accessible and financially viable to purchase.

Elena Millie was a curator and art historian at the Library of Congress. She collaborated on and authored multiple exhibitions, collections, and books throughout her extensive career as an accomplished art historian. Her article *Posters: A Collectible Art Form* distinguishes multiple posters from a diverse array of artists during the 19th century. It provides history of each poster, as well as short analyses and the posters’ effect geographically and culturally. Although the research could be more extensive regarding each poster’s purpose and relation to the world in which they were made, the article provides useful geographical and methodical information and analysis that is applicable to understanding the poster’s transition from marketing function to aesthetic fine art. The article assists in understanding how the methodology of poster production was used during the 19th century, thus allowing for further cultural analysis to be done. For example, the poster “Ambassadeurs – Yvette Guilbert” by Théophile Alexandre Steinlen, artist, and Charles Verneau, lithographer, was created for Yvette, a popular Parisian singer. The poster documents an illustration of Yvette as the prominent focal point of the piece, with stylized text and a background meant to attract the viewer. Meant only to be displayed for a few months, this poster, like so many others, “can no longer be considered insignificant or ephemeral” (Millie, 150). Millie continues by calling the functional poster meant for advertising “a persuasive art form, reflecting subtle changes in society through their popular imagery. They reveal trends, styles, events, and significant developments of their times” (150).

As such, the visual aesthetics of a poster supplement poster collectability fueled by mass production. This is important to the societal and historical context because it provides rich insight into the contexts by placing them upon the paper. Posters visualize the context of Art Nouveau through the style, the subject matter, and the pure advertising purpose. Therefore, by becoming the context itself by visual means, Art Nouveau posters manage that transition between the purpose of functionality for advertising in a pleasing, visual manner, and the collectability that ensues due to their developing notoriety.



Ambassadeurs - Yvette Guilbert  
Theophile Alexandre Steinlen  
(1859-1923)

Lithograph, Charles Verneau,  
Paris, 1894, 181 x 79 cm.

Process and the actual mechanical reproduction of the poster were not the only catalysts to the Art Nouveau poster turning from intended for function to a collectible. As poster production increased and posters became more widely used for advertising and marketing purposes, museums, auctions, and exhibits were among the first to pick up on its potential as a fine art form. As such, exhibits spreading across France began to encourage the public's perception of the mass-produced poster as a fine art form, which resulted in a greater increase of posters found in those same museums and exhibits (Millie, 150). This push by museums and exhibits on posters furthered the shift towards the view of the poster as a fine art collectible rather than a purely functional piece. As the perception changed, graphic design in Art Nouveau adjusted to meet the consumers, who were everyday citizens seeing these posters at every turn. Posters such as Emile Bertrand's "Cendrillon – Musique de J. Massenet," the first of several works created for the theater and with intended purposes for advertising the theater and Massenet's musical pieces, was exhibited at the Salon des artistes français (Salon of French artists) (158). Such work exemplifies the push by museums and theaters to exhibit posters as works of fine arts, thus increasing their value and the desire as a collectible object.



Cendrillon - Musique de J. Massenet

Emile Bertrand.  
Lithograph, Devambez Grav.-Imp., Paris,  
1899, 80 x 59 cm.

The perception and acceptance of Art Nouveau fluctuates; this is an important observation for further studying the societal effect of the art movement on the individual's perception and acceptance, in a similar fashion as to how it has been studied for its evolution as a whole. Dr. Willa Silverman, in her article "Esthetic Languages of the Book in Fin-de-Siècle France: Japonisme, Symbolism, and Art Nouveau in the Private Library of Art Nouveau," allows us a unique insight into the art world in connection with Art Nouveau by analyzing diaries from French jeweler and avid art collector Henri Vever. Both Warren and Silverman research Art Nouveau as a change to the art world, yet each source produces valuable input on separate spheres of challenge to the artistic community; Warren promotes Art Nouveau as a challenge to the artist world and Dr. Silverman promotes an intimate ideology in relation to Art Nouveau and the personal collection through her studies of Vever's diaries. These diaries underline Vever's thoughts as a collector and help to bridge that gap between the individual's perception of poster production influence and the content of the artwork, and those same posters studied in tandem with the far-reaching Art Nouveau. Because Vever balanced on the edge of working class and art collector, he becomes a prime example of the changes incurred by mechanical reproduction of posters' shift from a purely functional form to that of a desirable, collectible object. Specializing in research related to French society, culture, and politics from 1870-1914, the time of Art Nouveau's resurrection, in addition to specializing in the Art Nouveau movement itself, Dr. Silverman's background enhances her studies of Vever's diaries. She called Vever's collecting habits "experiments in Art Nouveau book design," stating they "finally, reveal his additional conception of the book as both surface to be decorated and space of artistic collaboration underscoring the equality of all arts" (179). As such, Vever considered books as this physical, mass-produced object, as wielding potential to become greatest of all forms of art simply by its materialistic quality. Dr. Silverman quotes Vever, who stated that books "illustrated in a superior manner, and engraved to perfection . . . were prized for their technical ingenuity and refinement" (181). Furthermore, according

to Dr. Silverman, Vever's diaries and personal writings indicate the "utilitarian purpose" of a book was matched in value by a book's ability to "exercise visual seduction" (181). In other words, the beauty of a book as an art form lies in its aesthetic beauty and visual creation, as well as the physical properties – the spine, cover, and pages. Although Vever states this specifically for books, the same concept can be applied to an Art Nouveau poster, allowing further study on the intimate relation between the art movement itself and the surrounding art world with the infamous rise of mechanical poster production becoming an object to be collected as an art form, as well as a functional, distributable medium. Such change in perception influenced the desire and ability to collect by the everyday consumer.

Reinhold Heller, professor of Art and Germanic Languages, condenses the sphere even further through his in-depth study of Toulouse-Lautrec's "At the Moulin Rouge," a painting created after the format of posters. Heller reviews what is already known about the artist and then takes it a step further, by seeking out further information in order to re-evaluate perception of the work. Heller's analysis is beneficial in understanding and researching the finer points of poster production's influence on the art community in turn of the century France, he focuses solely on "At the Moulin Rouge," placing the work as a foundation for poster incorporation and reception into the art world and the surrounding French culture. Heller states that as the viewer, "yearning for the familiar, we blind ourselves with comfortable precognition" (115) when viewing works of art that we are already heavily familiar with. That is, as accessibility to posters rose, works such as Henri Toulouse-Lautrec's "At the Moulin Rouge" change the standard and cater to the functionality, as do so many Art Nouveau works. Heller calls Toulouse-Lautrec's interest in lithography and the poster form "a desire to extend the meaning and application of art outside the traditional limits of the 'fine arts'" (129). There is an expectation for academic art, whereas Toulouse-Lautrec flips that standard and produces functionality in tandem with the fine art. "At the Moulin Rouge" has been exhibited multiple times after 1924, but never before Toulouse-Lautrec's death in 1902 (Heller, 116). The fact it was not exhibited until much later exemplifies the shift Art Nouveau saw as such style and design became more widely recognized and accessible.



At the Moulin Rouge

Henri de Toulouse-Lautrec (French, 1864-1901), 1894/95. Oil on canvas; 123 x 141 cm. The Art Institute of Chicago, Helen Birch Bartlett Memorial Collection (1928.610).

Therefore, Heller uses precognition as a basis to perceive the intended purpose and influence – a loss of physical reality and a means of escape (115) – of "At the Moulin Rouge". The analysis proves beneficial in distinguishing the difference between how Art Nouveau is perceived as a movement, and how mass poster reproduction affected the everyday person receiving the art as a functional or collective piece. In short, the Art Nouveau poster acts as a bridge between the fine arts world and the mass consumer world. Previously, these two separate spheres have rarely overlapped, yet Art Nouveau posters manage to break those barriers and successfully integrate the two by allowing the everyday citizen an entry point, however small or seemingly insignificant, into the fine arts world. Elena Millie's attribution to a foundational analysis to a broader array of poster and artistic work during 19th century France provides an insightful history of a wide variety of posters, as well as analyses and the posters' geographic and cultural effect upon its surroundings.

Through mechanical reproduction of the posters and the rise of mass production, technological advancement, and the shift in perception of the poster from functional to fine art, the Art Nouveau movement's influence in the art community breached into the lives of everyday citizens, changing the perception of the poster and the definition of "fine art" forever. The rise of mass poster production' influence on the mundane viewer and receiver of these works during the turn of the 19th century challenged perceptions of academic art. As production increased, so too did affordability and accessibility, resulting in a collectible poster form that found its way into the homes of many.

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# AUDIO SYNTHESIS VIA MEL-SPECTROGRAM INVERSION GENERATIVE ADVERSARIAL NETWORKS

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AUSTIN SNYDER

**M**el spectrogram inversion via generative adversarial networks will soon allow for reliable synthesizing of high-quality coherent waveforms. Recent research studies (Kumar et al., 2019a) have shown that it is possible to generate clear and understandable audio waveforms, although as other studies (Donahue et al., 2018a; Engel et al., 2019a) have shown, it can be extremely challenging. This work aims to help shed light on the current state of audio waveform generation, thus the project will discuss the background of why this task has been so challenging, as well as what new developments have led us to be able to better handle the issue. One of the many developments is the use of Mel spectrograms, so we have analyzed the differences between hertz and Mel spectrograms to better understand how using the Mel scale helps increase reliability. This project will also discuss the recent developments generative adversarial networks, specifically focusing on their two main components: the generative model and the discriminator model. The data set used in the training of our own model consists of audio MNIST files that have been transformed into spectrograms, so we will also discuss what the effect of this transformation are and the role it plays in generation. The project's results help us to better understand how the top GANs are constructed, which helps in the further research of new effective training techniques.

When most people think of what sound looks like, they will picture an audio signal (figure 1), otherwise known as an audio waveform is a 2D display of a sound's amplitude and time. While the term spectrum can be used to define a great many things, in its most watered-down form it can be defined as any continuous sequence or range which is ordered by a particular characteristic such as frequency or energy. When it comes to audio, a spectrum (Figure 2) shows the frequency for a whole audio signal. A spectrogram is a visual representation of how the spectrum of sound changes over time. This is done by taking overlapping sections of the frequency and stacking them so that we can better assess the amplitude as it varies over time. The x-axis represents time, the y-axis



represents frequency, and the color represents decibels.

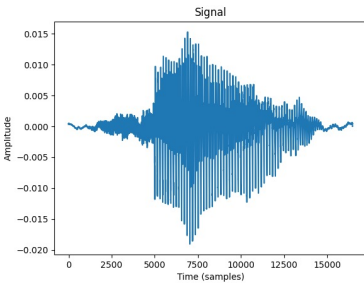


Figure 1

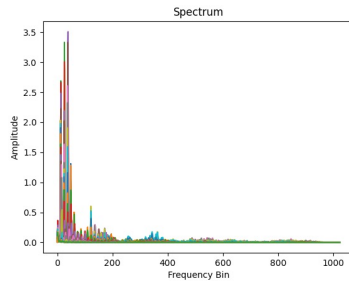


Figure 2

Now that we have covered what a spectrogram is, we need to discuss the different ways of measuring the frequency that is being represented. The hertz scale is the most widely used measurement of frequency, however it is not the best measure for our purposes. While most people can reliably discern the difference between a sound of 50 hertz and one of 100 hertz, the same is not true as the hertz increase. People have a much easier time telling the difference between higher frequencies, which is where the Mel scale comes into play. The Mel scale, which was proposed by Stevens, Volkman, and Newman in 1937, is a logarithmic transformation of frequency which makes sounds of equal distance to be perceived as such. In other words, there is more information now available than there was before. The benefit to using Mel spectrograms over hertz spectrograms boils down to there simply being more relevant data for our model to use.

Generative adversarial networks (GANs) are a very recent development in the world of machine learning, having been first described in 2014 by Ian Goodfellow, et al. in his aptly named paper “Generative Adversarial Networks”. GANs are made up of two different models: a generator model and a discriminator model. The generator models’ job is to generate new examples from a given set of data, and the discriminator’s job is to classify examples as either real or generated. These two models are trained together in competition with one another: the generator creates a group of samples which are then sent to the discriminator along with a group of real samples from the training data set, the discriminator then must classify all the provided samples as real or generated. When the discriminator model correctly identifies which of the provided samples are real or generated, it remains unchanged or is rewarded while the discriminator is penalized and updates its model parameters. Conversely when the generator can successfully create samples that the discriminator cannot correctly label, the discriminator is the model that gets its parameters updated. At the end of the training, the discriminator is discarded while the generator is kept for further use. Images such as these shown by Goodfellow (figure 3), show just how successful GAN image generation can be.

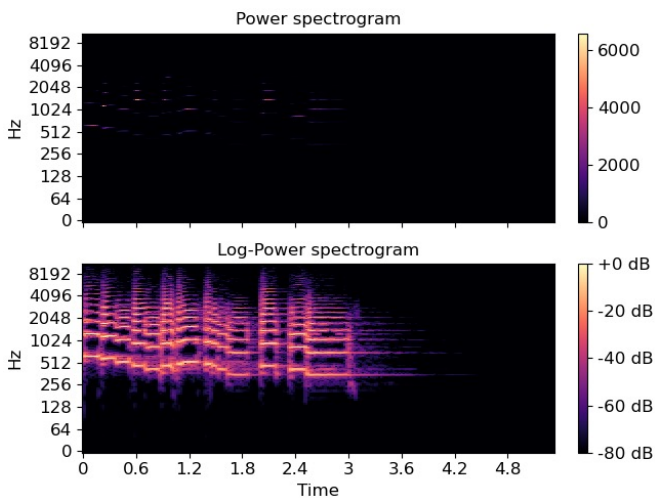


Figure 3

One of the first attempts at applying GANs to generate audio waveforms was WaveGAN (Donahue et al., 2018a). WaveGAN was able to prove that one second slices of coherent

audio waveforms of words, drums and other such sounds could be generated with GANs. Their research primarily focused on the use of real audio as input, although they did some work comparing to image-like audio and found that both have promise. Shortly after the release of WaveGAN, there was another model released called GANSynth (Engel et al., 2019a). GANSynth was able to generate coherent audio using modeling log magnitudes and instantaneous frequencies at a faster rate than their autoregressive counterparts. Another model released in 2019 was MelGAN (Kumar et al., 2019a) which is the most similar model to ours. MelGAN like GANSynth was non-autoregressive and it made use of Mel-spectrogram inversion.

The MNIST audio data set we used was sourced from Kaggle, and it contains audio samples of spoken digits (0-9) of 60 different speakers. The preprocessing relied primarily on the Librosa python library which is a package specifically meant for music and audio analysis. The samples were first converted to a floating-point time series and sample rate so that we had usable data. These were then used as input for the initial creation of the spectrograms, along with a fast Fourier transformation window length of 2048 and a hop length of 1024. The Fourier transformation is a mathematical formula that decomposes a signal into its individual frequencies and their subsequent amplitudes. The fast Fourier transform is the algorithm that is used to convert the floating-point time series we got from the signal into the spectrum that is needed to create our spectrograms. The fast Fourier transformation window length measures the size of each frame of audio and the hop length measures the number of samples between successive frames. The resulting spectrogram still needs some alteration, as we need to convert the power spectrogram, which is measured in amplitude squared, into a log power spectrogram, which is measured in decibels. This transformation provides more information which ultimately allows the model to better differentiate the training classes.



The final preprocessing steps are loading the spectrograms into arrays, like what we did before with the original data, and then we divide the image array by 255 to normalize the values into the range 0 to 1. This ensures that our numbers are small, which allows the computation to be easier and quicker.

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**SPRING 2023**





# INSULIN PUMPS PROVIDE BETTER ASSISTANCE TO TYPE ONE DIABETICS

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*KRISTEL ALADIN*

**T**ype one diabetes is an autoimmune disease that primarily impacts children to young adults. The bodies of type one diabetics do not produce sufficient insulin; without insulin, their blood sugar will increase and can become fatal. The patient will need to receive insulin daily; they can either inject themselves with a syringe or a pen-like injection device or use an insulin pump. Since patients have the option to choose how they will receive their insulin, the main objective of this project was to survey type one diabetics to determine which of the two methods is more effective. My thesis is “Insulin pumps provide better assistance to type one diabetics.” To address this hypothesis, we surveyed type one diabetics that are 18 years or older who switched from injections to an insulin pump to see if they have seen improvements in their A1C levels and seen improvements in their quality of life using an insulin pump. The results of the survey showed that among the respondents obtaining insulin with an insulin pump was a more effective approach than daily injections.

## INTRODUCTION

The overall purpose of this research is to spread more awareness about type one diabetes, which is extremely hard to manage. Type one diabetes is a chronic autoimmune disease that impacts adolescents and young adults, in which the patient’s pancreas does not make enough insulin, requiring that insulin be introduced into the body. The main objectives in managing type one diabetes are reducing hyperglycemia and preventing hypoglycemia to achieve a higher quality of life. For type one diabetics, it is extremely important to determine which forms of insulin delivery are better suited for them after six months of diagnosis. A type one diabetic can receive their insulin through multiple insulin injections or through insulin pumps. With insulin injections, the patient can use a syringe with a needle or a pen-like device that holds insulin with a small needle at the end of it. The patient will need to take short-acting and long-acting insulin each day. Both syringe



or pen-like devices will be injected into a patient's fat beneath their skin. A second, more recent option is an insulin pump, which is injected once and left on a specific part of the body for a couple of days depending on the product. Asking diabetics that are using or have used an insulin pump can determine whether insulin pumps are more effective for them than daily injections.

The objective if this project was to survey people who previously got their insulin through injections and then switched to insulin pumps, to see if insulin pumps are a more effective way to 1) keep their blood glucose in a healthy range and 2) maintain a higher quality of life.

## LITERATURE REVIEW

Type one diabetes is an autoimmune disease that primarily impacts children to young adults. Type one diabetics do not produce any insulin throughout their bodies. Without insulin, their blood sugar will increase and can become fatal. Currently, there is no cure for type one diabetes. With this being said, after discovering insulin, scientists have come up with two different ways for type one diabetics to receive their insulin. Type one diabetic can receive their insulin through multiple insulin injections or insulin pumps. With insulin injections, the patient can use a syringe with a needle or pen-like device that holds insulin with a small needle at the end of it. The patient will need to take short-acting and long-acting insulin each day. Both syringe or pen-like devices will be injected into a patient's fat beneath their skin. (Mayo Clinic Staff 2021) The number of shots the patient will be taking will depend on their blood sugar levels and how often they eat throughout the day. This can total up to approximately five times a day. Syringe or pen-like device or typically to be the cheapest option for a type one diabetic. On the other hand, insulin pumps only use short-acting insulin that is continuously delivered throughout the day. Long-acting insulin is not necessary for insulin pumps, unlike insulin shots. Insulin pumps replace the need for many daily injections. (Aleppo 2019) There are several types of pumps out currently and the patient has the choice that will better suit them. Insulin pumps are, unfortunately, more expensive compared to insulin injections. Typically, within the first six months to a year after diagnosis of type one diabetes, a provider will suggest to their patient to go on an insulin pump or not. Using these texts will help implement the difference between insulin pumps and insulin injections.

One of the main goals in controlling type one diabetes is to reduce hyperglycemia and prevent hypoglycemia. Choosing to take insulin injections or using insulin pumps can have a big significance of one's A1C level. Currently, the recent studies called "Impact of insulin pump therapy on glycemic control among adult Saudi type-1 diabetic patients. An interview-based case-control study." evaluated the outcome of insulin pumps compared to insulin shots. (Almogbel, 2020) It is important to note that there were 200 adults, with 83 being males and 117 being female. Additionally, both patients were using either management system and had equivalent education levels and carbohydrate count in their diet. Patients using pumps showed that they had a lower mean of hypoglycemia episodes and as well had a low annual mean of diabetic ketoacidosis events over the year. Patients using insulin shots had opposite results over their first year of therapy. As well, with the case study done by Karges evaluated and compared insulin pump therapy and insulin injection among adolescents and young adults with type one diabetes. (Karges 2017) This case study explained rates from over thirty thousand people of severe hypoglycemia and diabetic ketoacidosis is lowered with insulin pump therapy than with insulin injections which overall result in having a lower A1C. A type one diabetic main goal should have a low A1C level to sustain a healthy life. Recent studies have shown, insulin pumps have been proven to better assist with this goal. (Grando et al, 2019) Furthermore, Dr. Marie Mose conducted a case study that involved 976 patients with type one diabetes that were randomly allocated to insulin injections or insulin pumps within 23 trials. Researchers discovered that people who used insulin pumps had much lower hemoglobin A1C levels on average than those who used insulin injections, indicating better long-term blood sugar

management. (Reuters et al 2010) These case studies accurately show the differences on how insulin pumps and insulin injections impact the patient's A1C levels. There has been a gap in knowledge of type one diabetic that chooses to manage their blood sugar with insulin injection. There have been multiple cases that show results if the patient chooses an insulin pump will have a higher chance of obtaining a lower A1C level.

Quality of life is greatly impacted due to type one diabetes. The term quality of life is "Individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns." (Skevington 2008) How type one diabetic manages their diabetes can be either by insulin injection or insulin pumps; their choosing one over the other can impact their quality of life. To start off, a recent study involved 40 patients with type one diabetes on insulin pump therapy. The 40 patients were asked to complete a questionnaire about their quality of life. Compared to what has been observed in observational studies, it has been found that insulin pump treatment was found to significantly enhance type one diabetes patients' quality of life and diabetes control. (Alqambar et al, 2018) Whereas, with another case study that involved 68 adolescents that are type one diabetics compared their quality of life to those who were on insulin pumps and insulin injections. To evaluate the use of Pediatric Quality of Life Inventory 3.0 Diabetes to evaluate the patient's quality of life fully. Their questionnaire included the Likert scale, which had the subjects concerning diabetic symptoms, treatment challenges, adherence to therapy, anxiety, and communication. In their results, they found the patients using an insulin pump compared to insulin shots had a better quality of life in all aspects besides the one which was communication. These articles prove that a chance to have a higher quality of life for type one diabetics is using insulin pumps. There is a gap in knowledge within the type one diabetic community with who is most likely to achieve a higher quality of life.

## **METHODS**

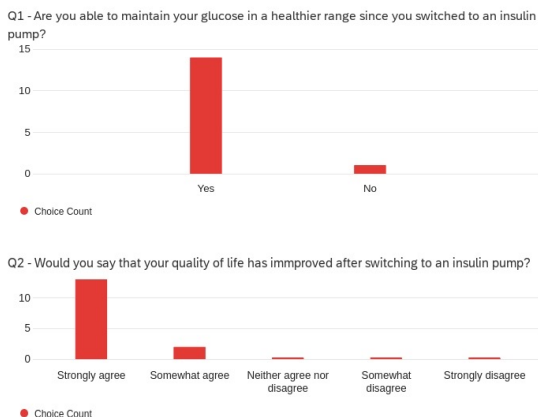
We sent out a questionnaire survey to type one diabetics who were over the age of 18 and who previously used insulin injections and then switched to an insulin pump. Since the survey involved human subjects, we first obtained approval from the University of West Georgia Institutional Review Board. This survey was set up in Qualtrics, and was sent out through social media, via Instagram. This survey had two questions. The first one was a yes or no question which asked "Are you able to maintain your glucose in a healthier range since you switched to an insulin pump?". The second one was a multiple-choice question with five choices ranging from strongly agree to strongly disagree; it asked, "Would you say that your quality of life has improved after switching to an insulin pump?" Potential respondents were informed that the survey was anonymous, and respondents registered their informed consent before proceeding. The survey was kept active for a period of 3 weeks to get as much response as possible.

## **RESULTS AND DISCUSSION**

In total, the survey received 15 responses during the designated time period. For question one, 14 respondents (93 %) answered yes, and 1 respondent (7 %) answered no. For question two, 13 respondents (87 %) answered "strongly agree" and 2 respondents (13 %) answered "somewhat agree." No respondents answered "neither agree nor disagree," "somewhat disagree," or "strongly disagree".

These results supported the hypothesis, showing that among the respondents insulin pumps are better suited to helping them better maintain their glucose levels in comparison to insulin injections/pens. In addition, the data show that insulin pumps are better suited for type diabetics because the respondents' quality of life has improved since switching from insulin injection/pens to an insulin pump.

## **RESULTS ILLUSTRATIONS**



## CONCLUSION

Type one diabetes is an autoimmune disease that primarily impacts children and young adults. The patients with type one diabetes have the option to choose between insulin injections or insulin pumps. The main goal of the two treatments is to deliver insulin to the patient. Yet, the two treatments provide different outcomes to health measures and lifestyle. With this research, we wanted to prove the claim that insulin pumps provide better assistance to type one diabetics by conducting a public survey. With the survey results showing that insulin pumps are a better option, this should bring awareness to the diabetic community. There is a gap in knowledge in which treatment is better to assist in type one diabetics. Often, diabetics struggle to make a final choice to see which treatment is better suited with their health and lifestyle. This autoimmune disease is known to be complicated to manage. The patient has to mimic an organ and always make critical process decisions every day for the rest of their lives. Having a straightforward answer to know which treatment is better will hopefully better serve the diabetic community. In the near future, we hope to continue to spread awareness and lead to diabetics being able to make a better decision on which treatment to go with.

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# GUI VS CONSOLE: AN EXAMINATION OF THE EFFECT OF ASSIGNMENT FORMAT ON STUDENT LEARNING IN CS1 WORKSHOPS

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ALEXANDER AYERS

Computer Science I, often shortened to CS1, is an introductory course that is hands-on and practical in nature. In the course, students learn foundational programming concepts that prepare them for the rest of the program at their university. The specific programming languages and paradigms utilized in the course vary between universities. In the course, students complete programming assignments in different formats. This study examines the effect of assignment formats on student learning performance and concept comprehension.

Standard application formats used in CS1 assignments include simple text-based console applications (TUI) and more complex graphical user interfaces (GUI). The difference between the two formats comes in their levels of complexity. Text-based interfaces, because they consist solely of text, are less complex in nature and more straightforward for students to program. Dissimilarly, Graphical interfaces are more complicated due to having graphical elements that require more framework code to be functional. However, prior studies have shown that GUIs are more engaging for students to work with due to increased interest in the project and familiarity with the graphical elements utilized [2].

The CS1 course featured in this study is organized into a weekly lecture with workshops twice weekly. The main lecture features instruction about that week's material, and the workshops have activities that reinforce the material taught. The programming language of choice in this course is Java, with an objects-first approach. Additional concepts taught include decisions, loops, methods, classes vs. objects, unit testing, and other foundational concepts. When the course reaches the sections utilizing GUIs, we first use the ACM Turtle library, then JavaFX. As for the fundamental design of the study, students were given assignments and quizzes in two different workshop sessions. The first session focused on loops, and the second focused on decision statements. The results were gathered from these assignments and quizzes and then measured in aggregate analysis related to the following topics: concept comprehension, number and

type of errors, and completion of assignments.

The structure of this paper will be as follows. Firstly, we will cover the background of work on the topic of CS1 education, detailing prior work and the topics each author wrote about in their studies. Secondly, the study's design will be explained, focusing on demographics, research questions, types of analysis, threats to validity, and specific details of the work done on the study. Thirdly, the study's results will be presented and explained in descriptive and graphical models. Finally, the discussion of the results in analysis, concluding the implications of the study, and additional questions that can be explored in future work.

## RELATED WORK

During a search of relevant literature, we noted a lack of research into the environment of workshops and supplemental instructions. The best comparison to this study, subject-wise, is a previous study by Hall et al. which focuses on evaluating a whole course with groups of students swapping assignment types consistently throughout the semester [1]. The study focused on student preference towards one format or the other. Surveys performed in the study showed that TUIs were preferred for their simplicity and sense of ease versus the more complicated GUIs [1]. GUIs were preferred due to students' familiarity with GUIs in their day-to-day lives and their desire to improve their skills [2]. As for which format a student would choose, students primarily gravitated towards the TUI over the GUI when given a choice. Additionally, the study focused more on whether the student would choose one assignment type over another versus student performance based on the assignment type [1]. Our study, comparatively, focuses entirely on student performance, keeps students on the same assignment type throughout the whole study, and focuses on the workshop/supplementary instruction environment [1].

There are two broad categories of literature related to the CS1 course. The first trend is for literature that performs examinations of the nature of the CS1 course across the field. This category includes articles that examine both the course itself for the effectiveness of current methodologies and the student's feelings on the course. The second trend focuses on proposing new ideas for the CS1 course that are meant to improve the course for a myriad of different purposes. Articles in this category propose a new solution, using current literature to support the proposed method's effectiveness; some go further by putting the idea into practice and gathering data on its effectiveness.

A study also performed at the University of West Georgia analyzed the effectiveness of the format of an exam [4]. The work done in this study is similar in approach to our study as it employs comparative analysis to see if there is a difference in student performance between traditional paper exams and exams in an Integrated Development Environment (IDE) [4]. The study found that students who had their exams on an IDE had no statistically significant differences in measured metrics from students who had their exams on paper. [4]. The metrics included the student's score on the exam, the number of errors present in written code, and the completion rate of the exam itself [4].

Students in CS1 face an arduous level of difficulty, and the reasons for this difficulty were examined by authors Kinnunen and Malmi in a study performed by them. This study analyzed a semester of the CS1 course to understand why students drop out of the course at the Helsinki University of Technology [6]. The experiment consisted of 18 non-major students, and data was gathered via a survey sent out to said students. They found that the primary reasons for dropping out were a lack of time, motivation, and understanding of the material [6]. The lack of time was founded on the rigor of the assignments and the amount of time required for each assignment. Motivation difficulties stem from the general lack of study motivation and the lack of a satisfying payoff after completing [6]. Finally, the difficulty of the field stemmed from the complete change of thinking, from difficulty finding errors, sizes of the projects, and lack of tutoring help on the complex parts of the assignments [6]. This study is compared to ours in that it directly examines the current CS1 course structure. It differs from our study in that it uses more

qualitative methods of measurement through surveys versus our quantitative approach to measuring the effect of assignment format on student learning. Additionally, the data from this study helped inform some of the performed analyses as it provided a framework to understand the struggles of the individual student in the CS1 course.

A study by Alex Edgcomb and others proposes a novel methodology for the structure of lab assignments in the CS1 course using shorter-length assignments that are automatically graded [3]. Under this methodology, a larger-scale lab assignment breaks down into several smaller independent auto-graded assignments, requiring only a certain number for completion [3]. This study was performed on a CS1 course using C++ as its chosen programming language, servicing 300-500 students each quarter (winter, summer, spring, and fall) [3]. This study analyzes the methodology's effectiveness for the student with analysis performed on ten measures, most notably including percent of assignments completed each day, the pivot factor of swapping assignments, and time spent working on each assignment [3]. The study found largely positive results, showcasing a unique benefit for the student, enabling them to swap between more challenging assignments to more accessible ones, as only a percentage of the total number of assignments are required [3]. This study is very similar to the work we have done in our study in that it is an examination of the structure of an assignment in terms of the scale of the assignment. It differs from ours because it compares a novel methodology to the traditional methodology versus our study, which compares two traditional methods to examine effectiveness. Additionally, this study's examination is larger in scope than ours in that it implements the new methodology of breaking up larger assignments into smaller individual chunks and examines its effectiveness.

A study conducted by authors Stevenson and Wagner proposes an alternative way of modifying assignments for the benefit of students [5]. The study details this approach as focusing on the subject matter of the assignment and making it relatable to the student's everyday life instead of being more abstract [5]. The study does not implement the proposed idea; it instead highlights a new set of criteria for judging assignments and suggests a few examples of assignments that fulfill said criteria. The criteria include the following: a realistic problem that enables a realistic solution, a sense of interest, creativity, innovation, and challenge for the student, and a focus on current topics in the class and utilization of an existing API [5]. Some suggested assignments include a web crawler for evaluating the effectiveness of links that uses string manipulation and a spam evaluator for an email that checks for certain conditions that match typical spam emails [5]. Highlighted issues for this paradigm are the difficulty of crafting an effective assignment under time pressure and the hidden complexities of the assignment only being revealed once the students do the work [5]. This study intersects with our study because it analyzes the structure of the individual CS1 assignment, just in a different light. It focuses on the subject matter of the assignment rather than the format, relying on a more abstract definition of real-world as compared to the more defined format we examine. Additionally, it provides suggestions for a new methodology following the assignment structure; it lacks examination of the current assignment subject matter and how it may impact the individual student's performance.

In order to improve engagement within the CS1 course, researchers Bayliss and Strout have looked into bringing logic from video games into the course [7]. Their article describes a course called RAPT that replaces older models such as payroll with a three-section game-development-based programming course. The course organization was a distance-based summer course taught over ten weeks using Java as its programming language [7]. Broadly, the course produced positive effects for the students as most students moved on to the next course in their curriculum, CS2, with most of those students moving past CS2 and onto higher-level courses [7]. The study also utilized a study to gauge student opinion on the course, with 30% of students citing the games-like nature of the course as the most significant reason they enjoyed the course [7]. This study relates to ours as it details a course with a similar structure to our analyzed CS1 course in that it uses Java and an objects-first approach. Additionally, it looks at a similar

idea of the format of the course and how it affects students. It differs because it looks at an entire course structure and the theming surrounding it. The study looks at the broader scope of the CS1 course and suggests an alternative to the current structure compared to analyzing current course structures.

## STUDY DESIGN

### 3.1. Research Questions

This study was conducted under the following fundamental question. Is there any difference in student learning by lab assignment format (TUI vs. GUI)? We then split the question into the following sub-questions.

- RQ1:** Does lab assignment format affect number and type of errors within the assignments?
- RQ2:** Does lab assignment format affect understanding of concepts reinforced by assignment?
- RQ3:** Does lab assignment format affect ability to complete the entire assignment?

### 3.2. Study Procedure and Setting

This study was conducted in the Fall semester of the 2022/2023 academic year with four different sections of the CS1 course. In the semester two workshops were evaluated near the middle of the semester. Each workshop session happens twice a week in a standard lecture period and features work that reinforces the concepts taught that week in the weekly lecture. In each workshop session, each student was given a coding assignment accompanied by unit tests programmed with JUnit and a way to run the program's output in the pre-assigned format. For the assignment, each student had to complete a single method relating to the concept programmed in Java on the Integrated Development Environment (IDE) Eclipse. After the assignment, each student immediately took a four-question conceptual quiz, with each question graded on a 3-point scale. Assignments were downloaded from our Course Management System (CMS) in the form of a starter project. Once completed, uploaded back to the CMS (as an exported Java project from Eclipse). Quizzes had consistent weights across all sections and were taken on the CMS.

**3.2.1 Workshop Topics.** The topics of the two evaluated workshops were decisions and loops. Decisions focus on the concepts of if, else-if, and else statements. Loops focus on the for loop and its components, including the index variable, update condition, and incrementor. These topics were chosen for their grounded nature in programming to maximize the applicability of these results to different course structures that may use different programming languages and paradigms. The assignment for the decision workshop was the classic FizzBuzz exercise, which depends on an inputted integer. If the integer is divisible by three, the method returns Fizz. If the integer is divisible by five, the method returns Buzz. If the integer is divisible by three and five, the method returns FizzBuzz. Otherwise, the method returns just the integer. The assignment for the loop workshop was a compound interest calculator, which accepted a principle, interest rate (in the form of a decimal), and the number of years to compound over. The method returns the compounded value based on these three inputs.

**3.2.2. Quiz Question Format.** Each quiz followed a similar format for each question in the set of four. The first question of each quiz involves tracing the output of a code snippet using the concept taught in that workshop and writing in the correct output. The second question is a multiple-choice question that tests knowledge of the concept. The third question involves refactoring a code snippet using the workshop's concept to change the behavior to something different. The fourth question has the student create a new method using the currently taught concept based on a provided method specification.

### 3.3. Demographics

The students who participated in the study belonged to four different sections of the CS1

course in the Fall 2022 semester. Each section was assigned either GUI or Console for the format of their students' workshop sessions. There were three face-to-face sections in the Fall 2022 semester, with one remote section. The remote section was asynchronous except for the workshop sessions, which met synchronously over Zoom.

Assignment Format	Face-To-Face Students	Remote Students
GUI	18	0
Console	9	2

Table 1: Students Participating in Study

Each student was given the option to opt-in to the study, and at any point before final grades were posted for the Fall 2022 semester, they could withdraw from the study. The mismatch in the number of remote students between the GUI and Console formats is due to there being only one remote section. The remote section was assigned the Console format to minimize the potential difficulties of setting up a GUI earlier in the semester over a Zoom meeting.

### 3.4. Data Collection

Two distinct forms of data were collected from the students, both in their ungraded forms. The first form was each assignment for the two workshop sessions, in the form of the exported Eclipse project that was then imported and checked by us. The second form was the quizzes, delivered in both a PDF of the questions and an exported spreadsheet containing the answers. In the collected data, some students were missing a workshop, quiz, or both. In these cases, these students' data were left out to preserve parity between the workshops.

### 3.5. Data Analysis

Every hypothesis was tested using Wilcoxon Ranked Sum (WRS) statistical tests to decide if the differences between the two data sets were statistically significant (each set of data, as well as specifics of each research question, detailed further ahead). WRS is a non-parametric version of the t-test used for dependent data sets and does not rely on the assumption that the data is normally distributed for validity. We used a target p-value of 0.05 (5% chance of a false positive) as the target for significance and evaluated from there. If the p-value was greater than 0.05, we accepted the null hypothesis, which states that the results between the two data sets are the same. If the p-value was less than 0.05, we accept the statistical difference and reject the null hypothesis. For each research question, the WSR test was performed for each assignment, and then each assignment was combined with values summed and then averaged to gauge overall significance.

**3.5.1 RQ1.** To address the number and type of errors, we coded each assignment for errors, checking the method the student had to code. We used the following two error types:

- Syntax - An error preventing the method from executing and crashes immediately. These errors include using the wrong operator, misspelling a keyword, or forgetting to close a parenthesis.
- Logical - An error that does not stop the execution of the program but affects the behavior. The program's behavior is not what it is supposed to be.

After coding all the errors, and then tallying up each type of error, the number of errors was inputted into a WSR test. The number of each individual type, as well as the combined total of errors, were analyzed for the GUI and Console formats. The null hypothesis is that the number of errors is the same for students with the GUI assignment versus those with the Console assignment. Thus, if we reject the null hypothesis, we state that there are statistically significant differences between the two assignment formats for the number of errors.



**3.5.2 RQ2.** To address the student's conceptual understanding, we graded the quizzes using the previously established scale, with a student who did not attempt the question being given a score of zero. We then summed up the total scores for each quiz and inputted the set of scores into a WSR test. The null hypothesis is that the total quiz score is the same for students with the GUI assignment versus the students with the Console assignment. Thus, if we reject the null hypothesis, we state that statistically significant differences exist between the two assignment formats for the total quiz score.

**3.5.3 RQ3.** To address the completion rate, we used three milestones, with each completed milestone adding a value of one to a maximum of three. The milestones we used were the following:

1. The code is able to be compiled and executed without any errors or crashes.
2. 50% of the provided unit tests run successfully.
3. 100% of the provided unit tests run successfully.

A student that did not attempt the method was given a completion score of zero. The completion rates were then inputted into a WSR test. The null hypothesis is that the total completion rate is the same for students with the GUI assignment versus the students with the Console assignment. Thus, if we reject the null hypothesis, we state that there are statistically significant differences between the two assignment formats for the total completion rate.

### **3.6. Threats to Validity**

The results from this course only take into consideration the setup of our CS1 course with a specific approach (objects-first approach with a strong emphasis on unit testing and code cleanliness) and a specific programming setup (Java on the Eclipse IDE). Therefore, other programs which use different setups may find the applicability of these results lessened [8, 9, 10]. Further study outside this specified program will be needed to see if the trends stated by these results hold for other programs.

Another threat to validity is the sample size of the Console group. The number of students assigned the Console assignment variant is lower than we would have liked to mitigate the influence of random chance from our results. Therefore, future work would benefit from an expanded selection of students.

Some uncontrolled variables in this study include an individual student's preexisting knowledge regarding programming and computer science in general, as well as the modality of the course. With the number of remote students being so low, we felt that any analysis regarding the influence of modality would have had too small of a sample size to exhibit significant results. Therefore, these factors may have influenced the results. The GUI group's sample size allows for a spread of experience levels, which lessens the threat to validity; the same cannot be said for the Console group.

Finally, due to the data from each assignment and quiz being graded by a singular individual, there may be present individual bias in the coding of each student's work. The reason for only one individual being responsible for grading is due to the scale of this study being limited. The coding also does not include the scope of the errors (whether or not it was a major/minor error). Due to only having one individual grading, introducing the coding of error severity would have introduced too high levels of individual bias. The individual responsible does have experience with CS1 as a course, so they are not unqualified to code for the previously stated measures.

## **RESULTS**

The following is each found p-value for each measured attribute for each research question. The significance has been highlighted using either red/green. The p-values highlighted in red are non-significant, and the p-values highlighted in green are significant. Significance is determined if the p-value is less than 0.05.

Measurement Name	P-Value
Number of All Errors, Both Assignments	0.09
Number of All Errors, Decision Assignment	0.50
Number of All Errors, Loop Assignment	0.02
Number of Logical Errors Both Assignments	0.25
Number of Logical Errors, Decision Assignment	0.26
Number of Logical Errors, Loop Assignment	0.02
Number of Syntax Errors, Both Assignments	0.33
Number of Syntax Errors, Decision Assignment	0.62
Number of Syntax Errors, Loop Assignment	0.47
Total Completion Score, Both Assignments	0.01
Total Completion Score, Decision Assignment	0.35
Total Completion Score, Loop Assignment	0.02
Total Quiz Score, Both Assignments	0.67
Total Quiz Score, Decision Assignment	0.27
Total Quiz Score, Loop Assignment	0.39

Table 2: P-Values for All Measures

In each of the following sections, there will be figures showcasing the spread of the values for the students belonging to either the Console or GUI dataset. The values have been color-coated for ease of distinction, with blue representing the students in the Console group and red representing the students in the GUI group.

#### 4.1. RQ1 - Number and Type of Errors

We found that there were statistically significant differences in both the number of logical and all errors on the loop assignment. We believe the significance found in all errors is affected by the significance found in the number of logical errors. All other measures, including the number of syntax errors on both assignments, the number of logical errors on the decision assignment, and the number of all errors on the decision assignment, lacked significance. The differences showed that the students who had the Console assignment had fewer logical errors than students who had the GUI assignment when coding the looping assignment. Thus, we reject the null hypothesis for the number of logical errors on the loop assignment and conclude that there are statistically significant differences between the students assigned the GUI assignment versus students assigned the Console assignment.

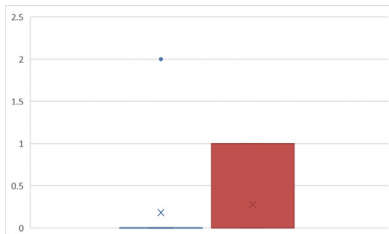


Figure 1: Number of Syntax Errors - Loop Assignment

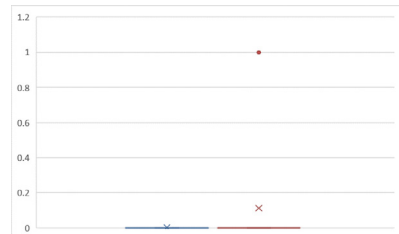


Figure 2: Number of Syntax Errors - Decision Assignment

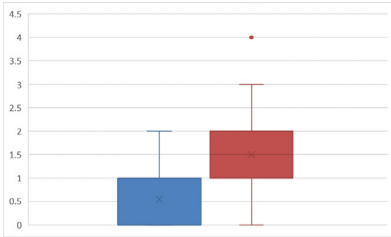


Figure 3: Number of Logical Errors - Loop Assignment

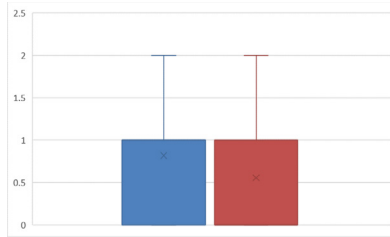


Figure 4: Number of Logical Errors - Decision Assignment

## 4.2. RQ2 - Conceptual Understanding

We found that there were no statistically significant differences on the total quiz score between the students who had the GUI assignment and the students who had the Console assignment. This lack of significance holds true for both datasets for the individual assignments, decision, and loop, and for the combined dataset of both assignments summed and averaged. We did not perform question-level analysis in order to gauge differences between each question for the different groups. Overall, we accept the null hypothesis and conclude that there are no differences between the two groups on quiz scores.

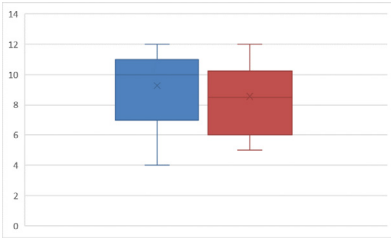


Figure 5: Total Quiz Score - Loop Assignment

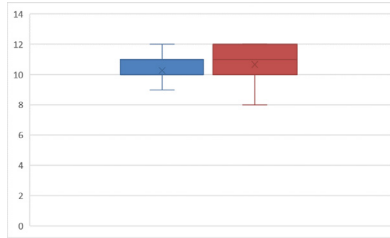


Figure 6: Total Quiz Score - Decision Assignment

## 4.3. RQ3 - Completion Rate

We found statistically significant differences between the total completion rate on the loop assignment and both assignments between students who had the GUI format and students who had the Console assignment. We found no statistically significant differences between the two groups on the decision assignment. We found on the loop assignment that the students who had the GUI format had a mean completion score of 1.5556 out of 3 (51.85% when converted to a percentage), and students who had completed the Console format had a mean completion score of 2.54545 out of 3 (84.85% when converted to a percentage). Overall, we reject the null hypothesis for the total completion rate on the loop assignment and conclude that there are statistically significant differences between the two groups.

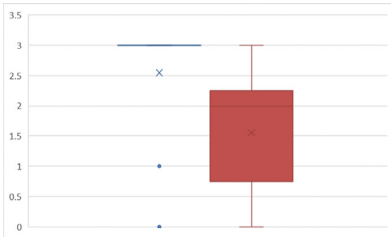


Figure 7: Total Completion Rate - Loop Assignment

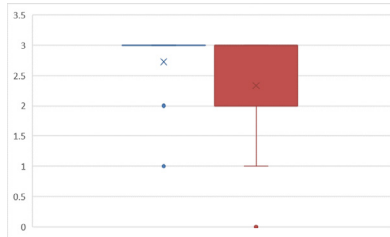


Figure 8: Total Completion Rate - Decision Assignment

## DISCUSSION

### 5.1. RQ1 - Number and Type of Errors

We found significant differences between the number of logical errors in the students with the GUI loop assignment versus the Console loop assignment. The number of logical errors represents errors in the behavior of the student's code, with more logical errors resulting in the program's lessened amount of correct behavior. Compared to the decision assignment, the loop assignment has a higher level of complexity due to the concept of loops having more elements compared to decision statements. We hypothesize that the reason for the difference in the number of logical errors for the loop assignment, as compared to the lack of difference in the decision assignment, is due to the difference in complexity level. When confronted with a more straightforward concept, such as decisions, the assignment format had no impact on the ability of the student to implement the method correctly. As shown in Figure 4, the spread of the number of logical errors is practically identical between the two groups. Compared to Figure 3, the students with the GUI format had a higher amount of errors as well as a higher spread versus the students with the Console assignment. We hypothesize that the native complexity of the GUI format, when combined with the higher complexity of the loop concept, caused students to have a more difficult time removing all of the logical errors, and the simplicity of the Console format better enabled the students to correctly code the assignment correctly thus reducing the number of logical errors.

As for the number of syntax errors, there was no difference between the two groups on both assignments. This lack of errors is likely due to the fact that syntax errors in the implemented method do not interact with the code for the assignment format. To explain, the presence of a syntax error means that the program will not be able to run and will crash. A syntax error prevents the program from compiling, thus reducing the student's interaction with the assignment format, be it Console or GUI. Additionally, a syntax error is generally easier to fix than a logical error, as a syntax error is directly highlighted by most IDEs (including Eclipse) with a specific message regarding the nature of the error. In other IDEs, the most common syntax errors can be automatically fixed. While Eclipse does not support this functionality, it shows the ease of fixing syntax errors. A logical error takes more time to fix, requiring higher problem-solving skills and the ability to deconstruct the written code to find the error in the behavior. During this process, the student is typically running the program, testing different inputs, and directly interfacing with the assignment format. Overall, the significance shown in the number of logical errors compared to the number of syntax errors aligned with our expectations, given the nature of syntax and logical errors.

### 5.2. RQ2 - Conceptual Understanding

Overall, we show a lack of significance in the results demonstrating that the quiz results between both groups are the same. Both groups of students demonstrated the same understanding of the concept of decisions and loops. Since the quiz scores are the same, we know that the assignment format did not influence the understanding of the concepts reinforced by the assignment. These results are interesting as it showcases that the assignment format does not affect whether or not the student is learning the material. As shown in Figures 1 and 2, the spread between the quiz scores for both groups is relatively similar, with some students showcasing higher scores than others. Additionally, as shown in the previously mentioned figures, the loop assignment has a broader spread of scores compared to the decision assignment. We surmise that this is due to the natural differences in complexities of both subjects, with the more straightforward concept of decisions garnering a tighter spread in higher quiz values compared to the loop assignment.

### 5.3. RQ3 - Completion Rate

Regarding the completion rate, we found significant differences in the loop assignment, which, with how we measured the completion rate, shares direct causality with the

number of logical errors. The amount of logical errors represents issues with a program's behavior, which connects to the completion rate since the completed assignment represents a fully and correctly implemented program. We found significance in the loop assignment, where the students with the Console assignment had higher completion rates than those with the GUI assignment. We also found no difference in the decision assignment. We believe this is due to the exact reasons for the significance of the number of logical errors on both assignments, with the ability to correctly implement the method being directly connected to the level of completion. The level of complexity of the loop assignment, combined with the more complex nature of the GUI format, made it harder for the students to complete the assignment entirely. Inversely, the Console format made it easier to complete the loop assignment as it reduced the overall complexity of the assignment for the student. The assignment format did not impact the ability of the students to complete the decision assignment, which follows the same lack of impact on the number of logical errors. Since the concept of decisions is relatively straightforward, the assignment format did not affect the student's ability to complete the assignment.

### **CONCLUSION AND FUTURE WORK**

After completing this study on the influence of assignment format on student performance in the CS1 course, we would like to note some recommendations and points of concern for instructors to consider. Overall, our results show a significant difference in the number of logical errors and completion rate on more complex assignments, with the Console format reducing the number of logical errors and raising the completion rate. We recommend that if an assignment involves a concept of higher complexity, instructors should use the Console format to facilitate the student's successful completion of the assignment. Since assignment format does not impact concept comprehension, there is little to no downside in this sense to utilizing the Console format on an assignment. Due to this, there is a benefit to an instructor considering utilizing the Console format for assignments in a semester that present higher levels of complexity.

During this study, we noted several points of interest that warrant further research to grow the base of knowledge surrounding this topic. Firstly, it is beneficial to see this study's replication in different programs to ours, as our work lies only in our CS1 program, with an objects-first approach and Java as the programming language. Our found results may not hold if applied in a program that uses functional or structured programming or features other languages, such as Python or C++, as its programming language of choice. Secondly, we did not control for a student's level of prior experience with programming before taking CS1, which may impact the influence of the format on that individual student. Future research controlling for this variable may show different levels of influence of the assignment format for different groups of students. Thirdly, there is a benefit in exploring student perception of assignment format in order to take into consideration the opinions and experiences of the students. This input from students may bring further illumination to areas in which difficulty arises from the format of an assignment. Fourthly, an area of potential influence left unexplored by us was the modality of the individual students (whether they were face-to-face or remote). The student's modality is an unknown quantity in how it influences the student's performance regarding assignment format, and future research can highlight this intersection of areas of influence. Finally, our ultimate objective is to replicate this study over an extended period and potentially expand it to an examination at the course level, where each assignment is evaluated to verify if our observations hold in a larger dataset. To this end, we are currently replicating the study in its current scope in the Spring 2023 semester to expand our dataset and confirm the accuracy of our observations.

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# NUTRITION'S IMPACTS ON POST-EXERCISE RECOVERY

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*NICOLE BRANUM*

**S**lamming weights, running sprints, pushing limits – athletics require dedication, hard work, and perseverance. Athletes train almost daily, sometimes twice daily, to prepare for competition. They place significant pressure on themselves to perform at their best every time they compete. On top of self-pressure, there is additional pressure from coaches, whether vocalized or not. When under such a significant amount of pressure, there comes a point when an athlete breaks, which leads to a mental or physical injury. Any form or severity of injury sidelines athletes. As soon as an injury occurs, coaches work to assist the athlete in the healing and recovery process. Professional medical intervention may be necessary, depending on the injury. The stresses of training and injuries are an inevitable part of athletics, especially at higher levels, and for any athlete, a fast recovery is the ultimate goal.

An athlete achieves recovery when “performance returns to baseline performance measures” (Markus et al., 2021, p. 970). A medical professional typically suggests physical therapy modalities (exercises, ultrasound, electrostimulation, etc.) or medication as a first attempt to resolve an injury. Physical training breaks the body down in the form of microscopic tears in the muscle. This breakdown, if appropriately monitored, is positive as muscular adaptations and improvements occur during the rebuilding process. One of the most impactful factors on recovery is nutrition, which is also most often neglected. Though it is not the main focus of this paper, it is important to note that the mental aspect of recovery is also often overlooked.

Nutrition, according to the Medline Plus portion of the National Library of Medicine from the National Institute of Health (NIH), is defined as a “field of study that focuses on foods and substances in foods that help animals (and plants) to grow and stay healthy” (U.S. National Library of Medicine, 2021). Sports nutrition is a specific realm of nutrition that “can be defined as the application of nutrition knowledge to a practical daily eating plan focused on providing the fuel for physical activity, facilitating the repair and rebuilding process following hard physical work, and optimizing athletic performance in com-



petitive events, while also promoting overall health and wellness” (Fink et al., 2015, p. 4). Along with physical means, such as ice, ultrasound, and massage, nutrition can speed up recovery; however, “nutrition often is an underutilized component” (Kloubec & Harris, 2016, p.7). Athletes have about 300-800 training sessions in one year and 1400-1800 eating occasions (Stellingwerff et al., 2019). Therefore, there is almost double the amount of time spent eating as there is training, meaning it is more likely to help or hurt an athlete.

The best analogy to describe athletes and their nutrition is that of a car and its gas. Cars cannot function without fuel, and neither can athletes. Gas comes in three different grades: regular, mid-grade, and premium. Each goes through the same processing but impacts the vehicle differently—the same is true with nutrition. The better an athlete fuels, the better their body functions. Though, unlike cars, no two athletes run on the same fuel. The quality of nutrition may be the same, but the exact foods and quantities are unique to that individual and his/her needs.

Nutrition is a critical yet underutilized component of recovery for athletes. Scientists are researching the effects of nutrition on post-exercise recovery; however, they must first address the existing gaps. Based on the reviewed studies, it became evident that the current research lacks variance in gender, age, sport/training type, and measurement method. Addressing these gaps would involve research on both genders, age ranges other than 20-30, variation in sport, and a recovery measurement other than muscle biopsies. Addressing these discrepancies allows more athletes to benefit from this research. Nutrition and recovery go hand-in-hand, yet the field still needs to dial in on the specifics that offer athletes the best recovery.

## LITERATURE REVIEW

The demands of an athlete are higher than those of a non-athlete. The training plans of high-level athletes vary greatly, but regardless, they are physically demanding. Along with physical stress from training, athletes also have psychological stressors. No matter the type of stress, it still has detrimental effects on the body. There are various ways to recover from the destruction caused by various stressors. The most commonly recommended modalities, as mentioned above, are used more to reduce symptoms rather than prevent them. Preventative treatments such as nutritional modifications can speed up recovery.

Discovering the best post-workout nutrient ratio has been the topic of many studies. Three specific protein (PRO)/essential amino acid (EAA) and carbohydrate (CHO) co-ingestion studies were analyzed.

The first study aimed to discover if CHO and PRO consumption after exercise would alter the glycogen synthesis rate, mixed muscle fractional synthetic rate (FSR), or whole-body net protein balance (WBNB). Six subjects performed three trials, each trial separated by seven days. One trial consisted of a two-hour cycling regime. Following each trial, they consumed a drink at a rate of 750mL/hr in 15-minute increments for the first three hours of recovery. The drinks had varying carbohydrate-to-protein ratios: 1.2g/kg h CHO: 0 PRO, 1.2 g/ kg h CHO: 0.4 g/ kg h PRO, and 1.6 g/ kg h CHO, respectively. The scientists took muscle biopsies at zero and four hours of recovery. The muscle biopsies showed that the co-ingestion of PRO and CHO did not alter the glycogen synthesis rate but did increase FSR and improve WBNB. The higher FSR could assist in muscle adaptation during recovery by stimulating muscle formation and repair. All the tested ratios had CHO concentrations greater than or equal to the optimal amount of 1.2 g/ kg h. When the CHO amount is sub-optimal, PRO co-ingestion increases the glycogen synthesis rate. The overall conclusion is that PRO and CHO consumption was more beneficial on FSR and WBNB than CHO alone (Howarth et al., 2009).

A later study by Koopman et al. aimed to determine if congestion of PRO and CHO altered the muscle protein synthesis rate post-exercise. Ten test subjects, all male, performed 60 minutes of resistance exercise and then consumed drinks containing PRO, PRO and low CHO, or PRO and high CHO. Along with consuming the PRO or PRO and CHO drinks, the subjects also received continued amino acid and glucose infu-

sions. Researchers took muscle biopsies immediately following exercise and at six hours post-exercise. In addition, they took blood samples every 15 minutes post-exercise for six hours. From the data analysis, scientists concluded that co-ingestion of CHO and PRO did not affect the mixed muscle synthesis rate when the amount of protein is ample and a positive net protein balance is achieved when protein is consumed post-exercise (Koopman et al., 2007).

The third study analyzed the impacts of essential amino acids (EAA) and CHO on the muscle protein net balance (NB). Muscle protein NB is the difference between muscle protein breakdown (MPB) and muscle protein synthesis (MPS). 13 male test subjects participated in leg resistance exercises and, two hours after exercise, consumed either EAA and high CHO or EAA and low CHO. They all received continuous amino acid (AA) infusions during the exercise and testing. The scientists took muscle biopsies and blood samples periodically before and after consumption. The MPB and MPS rates were measured using the biopsies. After a statistical analysis of the collected samples, the authors concluded that MPB decreased slightly, although not significantly, and that adding CHO to EAA did not increase MPS. The changes detected were consistent among both the high CHO and low CHO groups, so the level of CHO was not deemed impactful. The overall increases they saw in muscle protein anabolic responses were due more to changes in MPS than the MPB. (Glynn et al., 2010).

All three studies used muscle biopsies as a testing method, and all used the measurement of net protein balance to gauge recovery. The combined results show that consuming CHO and PRO post-exercise increases net protein balance when compared to CHO alone but does not alter the results compared to PRO alone.

The field of nutrition is a continuously changing and growing realm. The current research, although beneficial, needs to improve in a few areas. All the studies analyzed used male test subjects, an issue that ignores that female bodies are different and may react differently to PRO and CHO ingestion post-exercise. Using female participants would also open the door for studies to analyze how female hormones, such as estrogen and progesterone, impact nutrient needs for recovery.

Along with gender, the ages of participants were limited. The age ranges of the subjects were 30 +/- 2 (Glynn et al., 2010), 20.1 +/- 0.3 (Koopman et al., 2007), and 22 +/- 1 (Howarth et al., 2009). Chronological age and training age, "the total training time/experience the athlete has in that aspect of physical training" (Walker, 2016), should be noted and considered when analyzing recovery. Conducting research on the recovery of older test subjects, chronologically and training-wise, would introduce complexity, given that aged muscles often behave differently than young muscles.

Muscular recovery is only one aspect of recovery. The reviewed studies used muscle biopsies, allowing for comparison of the results but only giving data relating to muscle synthesis and breakdown rates. Haworth et al. share that mixed muscle FSR only accounts for about a quarter of whole-body protein synthesis, so other studies should widen the scope of muscle proteintypes analyzed. Muscle biopsies for recovery are not a practical means of recovery measurement for the everyday athlete. Utilizing measurements such as heart rate (HR) and heart rate variability (HRV) allows for easy monitoring by everyday athletes. HR and HRV are helpful measurement tools for recovery as they are representative of the state of the autonomic nervous system (Kellman et al., 2018). These measurement forms should be used in future studies on nutrition for recovery.

The parallels between the three reviewed studies allow for the comparison of results, though they only apply to a narrow group of athletes. Nevertheless, they are a good starting point for researching what nutrients consumed post-exercise will yield optimal recovery. Concurrent studies should be carefully crafted and consider gender, age, and measurement technique.

Athletics are commonly watched and played. However, televised events show only a glimpse of what athletes endure. The expectation is that these athletes push their bodies to the limits and then show up the next and perform at the same level. Maintaining top-notch performance in competition and training requires a significant focus on

recovery. The modalities of recovery often discussed are ice baths, compression boots, ultrasound, and electrostimulation. Nutrition is a critical component of recovery yet is often an afterthought for most athletes. What athletes put into their bodies has an impact on their performance. Research on the specifics of post-exercise recovery is still under development. Studies thus far have shown that protein or protein and carbohydrate consumption after exercise will decrease muscle breakdown compared to consumption of only carbohydrates. The narrowness of these studies limits the genders, ages, and training types to which the results can span. New studies that vary these parameters will offer data to encompass more of the athlete population.

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# DEGRADATION OF MICROCRYSTALLINE CELLULOSE BY NEW ISOLATES OF ADHERENT, BIOFILM-FORMING BACTERIA

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JOHN DAVID BUTLER

Cellulolytic bacteria employ a variety of different strategies for the degradation of cellulose. Our laboratory is interested in biofilm-mediated breakdown of cellulose and possible roles of exopolysaccharides in this process. As part of an effort to isolate new strains of biofilm-forming, cellulolytic bacteria, soil samples were collected from sites rich in decaying vegetation and used to inoculate a minimal growth medium containing a MOPS/Tris buffer (pH 7.4), a combination of inorganic salts, 0.05% yeast extract, and 1% microcrystalline cellulose (MCC) as the primary source of carbon and energy (MSYE-MCC media). These cellulose-enrichment cultures were grown aerobically at 30°C for 2 weeks in a shaking incubator, and culture samples were then spread over the surface of tryptic soy agar (TSA) plates. Colonies on TSA were streaked onto agar plates containing the MSYE basal medium plus either 1% carboxymethyl-cellulose (MSYE-CMC media) or 1% filter paper cellulose (MSYE-FPC). Over one dozen new, cellulose-degrading strains were isolated and initially characterized according to colony morphologies, relative cell size, cellular arrangements, Gram stain reaction, and other outstanding features. Approximately one quarter of the new strains were Gram-negative, and large inclusion bodies were noted in some. The remainder of the strains were either Gram-positive or Gram-variable. Many Gram-positive strains were bacilli arranged in chains (streptobacilli) and one strain exhibited filamentous growth. Phase-contrast microscopy was used to observe cultures grown in MSYE-MCC media, and strains which attached to MCC particles, aggregated on and around the particles, and grew as biofilms on the surfaces of the particles were selected for further study. These strains were also screened for the production of extracellular material as detected by phase-contrast microscopy. A few strains produced possible glycocalyx layers during biofilm formation and utilization of cellulose. These extracellular layers, and any exopolysaccharides associated with them, will be the primary focus of future research.

*Keywords: Cellulolytic bacteria, Cellulose degradation, Cellulomonas flavigena, isolating bacteria, soil bacteria, cellulolytic soil bacteria, microbial exopolysaccharide, exopolysaccharides, biofilms*

## INTRODUCTION

Cellulose is the most abundant organic compound on the planet, yet only certain microorganisms can break it down into metabolizable sugars (Cellulose, 2019). Animals, including humans, are incapable of degrading cellulose due to lacking enzymes required for this process. Cellulose-degrading bacteria, also called cellulolytic bacteria, sometimes secrete enzymes, such as cellulase, to carry out the degradation of cellulose. Others contain enzymes inside the cell or utilize a biofilm to degrade the compound. The extra-cellular “cellulosome” complexes produced by clostridia have been well studied. Several examples of bacterial species attach to the cellulose surface and grow as an adherent biofilm, including *Cellulomonas flavigena* and *Ruminococcus albus*.

Biofilms are complex structures consisting of multiple cells of a single type of organism or several different organisms. Biofilms form by cells attaching to a surface, such as cellulose particles, and secreting an extracellular polymeric substance (EPS). EPS is a viscous extracellular material that allows the cells to stick together, usually consisting of proteins, nucleic acids, and polysaccharides.

Isolating cellulose-degrading bacteria can be done using media enriched with different types of cellulose. This study was conducted using a minimal media containing microcrystalline cellulose (Avicel cellulose) to isolate strains of cellulose-degrading bacteria from soil samples. This media, originally developed for *Escherichia coli*, was modified from its original version and allowed the adjustment of nitrogen levels. The supply of nitrogen, and the carbon-to-nitrogen ratio (C/N), are known to affect biofilm formation and the production of exopolysaccharides. Because the interest of this study was with bacteria that attach to cellulose and degrade cellulose as an adherent biofilm, we screened new cellulose-degrading isolates for cellulose attachment, cellular aggregation, biofilm formation, and production of extracellular (glycocalyx) material in both high-N and low-N media.

This study aimed to isolate novel strains of cellulose-degrading bacteria and characterize their biofilm-mediated exopolysaccharide formation. Prior studies have analyzed the behavior of some cellulose-degrading bacteria, such as *Cellulomonas flavigena*. This study could help better understand cellulose degradation, biofilms, and exopolysaccharide formation by microorganisms.

## LITERATURE REVIEW

Cellulolytic organisms play an essential role in the ecosystem by breaking cellulose into metabolizable sugars and returning carbon to the carbon cycle, allowing other organisms to access carbon that would otherwise remain locked up in the indigestible compound. Biofilms assist microorganisms in adhering to surfaces and obtaining nutrients from their environment [1,2]. Cellulolytic organisms often employ biofilms for cellulose gradation (Kenyon et al., 2005). Researchers have identified several organisms with this capability and used them to examine cellulose degradation and biofilm behavior, including *Cellulomonas flavigena* (Antheunisse, 1984; Kenyon et al., 2005; Kenyon et al., 2017).

There are several purposes for studying cellulolytic organisms, including environmental and medical reasons. Biofilms also play an essential role in medicine because they make infections from disease-causing organisms more challenging to treat. Biofilms can protect cells and make bacteria more resistant to antibiotics (Wi & Patel, 2018). Exopolysaccharides are vital in biofilm formation and structure (Vu et al., 2009). Some exopolysaccharides, such as curdlan, serve as food additives (Verma et al., 2020). Curdlan is an exopolysaccharide produced by several different species of bacteria and plays a vital role in the cellulose-degrading abilities of the bacterium *Cellulomonas flavigena* (Kenyon et al., 2005; Buller & Voepel, 1990; Kenyon et al., 2017). Prior studies examining cellulose-degrading bacteria have analyzed the mechanisms by which these organisms perform these actions, finding that some utilize a cellulosome containing enzymes, such as cellulases, that catalyze the breakage of  $\beta$ -1,4 glycosidic linkages in the cellulose com-

pound (Bayer et al., 2004, Gupta et al., 2011). Studies have shown that the carbon-to-nitrogen ratio can affect biofilm and exopolysaccharide formation (Young et al., 2011).

While many studies have contributed to the current understanding of cellulolytic bacteria and biofilms' role in our ecosystem, more studies are needed. This study aimed to identify novel organisms that utilize biofilms for cellulose degradation, which may lead to a better understanding of biofilm-mediated cellulose degradation and the role of exopolysaccharides in this process. We aim to provide information that leads to identifying novel mechanisms by which cellulolytic organisms perform this function, which may help better understand the role of biofilms and cellulose degradation in our environment.

## MATERIALS & METHODS

### Isolation of Cellulose-Degrading Strains

Soil samples were collected from two different locations. Soil #1 was collected from a forest in Lyndhurst, Virginia, in an area rich in decaying vegetation located approximately 50 yards off Humpback Rocks hiking trail. Soil #2 was collected from a garden plot located in Temple, GA, where tomato plants are grown annually. Organisms in the soil were tested for cellulolytic capabilities by incubating for two weeks in a gyrorotatory shaking incubator (150 rpm) at 30°C. The basal growth medium used was the MOPS-buffered minimal medium described by Neidhardt et al. (1974). This medium was modified by the substitution of 1% cellulose (Avicel PH-101 microcrystalline cellulose; average particle size of 50 µm) for glucose and by the addition of 0.05% yeast extract (MSYE-MCC media). Cellulose-degrading isolates were then grown aerobically in Difco™ Tryptic Soy Broth (TSB) with shaking at 30°C for 48 hours. Frozen culture stocks were prepared by adding glycerol to a concentration of 16% and freezing at -86 °C.

### Characterization of New Isolates

Each new strain was characterized according to colony morphology, cell morphology, Gram stain reaction, and growth behavior in both rich and minimal media. Morphological features of colonies were recorded using TSA, and cell morphology was recorded using TSB. Gram stain reaction for all isolates grown for 24 hours in TSB was recorded using standard Gram stain procedures. Phase-contrast microscopy was utilized to observe living cell morphologies and arrangements in TSB and in MSYE-MCC. Photographs under phase contrast microscopy were recorded for cell morphology, Gram stain reaction, and growth behavior. Colony morphology photographs were recording using a mobile device camera. All cultures were grown aerobically at 30°C, and broth cultures were grown in a shaking incubator at 150 rpm. Because we were attempting to isolate new strains of biofilm-forming bacteria, the following characteristics were especially important: 1. attachment of bacterial cells to the particles of MCC; 2. aggregation of cells around MCC particles; 3. production of extracellular material (i.e., visible glycocalyxes). To test for cellulolytic behavior, each strain was also grown in media containing 1% microcrystalline cellulose (Avicel PH-101 cellulose with an average particle diameter of 50 µm) and either an excess of NH<sub>4</sub>Cl (20 mM), or a growth-limiting supply of NH<sub>4</sub>Cl (5 mM), as the nitrogen source (MSYE-MCC).

## RESULTS

The following figures display the results from all experiments including analyzing growth on TSA plates, gram stain reactions, and growth in high-nitrogen and low-nitrogen MSYE-MCC media. Each isolate was assigned a name with the letters BK and a number 1-12. For attachment and aggregation, only "+" and "-" symbols were used to represent either observed attachment or aggregation. A higher number of "+" symbols indicates more attachment or aggregation while a "-" symbols indicates little or no observed attachment or aggregation.



## BK #1



Figure 1.  
BK #1 colonies on TSA plate.  
Morphology: opaque white, punctiform, shiny, entire, umbonate

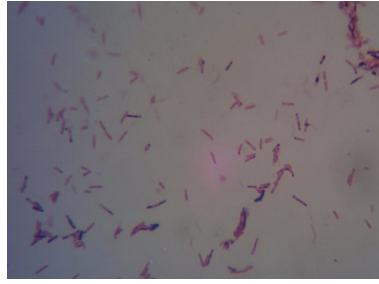


Figure 2.  
BK #1 Gram stain reaction: negative  
Cell morphology: bacilli, single cells, and short chains

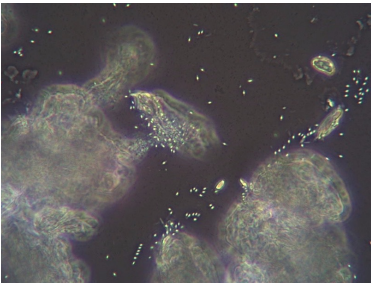


Figure 3.  
BK #1 Phase-contrast photomicrograph of high-nitrogen, cellulose cultures at 48-h of incubation.  
aggregation +  
attachment +

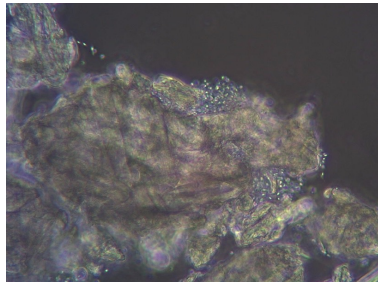


Figure 4.  
Phase-contrast photomicrographs of low-nitrogen, cellulose cultures at 48-h of incubation.  
aggregation ++  
attachment ++

## BK #2

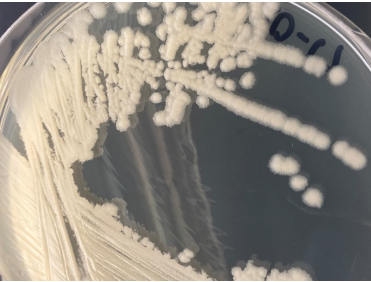


Figure 5.  
BK #2 colonies on TSA plate.  
Colony morphology: opaque white, round, rough, dull, smooth, lobate, convex

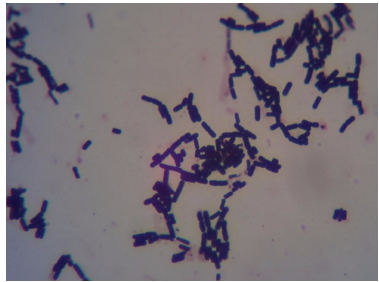


Figure 6.  
BK #2 Gram stain reaction: positive  
Cell morphology: bacilli, single cells and short chains

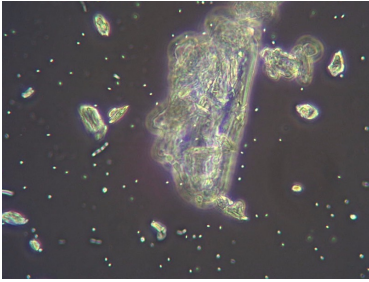


Figure 7.  
BK #2 Phase-contrast photomicrograph of high-nitrogen, cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

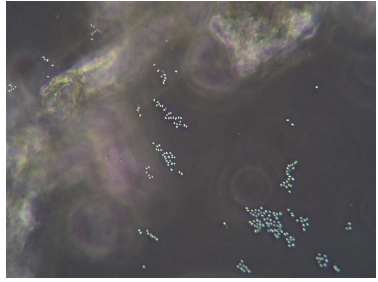


Figure 8.  
Phase-contrast photomicrographs of low-nitrogen, cellulose cultures at 48-h of incubation.  
aggregation +  
attachment -

### BK #3



Figure 9.  
BK #3 colonies on TSA plate.  
Colony morphology: opaque white, wrinkled, dull, filamentous, flat

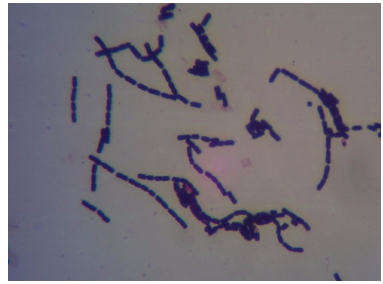


Figure 10.  
BK #3 Gram stain reaction: positive  
Cell morphology: bacilli in long chains

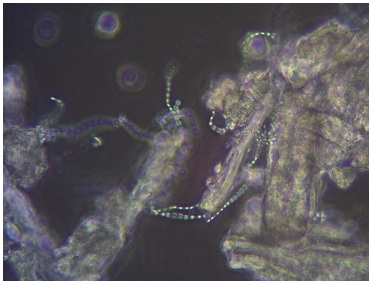


Figure 11.  
BK #3 Phase-contrast photomicrograph of high-nitrogen, cellulose cultures at 48-h of incubation.  
aggregation +  
attachment +

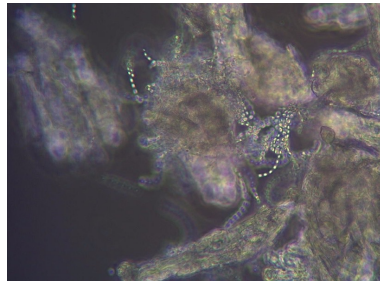


Figure 12.  
BK #3 Phase-contrast photomicrographs of low-nitrogen, cellulose cultures at 48-h of incubation.  
aggregation ++  
attachment ++

## BK #4



Figure 13.  
BK #4 colonies on TSA plate.  
Colony morphology: opaque white, round, rough, dry, filamentous, umbonate



Figure 14.  
BK #4 Gram stain reaction: positive  
Cell morphology: bacilli, single cells and short chains

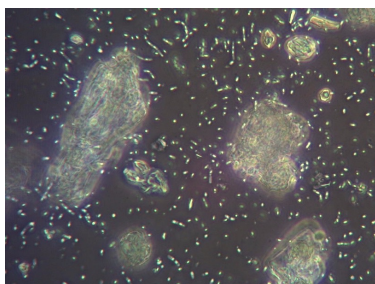


Figure 15.  
BK #4 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

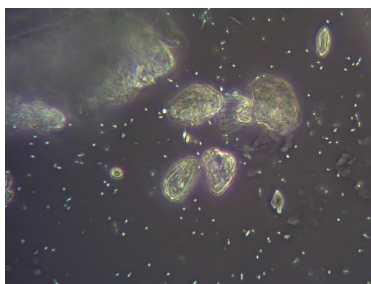


Figure 16.  
BK #4 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

## BK #5

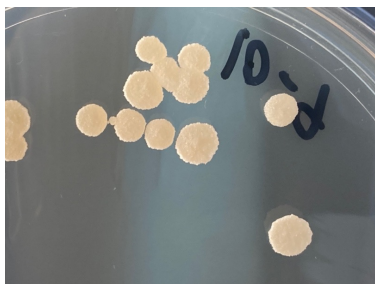


Figure 17.  
BK #5 colonies on TSA plate.  
Colony morphology: opaque white, round, rough, dry, filamentous, convex



Figure 18.  
BK #5 Gram stain reaction: positive  
Cell morphology: bacilli in long chains

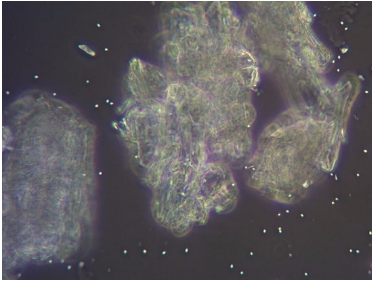


Figure 19.  
BK #5 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

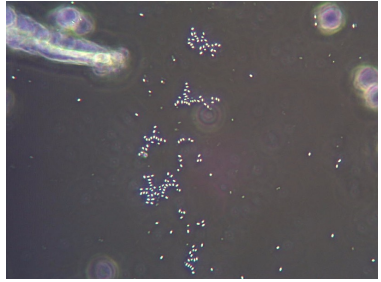


Figure 20.  
BK #5 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation +  
attachment -

## BK #6

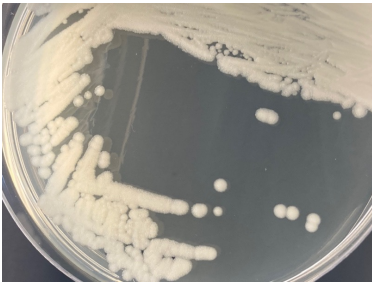


Figure 21.  
BK #6 colonies on TSA plate.  
Colony morphology: opaque white, round, rough, dry, filamentous, convex

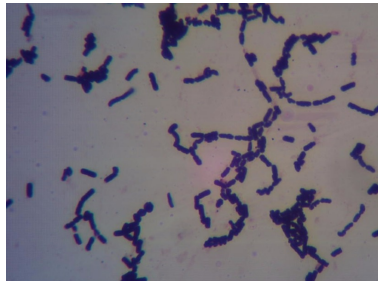


Figure 22.  
BK #6 Gram stain reaction: positive  
Cell morphology: bacilli; single cells and short chains

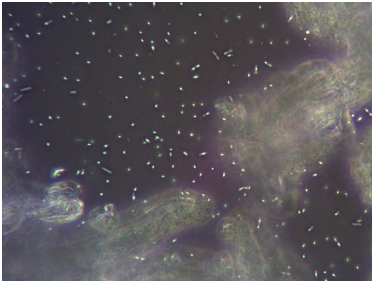


Figure 23.  
BK #6 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

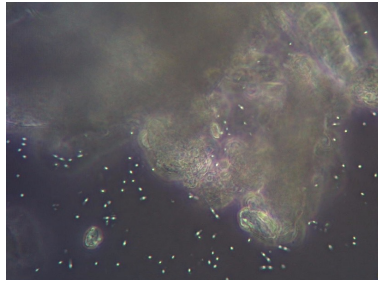


Figure 24.  
BK #6 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

## BK #7



Figure 25.  
BK #7 colonies on TSA plate.  
Colony morphology: opaque white, round, rough, shiny, entire, convex



Figure 26.  
BK #7 Gram stain reaction: positive  
Cell morphology: bacilli; single cells and short chains

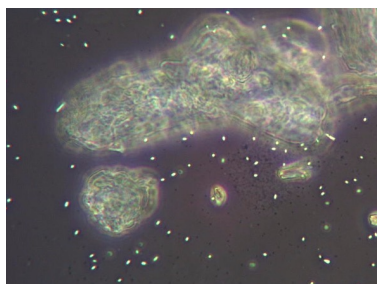


Figure 27.  
BK #7 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation - attachment -

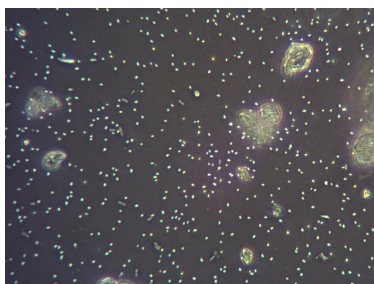


Figure 28.  
BK #7 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation - attachment -

## BK #8



Figure 29.  
BK #8 colonies on TSA plate.  
Colony morphology: opaque white, punctiform, shiny, entire, convex

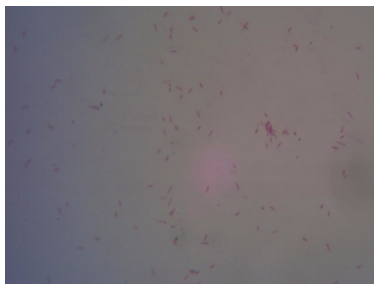


Figure 30.  
BK #8 Gram stain reaction: negative  
Cell morphology: coccobacilli;  
single cells and pairs

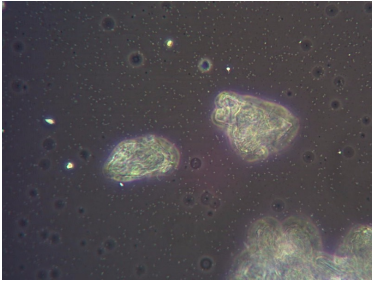


Figure 31.  
BK #8 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

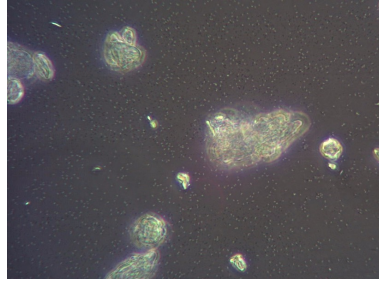


Figure 32.  
BK #8 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

## BK #9

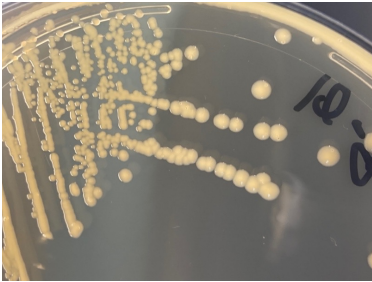


Figure 33.  
BK #9 colonies on TSA plate.  
Colony morphology: yellowish, round, shiny, moist, entire, convex

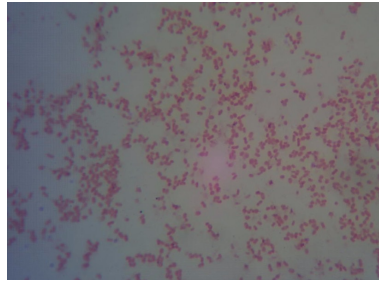


Figure 34.  
BK #9 Gram stain reaction: negative  
Cell morphology: coccobacilli;  
single cells

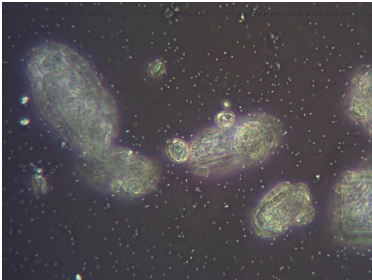


Figure 35.  
BK #9 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

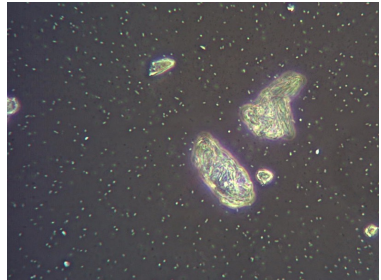


Figure 36.  
BK #9 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

## BK #10



Figure 37.  
BK #10 colonies on TSA plate.  
Colony morphology: creamy white w/ yellow tint, round, smooth, shiny, entire, convex

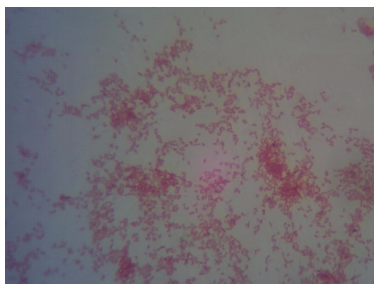


Figure 38.  
BK #10 Gram stain reaction: negative  
Cell morphology: coccobacilli;  
single cells and clusters

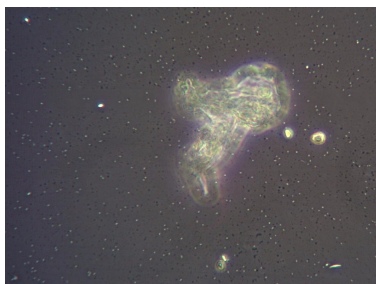


Figure 39.  
BK #10 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

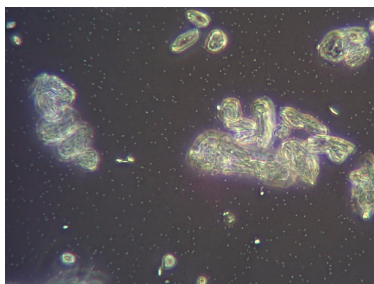


Figure 40.  
BK #10 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

## BK #11



Figure 41.  
BK #11 colonies on TSA plate.  
Colony morphology: opaque white w/ yellow tint, round, dull, entire, umbonate



Figure 42.  
BK #11 Gram stain reaction: positive  
Cell morphology: bacilli in short chains

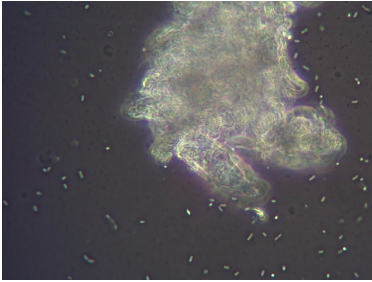


Figure 43.  
BK #11 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

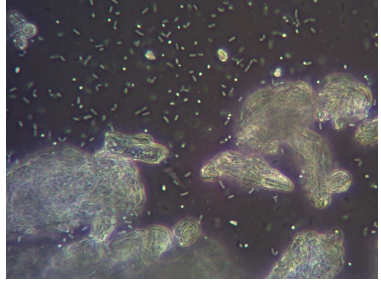


Figure 44.  
BK #11 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment -

## BK #12

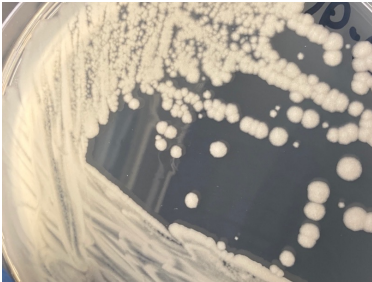


Figure 45.  
BK #12 colonies on TSA plate.  
Colony morphology: opaque white, round, rough, dull, filamentous, convex

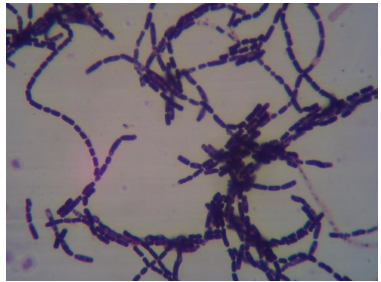


Figure 46.  
BK #12 Gram stain reaction: positive  
Cell morphology: bacilli in long chains

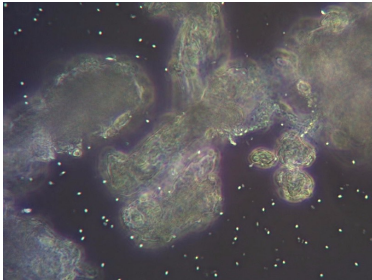


Figure 47.  
BK #12 phase-contrast photomicrograph of high-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment +

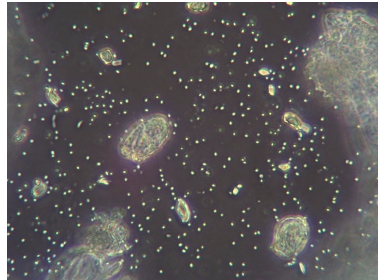


Figure 48.  
BK #12 phase-contrast photomicrographs of low-nitrogen cellulose cultures at 48-h of incubation.  
aggregation -  
attachment +

## DISCUSSION

A total of twelve cellulolytic organisms were isolated from cellulose-enrichment cultures using microcrystalline cellulose and a MOPS-salts-yeast extract minimal medium (MSYE media). Each isolate was given the name BK and assigned a number. Seven of the isolates were obtained from soil samples taken from an established garden plot in Temple, Georgia (BK1, BK3, BK5, BK7, BK9, BK10, BK12). Four of the isolates were obtained



from soil samples taken from soil samples from a forest in Lyndhurst, Virginia (BK2, BK4, BK6, BK8). One of the isolates was obtained from laboratory contamination (BK11). Eight of the strains were Gram-positive, and four were Gram-negative. Gram stain reactions, colony morphology, cellular shapes and arrangements are shown in the figures above.

Phase contrast photomicrographs in figures above show cell aggregation and attachment to cellulose particles after forty-eight hours of shaking incubation at 30°C. Two of the strains displayed significant aggregation and attachment to cellulose particles. These were Gram-negative strain BK1 and Gram-positive strain BK3. Glycocalyx production was difficult to determine. These strains are the focus of future studies, which will include identifying the strains and testing for production of EPS involved in biofilm formation.

## CONCLUSION

We isolated a total of eleven cellulose-degrading organisms from soil samples, and one organism obtained from laboratory contamination from an unknown source. Two of the twelve microorganisms showed significant aggregation and attachment to cellulose particles in cellulose-rich media. These were strains BK1 and BK3. It was difficult to discern if these organisms produced an exopolysaccharide, which will be the focus of future studies. This study is ongoing and will continue with identifying BK1 and BK3, and a further analysis of EPS production and biofilm behavior.

## ACKNOWLEDGEMENTS

I would like to thank William J. Kenyon, Ph.D., Emma S. Young, M.S., the University of West Georgia's Honors College and the University of West Georgia's Student Research Assistant Program (SRAP) for the resources, assistance, and guidance offered during this project.

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# THE ANALYSIS OF AUTISM EXPERIENCES FROM THE PERSPECTIVE OF AFRICAN-AMERICAN FAMILIES

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JANEA' CLARK

African American families with children with autism are experiencing disparities in the diagnostic and intervention services (Dababnah et al., 2018) at a higher rate than other races. African American children are diagnosed with ASD at a later age placing them at a greater developmental disadvantage than their counterparts. The purpose of this study is to examine how African American parents perceive the assessment and intervention processes and the information that is provided to them as caregivers. This study is important because research has documented differences in early diagnosis and intervention experiences for African-American children (Colic et al., 2021; Dababnah et al., 2018; Stahmer et al., 2019) that can impact their overall life outcomes (Shattuck et al., 2018). In an effort to decrease health-care disparities, this study will be achieved by conducting a semi-structured interview where commonalities and differences amongst African American families will be discussed. Based upon previous literature, the study's hypothesis is that families will express more challenges with navigating assessment and obtaining satisfactory services. The findings indicate that A-A families experienced communication breakdowns with service providers and there is a lack of accessibility to resources in rural counties. Data collection for this study is ongoing, preliminary findings indicate that A-A families experienced communication breakdowns with service providers. Suggestions for future research would be to investigate ways to help A-As families obtain services for their children with ASD and ways to facilitate culturally responsiveness in services while reducing communication challenges.

## INTRODUCTION

Substantial research indicates that Autism Spectrum Disorder is a neurological and developmental disorder that affects individuals of all races, ethnicities, and backgrounds

yet A-A Families with children that have an ASD diagnosis experience disparities and differences when it comes to accessing and participating in speech and language therapy services. A-A children are one of the non-white populations that have been diagnosed at a later age than other individuals with Autism. The late diagnosis impacts their language development and thus impacts other areas such as comprehension and their interactions with their peers and society. A-A families with children who receive such diagnoses often struggle to get a diagnosis in the first place and then are confronted with receiving services. Due to issues related to access and resources, special education services are not always equal for A-As when compared to their counterparts. The barriers to services places African American children at a disadvantage for receiving early intervention services and proper diagnoses. Many parents feel uninformed, misunderstood, and overlooked when it comes to the decisions and care of their child with an ASD diagnosis.

The current gap that has been noticed indicates a relatively low amount of research surrounding African American children with autism and the actions being taken to render proper services. "Black and A-A families are underrepresented in research on ASD and few studies have explored how to increase their involvement" (Shaia et. al p. 1841, 2020). The research that is not currently being conducted is how Black/A-A children with autism can be better serviced. Current research reports information detailing why they are reluctant to participate in research studies and the analysis of the current struggles that families face such as racial discrimination, poverty, socioeconomic status, amongst other factors. I became interested in this topic during my Language & Acquisition and Language Disorders in Children courses. The classes highlighted the importance of early intervention and developmental stages that children must experience to be developmentally efficient. As I learned the fundamentals needed for a child to be successful, the disparities in ASD seemed to be apparent. The information of A-As feeling discouraged or uninformed about ASD due to being overshadowed by behavioral issues or shame was disheartening. The disparities discussed sparked my interest on what is currently being done to remedy these issues, which led me on a search to find answers. The topic felt personal since I will be an Black/A-A clinician serving individuals from different races, backgrounds, and ethnicities; I wished to advocate and be a voice for those individuals who often feel much anxiety, nervousness, and more when it comes to these types of diagnoses. Through this search, I observed some gaps in diagnostics and intervention services that need to be addressed.

Diagnostics and intervention services are key in the diagnosis of ASD. Without proper assessment, ASD cannot be diagnosed. There is a large body of research reporting about ASD, but there are fewer studies discussing the experiences of Black/A-A Children with ASD. Numerous families report feeling misinformed when it pertains to ASD and their children, which can lead to a powerful obstacle on the families. The obstacle is faced from their communities and the professionals assigned to assist them. Families experience a lack of understanding from their families and professionals, which can make the experience exhausting as they fight to advocate for their children. While other races experience difficulties with receiving proper services, it is believed that due to implicit bias A-A children may experience an increased difficulty in receiving a proper and timely diagnosis (Lovelace, Robertson, & Tomayo, 2018). Common themes such as socioeconomic status, cultural background, and healthcare seemed to affect the diagnoses and the services provided.

I hope to assess past research, current research, and new knowledge along with primary accounts from four selected families with children in numerous places on the spectrum. I hope to see common themes amongst the families along with gathering advice to improve the diagnostic and intervention process to make it easier for A-A families. I will also highlight the growth the field of speech-language pathology has taken to ensure that African American children with ASD and their families feel comfortable accessing services and are capable of receiving services. This study will analyze literature while highlighting current accounts from A-A families to answer the research question of What are the experiences of African American Families with children that have Autism regarding the assessment and intervention process? I anticipate seeing A-A families will

have unique experiences regarding the diagnostic process and accessing intervention services. They will be able to provide insight for future directions for clinicians and researchers.

## REVIEW OF LITERATURE

### Background Information

Currently, there is a wide gap in research analyzing the experiences of African-American families with autism and their experiences with diagnostic and intervention access. ASD is a neurodevelopmental disorder and is often diagnosed based on professional observation and parent report of child behaviors (Dababnah et. al, 2018). There is not much representation analyzing these steps in their treatment. One study recognized this gap in literature and decided to analyze 22 Black families raising children with an ASD Diagnosis (Shaia et. al, 2020). They worked to identify barriers to research participation. The lack of literature raised flags seeing as Black Families experience health and diagnostic disparities (Shaia et. al, 2020) at a higher rate than other races. Recent research has begun to reveal bias towards Black Families negatively impacting provider-patient relationships. Black children are more likely to go undiagnosed with ASD and receive intervention services or developmental screenings before the age of three years old (Dababnah et. al, 2018). This mistrust stems from past research projects and how A-A Families have been rendered services in the past. Numerous studies have discussed the mistrust of healthcare providers and skepticism of information provided by medical figures (Williams et. al, 2019). Numerous studies have shown that Black families have a higher level of mistrust of healthcare providers and a higher level of skepticism of information provided by medical figures (Williams et. al, 2019). The current research presents unique challenges and obstacles that accompany a diagnosis of ASD that affect the family units and the family members individually. The themes suggest a culturally responsive approach being taken as the needed services are given (Lovelace, Robertson, & Tomayo, 2018).

### Diagnostic Process

A-A Children have been diagnosed at a later age than their peers. This disorder can be diagnosed by 2 years of age and intervention started by 12 months of age, but there is a delay in the diagnosis and intervention of A-A children. Factors such as healthcare access and ASD interpretations have been considered for impacting the delayed process of diagnosis of ASD in African American Children (Burkett et. al, 2015). The factors are speculated to be influenced by racial discrimination and implicit bias. Burkett, Morris, Mannin-Courtney, Anthony, & Shambley-Ebron (2015) conducted a study of 24 African American Families and 28 Professionals treating ASD. Parents took action and shielded their children from professionals that seemed distrusting to avoid negative encounters. This disconnect is presumably present due to the cultural differences amongst African American Families and Clinicians. Based on statistics, it was determined that African American children were delayed in their diagnosis, misdiagnosed, or diagnosed with a more severe case of ASD. For instance, Williams et. al (2019) proposed that the process for African American children being diagnosed with ASD was longer and filled with clinician bias. Difficulty with a diagnosis creates a barrier that prevents African American families from receiving proper intervention services. Many families expressed feeling less informed, less understood, and insufficiently included in decision making. Some researchers like Lovelace, Robertson, & Tamayo (2018) have factored in that parents may be over-reporting disruptive behaviors and underreporting the core symptoms present that resonate with ASD. Due to the lack of information given to parents, the early signs of Autism would be left ignored or misinterpreted with a different diagnosis. A-A children are more likely to be diagnosed 1.5 to 2 years later than White Children and are more likely to receive an initial diagnosis such as an adjustment disorder or conduct disorder (Lovelace, Robertson, & Tomayo, 2018). Black children are more likely to be diagnosed with more

severe forms of ASD, suggesting underdiagnosis of children with milder forms (Dababnah et. al, pg. 322, 2018). Cultural factors combined with thoughts and behaviors resulting in differences in how parents perceive their children's development. This process leads to parental stress that can carry over into the intervention process.

### **Intervention**

ASD is a complex disability affecting an estimated 1 in 59 children in the United States. Many of the families seeking early intervention for their children, who are experiencing delays, come from higher socioeconomic classes (Dababnah et. al, 2018). This finding supports the fact that lower income families or impoverished families are more likely to have a missed or delayed diagnosis. Many parents have had to seek help and intervention services elsewhere due to nonchalant primary providers. Studies suggest that Black children are five times less likely to receive intervention services. The screening for ASD may not occur at the rate of other children. Recent research has revealed that existing frameworks were not structured to effectively investigate how structural racism may contribute to health disparities. Frameworks such as Public Health Critical Race Framework (PHCRF) and the healthcare utilization model have been created to analyze healthcare and other external factors such as race and age on healthcare. It was initially intended for a different diagnosis but it has been adapted to address ASD diagnostic disparities among Black children.

### **Family Experiences**

Families are being impacted from different angles after receiving a diagnosis of autism spectrum disorder. Caring for a child with autism impacts personal relationships, finances, and the mental health of the families (Lovelace, Robertson, & Tamayo, 2018). Parents begin to feel depression, devastation, and despair upon hearing the diagnosis. Many feel a negative stigma attached to a diagnosis of ASD, which sometimes delays the follow-up to the referrals (Dababnah et. al, 2018). Cultural Factors along with thoughts and behaviors play a role in how parents from different races perceive their child's development. Due to the descriptions and attributes described, A-A children may receive a diagnosis of a conduct disorder before a diagnosis of ASD. Studies are presenting that A-A families are experiencing differences in treatment and the process of receiving treatment. The results in Lovelace, Robertson, & Tamayo (2018) display the experiences of three black mothers and their experiences with professionals. One mother reports that many professionals were condescending or shocked as the mother communicated with them about her child. Despite controlling for socioeconomic status, racial disparities persist in the diagnosis and intervention processes (Dababnah et. al, 2018).

### **Disparities and Differences**

Based on race and ethnicity, different racial groups are experiencing disparities based on numerous factors. Researchers Bilaver, Sobotka, & Mandell (2020) analyzed racial and ethnic disparities among nine common autism related services. Geography played a major role in the disparities. The biggest gap was seen in case management and care coordination services, where the need for intervention was witnessed for every minority group. Minority groups on Medicaid received different experiences than White Americans in not receiving outpatient services or being allotted school services as a possible way to place minority children in special education and bill the medicaid insurance. Poverty is a leading factor for the missed diagnoses (Dababnah et. al, 2018). The lack of response from primary care physicians of caregivers' worries is proving to be one of the contributors of late diagnoses in African American children that are at risk of ASD.

### **Recommendations and Progress**

To decrease the delay in diagnosis rates, families are speaking out about the health-

care's attention to caregivers' concerns (Dababnah et. al, 2018). Some progress has been noticed, but there is much more that needs to be done. Researchers are noticing a slight increase in the awareness of early intervention services for children with developmental delays. Providers are working to decrease the age of children when they are first diagnosed, but non-white children are still diagnosed 1-2 years later than white children (Wiggins et. al, 2019).

### **What's Not Discussed**

Much of the data does not discuss what clinicians and other professionals can do going forward. With the interviews I am gathering information from, I hope to be able to present some information that can help all professionals be aware of their actions and work towards improvement and change. In the following sections, I will explain the process of gathering information through interviews of professionals and caregivers to show that there is room for professionals to be more aware of their actions towards families seeking diagnosis and treatment. The findings I will present can offer a way forward in training and attention of professionals. I will analyze how A-A families will have unique experiences regarding the diagnostic process and accessing intervention services. They will be able to provide insight for future directions for clinicians and researchers.

## **METHODS**

Eligible participants included those who were the parents and legal guardians for a child with ASD and identified as Black or A-A. The final sample comprised four family dyads. The families were asked to complete a Demographic Survey and a Semi-Structured Interview with a standard number of questions. The study's principal investigator and researcher also served as the interviewer for the families. The term PI and interviewer will be used interchangeably for the remainder of the paper.

### **Demographic Survey**

Each parent or dyad of parents were required to complete a consent form and a Demographic Survey. The survey questionnaire was distributed via email. The participants, who identified as Black/African American, 18 years of age and older, and had one or more children with autism, were asked a standard set of interview questions about their experiences with having a child with ASD. (See Index A)

### **Semi-Structured Interviews**

First, the interviewer explained the purpose of the study and benefit to society from their participation (e.g., their experiences can be used to provide awareness and steps and advice towards change within the field). Second, the researcher explained the interview method to all the parents and answered any questions regarding the process and procedures for participating. The researcher will utilize a semi-structured interview format where a discussion will be encouraged between the researcher and participants through the researcher's minimal encouragers, constant eye-contact, forward leaning posture, summarizations and reflective statements, as well as follow-up questions to help clarify unclear statements that will be made. During the interview process, only one parent sat in on the interview by choice. The parents were primarily the mothers. The African American parents and legal guardians were further classified with categories stemming from the Demographic Survey. Transcripts will be reviewed by the PI for common themes from the participants, and this information will be used to describe their deidentified and collective experiences. After each interview, the researcher will analyze the transcription, making any needed corrections as well as extracting any identifying names or information to add the pseudonym and identifying number. Common themes will be pulled from each interview to be analyzed and inserted into the researcher's thesis paper. (See Index B)



## Procedure

After receiving Institutional Review Board approval from the University of West Georgia, as well as the participating families, the study began. Upon this approval, the PI proceeded with the study beginning in the Spring 2023 semester of the 2022-2023 academic school year. A purposeful sample method within this qualitative study to reach and recruit eligible families. A recruitment email or phone call was used to determine which families fit the criteria for participation. I met with each family to discuss the purpose and goals of the research study. The structure and outline of the study consisted of three stages.

Within the first stage, the PI informed each of the participants of the purpose of the study via email. Each parent or dyad of parents were required to complete a consent form and a Demographic Survey. The survey questionnaire was distributed to the participants via the emails that they provided. The participants, who identify as Black/African American, are 18 years of age and older, and have one or more children with autism, were asked a standard set of interview questions about their experiences with having a child with ASD. First, PI explained the purpose of the study and benefit to society from their participation (e.g., their experiences can be used to provide awareness and steps and advice towards change within the field). Second, the PI explained the interview method to all the parents and answered any questions regarding the process and procedures for participating. During the interview parents were asked a standard set of questions about their experiences related to the diagnostic and interventions services provided to their child with ASD. After gaining consent, the second stage of the study consisted of recorded interviews with the researcher. The interviewer worked around the parents' schedule to schedule the interview. The interview was conducted via Zoom. The interview took approximately 1 Hour. To ensure that the interview took no longer than an hour, the researcher attempted to pilot the interview with a parent volunteer who is not in the study. This volunteer was recruited through the comprehensive community clinic. The interview was adjusted as needed based upon the length of the pilot interview. If a pilot interviewee couldn't be located, the researcher had a timer set during the interviews and adjusted the pace accordingly. The researcher asked the parent or parents open ended questions to prompt dialogue.

## RESULTS

Themes emerged from each of the four interviews. Demographics about each interviewee and their child are outlined in Table 1. All participants participated in the Semi-structured interviews over Zoom. They each described their unique experiences receiving diagnostic and intervention processes for their child with ASD.

**Table 1 Key Demographics**

Family Names	Child's Age	Child's Gender	Date of Diagnosis (Month and Year)	Area Diagnosed	Location
Family A	10	Boy	October 2016	School System	Small Town or City/Rural Area
Family B	2	Boy	May 2022	Private Agency (Psychologist)	Suburb of City
Family C	22	Boy	April 2008	Private Agency (Psychiatrist)	Rural Area
Family D	16	Boy	January 2013	Private Agency (Psychiatrist) and School System	Suburb of City

a. Parents were given a family name in the beginning of the interview to de-identify them.

b. The caregiver relation is not listed on the key demographics, but all interviewees were mothers. The fathers did not sit in on the interviews or complete the demographic survey.

## EMERGING THEMES

### Theme 1: Family Backlash

Many of the primary caregivers reported distress and traumatic memories when recounting the road to a diagnosis. In this first theme, direct quotes from the interviews were extracted to detail the thoughts and feelings of the caregivers when seeking a diagnosis for their child. The interviewees or Mothers expressed the hardships they endured while also dealing with the thoughts and feelings of their family members. Many did not want the parents to seek a diagnosis or wished to compartmentalize the child's disorder due to denial or preconceived generational notions and feelings about disorders such as this.

"The first instance thing, or the first, you know, is to spank them, you know, like that solves the problem that corrects[them] no, they don't even know why you hitting them ..." – Family A

"It was almost like they were offended that I even went ahead and got a formal diagnosis, because now it's real"- Family B

"Initial diagnosis, had put up a block, you know, for a lot of our extended family"- Family B

"The issue it's like, Oh, you didn't have to go get them diagnosed now, you know, he's forever gonna labeled as autistic like as if that was, you know a bad thing. I guess. But you know that it also made me not really wanna be open about it like I just didn't wanna even discuss those things because there's that initial reaction from I'm like, you know what I'm a need this not to be a part of like I couldn't do that because it just wasn't conducive to my child's development"- Family B

"And when I tell you I was like so upset about he was like, you know, you don't gotta use the word autistic from my son. You can just say a little touched, I said, please don't ever say that again"- Family B

"I can't say my family because I did hide it so they couldn't encourage me or support me, because I didn't tell them." –Family D

An ASD stigma and distaste for labeling within the A-A community was expressed. This did not hinder the participants from further seeking answers, but the lack of support and understanding from families was disheartening. All of the participants relayed that denial or shame was prevalent in the A-A community, which contributed to the reduced awareness of ASD and sometimes a delay in diagnosis. The families were resistant to the label of "autism". One mother detailed that family members resulted in disciplinary actions due to the lack of understanding of the child's diagnosis and their actions.

Despite the stigma, some of the parents noted that some of the family members were understanding and provided support or shared information about ASD due to primary experience. The parents were really appreciative of those responses.

### Theme 2: Rural Counties

Families expressed that their demographic region was a key factor in how they obtained resources. Two of the families in particular mentioned that rural counties in particular were suffering due to the lack of resources for students with ASD and other disabilities as well as professional resources. One of the families recalls having to relocate to receive the services and answers she was seeking for her child. (Family A) "[We] Made a decision to relocate to Columbus. Not too far, you know, and the same services that I was begging for in SC School system (first school) I was able to receive in Columbus within 2 weeks...I'm wondering, is it because it's the school? Is it because of the area, you know? Is it because of the need for services?" The mother could not understand the lack in response from the school professionals that were supposed to assist her during this crucial time. The other two families recount issues with scheduling and the distance to receive services. One mother had to travel over an hour to for her child to be tested while one mother could not always get her child to therapy due to distance and having to work.

Participants, who discussed this theme later made suggestions on what could be done to improve this battle. The PI did not consider socioeconomic factors in this theme

due to socioeconomic status not statistically matching the geographical location of the families. The geographical locations the families lived in did contribute to the time it took to receive a diagnosis, but their needs were met after relocating or agreeing to travel the longer distances.

### **Theme 3: Needed Improvements**

All of the participants provided feedback on what they wished to see as the field continues to grow. The strategies improvements ranged from more resources in rural areas to questionnaires that provided more specific information to parents about ASD.

"Try to come up with like secondary strategies...So that way, you know, we can really attack it, you know, at any source...You ain't gonna see no difference if you're not doing it at home"- Family A

"...are there things that you specifically have a goal in the end, like life, long? Goal for your child that you want them to have as a tool and then maybe they can do like specialized training with that child, you know, specifically based those I don't want to say demands... So I feel like it's we can form progress to make it look like something that's easily digested to family, who already on the fence, or like not knowing their piece of work that will like resonate more with them."- Family B

"...to evaluate the whole child, and not just the autism, but when I say the whole child, like the child's I don't know if you're familiar with the term metro system like their child, system, their ecosystem..." - Family C

"..definitely not to (be) quick to diagnose that quick, to put them on any kind of medication. You know, have resources, because again it could be, you know, peers may be like me, maybe in denial, but still provide those resources, find places that they can go to, or they can get approved."- Family D

Overall, the parents voiced that they desired to see changes in the field. Now that they are more aware of ASD, they are more likely to seek out different resources and be a part of studies such as this one. Each family voiced their compliance in working with researchers to create routes to a more inclusive environment for A-A families seeking diagnostic and intervention services for ASD.

## **DISCUSSION**

This research collected the perspectives of a socioeconomically diverse sample of parents of A-A children with ASD. The findings have been analyzed and discussed throughout the paper. Demographic characteristics as well as racial factors were important to note as potential drivers to the racial disparities in ASD Diagnosis. The responses from the families in this study indicate that they often face challenges in garnering support through the diagnostic process within their extended family systems and communities. Respondents also noted that they faced difficulty with accessing services in rural areas and would like for clinicians to consider the family ecosystem during the evaluation and intervention process. Respondents shared that it would be helpful for clinicians, doctors, and other professionals to bring programs to rural areas to make services more accessible and asking more straightforward questionnaires during doctor visits whether it is a routine check-up or an emergency visit to catch signs and symptoms of Autism earlier on. They feel this will provide families with extra support and provide easier access to early intervention at an earlier age. My study is like other studies because it is accessing the disparities A-A families face when seeking diagnostic and intervention services for their children with Autism. My study also includes primary accounts of respondents' experiences. This study provides new insight about the experiences and disparities A-A face when having children with Autism. The hope is to provide the field with improvements that stem directly from the parents that assist clinicians in being more competent in this aspect.

This study is similar to (Dababnah et. al, 2018) in the analysis of A-A families and their experiences with children with ASD. Both studies showed that children were able

to access some intervention services such as speech therapy before receiving the ASD diagnosis. However, the current studies differed in terms of the level of reported issues due to clinician bias; this study's participants indicated that some of the disparities were attributable to the lack of resources in the areas they resided, which forced them to relocate or seek resources hours away. Participants in this study were also open to speak with researchers and advocate with service providers. This displays the trust and acceptance of disorders of ASD that A-A families are beginning to show. This study did find similar reports as those highlighted in Dababnah et al. (2018) that emphasized the existence of cultural stigma related to ASD and labeling in the A-A community, particularly among extended families of the participants. This study also provides suggestions and direct feedback from the parents being interviewed. Additionally, this study's results support Dababnah et al. (2018) suggestions regarding the need for interactive and routine discussions between caregivers and doctors about disorders such as ASD, to raise awareness and help parents identify early signs and symptoms.

The children discussed in this study were boys. Statistically, boys are diagnosed at higher rates than girls. In future research on this topic, it would be more comprehensive to include a sample of caregivers of girls with ASD to have a more inclusive pool of data and to assess if there are different experiences and feelings based on the gender of the child and not just the race and ethnicity.

## CONCLUSION

Although more research is being conducted to analyze the disparities A-A are facing with ASD, the call for action and changes are slow and steady. The growing popularity of this neurodevelopmental disorder has resulted in emphasis on the biological underpinnings of ASD and the intervention and diagnostic processes (Williams et. al, 2019). The present study contributes to scientific research and literature by analyzing A-A experiences when seeking diagnostic and interventions services for their child with ASD.

This study's results indicate that A-A families do have unique experiences when attempting to access diagnostic and intervention services regardless of demographics or socioeconomic status. Moreover, each participant contributes ready feedback about the needed improvements for this minority group and their children with ASD, which may be necessary since they will be directly affected by the changes. The results of this study highlight the importance of placing ASD research and treatment into a larger cultural context (William et. al, 2019) as well as the importance of feedback from parents, caregivers, and legal guardians are.

## APPENDIX A

### Demographic Survey Questionnaire

#### *The Analysis of Autism Experiences from the Perspective of African American Families*

Thank you for your participation in this study. This is a preliminary step you must take before the interview process along with completing the consent form, which will be emailed to you and must be returned before completion of the interview.

Thank you again for your participation. Please respond to each of the questions as best you can. Your responses will be kept confidential. If you have more than one child with autism, give answers for the oldest child with autism. We will use the initials ASD to refer to Autism Spectrum Disorder. ASD includes the range of diagnoses applied to children with social communication difficulties (such as Autism, PDD-NOS, and Asperger's).

1. What is your name?
-

2. What is your gender?
- Male (1)
  - Female (2)
  - Other (3)
3. What is your age?
- Under 18 (1)
  - 18 - 24 (2)
  - 25 - 34 (3)
  - 35 - 44 (4)
  - 45 - 54 (5)
  - 55 - 64 (6)
  - 65 - 74 (7)
  - 75 - 84 (8)
  - 85 or older (9)
4. What is Your Child's Name?
- 
5. Child's Date of Birth: (mm/dd/yyyy)
- 
6. What is your relationship to the child?
- Mother (1)
  - Father (2)
  - Grandmother (3)
  - Grandfather (4)
  - Other: (Specify) (5) \_\_\_\_\_
7. Are you of Hispanic, Latino, or Spanish origin?
- Yes (1)
  - No (2)
8. How would you describe yourself? Please select all that apply.
- White (1)
  - Black or African American (2)
  - American Indian or Alaska Native (3)
  - Asian (4)
  - Native Hawaiian or Pacific Islander (5)
  - Other (6)
9. What is the highest degree or level of school you have completed?
- Less than a high school diploma (1)
  - High school degree or equivalent (e.g. GED) (2)
  - Some college, no degree (3)
  - Associate degree (e.g. AA, AS) (4)
  - Bachelor's degree (e.g. BA, BS) (5)
  - Master's degree (e.g. MA, MS, MEd) (6)
  - Doctorate or professional degree (e.g. MD, DDS, PhD) (7)
10. What is your marital status?

- o Single (never married) (1)
  - o Married, or in a domestic partnership (2)
  - o Widowed (3)
  - o Divorced (4)
  - o Separated (5)
11. What is your current employment status?
- o Employed full time (40 or more hours per week) (1)
  - o Employed part time (up to 39 hours per week) (2)
  - o Unemployed and currently looking for work (3)
  - o Unemployed not currently looking for work (4)
  - o Student (5)
  - o Retired (6)
  - o Homemaker (7)
  - o Self-employed (8)
  - o Unable to work (9)
12. What month and year was your child diagnosed with ASD? (Month & Year)
- \_\_\_\_\_
13. Where was your child diagnosed? (Check One)
- o School System (1)
  - o State or Developmental Agency (Ex: Babies Can't Wait) (2)
  - o Marcus Autism Center or Emory Autism Center (3)
  - o Doctor's Office or Hospital (4)
  - o Private agency/practice (such as a Psychologist or Psychiatrist) (5)
  - o Other (Specify): (6) \_\_\_\_\_
14. Did your child have any other diagnosis before being diagnosed with autism?
- o No (1)
  - o Yes (If Yes, What was the Diagnosis?) (2) \_\_\_\_\_
15. After you started seeing behaviors that later turned out to be part of his/her ASD, how long was it before you talked to a professional about these behaviors? (Check One)
- o 0-3 months (1)
  - o 4-6 months (2)
  - o 7-12 months (3)
  - o More than a year (4)
16. After you talked to a professional about these behaviors, how long was it before your child was diagnosed with ASD? (Check One)
- o 0-3 months (1)
  - o 4-6 months (2)
  - o 7-12 months (3)
  - o More than a year (4)
17. How many different professionals did you see before your child was diagnosed with ASD? (Check One)
- o 1-2 professionals (1)
  - o 3- 4 professionals (2)
  - o 5-6 professionals (3)

- o Over 6 professionals (4)

18. Which of the following best describes where you live? (Check One)

- o Large City (1)
- o Suburb of city (2)
- o Small Town or City (3)
- o Rural Area (4)

19. Before you complete this survey, is there anything else that you would like to tell us about your experience with your child that we have failed to ask? Please use the space below to write your comments.

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## APPENDIX B

### Semi-structured Interview Questions

1. Explain the process that led to your child's diagnosis.
2. Talk to me about your feelings about the process leading to your child's diagnosis. Did you feel heard or supported? Did you experience stigma?
3. Did you experience any encouraging or discouraging moments during the road to a diagnosis?
4. Explain how each professional handling your case relayed information to you and your family. Describe how they made you feel and the environment/atmosphere they facilitated. Were they empathetic or very straightforward with disregard to your emotions and feelings?
5. Explain the services that have been the most and least helpful and why?
6. What obstacles have you encountered while trying to get services?
7. Explain how you felt when trying to gain knowledge about your child's/children's diagnosis.
8. Explain how you felt as an African-American Family having a child with ASD. Were there fears of backlash from your community, within your family, etc.?
9. Explain how professionals approached your child's case. Did they initially suspect ASD or did they suggest a different diagnosis?
10. Do you believe that being African American has had an effect on your experience, and if so how?
11. Explain the changes you believe that could make receiving intervention services easier.
12. Do you think there are any types of services or supports missing for Black/African American families that have children with ASD? What type and how will they be beneficial?
13. If you could give clinicians advice for working with African American families, what would you give them?

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# A COMPARISON GAME: THE IMPACT OF SOCIAL MEDIA AND SOCIAL COMPARISON ON THE DEVELOPMENT OF PERFORMANCE ANXIETY AND DEPRESSION IN COLLEGIATE ATHLETES

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*KATHERINE DENSMORE*

The mental health of college students is one of the most researched topics in the field of psychology. This can be attributed to the prevalence of mental health crises within this age demographic. Among one of the largest concerns for mental health researchers is the rate at which individuals of this age range commit suicide. Within the ages of 18 to 25, suicide is the second leading cause of death in the United States (Kella, 2021). It is estimated that one in every three college students will experience a significant symptom of a mental health crisis while enrolled in college. Of these 20.2 million students, only about 30%, or 6 million, will receive any type of treatment or help (Kuik, 2019). Some treatment options include seeing an on-campus counselor or working with a peer help group. Many different things can affect a student's choice to receive treatment, including the types of treatment services that are available to these individuals.

Many college campuses offer some type of mental health treatment or advocacy program to their students. In some cases, these resources cannot provide for the plethora of individuals seeking help. Because of this, many individuals cannot receive care for issues such as depression and anxiety. Of those not receiving care are collegiate athletes. Athletes for Hope reports that only about 10% of student-athletes receive any treatment or help (2019). This is significantly less than the 30% of college students who seek treatment (Kuik, 2019). College athletes are about 2% more likely to experience significant symptoms of a mental health crisis (Vickers, 2014). This slight increase is attributed to the increase in stress and workload associated with being a college student and athlete, but it is not statistically significant. While these individuals experience similar rates of symptoms, the disparity in those seeking treatment is concerning.

The slight increase in mental health symptoms in collegiate athletes can be attributed to the daily stressors these individuals face (Vickers, 2014). The schedule of a college

athlete differs greatly from the schedule of someone simply taking college classes. These individuals are responsible for workouts, practices, classes, homework, and many other things. This does not include other daily functions, such as cooking and eating meals and having social interactions. These students are also expected to travel with their team and perform at a peak level to ensure the success of their athletic program. College classes alone provide stress, but these individuals must combine this stress with the stress of their athletic performance. With all of this in mind, it is easy to see why these athletes are more likely to experience a significant mental health crisis than other groups of college students.

While the stressful nature of these individuals' lives is a concern of larger concern is that many of these student-athletes are not seeking treatment. The significant difference in the number of individuals seeking treatment is attributed to the stigma surrounding mental health advocacy and treatment within the athletic community (Vickers, 2014). In many cases, coaches are reluctant to work with the mental health professionals provided or advocate for better mental health resources for their athletes. Unfortunately, there have been some disturbing accounts recorded when coaches are forced to work with mental health professionals. One of these accounts occurred at the Ohio State University. Kerry Coombs, the defensive coordinator for the Buckeyes, greeted the team's new psychologist with profanity and refused to allow his players to meet with the psychologist (Babb, 2020). This occurrence is not the first or last of its time. Unfortunately, some members of university athletic departments are unwilling to accept that their athletes need mental health resources.

The stigma surrounding athlete mental health may also contribute to the significant lack of research about student-athlete mental health within the field of psychology. Up until the last couple of decades, this topic was not the center of much research. I believe this can be attributed to the stigma surrounding the athletic community and mental health. As advocacy for this discussion continues to grow, so does the amount of research and concern for this topic. By increasing the amount of research done within this sub-field of psychology, athletic administration, coaches, and parents can gain a better understanding of the struggles many student-athletes face alone while in college. I believe a better understanding of these issues is key to working towards a solution and providing a healthy environment for these young adults to continue their academic and athletic careers.

Because of the lack of research concerning student-athletes and their mental health, much of the background research for this research project is sourced from a few articles with recent publication dates. These articles, and many others, are a part of the recent surge in research being done on professional and student-athletes. As a result, many professional athletes have become outspoken about their struggles with their mental health. In many cases, these individuals share their stories through social media and other news outlets to advocate for the mental well-being of other athletes. By speaking up, professional athletes and Olympians, such as Micheal Phelps and Simone Biles, are working to break down the stigma that has surrounded talks about mental health within the athletic community. This type of advocacy and an increase in research will provide this community with the knowledge and resources to better understand the experiences of professional and college athletes.

While social media is used to help athletes, it has also been linked to causing negative mental health symptoms in those who consistently use them. In the last two and a half decades, the world has witnessed the internet being taken over by social media sites. This explosion has led to many changes in our daily lives and has been linked to an increase in mental health problems among 18 to 25-year-olds. Since the advent of social media, the suicide rate within this age demographic has increased by 33% in the United States (Verduyn et al., 2020). Because of the nature of their lives, student-athletes are at an even greater risk of developing mental health problems. Many of these student-athletes develop performance anxiety and depression due to their exposure to social media (Brougham, 2021). While these mental health problems can have many

different sources, the connection social media has proved to have with the development of mental health disorders is significant and should be considered when doing research within the student-athlete populations.

Based on my background research, social media usage among collegiate athletes should be evaluated to better understand the effects it has on their experiences. Within my research, I hope to expand upon the previously published works and provide substantial evidence as to why college athletes are experiencing mental health crises at an alarming rate. I also wish to identify why these individuals are not seeking any resources that provide treatment. By doing this, I hope to slowly break down the stigma around mental health within the athletic community and help to educate those within athletic departments about the athletic experiences within their programs. To do this, I will outline the significant problems facing college athletes, how social media and social comparison relate, and how this affects the experiences of college athletes. I will then collect first-hand accounts and reactions from college athletes at the University of West Georgia. This will provide empirical evidence to support my claim that the social comparison which occurs on social media sites has a significant negative effect on the mental health of collegiate athletes.

To complete this, I considered the daily experiences and activities of competitive collegiate athletes. The typical day as an athlete is very structured and action-packed. It usually consists of limited free time. Student-athletes generally have a very hectic schedule in which they must fit classes, homework, workouts, practices, and other daily activities. While some discount the struggles of being a student-athlete because it is seen as a choice, they also neglect to consider the needs of some students who cannot afford college without the financial assistance a scholarship provides. As a result, these students cannot afford to lose their scholarship money, and they experience an increase in the level of stress compared to other students. This stress combined with the other stressful aspects of college life creates an environment where mental illness breeds. With all of the demands on them, it is not surprising that college athletes develop mental health problems at a slightly increased rate compared to the entire population of college students (Vickers, 2014).

The overwhelming stress felt by student-athletes is only increased by the continual comparison of athletes to their teammates and other top athletes around the country. Because of the competitive nature of the sports industry, social comparison is inevitable, and depending on the level of competition it can be overwhelming. The social comparison refers to the comparison that occurs when we look at others within similar situations and evaluate our performance based on this information (Myers & Twenge, 2010, p. 410). The social comparison comes in two major forms: upward social comparison and downward social comparison. Upward social comparison occurs when one is compared to someone who is perceived to be more successful, and downward social comparison occurs when one is compared to someone who is perceived as being less successful. For this research, I will mainly focus on continual upward social comparison because of the negative effects it is proven to have on an individual's self-esteem.

By continually comparing yourself to individuals you perceive to be better than yourself, you become at risk of developing self-esteem problems. This is because of the ideal of success upward comparison causes (Myers & Twenge, 2010, p. 411). The development of idolized success leads to the development of performance anxiety and depression in athletes. Performance anxiety is defined as a severe fear of failure during an exhibition and is common among high-performing athletes (Deil et al., 2021). The development of performance anxiety and depression results from the pressure to conform to an idea of success and a fear of failing to meet expectations. Performance anxiety and depression have been linked to the further development of mental health problems. Along with the mental health risks, performance anxiety, and depression encompass, it also poses the risk of physical injuries because of the effects it can have on an athlete's self-esteem and confidence in their abilities (Vickers, 2014).

Social comparison is also present within the social media platforms most of the

world's population uses daily. Because of this, student-athletes are exposed to this type of comparison in multiple ways throughout their daily experiences. Social comparison on social media is one of the most prevalent negative forces working within the mental health crises of 18 to 25-year-olds. This assertion is based on the connection between social media and the increase in suicide rate within this specific age range (Verduyn et al., 2020). Social media provides a platform for individuals to flaunt their lifestyle and success to the billions of other people who frequent these sites. In many cases, we only see the positive snippet of someone's life, and we never become privileged to what negatives might be occurring within this person's daily life. When this success is continually placed at the forefront of our attention and consumed, social comparison is going to inevitably occur.

Social media and social comparison present a twist to the situations faced by college athletes. Currently, 98% of college-aged students have one or more social media accounts (Brougham, 2021). This means that almost every college athlete exposes themselves to the effects of social comparison in multiple ways every day. Within the sports industry, this comparison happens between teammates and competitors. While comparing ourselves to others is not always harmful, continual upward comparison between players, coaches, and other teams can lead to diminished self-value and worth. As an athlete, this comparison can be detrimental to performance and perceived abilities (Diel et al., 2021). Because of the mental health hazards, this should be a concern for players, parents, coaches, and university athletic administrators. All of these individuals wish for their athletes to succeed, but success is not achievable if these athletes are not physically and mentally healthy.

One of the most influential individuals working towards the goal of informing everyone about the mental health crisis among student-athletes is Victoria Garrick-Browne. As a DI college athlete, she faced many challenges, and she used them to begin the fight against the stigma held against college athletes who struggle with depression, anxiety, or other mental health disorders (2017). In 2017, she gave a TED Talk about the subject, and since then she has started a nonprofit organization that supports the research of student-athlete mental health. Since this TED Talk, research within this subcategory of psychology has greatly increased, and it has become a major concern for players, parents, coaches, and school administration. As this concern has increased, so has the attention of public outlets and the NCAA. The overall increase in attention to this subject is a positive thing and has resulted in more people being informed about the negative aspects of collegiate sports. As it continues to gain traction, the research into this topic will provide answers to the many questions that have become very relevant to the mental health of college athletes.

As a result of individuals working to spread more awareness about athlete mental health, more researchers are taking upon the task of working to explain the experience of athletes within all levels of competition. One of the most influential and helpful of these research articles is *Motivational and Emotional Effects of Social Comparison in Sports*. This research examines how an athlete's use of social comparison affects athletic performance (Deil et al., 2021). While it does not specifically concern collegiate athletes, the majority of the results within this article can be applied to collegiate athletes. The authors present the idea that social comparison affects the emotions and motivations present within athletes. Because all athletes focus on self-improvement, they are continually comparing themselves to others around them. This comparison takes the form of upward and downward comparisons. When done continually, the two types of comparisons can have different effects on an athlete's performance.

While both types of comparison impact our mental health, this research focuses on continual upward comparison because of the negative effects it has been proven to have. While social comparison can provide some powerful motivation for athletes, it also can lead to changes in motivation, self-esteem, and happiness. When athletes compare themselves to others who are not as good as they are, their motivation to be better dropped. This decrease in motivation can also be seen when athletes compare themselves to those whose ability is far greater than theirs. An example of this would

be a collegiate golfer comparing themselves to the number one professional golfer in the world. While college athletes could have great potential and eventually reach the professional level, comparing them to the best professional golfer would cause them to disengage from the sport, and their performance will represent this. Continual upward comparison results in an overall decrease in motivation, self-esteem, and happiness among athletes of all calibers.

Because social comparison is a natural part of any sport, athletes, and coaches must find a way to create an environment that optimizes motivation. This balance is very important, but it can be difficult to find. Often when this balance is not found, athletes face emotional and motivational issues within their sport and school. When these athletes are facing emotional problems and a lack of motivation, they do not perform to the best of their ability. For college athletes, this can be detrimental because many rely on their performance for scholarships. While a great emphasis is placed on their performance, it seems that many programs lack the resources to aid in an athlete's mental health. Without these resources, universities are allowing many athletes to compete without proper mental care. Without proper mental care, these athletes are at risk of developing more intense mental health problems or encouraging physical injuries during their performance.

Of the NCAA's 1,268 member institutions, less than one-fourth provide their student-athletes with access to a full or part-time mental health professional (Carr & Davidson, 2021). When compared to the number of athletic trainers provided for physical injuries, a problem appears. According to the Bureau of Labor Statistics (BSL), 5,760 individuals are working in full-time athletic training positions at colleges and universities, (2021). In comparison, the BSL reports that 650 psychologists are working for colleges and universities, (2021). This number includes all psychologists employed by the university, not just the ones provided to student-athletes. While there are not any statistics presented on the number of psychologists employed by athletic departments, the overall mental health professional population employed by universities is significantly lower than the number of athletic trainers employed.

Within the University System of Georgia, two schools provide some type of mental health resources alongside athletic trainers. These schools are the University of Georgia and the Georgia Institute of Technology. Neither university provides its athletes with full-time mental health professionals. Within these athletic departments, there is a consulting psychologist used when deemed necessary by the athletic training staff. Other universities in the US are beginning to hire full-time psychologists to work with their sports teams. Some of these universities include Ohio State University, the University of Arizona, the University of Arkansas, and other large universities. The majority of the universities that provide full-time mental health resources are DI schools with large athletic departments. Because of this, their athletic departments have more money to provide these types of resources to their athletes. Although some of these departments are providing these resources, the resources provided for mental health are not to scale with those provided for physical injuries.

*The Impact of Social Media on the Mental Health of Student-Athletes* outlines the major correlations between social media site usage and mental health problems, including depression, anxiety, eating disorders, and suicide (2021). Social media has already been proven to have certain effects on the mental health of all populations or people. Brougham wished to discover how these sites could be affecting the mental health of college athletes specifically. Research shows that athletes are more susceptible to mental health problems because of the pressure that comes with their position in life. While not all student-athletes suffer from mental health problems, the proportion of student-athletes with mental health diagnoses is greater than those within the other student populations. Studies also show that the types of mental health problems faced by college athletes differ in some ways. Because of the performance nature of their lives, they are more susceptible to some types of mental health problems than other populations.

The author and some of her colleagues experimented to examine the extent to

which social media truly affects student-athletes and their mental health. This experiment was based on a survey of over 2,000 student-athletes within the United States across all NCAA divisions. The results of this experiment show that social media can have a positive impact on its users, but the negative impacts should not be ignored, and it can be detrimental to some aspects of student-athletes lives. These negative impacts include procrastination, loss of sleep, and vulnerability to developing mental health disorders. While social media can provide a healthy escape from the problems and stress these athletes face daily, it can also lead to the neglect of responsibilities. When this occurs, many students procrastinate and neglect their schoolwork. As a result, social media usage has been linked to a lower GPA and many other negative side effects.

Along with the evidence that social media can cause procrastination, this article also provides evidence that social media causes changes in the user's sleep patterns. This has a significant negative impact on the student-athlete population. Sleep disturbances are caused by the amount of time individuals spend using these platforms (Brougham, 2021). In many cases, these platforms become a time vortex, and many users have a significant lack of concern for the time that these sites might be consuming. When you place yourself in this position, it is difficult to limit the amount of time you are spending on these sites. As a result, most people spend more time scrolling through these platforms than they intended. In most cases, this can lead to neglecting responsibilities and sleep loss. This is concerning for athlete populations because, without proper sleep, many athletes cannot perform at their peak athletic potential. This leads to a drop in performance and self-esteem, and it places the athlete at a higher risk of obtaining a physical injury.

While sleep loss is a significant negative effect of social media, the increase in emotional vulnerability within athletes is the most significant side effect of social media usage. Many student-athletes reported feeling more vulnerable about their appearance and performance because of the information they are exposed to when using social media (Brougham, 2021). This leads to the athletes feeling less confident in themselves and their athletic abilities. When this occurs, many athletes become more focused on how the individuals around them are performing and less on their abilities and performance. This distraction also results in a drop in overall performance. As a result, many athletes develop anxiety and depression from their usage of social media. This, in turn, makes these student-athletes more susceptible to the development of other mental health problems and physical injuries.

While there is not any research expounding upon the effects of social comparison within social media sites on student-athletes specifically, *Social Comparison on Social Networking* works to explain how social comparison within social media affects everyone who uses these platforms. The authors outline how social media can affect the subject's well-being and how it can change how we see the world that surrounds us (Verduyn et al., 2020). Social media has allowed everyone instant access to the lives of billions of people from all around the world. While this serves to connect people from different walks of life, social media platforms can also work against the betterment of society. In the mass majority of cases, these individuals only share the information they deem to be desirable for others to know. Because of this, we idolize the individuals and information presented to us within these sites. This idolization is the result of social comparison, and if done continually, it can be very harmful to everyone's well-being.

As we continuously ingest the information placed on social media, we continue to populate the image of an ideal lifestyle in which we believe we should be living. In most cases, this lifestyle is unobtainable, and it is the result of a fantasy we have for our lives. As a result, this idolization can lead to the development of a multitude of different mental health problems, including anxiety and depression. This is common within all types of populations around the world, and it can be difficult to undo the damage these social media platforms can cause. Like other populations, student-athletes face the same effects of social media, and sometimes these effects are exacerbated due to other social factors within their lives. Because they are exposed to more stress than other student populations, it is especially important to focus on how social media can influence the

development of mental health problems among student-athletes around the world.

*Sport-Related Anxiety Current Insights* is another influential research project within this subfield of psychology. The research within this article outlines the major concerns and developments within sport-related anxiety (Ford et al., 2017). Within this article, the authors provide definitions for what anxiety is and how it might present in athletes. This is important because of the difference between athletes and other populations of individuals. Being nervous before a competition is generally perceived as normal, but in some cases, athletes feel too nervous to properly compete. When this occurs, the athlete is not within their optimal level of arousal, and as a result, their performance will be negatively affected. Sport-related anxiety has quickly become one of the most researched subjects within this subfield of psychology because of the impact it has on athlete performance.

The major findings within this study outline why this research is important and how athletes can find their optimal anxiety level to better their performance. In most cases, this is enough to positively affect their performance, but some athletes still struggle to control their anxiety surrounding their sport, and therefore it is important to also consider these cases. The article also addresses the development of anxiety concerning sports performance. In most cases, these athletes are fearful of poor performance. As a result, they develop anxiety surrounding their performance. This type of anxiety is more common among athletes because of the social situations that dominate their lives. Because athletes are placed into these stressful situations more frequently than other populations of individuals, they are more likely to develop anxiety associated with performance.

The last article I wish to address is *The Psychology of Competition: A Social Comparison Perspective* (Garcia et al., 2013). The authors of this article address how competition is fueled by comparison and the psychological effects of this on the individuals within the competition. Social comparison is a natural aspect of competition. Without this type of comparison, competition would not exist. While it is a natural aspect of competitive behavior, social comparison can still have detrimental effects on the mental health of those within the crosshairs of the comparison. Because of this, it is important to evaluate the nature of competition from this perspective. Overall, some people experience more competitive behaviors than others. When this is considered, the authors discovered that these individuals are more susceptible to experiencing the negative effects of social comparison. In other words, the more competitive an individual is, the more likely they are to experience the pressure felt by social comparison.

This discovery allows researchers to better understand social comparison from an athlete's perspective. When considering the competitive nature of sports, it is easy to see why athletes are more likely to develop mental health problems. By identifying this cause, researchers can then focus on identifying where these causes enter the athletic experience. Because of the influence social media has on this age demographic, it is easy to assert that social media influences the lives of student-athletes. As these researchers have identified, those who are in more competitive situations are more susceptible to the negative side effects of social comparison. As a result, athletes are among the most at-risk populations to experience negative side effects from social comparison. When all of the factors are identified and added together, one can see that student-athletes experience social comparison at an increased rate compared to other populations. When these factors are all considered, it is easy to see why student-athletes experience more mental health problems than other groups of people.

While there is limited research within this field and no research on the specific topic I wish to address, the research performed has provided extremely useful information. Because of this background information, I was able to identify key ideas that continually populate the literature on this topic. From this, I found that social media usage is greatly connected with our mental health. When considering this, I identified that there is a great connection between these two aspects of our lives. This connection is created by the social comparison that occurs within these sites. As an athlete who has experienced mental health problems during my time in college, this made me think about this problem from a different perspective than some researchers. Because of this, my research is



unique within this field of study. When combining all of these aspects, I realized that social media was a significant cause of student-athlete mental health problems.

Within my research, I will work to synthesize and expand upon the findings and research presented within these articles. By synthesizing the information within these articles, my research will work towards my goal of providing a better understanding of the experience had by collegiate athletes. More specifically, I wish to investigate how social comparison within social media sites contributes to the mental health problems that consistently occur among collegiate athletes. The articles and research reviewed provide the much-needed background and supporting information to allow my research to be successful. Overall, my goal in completing this research is to provide more information concerning student-athlete mental health and draw more attention to the struggles some athletes may be facing alone. By doing this, I hope that more individuals will become aware of these problems and that athletic departments around the county will work to provide better mental support to their athletes.

To further investigate the proposed correlation between social media social comparison and student-athlete mental health I wished to survey the student-athlete population at the University of West Georgia (see Appendix A). The survey I created consisted of twelve questions, and it was to be collected anonymously. These questions aimed to identify the individual's social media usage and their self-evaluation of how their mental health was affected by this usage. Demographic information was also collected. By collecting this information, a conclusion can be drawn about how other factors may influence the development of anxiety or depression within these athletes. The other questions within the survey will inquire about the experiences the athlete has had while at UWG. These questions will inquire about their usage of social media, including the number of accounts and hours per week used. Then the athlete will answer questions about how they believe social media impacts their overall mental health and their mental performance while participating in their prospective sport. The final part of the survey is an open-ended question where the athlete. This is provided for the athlete to provide more information about their experiences if he or she wishes.

Eventually, I hope to complete this research, and I expect to find certain trends within the results of the survey. Overall, I expect to see a connection between student-athlete social media usage and the prevalence of performance anxiety and depression. I make this assumption because of the connection social media and social comparison have been proven to have on the mental health of individuals (Diel et al., 2021). I also expect to see some trends that connect with the demographic information collected at the beginning of the survey. This is because social media and social comparison are not the only things that can impact someone developing a mental illness. Ignoring things, such as someone's race, gender, or socioeconomic status, could lead to biased research. Previous research shows that certain demographics can influence the results of the survey. For example, I expect that the survey will show that female athletes are more likely to experience negative mental health symptoms when compared to the male athlete population. While the prevalence is mostly the same, male athletes tend to be less forthcoming with this type of information even in anonymous surveys (Verduyn et al., 2020).

During the process of developing this research question and proposal, I was required to receive approval from the Institutional Review Board, or IRB. While the athletic department at UWG approved to survey of the athlete population, the IRB required several revisions to my application. Because of the time constraints on this research project, I was unable to complete the proposed survey. While I plan to eventually complete this aspect of my research, it has been placed on hold until I can gain approval from the IRB. The completion of this aspect of my research is vital to understanding the experiences of the athletes at UWG. Eventually, I hope to work with the athletic department at UWG to create a better environment for those who elect to participate in intercollegiate athletics.

The issue of athlete mental health has increased in prevalence as many professional athletes have begun talking about their struggles with mental health. As more attention is

drawn to this issue, many NCAA Division I schools have worked to implement programs to assist in the mental health care of their athletes. Unfortunately, this trend has not followed within the lower divisions. This is most likely due to the allocation of funding to other aspects of athlete performance, such as physical strength and endurance training. While the physical fitness of athletes is vital to their performance, the mental fitness of athletes is also vital. When an athlete cannot perform at their best mentally, they cannot expect to perform at their best physically. Because of this, the mental performance of athletes should have the same amount of emphasis and care as their physical performance.

The goal of this study is better to identify the contributing factors to mental health crises student-athletes are currently facing. I specifically wish to focus on the development of anxiety and depression within this population. By identifying this key factor, more information can be provided to these student-athletes, their support systems, their coaches, and the athletic departments responsible for their well-being. Throughout this process, I wish to provide helpful information to everyone and create more awareness surrounding the issue of athlete mental health. Ultimately, this will allow these individuals to work to provide these individuals with the support and treatment options they need to perform their best physically and mentally. I believe that access to support and treatment is a vital aspect of keeping athletes healthy and happy during their time in college.

## APPENDIX

The purpose of this study is to investigate the effects of social media on student-athlete's mental health. The results of the study will be used for completing my thesis at UWG and may be used in professional publications in the field of psychology. Your participation in this research study is voluntary and you may decide to stop at any time with no penalty.

All responses will be kept confidential; the survey will be anonymous. Your participation will take approximately 10 minutes to complete. You may skip any questions you do not want to answer on the survey. You can exit the online survey form if you want to stop completely. By agreeing below, you consent to participate in the survey and allow your results to be used

### **Risks:**

The possible risks of this survey include the possibility of some questions triggering uncomfortable feelings of anxiety and/or depression concerning your past and current mental health or athletic performance. Because of this, all questions are optional and you may choose to quit the survey at any point.

Please visit the UWG Counseling Center or <https://www.westga.edu/counseling/> for more information and resources regarding help with a mental health crisis.

### **Benefits:**

There are no foreseeable benefits to you for participating in this research. Society may benefit from a greater understanding of athlete mental health which could lead to improved student performance in all aspects of their college experience.

### **Terminology:**

- *social comparison* - a type of self-evaluation that comes from comparing our achievements to those of others in similar social situations
- *depression* - continual loss of interest and dejected mood or behavior performance anxiety- continual concern about one's performance in pressure situations
- *mental health* - overall self-evaluation of one's mental state (could be good or bad; also can change throughout different situations)

If you have any questions or concerns about the nature of this research or the survey please contact Katherine Densmore, at kdensmo1@my.westga.edu, Dr. Jeffery Reber at jreber@westga.edu, or irb@westga.edu.

- I understand and agree to participate in this survey.
- I decline to participate in this survey

*Demographics:*

Gender:

- Male
- Female
- Non-binary/third gender
- Prefer not to say

Age:

- 18
- 19
- 20
- 21
- 22
- 23 or older

Ethnicity:

- Caucasian/ White
- African-American
- Hispanic
- I prefer not to say
- Other not listed

Grade Level:

- Freshmen
- Sophomore
- Junior
- Senior
- Graduate

How many social media platforms do you currently use?

- 1 to 2
- 3 to 4
- 5 or more
- None
- Unsure

About how many hours per week do you spend on social media?

- None
- Less than 5 hours
- 6 to 10 hours
- 11 to 15 hours
- 16 or more hours

How often do you feel your social media usage affects your mental health?

- Never

- Sometimes
- About half the time
- Most of the time
- Always

How often have you experienced performance anxiety while participating in your perspective sport?

- Never
- Sometimes
- About half the time
- Most of the time
- Always

How often do you compare your performance within your sport to that of others?

- Never
- Sometimes
- About half the time
- Most of the time
- Always

Does this comparison have any effect on your mental health?

- Never
- Sometimes
- About half the time
- Most of the time
- Always

How often do you feel that your sports performance is affected by the content you consume on social media?

- Never
- Sometimes
- About half the time
- Most of the time
- Always

To what extent do you feel your social media usage affects your performance anxiety?

- Never
- Sometimes
- About half the time
- Most of the time
- Always

If not social media, what other influences have caused you to experience performance anxiety while participating in your sport?

How often do you have depressive thoughts or feelings?

- Never
- Sometimes
- About half the time
- Most of the time

- o Always

To what extent does comparison affect the development of these thoughts and feelings?

- o Never
- o Sometimes
- o About half the time
- o Most of the time
- o Always

To what extent do you believe social media impacts the development of these depressive thoughts or feelings?

- o Never
- o Sometimes
- o About half the time
- o Most of the time
- o Always

Do these thoughts or feelings impact your athletic performance?

- o Never
- o Sometimes
- o About half the time
- o Most of the time
- o Always

If not social media, what other influences cause these depressive thoughts or feelings to arise?

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# MLB HALL OF FAME VOTING PATTERNS AND THE IMPACT OF INFORMATION SHOCKS

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*ETHAN FRELIGH*

I examine the factors that MLB Hall of Fame voters consider when electing a player for induction into the Hall of Fame. Players are eligible for induction five years after their retirement. After this period, the writers determine whether the player is worthy of induction over a ten-year period. Using a 14-year window, from 2009-2022, and using multi-variable regression, I estimate which factors played the biggest role in a player's induction. I find that for hitters, WAR, or wins above replacement, was the biggest determinant, while for pitchers, traditional statistics such as Earned Run Average and Wins played the biggest role.

## INTRODUCTION

Over the last 15 years, the introduction of advanced statistics and analytics to the game of baseball has changed how individuals view and analyze the game. The creation of WAR and other statistics, such as On Base Percentage Plus Slugging Plus (OPS+) and Earned Run Average Plus (ERA+) which adjust for league averages, and expected statistics such as xBA, which take batted ball data and calculate probability of a hit, have given us new ways to assess player value and has begun to change the fabric of how the game functions. As front offices begin to utilize these new statistics, other parts of the game have begun to change as well. These parts include voting bodies such as the Baseball Writers Association of America, or BBWAA, the writer's organization that handles a lot of the award and Hall of Fame voting processes that determine the games top awards. We have seen in other baseball voting awards, such as votes for the Most Valuable Player, that stats like WAR have made a huge impact (Ehlich, et al. 2019). This has caused some voters to re-evaluate certain candidates for the Hall of Fame in a different light. In this thesis I ask, given the shift in favor of WAR and other advanced stats for current players, is there also a shift in the analysis of careers of players already retired being judged on those same statistics?

Baseball writers are distinguished from other voting groups in a few key ways.



First, over 80% of ballots are made public both before and after the voting process. This allows other voters to see other ballots, their justifications, and possibly may lead some to change their vote on a particular player. There is no compensation or incentive to vote one way or another, and players appear on consecutive ballots for multiple years, which means previous vote totals can also be observed and can also potentially play a factor. Induction is also seen as prestigious, as around 1% of players make it into the HOF, and so votes are studied with major interest, and players will often have third parties using statistics to push for induction through social media or newspaper columns.

Another important aspect of this vote to point out is that there is nothing new to be gained from on-field statistics between retirement and eligibility. Voters have plenty of time to analyze the statistics of retired players, as players must be retired for at least 5 years before being put on the ballot, and then they can stay for, at most, ten years. The statistics a player has accumulated does not change over this time frame, but the interpretation of it has, requiring new analysis, and potentially changing how voters will vote.

I used 14 years of both total voter percentages and individual ballots from 2009 to 2022. I collected all major performance statistics as well as a few advanced statistics for the players that were eligible for election during that timeframe. My dependent variable for all regression models is the voting percentages for a particular player for a particular year. Including these statistics, I created a variable that attempted to assess the character of a player by documenting player characteristics such as accusations of performance enhancing drugs (PEDs), or off the field misconduct, as well as year-by-year vote totals. These have been points of controversy over the last 25 years of baseball, as players like Barry Bonds and Roger Clemens have overwhelming statistical measures but are tainted by these accusations, which have been proven to be significant in single year cases (Porter, 2014). Once I collected these data, I used multiple-variable regression, splitting the player pool into position players and pitchers, as well as some regressions looking at the vote change total year by year. Overall, I estimated sixteen separate regression models: six for hitters, six for pitchers, and four for other factors.

My results are as follows: for hitters, WAR is the most significant variable when all factors are controlled for, although runs are also significant across all specifications. For pitchers, while WAR is significant when it is the only variable in the model, it becomes less significant when other variables such as ERA or Wins are included. As far as other factors, PEDs have a negative statistical influence on a player's candidacy no matter their statistical performance. Most significantly, in terms of voting point changes, the previous year's voting changes has a much larger impact compared to statistical performance.

## LITERATURE REVIEW

This thesis contributes to the literature in two major aspects: using baseball as a lab to explore economic trends and as a window into how voters react to other voters in a controlled setting. Newham and Midjord (2019) find evidence suggesting that FDA expert panelists herd when voting on new drug applications; one set of estimates suggests that nine percent of sequential votes are herd votes. Sanders et al. (2021) found that "Rather, members of the MVP voting body after 2004, many of whom also were members of the same voting body beforehand, exhibited an average tendency toward behavioral agility in processing new information about candidate quality." They suggest that "the results might also suggest that voters are conformists. That is, once they accept that a computerized algorithm reflects the real qualities of the candidate on the ballot, they vote accordingly. If the algorithm changes, the voters may change their votes in turn." These two papers show the importance of vote herding in both non-sport and sport setting as well as showing the influence of other people and how they can affect each other.

This paper also coincides with other papers that use baseball as a lab for testing economic phenomenon. There have been other papers to do this as well, although my paper is the first to use HOF voting data. The most common example of this is using MLB data to explore racial bias, and it was found that there may have been some discrimina-

tion against African American and Hispanic players receiving marginally fewer votes than other races (Jewell et al. (2002); Findlay and Reid (1997)). However, these studies used data from the 1960s to the 1990s, where individual ballots were not publicly tracked, so increased exposure should reduce the chance of discrimination as well as other studies finding that race has no effect on induction into the Hall of Fame (Jewell (2002); Mills and Salaga (2011)).

There has also been literature on both stats and off the field stats and how they affect certain MLB voters in different aspects. One study found that “based on factors such as what era the player played in and off the field factors, that “suggest that purely statistical measures will never fully reflect a player’s fitness for inclusion in, or exclusion from, the HOF.” (Miceli and Volz, 2012). Another paper found that in the 2013 HOF voting ballots that “the voters subconsciously judge a player based on his association with steroids or performance enhancing drugs.” (Porter, 2014). These two papers show that voters are influenced by factors that aren’t statistical, and that they do have an influence on who voters vote for.

Lastly, more recent papers, such as Sanders et al. (2021) and Ehrlich et al. (2019) point to the increased importance of these statistics in voter decisions. The Sanders paper, as mentioned before, found that people that voted on MVP candidates began to use WAR as a significant factor in who they voted for, and once other voters saw this trend, they followed suit in using WAR as their own indicator. The conclusion of their paper states that “Voting behavior is more positively responsive to increases in candidate quality after the information frontier shift. As a result, voting became less noisy overall with respect to observable candidate characteristics.” This means that as WAR became more accepted, there was less negative reaction towards the all-encompassing statistic, and voters began to respond to it in a much more positive light. Ehrlich found something similar two years earlier, stating that “Since 2004, we find evidence that the creation of WAR has changed decision-making behavior in a high stakes environment (MLB MVP Voting) both significantly and substantially.” Importantly, there is substantial duplication in the people that vote for MVP and people that vote for the HOF, since they are both voted on by subsets of the BBWAA. Since our voting pool looks at 2009-2022, I can reasonably expect voters to understand these advanced statistics when looking at HOF voting data.

## DATA

The voting data is collected from 2009-2022. This data was taken from the “Baseball Hall of Fame Tracker,” which is a site organized by four baseball enthusiasts—Ryan Thibodaux, Anthony Calimo, John Devivo, and Adam Dore—who scrape all available individual ballots from writers and compile the results by year (Thibodaux et al. (2022)). They collected their data from many different sources, including Twitter and newspaper outlets. They also collect the date the ballot was released, and note whether there were any additions or drops to the ballot relative to a voter’s ballot last year. Figure 1 shows that the sample size has increased over time, as over the last decade voters have been increasingly more willing to reveal their ballots to the public.

Although we have voter data stretching back to 2009, the number of public votes increased substantially beginning in 2013, when Thibodaux and his team officially took over the Tracker. It is reasonable to believe that if stronger attempts to collect data were available, we would have more ballot data for the years between 2009-2013. While there may be some selection effects, as voters that choose not to reveal their ballots may be as likely to vote for certain players, since over 80% of the voting pool does reveal their ballots now, voter selection is unlikely to drive the regression results.

## Player Characteristics

Any player that has at least ten years of MLB service is eligible to be put on the ballot. However, MLB initially screens those players that stand almost no chance of induction, leaving us with 435 unique players who were on the ballot at least one year between

2009-2022. These players range from players who were team leaders that reached the ten-year service requirements, to certain “first ballot” Hall of Famers, players with statistics that measure up to the all-time greatest players.

While voters consider objective stats, ultimately voting for the Baseball Hall of Fame is subjective. BBWAA encourages consideration of external characteristics, stating that “Voting shall be based upon the player’s record, playing ability, integrity, sportsmanship, character, and contributions to the team(s) on which the player played.” (BBWAA (2022)). Table 2 documents external factors that may influence voting, such as performance-enhancing drug usage.

After all factors had been accounted for, I separated the players into two categories: pitchers and position players. This is because these players are judged on two entirely different sets of statistics. In summary, there were 304 position players and 131 pitchers.

For hitters, the independent variables of interest are WAR (Wins Above Replacement), OPS+ (On Base plus Slugging Percentage), home runs, runs batted in, stolen bases, runs, and batting average. WAR, as stated earlier, has become the go to statistic for a lot of voting awards, and while the exact formula is hard to understand, it simply is a numerical calculation of a player’s value relative to a replacement player. There are 2 accepted values for WAR, bWAR, which is Baseball Reference’s WAR calculation and the one I use for this project, and fWAR, which is Fangraphs, a statistic tracking website that has been on the forefront of the creation of new statistics, own calculation. OPS+ is another advanced statistic, although its base is much simpler to understand. OPS+ is on base percentage plus slugging relative to the rest of the league, with 100 being the league average. That means if your OPS+ is around 125, it means your OPS is 25% better than the league average each year, and if it is around 75, you are 25% worse than the league average. The other statistics used are more traditional and are familiar to anyone that has been around the game of baseball: home runs is the number of balls hit out of the ballpark in fair territory and is one of the leading indicators of power hitters, runs batted in or RBIs is the number of runs driven in by a batter, stolen bases is the number of bases swiped by a player when on the basepaths, runs is the number of times a player has crossed home plate by any means, and batting average is the number of hits divided by at bats a player has. Over a full season, you would want to see WAR be around 4-5, HRs around 25-30, and batting average around .280 to .300, as these totals indicate a strong performance in a year. In terms of career, these statistics have certain milestones that voters have used to help with induction into the Hall of Fame, such as 500 HRs, 3000 Hits or a .300 batting average, over a career. Hitting these milestones usually comes with a much higher chance of induction but is not guaranteed.

For pitchers, the variables are WAR, ERA+ (earned run average relative to the rest of the league) wins, saves, strikeouts, and earned run average. WAR carries the same definition for pitchers as hitters, and ERA+ is earned run average relative to the league, following the same structure that OPS+ does. The traditional statistics for pitchers are wins, which is when player gets credit for a team winning, saves, which is when a pitcher completes a game when their team is up by three or fewer runs, strikeouts, when a pitcher retires a hitter by getting three strikes in one at bat, and earned run average, which is the number of earned runs divided by the amount of innings pitched. Milestones for pitchers include 250 Wins, 3000 strikeouts, or a 3.00 ERA.

WAR, OPS+ and ERA+ are relatively new statistics built to figure out things such as player value, or better ways to measure a player’s impact on the mound or on the field. These statistics account for positional differences in fielding, a player’s performance relative to his or her peers, and different factors that may influence a pitcher’s performance. The others are more traditional statistics that have been used to figure out a player’s impact. Position also matters for hitters and pitchers, as defensive-oriented positions, such as catcher and shortstop, usually have smaller values for hitting statistics due to the complexity of playing the position that WAR can compensate for. Relief pitchers are judged much more on their save and strikeout total, while starters will be judged for ERA and wins.

## SPECIFICATIONS

The base model we had for these regressions is as follows:

- Multiple linear regression:  $\text{voting\%} = f(\text{player statistics including WAR, PED usage, PED usage} \times \text{WAR})$

For hitters I estimated this regression model:

$$\text{percent}_{i,t} = \beta_0 + \beta_1 \text{WAR}_i + \beta_2 \text{OPS}_i + \beta_3 \text{HomeRuns}_i + \beta_4 \text{RunsBattedIn}_i + \beta_5 \text{Runs}_i + \beta_6 \text{BattingAvg}_i + \beta_7 \text{PEDs}_i + \beta_8 \text{PEDs} \times \text{WAR}_i + \mu + \epsilon_{i,t}$$

For pitchers, I estimated this regression model:

$$\text{percent}_{i,t} = \beta_0 + \beta_1 \text{WAR}_i + \beta_2 \text{ERA}_i + \beta_3 \text{Wins}_i + \beta_4 \text{Saves}_i + \beta_5 \text{Strikeouts}_i + \beta_6 \text{EarnedRunsAvg}_i + \beta_7 \text{PEDs}_i + \beta_8 \text{PEDs} \times \text{WAR}_i + \mu + \epsilon_{i,t}$$

These regressions both use WAR as an explanatory variable, as well as having a PED dummy variable as well as an interaction term for PED and WAR for both hitters and pitchers, showing that for each 1 WAR a player gains, if influenced by PEDs, how much it cancels each other out.  $\text{Percent}(i,t)$  is the percentage of votes that player  $i$  receives at time  $t$  and is bounded between 0 and 1. The performance characteristics are as defined previously, and we included a binary variable set equal to 1 if a player was credibly accused of or found to have used performance-enhancing drugs (PEDs). Use of PEDs is considered to be unethical (Bradbury (2013); Gould and Kaplan (2011)), and a major task of voters is to decide how relevant this usage may be to a player's Hall of Fame prospects. I also include year fixed effects to control the composition of players on a ballot in any particular year.

I provide descriptive estimates for how voting percentages evolve when players are neither elected to the Hall of Fame nor eliminated from future consideration. Importantly, no new information about a player's on-field performance is available, though in rare circumstances new information about a player's character may become available. To describe how voting percentages evolve, we use a change in basis points between time  $t$  (when the ballot is cast) and  $t - 1$  (the last time a ballot was cast for this player). This variable measures how many new basis points a player received between ballots. I use this measure in place of the number of votes, since the number of voter's changes between ballots. This measure is more easily calculated by voters and is qualitatively similar to a percentage change in basis points. I include metrics for both performance-WAR-and ethical considerations-whether or not a player used performance-enhancing drugs. To measure previous voter behavior, I include a lagged value for the change in basis points between  $t - 1$  and  $t - 2$ , the previous times that a ballot was cast prior to time  $t$ . Voters can observe the change in basis points between  $t - 1$  and  $t - 2$  when deciding whether or not to vote for a player in time  $t$ . Finally, since a player eventually exhausts his eligibility for induction, we include a binary variable that captures whether it is the last year on a ballot for a player. Voters may be sympathetic to including a player in his last year on a ballot. We thus estimate:

- $\Delta \text{BasisPoints}_{i,t} = \gamma_0 + \gamma_1 \text{WAR}_i + \gamma_2 \Delta \text{BasisPoints}_{i,t-1} + \gamma_3 \text{PEDs}_i + \gamma_4 \text{LastYear}_i + \epsilon_{i,t}$

where  $\Delta \text{BasisPoints}_{i,t-1} = \text{BasisPoints}_{i,t-1} - \text{BasisPoints}_{i,t-2}$ . Notably, this measure does not control for how many voters vote in any particular year; I attempt to proxy for the change in votes voters might plausibly use in reformulating their opinion about a player, which is a quick "back of the envelope" calculation of whether or not a player improved in stature among other voters.

Overall there are 16 regressions estimated, six for hitters, with various combinations for the variables and regression 5 and 6 being the most important, six for pitchers, who also have various combinations, and 4 for change in basis points.

## RESULTS

The hitters are presented in table 1. For all regressions that WAR is a part of, it is shown to be statistically significant at the .01 level, with the estimate ranging from .002 to .009. Runs is also shown to have significance in regression 5 with an estimate of .0002. It is interesting to note that while batting average has major significance in regression 3, when WAR isn't included, it loses its significance when WAR is included, meaning that WAR takes precedence over batting average in the voters' eyes. PED usage also plays a significant negative role in voter percentages, as in both regression 5 and 6 it is shown to have major significance with estimates of -.2 for both regressions. As such, the interaction term in regression 6 also has major significance, with an estimate of -.006. This means that hitters are heavily penalized for being associated with PED or off the field conduct, for example, a player with 51 WAR would have a reduction of .161. These results indicate that WAR takes precedence over traditional stats, and even other advanced stats such as OPS+. This makes some sense, as WAR can encompass defensive value better than any other statistic, and for hitters that excel in the field, their offensive measures aren't going to line up well with other traditional measures, where WAR can close that gap to justify induction.

For pitchers, WAR carries significance when it is the only variable tested, as shown in regression 2 and 3, but when factoring in all other variables, it loses its significance to more traditional statistics, such as wins, with an estimate of .0002 and earned run average with an estimate of -.19, which makes sense because a lower ERA means you are a better pitcher. Saves also has major significance, which also makes sense in context because of the lack of relief pitchers that have been elected, and the ones that have gained election being the pitchers with the most saves in MLB history. PED again has a significant impact for pitchers as well, with an estimate of -.2999, but interestingly loses its significance in regression 6 to the interaction term, with an estimate of -.0003, again proving that association with PEDs has a substantial negative effect on the electability of a candidate.

The results for the final sets of regressions are very interesting. Not only is the basis point increase significant, but its estimate also trumps every statistical measure, advanced or not, in all 4 regressions its accounted for, ranging from .26 to .33. WAR also has some significance, as well as PED again having a significantly negative estimate. I also looked at if the last year on the ballot had any effect on the voters, but I found it to be insignificant. This means that, when all factors are accounted for, the year-by-year change has the most impact on a voter and his voting patterns.

## CONCLUSION

I examined what factors are most important to a voter's vote in the Baseball Hall of Fame voting setting. This setting allows us to see some unique features, such as voters not learning anything new statistically, nor any incentive to vote one way or another. What I find is initial evidence of vote herding, as well as certain statistics that could be used to predict which players stand better chances of election than others. I found that WAR for hitters and traditional statistics are the measures used by voters to determine electability, as well as other factors such as year-by-year vote totals, and influence from PEDs.

Further research could see me add more variables into the mix, as well as determining just how much the year-by-year vote matters over the initial statistical assessment for repeat candidates. Alternatively, I would also like to look at players elected via committee voting, as well as adding other voted upon awards to the equation, such as All Star game appearances, and other awards such as MVPs and Gold Gloves.

## APPENDIX

### Percentage of Hall of Fame Votes Revealed Over Time

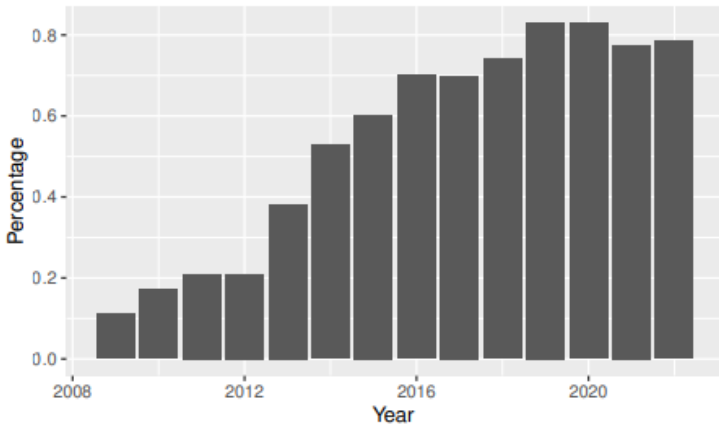


Figure 1: Percentage of Hall of Fame votes revealed over time

### WAR Totals Over Time

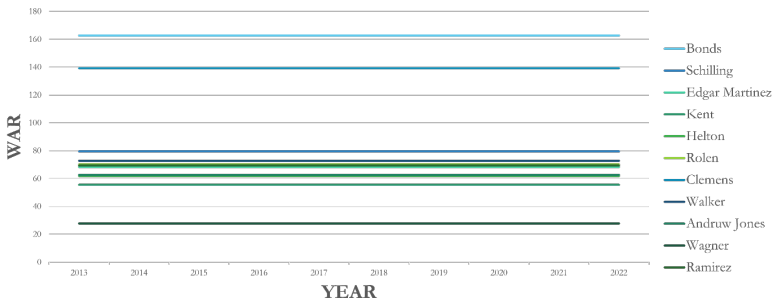


Figure 2: WAR Totals over time for Selected Players

### Vote Percentages over Time

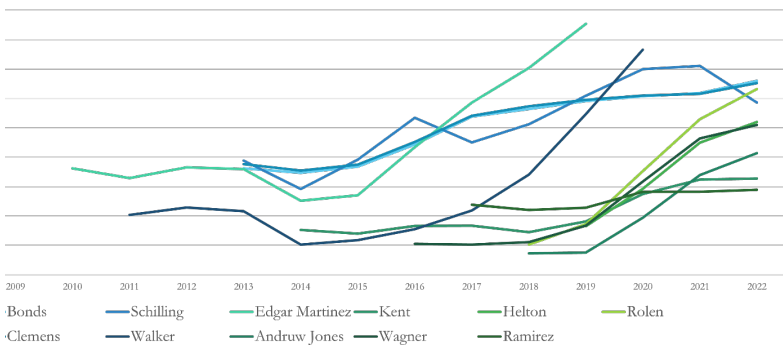


Figure 3: Voter Percentages over Time for Selected Players

Statistic	N	Mean	St. Dev.	Min	25th	75th	Max
WAR	80	37.936	25.71	7.1	18.875	50.8	139.2
ERA	80	3.69	0.524	2.21	3.337	4.115	4.61
ERA+	80	119.475	19.538	93	106.8	127	205
W	80	143.425	80.115	26	75	195.5	355
Strikeouts	80	1731.35	856.491	599	1040.2	2091.5	4875
Saves	80	98.562	156.144	0	0	158	652

Table 1: Summary Statistics for Pitchers

Statistic	N	Mean	St. Dev.	Min	25th	75th	Max
WAR	164	38.734	22.615	1.7	22.75	50.625	162.8
R	164	1050.24	343.169	260	788.5	1243	2295
HR	164	269.555	142.064	18	172.5	352.2	762
RBI	164	1036.81	362.395	251	764.5	1287	2086
SB	164	147.976	175.166	5	30	205.2	1406
BA	164	0.28	0.016	0.232	0.271	0.291	0.318
OPS+	164	114.11	17.588	72	102	124.2	182

Table 2: Summary Statistics for Hitters

Determinants of Hall of Fame Voting Percentages: Hitter Characteristics							
	(I)	(II)	(III)	(IV)	(V)	(VI)	
Intercept	-0.08073*** [0.024589]	0.00745 [0.08224]	-1.234441305 [0.210663]	-0.753770157 [0.235076968]	-0.860232409 [0.22623916]	-0.2421*** [0.0277]	
WAR (Wins Above Replacement)	0.00553*** [0.000413]	0.00605*** [0.000617]		0.0032*** [0.0011]	0.0028*** [0.0010]	0.0096*** [0.0005]	
OPS+ (Standardized On-Base + Slugging Percentage)		-0.00093 [0.00083]		0.00174 [0.00139]	0.00148 [0.00133]		
Home Runs			5.66 x 10 <sup>-5</sup> [0.000197]	-0.00062** [0.00028]	-3.871 x 10 <sup>-5</sup> [0.00029]		
Runs Batted In			-0.000146233 [0.00012]	0.0001 [0.000142]	-1.488 x 10 <sup>-5</sup> [0.00013]		
Stolen Bases			-2.974 x 10 <sup>-5</sup> [0.000133]	-1.89 x 10 <sup>-6</sup> [0.00013]	3.4399 x 10 <sup>-5</sup> [0.00012]		
Runs			0.000479*** [0.000115]	0.00023* [0.00013]	0.00027** [0.00013]		
Batting Average			3.5855*** [0.8271]	1.3365 [1.08147]	1.6472 [1.0383]		
Confirmed PED User? (1 if yes, 0 otherwise)					-0.20897*** [0.0401]	0.2008*** [0.0593]	
Confirmed PED User X WAR (interaction term)						-0.0062*** [0.0008]	
Observations	304	304	304	304	304	304	304
R-squared	0.372	0.374	0.407	0.44	0.487	0.533	

Each column contains a regression model where the dependent variable is the percentage of votes a hitter received for the Hall of Fame.

Standard errors in brackets; \*\*\* indicates  $p < .01$ ; \*\* indicates  $p < .05$ ; \* indicates  $p < .1$

Data include all hitters on Hall of Fame ballots from 2008 to 2022.

Table 3

Determinants of Hall of Fame Voting Percentages: Pitcher Characteristics						
	(I)	(II)	(III)	(IV)	(V)	(VI)
Intercept	0.0074 [.03687]	0.3278*** [1.202]	-0.0095 [0.2427]	0.7024 [.6014]	0.1841 [.5701]	-0.0847** [.0411]
WAR (Wins Above Replacement)	0.0050*** [.0006]	0.0047*** [.0006]		-0.0019 [.0022]	0.0008 [.0022]	0.0078*** [.0008]
ERA+		0.0032*** [.00096]		-0.0028 [.00226]	-0.0014 [.0021]	
Wins			0.0018*** [.0006]	0.0020*** [.0006]	0.0019*** [.0006]	
Saves			0.0009*** [.0002]	0.0009*** [.0002]	0.0009*** [.0002]	
Earned Run Average			-0.0682 [.0545]	-0.1996** [.0996]	-0.116 [.0906]	
Strikeouts			8.45 x 10 <sup>-5</sup> * [4.88 x 10 <sup>-5</sup> ]	0.00012* [6.52 x 10 <sup>-5</sup> ]	0.00011* [6.06 x 10 <sup>-5</sup> ]	
Confirmed PED User? (1 if yes, 0 otherwise)					-0.2999*** [.06566]	-0.0326 [.1614]
Confirmed PED User X WAR (interaction term)						-0.0033*** [.00156]
Observations	131	131	131	131	131	131
R-squared	0.348	0.399	0.569	0.58	0.641	0.445

Each column contains a regression model where the dependent variable is the percentage of votes a hitter received for the Hall of Fame.  
Standard errors in brackets; \*\*\* indicates p < .01; \*\* indicates p < .05; \* indicates p < .1  
Data include all pitchers on Hall of Fame ballots from 2008 to 2022.

Table 4

Determinants of Voting Basis Point Changes					
	(I)	(II)	(III)	(IV)	(V)
Intercept	2.6468*** [.7392]	1.5662 [1.358]	0.1304 [1.597]	-0.9153 [1.5941]	-1.123 [1.6123]
Basis Point Increase (previous year)	.3324*** [.0901]		0.3241*** [.0895]	.2675*** [.0892]	.2664*** [.0893]
WAR		.0317* [.018]	0.0362* [.0204]	0.0236*** [.002]	.0742*** [.0236]
PED Usage				-2.953*** [.004]	-5.0632*** [1.7150]
Final Year of Ballot?					1.8591 [2.0878]
Observations	144	144	144	144	144
R-Squared	0.085	0.016	0.107	0.16	0.165

Each column contains a regression model.  
Dependent variable is the change in basis points for the percent of a player's Hall of Fame totals.  
Standard errors in brackets; \*\*\* indicates p < .01; \*\* indicates p < .05; \* indicates p < .1  
Data include all players on Hall of Fame ballots from 2008 to 2022 who were included on multiple ballots.

Table 5

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# THE INTELLECTUAL EXPERIENCES OF DEAF AND HARD-OF-HEARING INDIVIDUALS

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BIANCA GRANT

**D**eaf people may not be viewed as a cultural group so much as they are viewed as individuals with a disability; furthermore, deaf people may be misunderstood by the general hearing population. The intellectual experiences that a d/Deaf or hard-of-hearing individual faces influence the person that they develop into. The purpose of this study is to understand the lived experiences of Deaf people and how those experiences shape their identity; in addition, this study will contribute to the way hearing people, professionals, and clinicians understand Deaf culture. It is crucial to analyze the relationship between past experiences and current viewpoints. Learning about different cultures has become increasingly popular in the United States, but there may be misunderstandings, stereotypes, and misconstrued information. In order to appropriately highlight the impact of certain experiences, an open-ended survey for d/Deaf and hard-of-hearing (DHH) adults who are 18 years of age or older was the chosen method to capture the unique experiences of DHH individuals through a phenomenological approach. Respondents reported very different values, beliefs, and attitudes based on differing educational, family, and social/environmental experiences. Overall, this study provides valuable insight for hearing professionals to understand and respect Deaf perspectives.

*Keywords: Hard of hearing, Deaf culture, Deaf education, Deaf families, Identity, Experiences*

## INTRODUCTION

The negative and positive events that Deaf individuals experience at school, work, and in family interactions aid in the development of the cultural identity of the Deaf community. Deaf people are not viewed as a cultural group so much as they are viewed as individuals with a disability; furthermore, in the field of communication sciences and disorders, it is important to understand all methods of communication, how society perceives communication, the culture of certain groups of people, and experiences that specific cultural groups

face. More specifically, clinicians need to be aware of feelings, experiences, and culture to ensure a comfortable environment and meaningful client-to-clinician relationship with d/Deaf individuals. It is best to hear about Deaf culture from those who are members of that specific cultural community to eliminate implicit bias, so the purpose of this research is to gain that perspective from the d/Deaf and hard-of-hearing population by conducting a phenomenological study that will investigate the everyday and past experiences of these individuals. Although many people have limited knowledge of what it is like to be d/Deaf in America and how intellectual experiences have influenced the identity of Deaf individuals—family dynamics, work, societal, and school experiences are unique to each individual in the Deaf community and assist in the blossoming of the Deaf culture overall.

The intellectual experiences that influence perception and are vital to the development of Deaf culture include school, work, and family experiences. The color of someone's skin plays a factor in how others perceive them and how the world will accept them; in addition, being deaf has the same effect. When researching the intellectual experiences of Deaf people, having a basic understanding of their demographics can help piece together how that may have influenced the experiences that they had. The prevalence of deafness and hearing impairments in each ethnic group affects the research that was developed in the past, and what will be developed from this point on. Where a person is from, where they live, and the color of their skin can directly impact their experiences, which will vary for each individual. This study will examine how these differences can shape each individual. Overall, in a world that often does not accept people for who they are, Deaf culture is important because this ideal is portrayed through their identity and their community.

Years before d/Deaf people were able to share their experiences with the world, hearing people were the voices of deaf people. According to the United States Census Bureau, 3.5 percent of the population in the United States is deaf (2022). About 11.5 million Americans are unable to hear their phone ringing, fire trucks, and the sound of a baby's cry. It is important to bring awareness to the experiences of Deaf people in the following context: Audism and mental health, family dynamics, protection versus hardships, identity development, and equity. We often think of life from the hearing perspective, so it is important that those who are not familiar with the Deaf culture understand that there is a difference between being deaf and being Deaf. Deaf with the lowercase "d" portrays deafness as a disability and as an impairment. Deaf with the capital "D" exhibits deafness as an identity and is proud to represent the culture in all ways. Not only is it an identity, but it is also a family, but there are many people in the world that do not see it that way. People who are Deaf are proud. They do not view themselves as having a disability. It is just a difference. One person may have curly hair, and someone else might have straight hair; in addition, one person can hear, and someone else might not be able to hear. However, that does not make the other person incapable of greatness or worthy of opportunities in this world.

American Sign Language (ASL) is an integral component of the Deaf culture; however, individuals are frowned upon in society when communicating with this language because it can make others who are not knowledgeable "uncomfortable." Like many other places around the world, our society favors the use of spoken language; furthermore, taking the time to learn a language that helps others feel included is not the typical route of the majority. Americans push for people to speak—in English. With many people being unaware of Deaf culture, the individuals who are a part of the Deaf community feel isolated when they are unable to relate and communicate with other people that are not in the same community.

This research aims to change the way hearing people understand Deaf culture by highlighting the experiences that d/Deaf and hard-of-hearing individuals have and the impact of those experiences with hopes to raise awareness for those in the field of speech-language pathology and within society. This was done by recruiting participants who are 18 years of age or older and identify as d/Deaf or hard of hearing to complete a survey about their experiences as a d/Deaf or hard-of-hearing person in the following

context: school experiences, work experiences, communication, interactions, feelings, and cultural identity. A qualitative phenomenological research study provides the Deaf community with a voice. This approach aims to “investigate the everyday experiences of human beings while suspending the researchers’ preconceived assumptions about the phenomenon. In other words, phenomenological research studies lived experiences to gain deeper insights into how people understand those experiences” and this is the best way to acknowledge the Deaf community (Delve & Limpaecher, 2022). The outcome of analyzing the survey will bring about themes relating to the identity and emotional experiences of the individuals. The experiences will be analyzed to see how one experience relates to or directly affects the other and how that shapes the individual overall as well as their view of the world around them.

### **PERCEPTIONS AND PERSPECTIVES OF D/DEAF AND HARD OF HEARING INDIVIDUALS IN SOCIETY**

According to Olsson and Gustafsson (2022), Deaf culture deals with how individuals view themselves within their cultural group; in addition, one’s social identity reflects the connection between an individual and their society. In order to feel a sense of inclusion and belonging, there needs to be human interaction involved. Due to deafness being low prevalence, there is often a lack of communication between d/Deaf individuals, and between d/Deaf or hard-of-hearing individuals interacting with hearing individuals. Deafness is a shared experience, and the Deaf community is proud to be a socio-cultural minority. The deaf community is more inclusive, and if a person who is not Deaf becomes a part of the community, it is usually to support the goals of the community and to actively participate in the events that raise awareness and help each member of the community achieve their goals (Nomeland, 2011). It is stated that individuals who are d/Deaf and hard of hearing are referred to as individuals with a “hidden disability” because they are able to function in the environment around them; however, other people within a community are unable to identify that a person can’t hear until they have some sort of interaction with that individual. Hearing loss reduces the ability to communicate and experience social interactions, relationships, education, and employment in a way that is natural within a society. (Olsson & Gustafsson, 2022). Studies reveal that years of being socially isolated have a negative effect on an individual’s “representation of the self” which is shaped by past and present experiences (McIlroy & Storbeck, 2011). With that said, d/Deaf and hard of hearing individuals are viewed in a way that negatively impacts their ability to be present in society and foster meaningful communication with other members in a community. Contributions from the studies reviewed here will assist when analyzing the relationship between experiences.

### **IDENTITY DEVELOPMENT AND EVOLUTION OF DEAF CULTURE**

It has been suggested that there was a lot of shame and judgment toward people who were Deaf or hard of hearing at first; however, this community is proud of who they are, and it appears that those who identify as members of the Deaf culture and community would not change themselves in a way that conforms to society. Hearing status does not have to be the factor that defines a person; just like how skin color does not have to define a person. Anglin explains that deafness does not have to be viewed as an impairment; furthermore, it can be viewed as a “cultural variant” (Anglin, 2020). The word ‘deaf’ with a lowercase ‘d’ means that deafness is being addressed as an impairment. People who are deaf or hard-of-hearing and were not deaf or hard-of-hearing for their entire life may be embarrassed about it since they can no longer live life in the way that they are used to. It is harder when an older person is used to living their life a certain way, and then suddenly they can no longer hear and receive input from the environment around them. On the contrary, when the word ‘Deaf’ is spelled with a capital D, Deafness is being addressed as a culture and a community that people are proud to be a part of.

## Deaf People's Experiences in Family

The majority (91.5%) of Deaf people are born into hearing families, and it is hard to foster a connection when there isn't a shared language (Kuckner & Velaski, 2004). Some family members are willing to learn how to sign, but many choose not to; in addition, this often leads to a lack of communication abilities between families. It is common for Deaf people to feel like they are missing a connection with their immediate family due to the communication barrier that they share. Kuckner and Velaski (2004) focus on the aspects of what makes a Deaf family healthy instead of the factors that negatively impact the Deaf person in the family. The factors that the family members believe influenced their relationship with the Deaf child include willingness to learn American Sign Language, commitment, and involvement of other family members. When the family expresses interest in learning a new language, the child feels important enough. Dedication is also important because learning another language can be challenging; however, the effort is appreciated. Practicing ASL with children gives them access to the language necessary for communication within the family and beyond, and this improves family dynamics.

Family dynamics refers to how family members interact with each other and is influenced by how they communicate and the experiences they have (Johnson & Benedict, 2012). Although it is expected for all members of the family to communicate with one another, do activities with one another, and form connections, it can be difficult for this to happen depending on the family dynamics of d/Deaf and HOH families. A disconnect may be created in a family because the majority of deaf people are born into families that are hearing (Chovaz et al., 2022). A participant that shared hardships in the Lived Experience study expressed the following:

When I was growing up, I would say I had both positive and negative experiences when it came to communication. My family and I would be at get-togethers; I would want to know what was going on. My mom could sign a little, and she would speak a bit, but her skills were very basic, and I was left out. If there were other deaf people there it would be easier for me, but with hearing people, I was just not very comfortable or happy that we could not communicate. After a while, I stopped going because I was unable to keep up with the conversations. (Participant #13, age 40, female) (Chovaz et al., 2022, p.657).

Many participants have variations of similar struggles. When a deaf person lives with a hearing family, it is harder to feel heard because oftentimes, deaf individuals are looked over. Other challenges that the participants of this study had to overcome include learning to sign and helping people understand deafness (Kucker & Velaski, 2004). The experience that someone has with family depends on the views within the relationship. For example, Jemina Napier is a hearing child who has deaf parents, and she had a unique experience. Her father was the only deaf person in his family, so he was raised orally and learned sign language when he met Jemina's mother. Jemina's father believed that the majority rules, and in order to fit in with the rest of his family, he had to speak like them. On the other hand, Jemima's mother had generations of Deaf family members, so she grew up with Deaf culture all around her (Bishop & Hicks, 2012). From stories and examples like these, it is evident that family interactions impact Deaf individuals' views of their identity and their life.

## Deaf People's Experiences in Education

The methods for educating d/Deaf children are constantly changing, so this specific type of education states that it is important to review history in order to find present-day solutions (Arnold, 2022). For over 200 years, deaf educators have debated about which methods should be used—oralism or total communication. Mainstream or residential? With that said, when it comes to deaf education, decisions have to be made, and oftentimes factors such as family dynamics and identity influence these decisions. According to a study that was conducted with the family members of Deaf individuals, one of the main challenges they had to overcome was finding a good educational program that provides the services that are needed for their child (Kuckner & Velaski, 2004). Some

factors that play a part in this decision are where the sibling(s) goes to school, and what options are available in the state that the deaf individual lives in. Residential schools can be helpful depending on what each individual desires from their educational and intellectual experiences. It is also possible to incorporate residential and mainstreaming if the family believes that is best. One study reported that DHH students would rather receive mainstream education, and more students transition to this form of education rather than continuing in the special education setting. The different education environments that were reported as public data for the current population survey are as follows:

- Inside General Class 80% or More of the Day
- Inside General Class 40% Through 79% of the Day
- Inside General Class Less Than 40% of the Day
- Separate School, Residential Facility, Parentally Placed in Private Schools, Homebound/Hospital, and Correctional Facilities (Office of Special Education Programs, 2020)

Being inside the general education classroom for more than 80% of the day is considered the most mainstream environment. This included:

Students that were learning in the general education setting with additional services that are provided during general instruction with the rest of the class, children that learn in the general education environment but also leave class to receive additional special education services, and children are placed in general education but receive special education services in a resource room” (Epstein et al., 2022, p. 1163).

One Deaf participant stated that the educators at his school valued the speech aspect rather than providing an environment where he could be intellectually engaged (Chovaz et al., 2022).

Oralism is a method that only allows for instruction in English. Total communication encourages the use of signs, visuals, manual signs, and other forms of English such as writing; in addition, the Bilingual-bicultural method only allows for the use of sign language (Arnold, 2022). There are pros and cons for each. For example, since deaf children have a hard time learning how to read and write the language of the hearing community (English— for the purpose of this example) a Deaf family may suggest the use of American Sign Language (ASL) to preserve their culture; however, if the family was hearing, they might want the d/Deaf or hard-of-hearing (DHH) child to learn English to practice the things that would be expected in society because it is familiar (Arnold, 2022).

After all these years of deaf education being in existence, there is still a noticeable achievement gap between DHH students and hearing students. The low academic achievement does not benefit DHH students in any way, and it makes life after school difficult (Herring & Woolsey, 2020). It is typical for DHH students to experience delays in literacy development. They also have trouble with language, reading, and writing skills for different reasons. Other factors such as family, language, and identity influence development. For example, if a student does not have a language model at home because the parents do not sign, then the student will not have the necessary skills to complete grade-level content in school. If a student is having difficulty because of a late diagnosis, that can have a negative impact on the rest of their development since the early years are vital for language development. Reading is an important part of the educational experience, but it has a negative effect on the rest of an individual’s life if difficulties are not identified and if proper attention is given (Wang & Andrews, 2020). The average reading level of an 18-year-old DHH student would approximate a 4th-grade student. This is why early intervention is critical to the success of DHH students.

Ultimately, what a student decides to pursue directly affects their future successes, identity, and accomplishments as a Deaf person. Anglin’s (2020) study found that many of the participants felt frustrated with residential schooling because they missed many opportunities and felt as if they were viewed at a lower standard by the outside world; however, these feelings can go both ways. Participants also stated that

they felt like they were held to a lower standard in mainstream education because of their deafness (Anglin, 2020). Residential schools are often far from home. For reference, there is only one residential school in Georgia— the Georgia School for the Deaf in Cave Springs. Depending on what the schooling experience is like, this can construct a Deaf individual's view of what family means to them, or immersion can take over and change the student's life. Participants in Anglin's (2020) study reported experiencing a sense of "dislocation" when they spent time away from their family, community, and friends. Although there are differing perceptions of this matter, participants stressed the importance of experiencing what it is like to be fully immersed in Deaf culture. People in that environment know what it is like to live life as a Deaf individual and can share similar stories that can encourage others within the community. Those who make the decision to attend a residential school undergo a transformation in their lives (Anglin, 2020). As the years go on, a smaller and smaller percentage of Deaf students go to a special school for their education (Mitchell & Karchmer, 2006). Sharing that experience and building those relationships from the residential school is a great opportunity for Deaf students to support one another. Even if a Deaf individual decides to go to a mainstream school, having connections with Deaf people can encourage an individual to not lose sight of their unique characteristics. Overall, the school systems would have a better understanding of what a Deaf learner needs if they would ask the Deaf learners to share their opinions and what they value most when receiving an education. These school experiences directly influence how a d/Deaf or hard of hearing individual will view their life in the future and how their previous experiences have shaped them.

### **Deaf People's Perceptions of American Sign Language**

American Sign Language (ASL) plays an important role in the formation of Deaf identity (Byatt et al., 2021); however, ASL may be viewed as less than. ASL is not the only language that is viewed through this lens. In fact, ASL was considered an invented language up until relatively recently— when it became recognized as a natural language like other ones that are more commonly used, such as Spanish or German. (Brueggemann, 2009). Sign languages have their own grammatical structures that make them real languages. American Sign Language is a real language with its own structure. It has the required components of language— speech (signed), syntax, and semantics, and is a major component in Deaf culture (Pfau et al., 2012). Culture reflects a group's experiences and similarities— language, food, and so much more. In this case, American Sign Language is an important part of the Deaf culture. Preservation of the early signs occurred because Deaf people were not viewed as "issues" in early history, and signed languages as a form of communication was useful. The same idea of preservation applies to Nicaraguan Sign Language— the children's "innate ability" to have an understanding of language and to develop a shared code is the reason why it lived on. This language developed naturally because of the need to communicate with other people in the community. If the incidence of deafness was great enough in a certain area, that community was able to communicate using home signs; however, it wasn't until about 300 years ago that sign language was developed into a method of communication for many worldwide. Deaf people were brought together in the 18th and 19th centuries because of the drive they had to work in the factories during the Industrial Revolution. This is how deaf communities began to form, and this was the start of a transformation that is ongoing (Pfau et al., 2012).

Users of ASL often try to seek approval because it can make people feel uncomfortable when they do not understand the language that is being used around them. Each day, humans rely heavily on gestures to help communicate thoughts and feelings with others, so ASL should not be viewed as less than. Although the term "language" is Latin for the tongue, language is not just a physical system. It is a cognitive system that works with the physical system in order to express what we process once it travels from the brain (Nomeland, 2011). Research that was conducted on what it means to be d/Deaf revealed that a sense of being and identity can foster with a shared code

that a community shares because being around others that we can share a socially accepted language provides a form of belonging and validation. With that being said, language deprivation eliminates this sense of being for the/Deaf and hard-of-hearing population (Cue et al., 2019). Sharing a socially accepted code with others who have similar experiences and cultures makes communication feel meaningful. Since there are not a lot of people that use ASL, meeting people that use the language and identify with the culture provides a sense of community and belonging for deaf and hard of hearing individuals.

### **Deaf People's Perceptions on the Development of Identity**

Identity begins to form during adolescence. The evolving identities of Deaf and hard-of-hearing adolescents are exposed to social aspects of society at this age. The social aspects include family, school, language, and culture. As individuals are experimenting with the differences around them, they also start to appreciate the things that already exist within themselves. Byatt states the "identity construction is a combination of how individuals perceive themselves and how the communities with whom they interact shape their identity," so this plays an important role in the development of Deaf identity as well (Byatt et al., 2021, pg. 6). The main factor that influences the identity of a Deaf person or an individual who is hard of hearing is the audiological diagnosis. If an individual chooses to neglect the diagnoses and chooses not to identify with a cultural group that may share similar audiological diagnoses, then that individual will have a different perception of deafness and what it means to be Deaf.

The Deaf Identity Development Scale measures the journey taken by a Deaf of hard of hearing individual and measures their growth and movement that takes place during the development of their identities. More specifically, the scale measures how individuals who are DHH, move from "oppression to liberation" (Glickman, 1993 p.276) while identifying, categorizing, and identifying emerging themes (Byatt et al., 2021). Byatt et al. (2021) sought to understand how DHH adolescents form and define their Deaf identity, and the 4 stages of development were identified through Glickman and Carey's model- a DHH child beginning their life (typically in a hearing family), identity ambiguity, being immersed in Deaf culture, and being comfortable with both Deaf and hearing culture. The study allows participants to share part of their Deaf identity if they have one. It also highlights the importance of early intervention and hearing screenings. The goal of this study was to get an understanding of how adolescents viewed themselves as individuals and as contributors to society in order to help them progress into their adult years.

Based on the environment, an individual's identity might not feel like it should be something to be proud of. For example, many participants would choose to identify as "hearing" because that is what was considered normal in their specific environments. Throughout history, the perceptions that DHH individuals have on their identity evolves. As their identity is developed, the individuals feel a sense of belonging and empowerment (Byatt, 2021). The Deaf community uses metaphors that relate to sleeping and being awakened to symbolize the changes happening within each individual that influences the community as a whole (Goedele, 2016). Nature terms, such as "blossoming" are more commonly referenced to symbolize "reaching one's potential" within the Deaf community and beyond (Clerck, 2016). All of the experiences directly influence the view that a DHH individual has on their own life. Identity plays a big role in Deaf culture, so each individual had to understand the experiences that made them into the person that they are.

### **PRESENT STUDY**

The present study seeks to understand how Deaf people's intellectual experiences contribute to the development of their identity. The intellectual experiences that will be highlighted for the purpose of this research include family, school, and social aspects. The literature that was reviewed here emphasizes the importance of different factors, such as family dynamics, and how that influences the development of each individual that



becomes shaped by their intellectual experiences. Based on the research that has already been conducted, this present study on the intellectual experiences of d/Deaf and hard-of-hearing individuals will combine these different aspects of an individual's life in the family, school, identity, and cultural environments to understand the influence of one experience on another. There are a lot of factors to consider—since there are different ways to be educated, different characteristics that make up a family, and different experiences that lead to realizations about oneself. This research aims to highlight the past experiences as well as themes that arise from all of the d/Deaf and hard-of-hearing individuals that shared their experiences. Not only are these experiences highlighted, but the connection between the experiences and their being have been analyzed so that people in society and professionals in the field of communication sciences and disorders can understand the perspective directly from a d/Deaf or hard-of-hearing individual. To fill the gap between certain cultural groups in society feeling isolated, differences need to be normalized instead of criticized; furthermore, this research aims to raise awareness to become culturally aware and responsive when working in professional settings that treat and interact with a wide variety of people on a daily basis. Since few studies report on a Deaf person's own experiences and viewpoints with their family experiences, this study will give participants the opportunity to speak for themselves as adults about their family dynamics and other aspects of their life. Diving into the mind of a d/Deaf person or hard-of-hearing individual gives an inside look at Deaf culture and perspectives on struggles. Gaining their perspectives also helps to form a bridge for the disconnect and achievement gaps and helps to better the lives of Deaf and hard-of-hearing people in America. The present study seeks to answer the following research question: how do intellectual experiences from school, family, and identity affect the life of a Deaf or hard-of-hearing individual?

## METHODS

The present research was a qualitative phenomenological study of Deaf and hard-of-hearing adults' experiences at school, work, and within society. Feelings about identity were also analyzed. For recruiting participants, the survey was distributed at a school for the deaf and on social media platforms. All participants were above the age of 18 and identified as deaf or hard of hearing. The study was conducted at the University of West Georgia as a part of a project related to an undergraduate thesis on the intellectual experiences of deaf and hard-of-hearing individuals. This survey was distributed for research purposes, and participation was voluntary. Demographic information was collected to identify similarities and differences between experiences that certain people have within the d/Deaf community and those who are hard of hearing. The survey provided the opportunity for participants to address the following:

- Where are you from?
- What does ASL and being d/Deaf mean to you?
- Describe your experiences in school. We are interested in things like if you attended a public or deaf school, what your interactions were like, your communication, your feelings, etc.
- Describe your experiences with your family when you were growing up. We are interested in things like if you grew up in a hearing or deaf family, what your interactions were like, your communication, your feelings, etc.
- What influenced the development of your identity as a d/Deaf person?

The open-ended question structure does not allow for follow-up questions, but it gives participants the opportunity to share any thoughts that they have on the proposed concept. Inductive qualitative coding was used in order to capture the true meaning of what it is like to be Deaf and hard-of-hearing and assign meaning to it. The responses were divided by question, and the value codes were applied to each participant's response. The value codes and responses were themed phenomenologically to see the relationship between experiences and status with identity and deafness.

## RESULTS

All participants were assigned a number to preserve confidentiality. There were a total of 19 surveys with 6 abandoned, leaving 13 viable responses for analysis. First, the collected responses were divided into each question that was asked. Figure 1 depicts the value coding used to analyze the values, attitudes, and beliefs as they emerged through reading the responses of each participant. Their attitudes, values, and beliefs differed based on their hearing levels and when they became deaf. This influenced participants' decisions on choosing to identify as a part of Deaf culture. Participants who lost their hearing during adulthood experienced more feelings of depression and feeling left out of the activities and conversations that they are no longer able to be a part of. Two participants became hard of hearing as an adult, and five participants have been hard of hearing since childhood. Many of the issues reported by hard-of-hearing participants include issues communicating with family and in public settings. When family members or people, in general, do not take the time to understand how to improve communication, it adds to the isolation that these individuals feel.

The responses show that several participants had families that provided support and molded the participants to be proud of Deaf culture in a hearing family. In addition, all the participants come from hearing families, but the way that the family and teachers treated the participants shaped their perception of the situation that they were in. Those who had positive perceptions of their experiences had some form of support in their life. More specifically, one participant who only attended a Deaf school had the best experiences overall. On the other hand, those who became deaf of hard-of-hearing later in their lifetime had difficulty communicating how they used to before their incidents. Value coding brought their responses to life by capturing their experiences. Once the value codes were analyzed, the data was themed phenomenologically in order to have a better understanding of why certain people faced negative experiences and perceptions. Figure 2 highlights the themes that emerged from the value codes.



Figure 1: Value Coding Diagram



Figure 2: Theme Chart

## CONCLUSION

The aim of the present study was to be culturally competent in the field of communication sciences and disorders. There are a variety of cultural backgrounds to be aware of, so it is important for future clinicians, professionals in the field, and people in society to understand Deaf experiences and how that projects onto the identity of each individual. It is also important to raise awareness about Deaf culture and the differences in what it means to be deaf. There are people who are deaf that are ashamed of the condition that they are in, and they view it as a disability or impairment. On the other hand, there are people who are proud to be Deaf, and they showcase the true importance of Deaf culture that is often overlooked. In the analysis, a pattern became evident. *Support* emerged as a factor that contributed to the positive perceptions of intellectual experiences. Support can be shown in different ways, but having a sense of community or belonging can lead to a positive experience, especially in the school setting. The results indicate that the participants

appreciated inclusivity and valuable connections with friends, family, teachers, and other individuals. However, a challenge that prevents all individuals from having this experience is the lack of awareness and understanding. For example, if there is a hard-of-hearing student in the classroom, reasonable accommodations can be provided to ensure that they get the most out of the educational experience. The accommodation will provide a sense of support that will help the individual feel like they belong in the classroom with their peers. A great opportunity to create social inclusion would be promoting the use of American Sign Language or Signed English to all children during early development. Clinicians that work with the pediatric population can help promote the development of Deaf identity. Most clinicians are hearing, so connecting families to deaf adult mentors and parents of other Deaf children can help with forming a sense of community and support. Overall, the results of the present study add to older research and literature on deaf and hard-of-hearing experiences by providing the opportunity for participants to share information about different areas of their life and identity from their own perspectives without steering them in a certain direction with each open-ended question.

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# SEX OFFENDERS: A DIVE INTO TYPOLOGY AND RECIDIVISM

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JASMYN GREEN

Researchers are exploring how to improve detection techniques and treatment programs for sexual offenders in order to reduce reoffending. Therefore, it is crucial to analyze the relationship between past literatures and current viewpoints regarding this topic. These perspectives are to methodically craft an overall purview of sexual (re) offending and determine the factors that play an influential role in relation to sex offender typologies. The purpose of this research is to explore literature from previous studies to determine what factors are implicated in various sex offender typologies as well as broadening the perspective data to determine if there are any significant treatments that are useful when treating sexual offenders. Specifically, this research includes information about etiological factors implicated in sex offending, risk factors, and recidivism rates to better understanding taxonomical differences. The results of the study will show how biological, psychological, and social etiological factors increase the likelihood of specific risk factors implicated in sexual (re)offending. After exploring previous studies to determine implicative factors in sex offender typology, research can conclude evidence-based recommendations for both law enforcement and treatment providers that can help improve current techniques being used.

## BRIEF HISTORY OF SEX OFFENDER LEGISLATION

Before 1994, there was not even a registration for sex offenders, and it was not common for surrounding areas to know if someone in their proximity had committed a sexual offense. All these laws regarding sex offenders did not come into effect until a boy named Jacob Wetterling was kidnapped from his hometown and then murdered at the age of 11. After such a gruesome crime that made national news was committed, Congress began to address the issues at hand and from the year 1996-2003 passed several laws that would enhance, clarify and strengthen the provisions of the Jacob Wetterling Act. After these laws had passed, congress continued to pass another act that would hopefully

protect the next generation. SORNA is the Sex Offender Registration and Notification Act which revamped the federal standards for sex offender registration regarding notification of sex offenders in the area. Other than the Jacob Wetterling Act there was Megan's law (1996) permitting that public disclosure of information would be mandated if it were needed to protect the public and this law even went international in 2016 saying that offenders needed to provide prior notice when leaving the country. Also in 1996, The Pam Lychner Sexual Offender Tracking and Identification Act of 1996 was established to create as law enforcement only national database which is known as NSOR or National Sex Offender Registry. These are just a few of the laws that were set in place to make sure the public felt safe and that these offenders were not only punished for what they did but followed the laws after being released from prison. All of this is to state that the roles of etiological and risk factors play a part in the origins of typology of sexual offenders (Legislative history of federal sex offender registration and notification, n.d.)

## **INTRODUCTION**

Sex offending is a topic that allows for researchers to explore an abundance of avenues that allows for a better understanding of sex offending in its entirety. Gathering insight into the inner working characteristics of a variety of sexual offenders which can include typology, the likelihood of them continuing to persist down this path as well as their recidivism rate over time. Through intensive research, researchers have been able to successfully maintain a grasp on the recidivism rate of sex offenders as a whole but there is still extensive research that needs to be done. While studying research in the field of both criminology and psychology previous knowledge from an abundance of distinctive documentaries has led me to the discovery of recidivism amongst sex offenders. Developing a passion for this topic came from an inquiry of data composed by a psychologist and criminologist studying the very scope of research that has engaged my attentiveness to the processes needed to establish a greater understanding of what the connection between recidivism and the treatment plans used to prevent reoffending. The topic of recidivism amongst sex offenders has been explored for decades and there is still current research being done on the topic. Exploring recidivism rates amongst sex offenders allows for proper treatment and assessments to be explored and a distinct analysis can be done to understand if there are any relations between the different types of sex offenders and the rate at which they reoffend.

## **REVIEW OF LITERATURE**

### **Psychiatric History**

Psychiatric hospitalization has been known to have a direct correlation with an increased rate of sexual recidivism (Lee & Hanson, 2016). This is due to specific criminogenic needs such as loneliness and social rejection that have a connection to the psychiatric symptoms and recidivism rate. A history of mental health is usually associated with risk factors related to recidivism and compared to the general population; sex offenders are more likely to have a history of psychiatric hospitalization (Lee & Hanson, 2016). Furthermore, there is a higher risk of sexual crimes being committed when an individual has a history of psychiatric hospitalization (Lee & Hanson, 2016).

A main reason that someone might be admitted into a psychiatric hospital is schizophrenia, but some other reasons include, mood disorders, substance related disorders and personality disorders. It is known that externalizing disorders such as personality disorders or substance abuse are strongly correlated with recidivism rates in the sexual offender population (Lee & Hanson, 2016). This is because some of these disorders might have an indirect link to criminal recidivism through criminogenic needs. In other words, these psychiatric disorders such as psychosis might influence several dynamic factors such as procriminal associates, Financial instability and noncooperation with supervision that would increase their risk of reoffending. The association between psychiatric symp-

toms and recidivism risk are caused by general difficulties of engaging and complying with the rules of society such as a breach in conditional releases and poor cooperation with supervision. (Lee & Hanson, 2016)

### **Childhood Influences**

The influence of insecure attachment style on a sexual offender's childhood can affect the development of social skills and self-confidence (Simmons, n.d.). The history of adverse childhood experiences (i.e., neglect, physical abuse, molestation) has been known to be associated with sexually offending behaviors. Ramirez et al.'s findings state that there is already an element of aggression and coercion when an unwanted sexual act takes place; however, the amount of aggression and method chosen is contingent on the kind of childhood that the offender had. The offenders that have been convicted tend to have a history of neglect, violence, and disruption within the home.

Not all perpetrators were abused growing up and the majority who were abused do not go on to offend. When there is a pattern of abuse and even emotional rejection mixed with sexual abuse that may increase the risk that these victims may become abusers themselves. Instances of emotional abuse can also suggest developmental precursors for sexual abuse. When a child experiences maltreatment they begin to have negative perception development which is contingent on the degree of perceived damage that the specific child has experienced. These factors are dependent upon the severity of the abuse but also how frequent the abuse might have been (Ramirez, Jeglic, Calkins, 2015).

### **Social Influences/Intimacy**

The failure to develop secure attachment bonds in childhood results in the failure to achieve intimacy which in turn can lead to vulnerabilities that may cause someone to seek out nonconsensual partners for sexual contact. For instance, a sexual offender may use deviant sexual fantasies in order to achieve intimacy, power and control. It is suspected that men who have committed sexual offenses tend to have relationships with people that lack intimacy. For example, they tend to express a less pronounced fear of rejection where a child molester may report a greater fear of rejection. Although there are limitations in this area of study, sex offenders still present certain dispositions that can be deemed problematic regarding general intimacy (Martin & Tardif, 2013). Due to a fear of rejection, their social skills and challenges relating to others may lead to intimacy deficits as they may believe that rejection will be the ultimate outcome. This can lead men to feel entitled to having their needs met on demand. Polascheck and Gannon's Rape Implicit Theories are rooted in strong roots of traditional patriarchy with some of the theories such as entitlement stating that "rape serves as a way to keep women in their place" is a representative cognitive distortion for this theory (Polascheck & Gannon, 2004, pg. 302). When a sexual offender does decide to partake in an intimate relationship the conflicts that do arise can be shown to lead to an increase in recidivism (Martin & Tardif, 2013). Furthermore, problems with intimacy is a risk for re-offending. Characteristics such as low sexual self-esteem, anxiety of abandonment, and feelings of sexual depression indicate that there are specific intimacy deficits among sex offenders (Martin & Tardif, 2013).

### **Recidivism**

Recidivism refers to committing a new offense within 3-5 years post incarceration. There are seven factors that are associated with sexual recidivism. These seven factors include social influences, intimacy deficits, pro-offending attitudes, general self-regulation, sexual self-regulation, and cooperation with supervision. It is often that sexual offenders will reoffend with a non-sexual offense rather than a sexual offense. In the research, sexual recidivism was predicted by almost all the indicators of antisocial orientation such as a history of rule orientation as well as antisocial personality (Hanson & Morton-Bourgon, 2004). Sexual recidivism will increase when these deviant interests are present in the offender's life. For the majority, the deviant sexual interest does not have to be done by



committing sexual crimes. Within these factors are three additional characteristics that can be persistent with sexual offenders: a negative family background, problems with friends and lovers, and attitudes tolerant of sexual assault. Although these characteristics may be true, there is also a general problem with impulsivity and criminality. Research has consistently shown that a predictor of sexual recidivism is connected to antisocial personality, antisocial traits, and history of the rule violation and this also includes personality disorders (Hanson & Morton-Bourgon, 2004). A few examples of the causes of recidivism had to do with a noncompliance with supervision as well as a violation of conditional release (Hanson & Morton-Bourgon, 2004).

## **Factors**

There is a consensus in the research and clinical community that there are a range of complex interrelated factors that correlate with sexual offending (Thakker & Ward, 2014). Some of these factors include genetic disposition, early life experience and substance abuse (Thakker & Ward, 2014). Finkelhor's Precondition Model (Finkelhor, 1984) focuses on how a person could sexually offend against children and it is usually because they exhibit four problematic tendencies: emotional congruence, sexual arousal, blockage, and disinhibition. Child sexual offenders tend to have a difficult time connecting with adults due to various problems and obstacles both emotionally and sexually, so they tend to seek the company of children to fill an emotional void and because they are naturally sexually aroused by children (Finkelhor, 1984). This can be due to a range of problems such as poor impulse control or even substance abuse. All of these factors combined are commission of a sexual offense against a child (Thakker & Ward, 2014). Ward and Beech's Integrated Theory focuses on sexual offending as a whole rather than homing in on child sexual offending. According to this theory there are three factors (biological, psychological, and social factors) that come together in the creation of sexual offending. These three groups of variables when placed together can lead to the manifestation of sexual offending (Ward & Beech, 2008). It suggests that biological factors such as genetic predisposition and neurological development, psychological factors such as motivation, emotion and memory and, social factors such as environment and personal situation can result in changes in clinical symptoms such as emotional regulation problems and deviant sexual arousal which they will cause sexual offending (Ward & Beech). These changes can lead to clinical symptoms such as emotional regulation problems and deviant sexual offending. This theory is not only seeking the emergence of sexual offending but the maintenance of such behavior as well (Thakker & Ward, 2014).

## **Sex Offender Typologies**

Sexual offenders are not a homogenous group of offenders; rather, there are various typologies, all of which have unique attributes and risks for reoffense. These typologies can help imply victimization that may be linked to a specific type of sexual offender. This helps provide a comprehensive understanding of deviant sexual behaviors required for treatment intervention and effective supervision (Simons, n.d.). The sex offender typologies include child sexual abusers, rapists, and internet sexual offenders. A child sexual abuser can be defined as the use of force or coercion of sexual nature when the victim is younger than age 13 and the age difference between the perpetrator and victim is usually anywhere between 5-10 years. A rapist is someone who tends to be of a lower socioeconomic status and exhibits a personality disorder (Simons, n.d.). They usually have a greater number of previous violent convictions and will use increased levels of aggression. Internet sexual offenders have come from the accessibility of pornography that is on the internet and has facilitated the development and maintenance of sexual deviance. There are three ways in which the internet has been used as a vehicle for child sexual abuse. These three ways consist of the viewing of pornographic images of children, sharing pornographic images of children and luring or procuring child victims online. This is beneficial to the internet sexual offenders because it aids in their arousal

and masturbation and is a substitute for child sexual contact (Simons n.d.).

### **Child Sexual Abusers**

A child sexual abuser can be defined as the use of force or coercion of sexual nature when the victim is younger than age 13 and the age difference between the perpetrator and victim is usually anywhere between 5-10 years. The perpetrators will start to build rapport with the children in order to then manipulate him/her into compliance with the sexual act (Simons,n.d.).This is the most damaging component of child sexual abuse because more than likely, it is someone they know or are comfortable with. A main thing to understand is that these perpetrators perceive that this sexual relationship is acceptable and even mutual. Pedophilia is the term used when an individual has a clear sexual preference for children. Not all of those who meet diagnostic criteria for pedophilia actually go on to offend; however, this innate attraction is important to address in treatment in order to reduce the chances that individual will commit a contact offense. This includes things such as the viewing of child pornography whereas non pedophilia is child abuse that involves sexual contact with a child that may or may not lead to pedophilia. With this being said, there are different types of child sexual abusers (Simons). There is the fixated offender who prefers to interact with children socially and sexually. In this instant, a relationship is formed with the children in order for the perpetrator to meet their sexual needs and more than likely the victims are not related to them and are often male children. Then there is the regressed child sexual abusers often consist of incest offenders or offenders who are mainly attack female adolescents (Simons,n.d.).

### **Rapists**

A rapist tends to be younger than other sex offenders and they are socially competent and oftentimes have engaged in an intimate relationship in the past or may even currently be in one. They tend to have a lower socioeconomic status and tend to abuse substances as well as exhibit personality disorders such as antisocial disorders (Simons). Rapists tend to differ based on the degree of aggression and motivation as well as if their needs are sexual or nonsexual- rephrase. Unlike other sexual offenders, rapists tend to have a unique relationship with their victims. Acquaintance rapists are oftentimes less violent and less opportunistic but are more coercive. Stranger rapists tend to be more hostile toward and more expressive in terms of inflicting pain on their victims. Characteristics such as aggression and antisocial behavior have allowed for researchers to determine four categories of rapist. The first type is the power reassurance/sexual aim rapist (Simons, n.d.). These rapists are often characterized by poor social skills as well as feelings of inadequacy. The force that is used during the act is sufficient and only used for compliance and/or to complete the sexual act. The power assertive/antisocial rapist is impulsive and will use aggressive methods. Compared to other sexual acts, the likelihood of a weapon being used is higher due to the unpredictability of the crime. These sexual acts are unplanned and is unlikely to use a weapon. The anger retaliation/ aggressive-aim rapist who commits sexual acts motivated by aggression and power. The sadistic rapist is someone who wants to re-enact sexual fantasies that involve torture and pain. This type of rapist usually excessively plans and may often result in an increase in sexual murder. (Simons, n.d.).

### **Female Sexual Offenders**

Female sexual offenders are less common than male sexual offenders Female offender victims tend to be males and strangers. A main difference between male and female sexual offenders is that they do not commit these crimes alone. They will usually pair off or even offend in groups. If a female offender does commit a crime alone then they are more likely than none to have a diagnosed mood disorder (Simons,n.d.). They exhibit a greater need for dominance, negative mood state and extensive abusive fantasies. When a female offender commits a crime with a male, it usually means that might display low

self-esteem, socially isolated and emotionally dependent. If they decided to take on a leadership role in this partnership then this is motivated by anger, jealousy and usually the need for retaliation. The most common type of female offender is a teacher/lover nurture because these offenders will abuse boys when they are in a position of trust (Simons,n.d.).

**Internet Offenders**

The availability and easy access to the internet has made it easy for the development of sexual deviance through pornography. The internet has been used as a hub for child sexual abuse in at least several different ways. Individuals will download pornographic images of children as a way of facilitating relationships in substitute for child sexual contact (Simons,n.d.). These people reportedly have more psychological difficulties in adulthood and very few sexual convictions. There are also four subgroups of this type of offender which are individuals who access pornographic images impulsively/out of curiosity, individuals who access or trade pornography to fuel their sexual interest in children, sexual offenders who use the internet as a part of a pattern of offline contact offending and individuals who download pornographic images for nonsexual reasons.

**METHODS**

After intensive background work and exploring the different typologies research has shown that there are seven major risk factors that are associated with recidivism. These risk factors are what researchers and lawmakers are using in order to improve intervention management.

<b>Major Risk/Need Factor</b>	<b>Indicators</b>	<b>Intervention Goals</b>
Antisocial Personality Pattern	Impulsive, adventurous pleasure seeking	Build self-management skills and teach anger management
Pro Criminal Attitudes	Rationalizations for crime, negative attitudes towards the law	Counter rationalizations with prosocial attitudes
Social Supports for Crime	Criminal friends, isolation from prosocial others	Replace procriminal friends and associates with prosocial friends/associates
Substance Abuse	Abuse of alcohol/drugs	Reduce substance abuse, enhance alternatives to substance abuse
Family/Martial Relationships	Inappropriate parental monitoring and disciplining, poor family relationships	Teaching parenting skills, enhance warmth and caring
School/Work	Poor performance, low levels of satisfactions	Enhance work/study skills, nurture interpersonal relationships
Prosocial Recreational Activities	Lack of involvement in prosocial recreational/leisure activities	Encourage participation in prosocial recreational activities

*Table 1. The seven major risk/need factors along with some minor risk/need factors (Canada, 2022)*

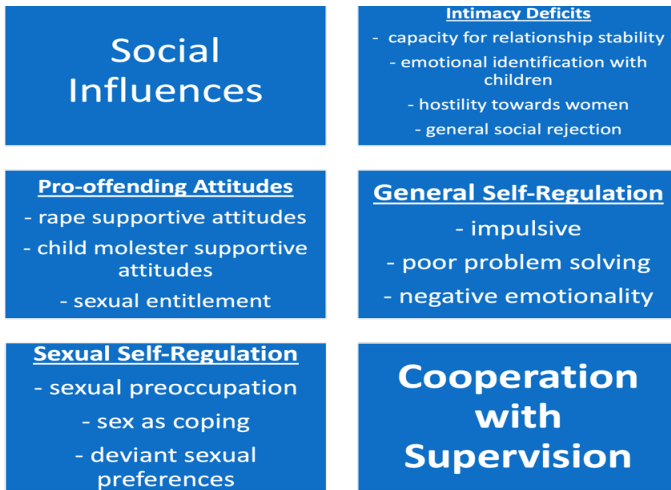
These traits are also dynamic and changeable however they are not necessarily associated with the probability of recidivism.

<b>Non-Criminogenic, Minor Needs</b>	<b>Indicators</b>
Self esteem	Poor feelings of self-worth
Vague feelings of personal distress	Anxious, feeling blue
Major mental disorder	Schizophrenia, manic depression
Physical health	Physical deformity, nutrient deficiency

*Table 1. continued*

Along with general risk factors, there are stable dynamic risk factors that are directly

associated with sexual recidivism: (1) Social, Influence, (2) Intimacy Deficits, (3) Pro-Offending Attitudes, (4) General Self-Regulation, (5) Sex Self-Regulation - sexual preoccupation, sex as coping, deviant sexual preferences, (6) Cooperation with Supervision.



## RESULTS

### Risk-Need-Responsivity Model

The ultimate goal of treatment programs for sex offenders are intended to address any underlying factors that have possibly contributed to an offender's problematic sexual behavior in hopes of reducing the risk of reoffending. Typical programs will usually involve a combination of psychotherapy, medication, and behavioral interventions. If the goal is to reduce recidivism rates amongst offenders, then the target is to ensure the reliability of different responses which will measure for low-risk offenders from high-risk offenders in order to provide proper treatment. Subsequently, reviewing the different typologies (Bonta et al., 2022). The research continues after these sex offenders have been imprisoned and long after they are released. A major avenue for comprehension of the topic comes from the treatment programs and offender risk assessment. When studying the possible treatment plans for sex offenders, it is important to note the RNR model. The RNR model better known as the Risk-Need-Responsivity model is a tool used for assessment and treatment of sex offenders and probably the most influential model. There are three principle to this model:

Risk Principle: matches the level of service to the offender's risk to reoffend.

Need Principle: assess criminogenic needs and target them in treatment.

Responsivity Principle: maximizes the offender's ability to learn from a rehabilitative intervention by providing cognitive behavioral treatment and tailoring the intervention to the learning style, motivation, abilities, and strength of the offender.

Within the responsivity principle, there are two subparts that are explored. The first part being the general responsivity which uses the cognitive social learning methods to influence behavior. This is generally the most effective regardless of the type of offender (i.e. child abuser, rapist, female offender) due to the cognitive social learning strategies. The second part is the specific responsivity which is considered the 'fine tuning' of cognitive behavioral intervention (Bonta et al., 2022). This responsivity takes into account strengths

and weaknesses as well as personality, motivation, bio-social and individual characteristics such as learning styles (kinetic, auditory, visual). In addition to the responsivity model, the risk principle also has two components. When focusing on the risk principle, it is important to note the reliability of predicting criminal behaviors which causes the need for evidence-based risk assessments. When the risk level of an offender increases then the amount of treatment is likely to be increased. This is highlighted in the second component of the risk principle because there is a need to properly match the risk level to the treatment level.

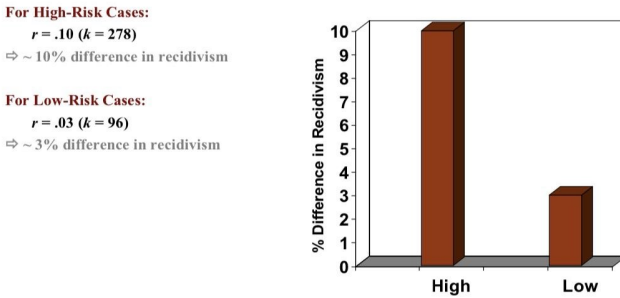


Figure 1. Treatment Effectiveness as a function of adherence to the risk principle

It is critical to note that if treatment intensity is not matched properly with risk level, the treatment would be considered wasted resources and, in some cases, make matters worse. Figure 1 shows that recidivism rates for treatment services given to high-risk offenders are lower than those for treatment given to low-risk offenders. In reality, treatment provided to high-risk offenders were linked to an average 10% decrease in recidivism in 374 tests of risk principle (Andrews & Dowden, 2006). Additionally, Figure 1 shows that offering therapy to low-risk offenders has a very minor impact (approximately a 3% decrease in recidivism; Andrews & Bonta, 2006). However, some studies demonstrate that offering extensive treatment to low-risk offenders may encourage criminal behavior and that, when offered to higher-risk offenders, same services can significantly reduce recidivism. Generally, the risk principle main treatment services are better utilized amongst higher risk offenders.

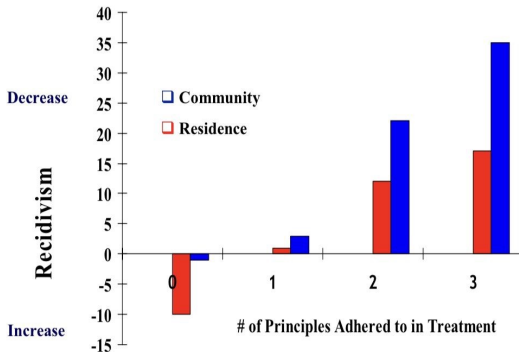


Figure 2. Adherence to the RNR Principle by Setting

Figure 2. shows the effectiveness of treatment when there is an increased use of the risk-need-responsivity principles. If a treatment intervention only adheres to one of the principles then a decrease in recidivism is beginning; however if all three principles are involved in treatment then there is an average difference of 17% recidivism rate amongst treated and the non-treated settings. Treatment can take place in residential areas but

there is a much higher rate of success in community settings.

In the table below, “offender treatment programs that adhere to the principles of risk, need and responsiveness measure up quite well to the police’s ability to clear a crime and even some common medical interventions” (Bonta et al., 2022).

Intervention	Target	Success Rate
Criminal Justice	Break and Enter	0.16
Police Clearance	Auto Theft	0.12
Offender Treatment (RNR)	Recidivism	0.29
Medical Interventions		
Aspirin	Cardiac Event	0.03
Chemotherapy	Breast Cancer	0.11
Bypass Surgery	Cardiac Event	0.15

(Sources: Andrews & Bonta, 2006; Fedorowycz, 2004; Lipsey & Wilson, 1993)

### Comparative Effectiveness for Selected Interventions

If agencies are able to achieve a specific level of commitment, then recidivism rates will decrease significantly compared to other agencies who do not follow the RNR Model. These are a few of the principles that need to be followed in order to achieve these results:

#### Overarching Principles

*Respect for the Person:* services are provided in an ethical, legal, just, moral, humane, and decent manner.

*Human Service:* Introduce human service delivery rather than relying on the severity of the penalty.

#### Structured Assessment

*Strengths:* Assess personal strengths and integrate them in interventions

*Breadth:* Assess specific RNR factors as well as non criminogenic needs that may be barriers to prosocial change but maintain a focus on the RNR factors.

#### Program Delivery

*Relationship Skills:* Respectful, collaborative, caring staff that employ motivational interviewing

*Structuring Skills:* Use prosocial modeling, the appropriate use of reinforcement and disapproval, cognitive restructuring motivational interviewing

#### Organizational

*Continuity of Service:* Provision of services and ongoing monitoring of progressing

*Community Linkages:* The agency within which the program is housed will maintain positive relationships with other agencies and organizations

## CONCLUSION

Understanding risk factors for sexual reoffending is a key component of treatment. Similarly, it helps law enforcement and community supervision officers with detection methods, and understanding risky behaviors that may be indicative of, or lead to sexual (re)offending. Additionally, risk factors help us determine an offender’s risk of recidivism and thus, the dosage of treatment necessary for the individual. (higher risk = higher dosage/more intensity for treatment). In order to address necessary treatment targets and risk of reoffending, clinicians, researchers, and law enforcement should have a solid understanding of offender typologies. The study of recidivism typology has provided vital insights into understanding the complex nature of criminal behavior and its potential for repetition. Typology frameworks have aided in the identification of various subgroups within the offender population, enabling focused interventions and risk management methods. Typology has aided in the development of more effective preventive, rehabilitation, and reintegration programs by classifying criminals based on similar characteristics and risk factors. Individual differences and various routes to criminal activity have been highlighted in research on typology and recidivism. Offenders are not a homogeneous group, according to typologies, but rather demonstrate a wide diversity of reasons,

triggers, and patterns of criminal action. Understanding these differences is critical for adapting interventions to the individual needs and circumstances of various offender types. Furthermore, typology research has shed light on the underlying factors that contribute to recidivism, such as psychological characteristics, social influences, and environmental influences. Typology research has offered useful information for policy-makers and practitioners in developing evidence-based ways to minimize recidivism rates by identifying the primary determinants of reoffending. However, it is critical to recognize the limitations of typology frameworks. Classification techniques can oversimplify human behavior and fail to represent the dynamic nature of crime. Furthermore, the efficacy of typologies in predicting recidivism varies according to contextual factors and the accuracy of the data used for classification. While typology research has improved our understanding of recidivism and aided in the development of targeted interventions, it is critical to approach these frameworks critically. Future research should continue to refine typologies, taking into account existing limitations and experimenting with new techniques that take into account the evolving understanding of criminal behavior. Finally, a comprehensive approach to reducing recidivism necessitates a mix of typological insights, evidence-based interventions, and systemic changes aimed at addressing the underlying causes of crime.

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## LEARNING BARRIERS FOR BILINGUALS

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*NICOLE LOPEZ MIRANDA*

**W**hen Spanish-speaking people from Latin America move to the United States, one of the first barriers they may come across is the change in language. Adults have to manage their way around with various levels of knowledge in English. In many communities, they are placed head first into a new world of communication, adapting to it almost by force. Children who are immigrants or children of immigrants are given a different situation: school. Education, their parents may hope, will be an opportunity for them to adapt to their new country. Perhaps, as the education systems supposedly promise, the kids will be given the same opportunities as other kids with different backgrounds who are around them. The issue, however, is that in many cases, Hispanic children are separated from the rest of their generation in different classrooms. Public schools around the country have a variety of systems implemented in their districts. Some have “bilingual” classrooms, where Hispanic kids spend kindergarten to fifth grade learning in English and Spanish. Other schools, especially middle and high schools, have ESL or ESOL (English as a Second Language) curriculums, meant to help students who are learning how to speak English. Both of these systems are flawed: bilingual classrooms segregate Hispanic kids away from the rest of their grades. ESL classes on many occasions are underfunded and defective and limit older kids’ extracurricular opportunities. The flaw that ties these classes together is the superiority that is placed on the English language above all others in the education system and the country, as well as the ethnic superiority that ends up dividing the Hispanic children away from the rest of their peers. A possible solution to some of these problems is to place the opposite expectations on the language and the children. My graphic design proposal and designed curriculum show a hopeful system that is slowly beginning to show up around the country: dual language programs that become part of schools where the previously mentioned programs were held. Dual language schools allow for groups of kids to learn in the same classroom, and help each other with their individual and highlighted academic strengths. My exhibition is an exploration of my dual language proposal visually. I designed and showcased my thesis in a booklet and posters, highlighting these factors with a solution

that was emphasized by its visual elements. I created and designed a new curriculum and booklet to highlight the benefits of these programs and present a scenario from the perspective of a bilingual student. The visual design of my project was influenced by Mexican and Latin American styles, using Loteria cards as visual identity to represent testimonials and using monarch butterflies as a symbol of immigration, integration, and a symmetrical view of languages in the country. I believe that integrating classrooms is the first step to breaking down barriers for children based on their language or appearance.

The sources I used investigate concepts of bilingualism, the immigration experience, bilingual education, and its variants. I used these sources to come up with content as well as inspiration for my newly designed curriculum. The content is therefore based on perspectives of what this education looks like and became my groundwork for I could propose a solution (this being dual immersion programs, another topic in my research). My design-centered sources were immigration, catalog, and bilingual book design. My goal with my design was to convey its purpose both with text and in its actual design. This is why I took Latin American and other immigration designs as inspiration for my work. My final source and content was a collection of people's



Lopez Miranda, Nicole "Learning Barriers for Bilinguals" Front Cover

experiences in ESL and bilingual education, which made it onto the final design in a figurative and visual sense. In other words, I use the idea of integrating children and languages into the booklet that I designed with visual references to culture and language.

The format of bilingual education has been questioned for decades but is rarely brought up in the media. In 1985, Rosemary Rinder wrote in The New York Times that "bilingual education is a form of segregation. All the little Hispanic children are rounded up and sent to a special classroom. Consequently, they form friendships within this group, and the children of English-speaking backgrounds form their friendships within their group." This statement and article became evidence of these curriculums being questioned for the same concerns I had and experienced myself. Rosemary also proposes to "Integrate the Hispanic children into the regular school programs," calling for no more separation, and for expanding foreign-language instruction. This is very close to my own solution and designed curriculum, but the next step was to figure out why, nearly forty years after Rosemary Rinder wrote this article, bilingual education continues to exist. The most important part of this article was that it made it a fact that bilingual education has been questioned before, and my own solution has been considered. It was not the only one to do so, though the rest are from more contemporary points of view.

Krystina Yackle proposed the same solution, with a more in-depth analysis of the issue and steps to the solution. Yackle considers bilingual and ESOL classes segregation, or ELL as she defines them. The Equal Educational Opportunities Act (EEOA) states that it is meant to "take appropriate action to overcome language barriers that impede equal participation by its students in its instructional programs," without clarifying what actions are best, or appropriate (Yackle). This leads to many different systems including these ESL and bilingual classrooms. These classes have negative effects on these children because their parents admitted to speaking Spanish at home. Effects include physical and social separation, creates a larger separation in society based on language barriers in the long run, and does not expose the students enough to the language that is supposedly their second. Yackle's name for dual immersion programs is Two-Way Immersion, or TWI, which contains different models of immersion into two languages (90 to 10, and 50 to 50). This structure lets students focus more on academia and benefits native-English speakers as well. Everyone is given an equal opportunity in these classrooms while strengthening their knowledge in their languages. Instead of being placed in remedial ESL

classes, students are in enriched and even advanced classes now using bilingualism.

These immersion classrooms are also described and researched thoroughly by Steele in “Effects of Dual-Language Immersion Programs on Student Achievement.” They explain that ELs (English Learners) are segregated less than “transitional or developmental bilingual programs” so that both native speakers and those new to the language have access to the same education. (Steele, 286S). The call to action in this journal is the same as others: integrating classrooms by beginning immersion programs, as many countries around the world already do. Unlike other sources, Steele is able to provide evidence through their research that these programs do benefit all students.

The term, “bilingual classrooms” may sound like a class where kids are able to interact and learn in two languages. Unfortunately, this is not the case. Bilingual classrooms are prominent in states near the Mexican border, where students who have English as a second language “are placed into classrooms away from fluent English speakers” (Yackle, 1). While in *Brown v. Board of Education*, school segregation of races was deemed unconstitutional, bilingual classrooms continue to segregate in a different form: through language (Yackle, 1). I also argue that through intersectionality, this ends up segregating by race, given that the majority of Spanish speaking Latin American students are not considered white. Meanwhile, other ESL children who may speak another language are placed into ESL or ESOL classrooms. In many schools not near the Mexican border, ESL classrooms are for Hispanic and Latin American students as well. ESL programs consist of giving children a remedial class to enhance their English proficiency.

Both bilingual and ESL classrooms are a result of the Equal Educational Opportunities Act (EEOA), which was meant to provide the education of students who had language barriers in education. It states that it is set to “take appropriate action to overcome language barriers that impede equal participation by its students in its instructional programs,” without explaining what exactly should be done for these students (Yackle, 2). It is also a replacement of former ways of handling ESL students, such as Mexican schools or past programs where children were banned from speaking Spanish in school if they did not want to be punished. Many schools also receive special funds or even rewards for having bilingual classrooms, with a belief that they are good for children who speak English as a second language.

Sadly, bilingual classrooms and ESL programs are usually underdeveloped, underfunded (as funds received in reward are commonly used for something other than the classes), segregate students, and ESL children miss out on many academic opportunities. The view of these classes portrays knowing another language as an issue, so these children are also given education with the perspective that they are less intelligent than the other English speaking children. This discourages children from learning, and entices teachers and schools to treat their education as such. This results in students who are ESL students to score less than English speakers. For example, in a study by the National Center for Educational Statistics in 2011, 73% of 8th grade ESL students scored in the low category in Reading comprehension tests while only 19% of English speakers fit under the same category (Yackle, 2). Lower quality learning leads to these results, inhibiting the children from pursuing academia at a young age. Socially, ESL children are taught that they are different from the rest of the school. They only interact with each other, and English speaking children are taught that ESL students are intellectually and socially different from them at a young age.

Both ESL and bilingual classrooms are aimed to help children improve their English, and yet, they are separated from the best source of social interactions with actual English speaking students. This environment could provide them with better opportunities to fully immerse into the language that predominates the United States. My and other scholars’ proposal is similar: simply integrating all children into the same classrooms. Children learn in two or even more languages from a young age, when learning languages is typically easier. In fact, schools in the United States have begun to begin these programs in a few states. Two-Way Dual Language Immersion programs, or Dual Immersion Programs are common in many parts of the world. In a study done in Portland public Schools

Immersion Programs, Immersion schools teaching both in English and a partner language were compared to schools that did not have these programs. The partner languages included Spanish, Mandarin, Japanese and Russian (Steele, 298S). Outcomes proved the benefits of learning in more than one language in both models, and that these programs can be implemented into school systems in the United States. There is not only less segregation and better academic opportunities with these classes, but all children are able to benefit from them, including those who speak English as a first language (Yackle, 8). English speakers and English learners are treated equally in this set up – native English speakers are able to help their peers and the second language speakers can do the same with the partner language. The focus of just learning English for these students shifts to the important academic lessons and grade-level assignments, and knowing the partner language is viewed as intelligent, rather than an issue that must be overcome with remedial ESL or bilingual lessons. No one is no longer replacing their language, but adding one. Most importantly, students are equal in Dual Immersion programs. They are not separated from their peers, and thus do not learn to discriminate. ESL and other curriculums will always be needed, but hopefully, with a learning barrier taken down, others will follow.

The second part of my study, and step to create my curriculum and booklet was to ask for personal experiences in these programs. I wanted to hear not just from professionals in the field, but those who had actually been in these classes. All answers provided me with the same input: ESL and bilingual programs are flawed, and many testimonials admitted to feeling discriminated against in these settings. I highlighted these testimonials in my booklet.



Lopez Miranda, Nicole "Learning Barriers for Bilinguals" Testimonials 1

Lopez Miranda, Nicole "Learning Barriers for Bilinguals" Testimonials 2

People recounted either what they remembered, or what their siblings had gone through in these classes. Someone's sister was not allowed to join extracurricular activities because they had to take ESL classes, one person mentioned that they were treated with second-hand class materials while when they transferred to "regular" classrooms, they were treated as intelligent, another mentioned that they were placed in these classes only so they could translate for other students, another mentioned that they were expected to use dictionaries with no other guidance, another mentioned that they already spoke English but were racially stereotyped to be placed into ESL anyway, and another mentioned that their sister was not allowed to present her project because she was in ESL. Some students even remember being taught by only Google Translate, as their teachers did not speak their language. These testimonials concluded that the system in these language learning classes is broken, and only provides barriers to these students.

My exhibition consists of two primary visual factors: my curriculum booklet and posters highlighting what I gathered from my research. My visual design influences included designs created by immigrants, Mexicans, and other Latin Americans. I used the visual identity of Loteria cards to represent the testimonials in bilingual labeled illustrations. As you look through my project, you are being transported in just a little of what dual immersion programs could look like. My goal with this booklet was to use

sarcasm and an introduction to the programs. Monarch butterflies are known to migrate across Mexico and the United States. I saw them as a symbol of immigration, integration, and a symmetrical view of languages that we could obtain in the country. I used them as visual identity in both the booklet and my posters.

My work for Learning Barriers contains the motifs of monarch butterflies and barriers/fences. In this poster (poster 1), I have the butterfly being covered by a paper and barriers that also nearly form part of a USA flag in the poster.

This poster (poster 2) shows two sides of education: the more fun, exciting one, and the bilingual one, where the butterflies continue to be covered by barriers. This is meant to highlight the separation kids are forced to go through in school, and show the benefits one child gets while the other is limited. The poster also mockingly promotes the classrooms, saying that you can keep your second language... but only to yourself, separated from the rest.

This poster (poster 3) uses the Loteria-influenced illustrations that I made to represent the testimonials of the real-life “reviews” of bilingual education. This brings attention to the booklet, to find out what each of these images means. The Spanish and English translations in the booklet are also meant to show how dual immersion classes work: creating equality between both languages.

This final poster (poster 4) shows the butterfly finally breaking through the barriers with the help of integrating classrooms.

My exhibition and showcase reception was on April 27, where I had a recorded artist talk for people to listen to while being able to interact with my project by flipping through the booklet and taking a sticker. I also received feedback from my audience about them not being aware that these classes were truly a thing, while others had not considered that it was indeed segregation. My goal with my project was not to just visually bring awareness to these issues in education but to also suggest change and solutions. While it may not be easy to implement dual immersion programs in every school in the United States, it is my hope that soon, a start will be made to dismantle barriers in education and that each child will have the same opportunities in academia regardless of which languages they speak.



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 "Learning Barriers for Bilinguals" Poster 1

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Lopez Miranda, Nicole  
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 "Learning Barriers for Bilinguals" Poster 4



Lopez Miranda, Nicole "Learning Barriers for Bilinguals" Showcase

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# VISUALIZING A DISPARATE PRICE INDEX FOR DIFFERENT MARGINAL GROUPS

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PAYTON MASSEY

The CPI-U (Consumer Price Index for All Urban Consumers) is the most cited price index, and is used to determine interest rates, Social Security payouts, and tax brackets, meaning it is notable for many Americans. While many papers examine biases in CPI calculations and suggest improvements, this paper examines alternative constructions of the CPI by altering the market basket to more closely represent the spending patterns of different groups. Since the market basket is determined by averaging the spending patterns of thousands of households, the CPI may not be representative of the cost of living of individuals whose spending habits are distinctly different from the “typical” consumer, such as college students and the elderly (BLS, 2012). This paper constructs alternative baskets that represent consumption patterns of different groups, and utilizes a Laspeyres price index as the basis for constructing inflation rates. These measures are illustrated with novel visualizations to emphasize the inherent group differences. By modifying the weights in the basket of goods to accommodate for the spending habits of both the elderly and college students, we find that their costs of living evolve differently compared to the CPI-U. Indeed, we find that a price index constructed for a “typical” consumer can be misleading for those in different stages of the life-cycle model, as suggested by Deaton and Muellbauer (1980).

## INTRODUCTION

Interest in inflation has been on the rise as the annual inflation rate began to rise in 2021 and skyrocketed to over 7% in 2022 (BLS, 2023). Inflation, at its core, is the change in prices over time, and the consumer price index for all urban (CPI-U) consumers is the most widely used inflation statistic for Americans (Mankiw & Ball, 2011). The CPI-U is constructed to represent inflation for the majority of Americans, and is estimated to include 93% of the U.S. population (BLS, 2023). Because the CPI is constructed to act as a summary measure for inflation and is based on a basket of goods and services for a



typical consumer, it largely ignores groups that may have unique spending habits (BLS, 2023).

College students and retirees are two groups that have unique spending patterns compared to the average American population that may affect their individual inflation rates. College students incur expenses of college tuition and school supplies that other consumer groups may not. For example, in 2011-2012,<sup>1</sup> the average price of tuition for public four-year universities was \$8,244 (College Board, 2012). Similarly, retirees, due to their age, may incur higher healthcare expenses such as prescriptions and doctors visits. A 2019 Healthview Report estimates that a healthy 65 year old couple retiring in 2019 would spend \$387,644 in lifetime healthcare costs<sup>2</sup>. Additionally, many retirees move into assisted living communities which is a large, retiree-specific expense. According to the 2020 Genworth Cost of Care Survey, the median monthly cost for assisted living in the United States is \$4,300.

The purpose of this paper is to construct two alternative indices based on the distinct expenditures of these college students and retirees in order to observe and determine how price changes are affecting them. First, I accessed the 2011 diary CE data from the BLS website. The diary data is one of two consumer expenditure surveys used by the BLS to construct the CPI. From this, I was able to filter out the individuals of interest and match them to their corresponding expenditures. Next, I totaled the expenditures for each good and service group which were then matched with corresponding price indices published by the BLS and available to access via the Federal Reserve of Economic Data (FRED). After this, I constructed weights for each of the expenditures classifications to represent the amount spent on each good/service group out of all expenditures for either group of interest. Finally, I matched the weights to their corresponding price indices and calculated an alternative price index for both college students and retirees from 2011 to February 2023.

The resulting indices show there is a difference in the inflation experienced by each group. College students' top expenditures contained tuition which was not entirely absent from the retirees' index, but it was not in their top expenditures. Additionally, the retirees' top expenditures included medical expenses, a group that was not as prevalent in the college expenditures. Both indices follow the same pattern as the CPI-U, but generally fell below it. This was surprising because the CPI-E, an experimental inflation measure for those over 61, is thought to show inflation is higher for this group than the CPI-U. I was also surprised that the college index fell below the CPI-U, as tuition was a top expenditure for college students, and these prices have soared.<sup>3</sup>

Diary data was the only CE survey used to create these indices which may leave some gaps in the understanding of each of these groups expenditures, as diary data primarily canvases smaller weekly expenditures. To remedy this, I would need to include the interview CE survey data into these indices. This may provide more valuable insight into larger expenditures incurred by each group. Additionally, I held the market basket constant from 2011-February 2023 which doesn't account for changing spending habits, so I would need to update the market basket annually to account for shifts in spending.

## LITERATURE REVIEW

Many sources agree the CPI is the most common measure of price levels, and therefore, it is significant to many (Wynne and Sigalla, 1994) (Mankiw and Ball 2011). It is important to note the CPI is not measuring change in all prices over all time; it would be impossible to collect all prices for all consumers for all of time. Instead, it is an estimated measure of the change in the cost of living, or the change in the cost to obtain a base level of utility over time (Wynne and Sigalla, 1994). Specifically, the CPI is a "measure of the average

<sup>1</sup> This market basket constructed for this analysis is constructed using the 2011 Diary survey, so while not the most recent year of tuition data, it is the most relevant for the purposes of the analysis.

<sup>2</sup> These healthcare costs "include premiums for Medicare Parts B and D, supplemental insurance (Mediagap), and dental insurance, as well as out-of-pocket costs related to hospitalization, doctor visits, tests, prescriptions drugs, hearing services, hearing aids, vision, and dental" (HealthView, 2019).

<sup>3</sup> The College Board publishes the different costs of colleges, and their 2022 "Trends in College Pricing and Student Aid" report showed that there was a 65% increase from 2002-2012 and a -1% decrease from 2012-2022 in tuition and fees for public four year universities.

change of prices over time in the prices paid by urban consumers for a market basket of consumer goods and services” (Congressional Digest, 2023).

The CPI is constructed by the Bureau of Labor Statistics (BLS) using price data and consumer expenditure (CE) surveys they collect at regular intervals. The BLS publishes the methods used to calculate the CPI in its “Handbook of Methods” which is updated with any changes made to its calculation. In fact the majority of the literature surrounding the CPI can be found in the BLS’s database. Additionally, many articles feature summaries of the methods used to construct the CPI. For example, a 2023 Congressional Digest article outlines these methods. Here, they describe that the CPI is constructed using a set of interlocking surveys. These surveys determine which price data will be collected and the weight will be assigned to each price. Together, this forms the resulting CPI.

There are many criticisms of the CPI which center around the biases in its calculation. Wynne and Sigalla examine many of these biases in their article “The Consumer Price Index” and discuss how these biases may cause an either over or understatement of the CPI (1994). According to Wynne and Sigalla, the most frequently studied of these criticisms is substitution bias. Because the CPI is calculated using a fixed basket of goods and services which is held constant for two years, it ignores consumers’ reaction to substitute higher priced goods and services for those with lower prices which may overstate the overall CPI. In addition to this, they examine outlet substitution bias, quality bias, and new goods bias. Hausman (2002) echoes many of the same criticisms of the CPI as Wynne and Sigalla in his article, specifically focusing on substitution, new goods, and quality biases found in the CPI. Hausman (2002) also points to the fixed basket used to calculate the CPI as the main cause of the biases, but he submits the solution for these biases can be found in frequently updating the prices and quantities through barcode scanner data (2002).

A newer criticism of the CPI is of its mismeasurement following rapidly changing consumer expenditure patterns during the COVID-19 crisis. A 2022 BLS article notes that “when spending patterns change quickly, fixed-weight indexes can become biased”. This article examines the difference between the traditional CPI-U which uses pre-pandemic data, an alternative index using 2020 CE data, and an alternative index created by Alberto Cavello using real-time expenditure data. Another criticism of the CPI aside from the biases found in its calculation is inflation inequality. Inflation inequality is summarized as the different effect inflation has on “households with different demographic dimensions” (Jahromi et al., 2023).

There are several studies that construct alternative indices based on segmented consumer groups or alternative prices. The Billion Prices Project is one such initiative to construct alternative price measures using daily prices from online retailers. Additionally, the BLS published a working paper and subsequent article examining an alternative CPI index for various income groups. This paper determined those with lower income faced higher inflation than the CPI-U, and those with a higher income faced lower inflation than the CPI-U (2021). A 2006 study done by Leslie McGranahan dove further into inflation for various groups by constructing inflation measures for 31 different demographic groups using CE data from 1984-2004. McGranahan found that those 65 and over had the most deviation from overall inflation, and lower income groups faced higher variability in their inflation measure. My own research is heavily influenced by McGranahan’s study, but aims to look closely at inflation experienced college students, a group not explicitly examined in her study.<sup>4</sup>

## METHODS

### Data Collection

There are two primary pieces of data needed for each group in order to construct the alternative price indices: expenditure data and price data. The Bureau of Labor Statistics

<sup>4</sup> McGranahan did examine inflation for a college educated group defined as either head or spouse indicated they had a Bachelor’s degree or higher, but she did not examine inflation measure for those who indicated they were currently in college.

(BLS) collects and publishes the Diary and Interview Data on their site. Since the analysis presented here only focuses on ten years of data, the 2011 Diary responses were used for the purposes of constructing the initial market basket, defining the groups of interest, and determining their expenditures. These two pieces are used to create the resulting index by first determining the weights applied to each price category and then applying these weights to published BLS price data to determine the overall monthly index.

Each yearly diary publication contains several file types: characteristic and income data, expenditure data, and summary data. Each file contains one quarterly entry resulting in 12 total files of diary survey data. The MEMD files contain the characteristic data needed to segment the data into the specific demographic groups of interest, and the EXPD files contain the expenditure data for each respondent. Therefore, these files fulfill the first piece needed to construct the price indices. Additionally, the Federal Reserve of Economic Data (FRED) publishes price indices as time series from the BLS data on their site. In order to determine the evolving prices and construct the index from 2011 to February 2023, I collected these price indices for the corresponding market basket groups for the corresponding time period.

### Data Cleaning

Each file contains the variable NEWID which represents a unique survey respondent. The MEMD file variable IN\_COLL specifies whether respondents are in college<sup>5</sup> full-time, part-time, or not at all. After filtering the dataset to include only persons who are in college part time and full time, the average age of the respondents was still above 40. The largest age group of those in college are 18-24 year olds (The Hive Law, 2023). In order to mirror this, the dataset was further filtered to include only those respondents who were in college and under the age of 26. Similarly, I filtered the data by the variable WHYNOWRK to create the retired group of interest. This variable contained an indicator for those who did not work because they were retired. Subsequently, any observations that met these criteria were used to calculate the expenditures. Table 1 shows the summary data for the two groups.

Table 1: Summary Statistics for College and Retired Age Groups

Total College Respondents	1205	Total Retired Respondents	4073
Average Age	21	Average Age	72
Average Wage	\$12,945.10	Percent Receiving RR or SS	69.85%
Expenditure per Person	\$568.62	Average Yearly Amount of SS Received	\$11,267
		Expenditure per Person	\$446.44

Next, in order to determine the expenditures for each group, the selected NEWIDs were matched with their corresponding expenditures in the EXPD file. The following R code combines the NEWIDs with all the matching expenditures for each respondent for quarter one.

#### #College Matching

```
q1.11$MATCH.C<-q1.11$NEWID %in% q1.11$Q1NEWID
q1.11_C<-q1.11%>%
  filter(MATCH.C=="TRUE")
```

#### #Retired Matching

```
q1.11$MATCH.R<-q1.11$NEWID %in% q1.11$Q1NEWID_RETIRED
q1.11_R<-q1.11%>%
  filter(MATCH.R=="TRUE")
```

This code is repeated for each quarter of observations and corresponding groups of

<sup>5</sup> Full time college students are indicated by a response of 1 for the IN\_COLL variable, 2 indicated part time students, and 3 indicates those who are not in college. Blanks indicate those who did not respond.

NEWIDs.

Additionally, because there are no price indices available from the BLS for each of the individual items, the individual items that made up the 2011 market baskets for these two groups were insufficient to create the indices. These items, each represented by a UCC code and an corresponding item description, were grouped into market basket groups that correspond with the indices available via the FRED database. Table 2 shows the constructed market basket groupings with the corresponding price indices used later as the price component of the constructed indices for the two groups of interest.

*Table 2: Market Basket Groups and Corresponding Price Indices*

Market Basket Group	Price Index
<b>Food</b>	
Cereals and Cereal Products	<a href="https://fred.stlouisfed.org/series/CUSR0000SAF111">https://fred.stlouisfed.org/series/CUSR0000SAF111</a>
Bakery Products	<a href="https://fred.stlouisfed.org/series/CUSR0000SAF111">https://fred.stlouisfed.org/series/CUSR0000SAF111</a>
Meats, Poultry, Fish, and Eggs	<a href="https://fred.stlouisfed.org/series/CUSR0000SAF112">https://fred.stlouisfed.org/series/CUSR0000SAF112</a>
Dairy Products	<a href="https://fred.stlouisfed.org/series/CUSR0000SEFJ">https://fred.stlouisfed.org/series/CUSR0000SEFJ</a>
Fruits and Vegetables	<a href="https://fred.stlouisfed.org/series/CUSR0000SAF113">https://fred.stlouisfed.org/series/CUSR0000SAF113</a>
Sugar and other Sweets	<a href="https://fred.stlouisfed.org/series/CUSR0000SEFR">https://fred.stlouisfed.org/series/CUSR0000SEFR</a>
Fats and Oils	<a href="https://fred.stlouisfed.org/series/CUSR0000SEFS">https://fred.stlouisfed.org/series/CUSR0000SEFS</a>
Miscellaneous Foods	<a href="https://fred.stlouisfed.org/series/CUSR0000SAF115">https://fred.stlouisfed.org/series/CUSR0000SAF115</a>
Nonalcoholic Beverages	<a href="https://fred.stlouisfed.org/series/CUSR0000SAF114">https://fred.stlouisfed.org/series/CUSR0000SAF114</a>
Food away from Home	<a href="https://fred.stlouisfed.org/series/CUUR0000SEFV">https://fred.stlouisfed.org/series/CUUR0000SEFV</a>
<b>Alcoholic beverages</b>	
Alcoholic Beverages at Home	<a href="https://fred.stlouisfed.org/series/CUSR0000SAF116">https://fred.stlouisfed.org/series/CUSR0000SAF116</a>
Alcoholic Beverages Away from Home	<a href="https://fred.stlouisfed.org/series/CUSR0000SEFX">https://fred.stlouisfed.org/series/CUSR0000SEFX</a>
<b>Household furnishings and supplies</b>	
Rent of Primary Residence	<a href="https://fred.stlouisfed.org/series/CUUR0000SEHA">https://fred.stlouisfed.org/series/CUUR0000SEHA</a>
Lodging Away From Home	<a href="https://fred.stlouisfed.org/series/CUSR0000SEHB">https://fred.stlouisfed.org/series/CUSR0000SEHB</a>
Owners' Equivalent Rent of Primary Residence	<a href="https://fred.stlouisfed.org/series/CUSR0000SEHC">https://fred.stlouisfed.org/series/CUSR0000SEHC</a>
Tenants' and Household Insuranc	<a href="https://fred.stlouisfed.org/series/CUUR0000SEHD">https://fred.stlouisfed.org/series/CUUR0000SEHD</a>
Fuels and Utilities	<a href="https://fred.stlouisfed.org/series/CUSR0000SAH2">https://fred.stlouisfed.org/series/CUSR0000SAH2</a>
Water and Sewer and Trash Collection Services	<a href="https://fred.stlouisfed.org/series/CUSR0000SEHG">https://fred.stlouisfed.org/series/CUSR0000SEHG</a>
Household Furnishings and Operations	<a href="https://fred.stlouisfed.org/series/CUSR0000SAH3">https://fred.stlouisfed.org/series/CUSR0000SAH3</a>
<b>Apparel and Apparel Services</b>	
Men's Apparel	<a href="https://fred.stlouisfed.org/series/CUSR0000SAA1">https://fred.stlouisfed.org/series/CUSR0000SAA1</a>
Boys' Apparel	<a href="https://fred.stlouisfed.org/series/CUSR0000SAA1">https://fred.stlouisfed.org/series/CUSR0000SAA1</a>
Women's Apparel	<a href="https://fred.stlouisfed.org/series/CUSR0000SAA2">https://fred.stlouisfed.org/series/CUSR0000SAA2</a>
Girls' Apparel	<a href="https://fred.stlouisfed.org/series/CUSR0000SAA2">https://fred.stlouisfed.org/series/CUSR0000SAA2</a>
Children's Apparel	<a href="https://fred.stlouisfed.org/series/CUSR0000SEAF">https://fred.stlouisfed.org/series/CUSR0000SEAF</a>
Footwear	<a href="https://fred.stlouisfed.org/series/CUUR0000SEAE">https://fred.stlouisfed.org/series/CUUR0000SEAE</a>
Other Apparel Products and Services	<a href="https://fred.stlouisfed.org/series/CPIAPPSL">https://fred.stlouisfed.org/series/CPIAPPSL</a>
<b>Transportation and Transportation Services</b>	
New and used motor vehicles	<a href="https://fred.stlouisfed.org/series/CUSR0000SETA">https://fred.stlouisfed.org/series/CUSR0000SETA</a>
Motor fuel	<a href="https://fred.stlouisfed.org/series/CUSR0000SETB">https://fred.stlouisfed.org/series/CUSR0000SETB</a>

Market Basket Group	Price Index
Motor vehicle parts and equipment	<a href="https://fred.stlouisfed.org/series/CUUR0000SETC">https://fred.stlouisfed.org/series/CUUR0000SETC</a>
Motor vehicle maintenance and repair	<a href="https://fred.stlouisfed.org/series/CUSR0000SETD">https://fred.stlouisfed.org/series/CUSR0000SETD</a>
Motor vehicle insurance	<a href="https://fred.stlouisfed.org/series/CUSR0000SAT1">https://fred.stlouisfed.org/series/CUSR0000SAT1</a>
Motor vehicle fees	<a href="https://fred.stlouisfed.org/series/CUSR0000SAT1">https://fred.stlouisfed.org/series/CUSR0000SAT1</a>
Airline fare	<a href="https://fred.stlouisfed.org/series/CUSR0000SETG01">https://fred.stlouisfed.org/series/CUSR0000SETG01</a>
Other Intercity Transportation	<a href="https://fred.stlouisfed.org/series/CUUR0000SETG">https://fred.stlouisfed.org/series/CUUR0000SETG</a>
Intracity Transportation	<a href="https://fred.stlouisfed.org/series/CUUR0000SETG">https://fred.stlouisfed.org/series/CUUR0000SETG</a>
<b>Healthcare</b>	
Medical care services	<a href="https://fred.stlouisfed.org/series/CUSR0000SAM2">https://fred.stlouisfed.org/series/CUSR0000SAM2</a>
Medical care commodities	<a href="https://fred.stlouisfed.org/series/CUSR0000SAM1">https://fred.stlouisfed.org/series/CUSR0000SAM1</a>
<b>Recreation Goods and Services</b>	
Video and audio	<a href="https://fred.stlouisfed.org/series/CUSR0000SERA">https://fred.stlouisfed.org/series/CUSR0000SERA</a>
Pets, Pet Products and Services	<a href="https://fred.stlouisfed.org/series/CUSR0000SS61031">https://fred.stlouisfed.org/series/CUSR0000SS61031</a>
Sporting Goods	<a href="https://fred.stlouisfed.org/series/CPIRECSL">https://fred.stlouisfed.org/series/CPIRECSL</a>
Other Recreational Goods	<a href="https://fred.stlouisfed.org/series/CPIRECSL">https://fred.stlouisfed.org/series/CPIRECSL</a>
Recreational Services	<a href="https://fred.stlouisfed.org/series/CUUS0000SARS">https://fred.stlouisfed.org/series/CUUS0000SARS</a>
Recreational Reading Materials	<a href="https://fred.stlouisfed.org/series/CUUR0000SERG02">https://fred.stlouisfed.org/series/CUUR0000SERG02</a>
<b>Personal care products and services</b>	
Personal Care Products	<a href="https://fred.stlouisfed.org/series/CUUR0000SEGB">https://fred.stlouisfed.org/series/CUUR0000SEGB</a>
Personal Care Services	<a href="https://fred.stlouisfed.org/series/CUUR0000SEGC">https://fred.stlouisfed.org/series/CUUR0000SEGC</a>
Misc. Personal Services	<a href="https://fred.stlouisfed.org/series/CUSR0000SEGD">https://fred.stlouisfed.org/series/CUSR0000SEGD</a>
<b>Education and Communication</b>	
Educational Books and Supplies	<a href="https://fred.stlouisfed.org/series/CUSR0000SEEA">https://fred.stlouisfed.org/series/CUSR0000SEEA</a>
Tuition, Other School Fees, and Childcare	<a href="https://fred.stlouisfed.org/series/CUSR0000SEEB">https://fred.stlouisfed.org/series/CUSR0000SEEB</a>
Information and Information Processing	<a href="https://fred.stlouisfed.org/series/CUSR0000SAE21">https://fred.stlouisfed.org/series/CUSR0000SAE21</a>
Information Technology, Hardware and Services	<a href="https://fred.stlouisfed.org/series/CUSR0000SEEE">https://fred.stlouisfed.org/series/CUSR0000SEEE</a>
<b>Tobacco Products and Smoking Supplies</b>	
Tobacco Products and Smoking Supplies	<a href="https://fred.stlouisfed.org/series/CUUR0000SEGA">https://fred.stlouisfed.org/series/CUUR0000SEGA</a>

With the UCC's grouped, the expenditures need to be matched to their corresponding market basket group. The following R code accomplishes this task and sums each group:

```
#College Matching
summary1_C<-codes.1%>%
  group_by(ITEM_GROUP)%>%
  summarize(sum(COST))

#Retired Matching
summary1_R<-codes.1%>%
  group_by(ITEM_GROUP)%>%
  summarize(sum(COST))
```

The code is repeated for each quarter and results in a summary of each group's total expenditure. Finally, the following R code combines each summary into one dataset and

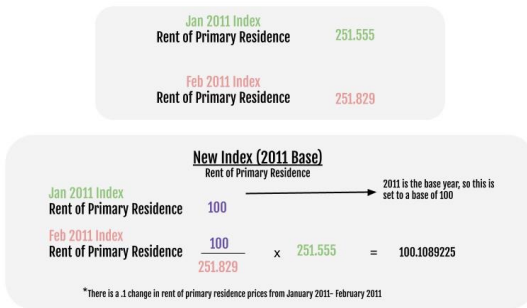
exports it to a .csv file for the final calculations and analysis:

```
summaryj1<-full_join(summary1,summary2,by="ITEM_GROUP")
summaryj2<-full_join(summaryj1, summary3, by="ITEM_GROUP")
summaryTOTAL<-full_join(summaryj2, summary4, by="ITEM_GROUP")
write.csv(summaryTOTAL,"Expenditures_2011_RETIRED")
```

### Calculations

Price indices are collected from January 2011 to February 2023. While the collected price indices use the years 1982-1984 as the base year, meaning the years preceding and preceding these years will reflect price changes relative to 1982-1984, the market basket created for these two groups are based on 2011 survey data. Consequently, to facilitate a better understanding of how prices are changing for these groups relative to 2011, I set 2011 as the base year. Figure 1 is a sample calculation of how this is done.

Figure 1: Calculation of 2011 Base Index



The results allow for the price changes to be observed relative to a base of 100 with price increases and decreases resulting in a price index of above and below 100 respectively.

Next, the weights for each market basket group are calculated from the expenditures collected for each group of interest by dividing the sum of each market basket group expenditures by the total of all expenditures. Finally, the index is constructed for each group by multiplying the weights of each market basket group with their corresponding price index.

### RESULTS

An initial look at the expenditures for the ungrouped UCC list shows there is a difference between spending for college students and retirees.

Table 3: Top Detailed Expenditures



While the top expenditures for both groups center around housing and utilities, there is a notable difference in the types of housing expenditures for each group. College students' top expenditure was rent of a dwelling. This supports the understanding that many college students live in college housing or rent off campus housing.<sup>6</sup> Conversely, retirees' top expenditure was on property taxes, pointing to the fact that they are primarily homeowners<sup>7</sup>. However, it should be noted that the retiree group still had a large amount of expenditures on rent of dwelling, suggesting many of them may have transitioned into assisted living. Utilities such as gasoline and electricity were major expenditures for both groups, as both fell within the top five expenditures for both groups. Another notable difference between the two groups was the retirees spending on healthcare and college students spending on tuition. Health insurance, prescription drugs and care of invalids all were included in the top ten expenditures of retirees, but were absent in the top ten expenditures of college students. Similarly, college tuition was included in the top expenditures of college students, but wasn't present in the top expenditures of retirees. Overall, there was an observable difference between the spending of the two groups indicating the two groups may experience inflation differently.

Table 4: Expenditure Weights

College		Retired	
ITEM GROUP	Weights	ITEM GROUP	Weights
Fuels and Utilities	0.1374	Fuels and Utilities	0.1328
Rent of Primary Residence	0.1008	Household Furniture and Operations	0.1206
Motor fuel	0.0796	Medical Care Services	0.0755
Food Away from Home	0.0774	Food Away from Home	0.0579
Household Furnishings and Operations	0.0687	Motor Fuel	0.0557
New and used Motor Vehicles	0.0569	Rent of Primary Residence	0.0525
Tuition, other School fees, and Childcare	0.0426	Owners equivalent rent of Primary Residence	0.0499
Motor Vehicle Insurance	0.0386	Medical Care Commodities	0.0456
Meats, Poultry, Fish, and Eggs	0.0278	Motor Vehicle Insurance	0.0330
Medical Care Services	0.0274	Motor vehicle Maintenance and Repair	0.0269
Women's Apparel	0.0239	Tenants and Household Insurance	0.0266
Fruits and Vegetables	0.0232	Meats, Poultry, Fish, and Eggs	0.0264
Motor vehicle maintenance and repair	0.0217	Fruits and Vegetables	0.0237
Miscellaneous Foods	0.0213	Miscellaneous Foods	0.0203
Medical Care Commodities	0.0184	Women's Apparel	0.0195
Recreational Services	0.0179	Recreational Services	0.0172
Educational books and supplies	0.0151	Pets, Pet Products, and Pet Services	0.0143
Men's Apparel	0.0136	Tuition, other School Fees, and Childcare	0.0130
Dairy Products	0.0127	Dairy Products	0.0127
Bakery Products	0.0117	Men's Apparel	0.0121
Personal Care Products	0.0112	Bakery Products	0.0117
Nonalcoholic Beverages	0.0110	Misc. Personal Services	0.0113
Footwear	0.0102	Nonalcoholic Beverages	0.0105
Motor Vehicle Parts and Equipment	0.0101	New and Used Motor Vehicles	0.0101
Pets, Pet Products, and Pet Services	0.0084	Personal Care Products	0.0098

6 According to a 2016 National Postsecondary Student Aid Study, of the full time students attending a four year public university, 36% lived on campus and 46% lived in off campus housing. These statistics were accessed through a Urban Institute article.

7 Census data shows that about 80% of homeowners were 65+ in 2011. The age group least likely to own a home were those under 35 years; less than 40% of those 35 years or younger were homeowners.

Other Apparel Products and Services	0.0083	Personal Care Services	0.0091
Information Technology, Hardware and Services	0.0083	Motor vehicle parts and equipment	0.0083
Airline fare	0.0080	Footwear	0.0080
Owners Equivalent Rent of Primary Residence	0.0079	Other Recreational Goods	0.0079
Alcoholic Beverages at Home	0.0075	Alcoholic Beverages at Home	0.0077
Cereals and Cereal Products	0.0060	Other Apparel Products and Services	0.0066
Sporting Goods	0.0059	Information Technology, Hardware and Services	0.0065
Tobacco Products and Smoking Supplies	0.0059	Airline fare	0.0065
Other Recreational goods	0.0058	Cereals and Cereal Products	0.0050
Video and Audio	0.0057	Recreational Reading Materials	0.0050
Tenants and Household Insurance	0.0050	Tobacco Products and Smoking Supplies	0.0048
Intracity Transportation	0.0049	Sporting Goods	0.0048
Alcoholic Beverages away from Home	0.0047	Sugar and other Sweets	0.0046
Personal Care Services	0.0047	Educational Books and Supplies	0.0040
Sugar and other Sweets	0.0040	Lodging away from Home	0.0039
Fats and Oils	0.0036	Fats and Oils	0.0038
Misc. Personal Services	0.0032	Video and Audio	0.0034
Motor Vehicle Fees	0.0031	Alcoholic Beverages away from Home	0.0028
Recreational Reading Materials	0.0025	Motor Vehicle Fees	0.0020
Children's Apparel	0.0022	Girls' Apparel	0.0018
Girls' Apparel	0.0020	Intracity Transportation	0.0017
Lodging away from home	0.0017	Boys' Apparel	0.0013
Boys' Apparel	0.0015	Children's Apparel	0.0008
		Information and information processing	0.0000

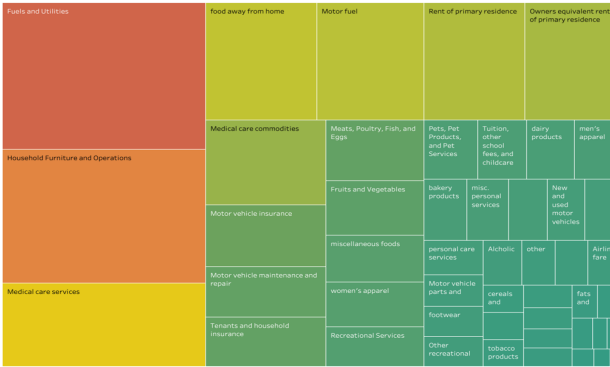
The results of the market basket group expenditures revealed that the groups would have different weights for the corresponding price indices. For college students the groups receiving the highest weights were fuels and utilities, rent of primary residence, motor fuel, food away from home, and household furnishings and operations with weights of .1374, .1008, .0796, .0774, and .0687 respectively. The retired group's highest weights categories were fuels and utilities, household furniture and operations, medical care services, food away from home, and motor fuel with weights of .1328, .1206, .0755, .0579, and .0557 respectively. Once again, the weights exhibit that different groups within the American population have different spending patterns.

Table 5: Visual Representation of the College Expenditure Weights



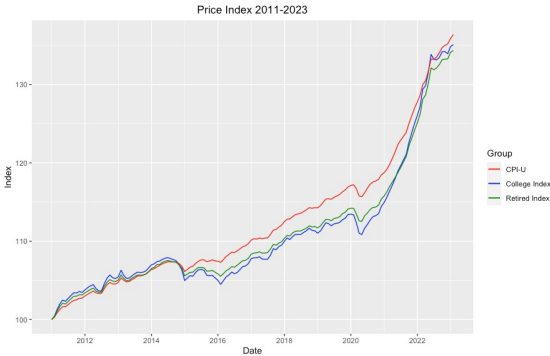


Table 6: Visual Representation of the Retired Expenditure Weights



The price indices for each group also show there is variation in the price changes for each group relative to each other and the CPI-U.

Table 7: Price Indices 2011-2023



Each of the groups follow the general trend of the CPI\_U, but both groups' indices are higher than the CPI\_U until the beginning of 2015. After this, both groups drop below the CPI-U, and with the exception of a minor spike above the CPI-U of the college index, they remain below the CPI-U. Additionally, the college index was the highest from 2011-2015 with the retired index falling just below it until 2015 where the college index fell below the retired index and remained below the retired index.

The cause of these differences is largely due to the reduction in motor fuel prices which fell in 2015. Both college students and retirees' top expenditures included motor fuel. College students have a slightly higher weight--.0796--compared to retirees, who have a motor fuel weight of .0557. Therefore this drop in motor fuel prices causes a larger reduction in the college students index, as it encompasses more of their expenditures, and this can be seen in the resulting drop of the college index below the CPI-U and the retired index in 2015.

Table 8: Heatmap of College Price Indices by Group

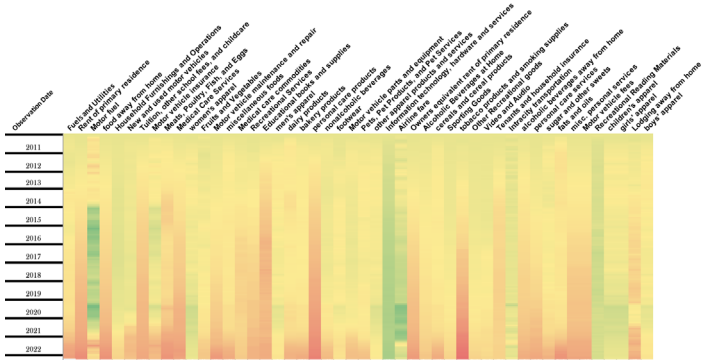
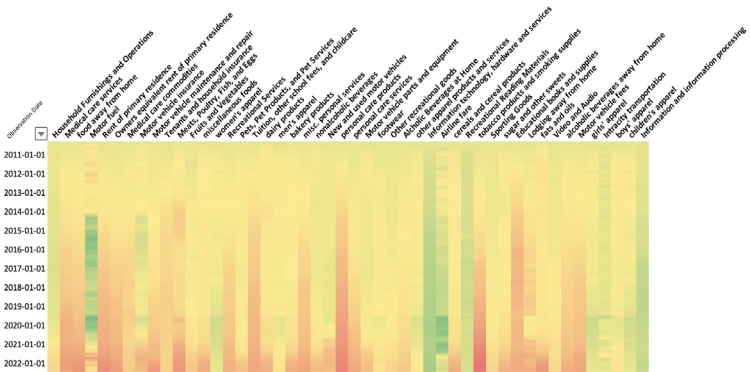


Table 9: Heatmap of Retirees Price Indices by Group



Each heatmap shows the highest weighted expenditures for its corresponding group. Notably, college students experience high inflation for tuition which is one of their top expenditure categories. Additionally, they experience high inflation for rent of primary residence which is their second highest expenditure category. Retirees are experiencing high inflation for medical care services and commodities as well as rent of primary residence. This corresponds with rising prices of assisted living for the elderly.<sup>8</sup>

## CONCLUSIONS

### Findings

The constructed weights and resulting indices show that these two groups' inflation varies from the overall CPI-U. College students and retirees' indices both primarily fell below the CPI-U beginning in 2015 due to decreasing prices of motor fuel. The indices for the two groups show there is a difference in inflation between the college students and retirees. The retirees experienced higher inflation than the college students due to experiencing higher inflation for more of their heavily weighted expenditures categories.

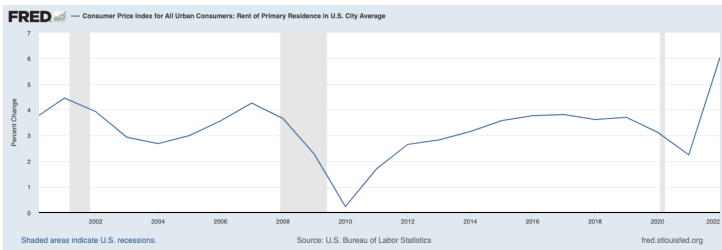
Interestingly, the retired index constructed here fell below the CPI-U which was unexpected. The BLS creates and publishes the CPI-E, an index for those over the age of 62 (BLS, 2012). From 1998-2011 the CPI-E rose at a rate of 3.1% compared to the 2.9%

<sup>8</sup> According to research done by A Place for Mom, a retirement planning service company, on average the cost of assisted living rose 3.36% each year from 2011-2021. Additionally, from 2019-2020 the median cost rose 6.15%

rise of the CPI-U (BLS, 2012). Considering this, it is interesting to note that the retired index constructed here fell below the CPI-U for the majority of the 11 years observed. The reason for this could be the falling rates of inflation for medical expenses and shelter since 2005, causing the CPI-E to consequently fall, as shelter and medical expenses are major expenses for the elderly (BLS, 2012).

The college index similarly fell below the CPI-U. However, compared to the retired index, the college index was higher than the retired index from 2011-2015. This could be due to the fact that rent of primary residence is a high expenditure category for college students, and the prices for this category began rising from a 0.23% change from 2009 to 2010 to a 2.65% change from 2011 to 2012. Additionally, the college student index rose higher than the retired index in mid-2021 where the 2.24% increase from 2020 to 2021 rose 6.03% from 2021 to 2022.

Table 10: Annual Inflation Percent Change for Rent of Primary Residence



Retrieved from: <https://fred.stlouisfed.org/series/CUUR0000SEHA#>

Table 11 and 12 show the monthly changes and year over year changes for the college and retiree indices.

Table 11: College Monthly and YoY Inflation Rate

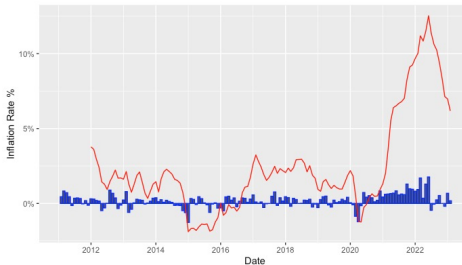
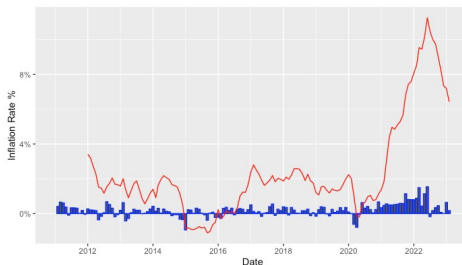
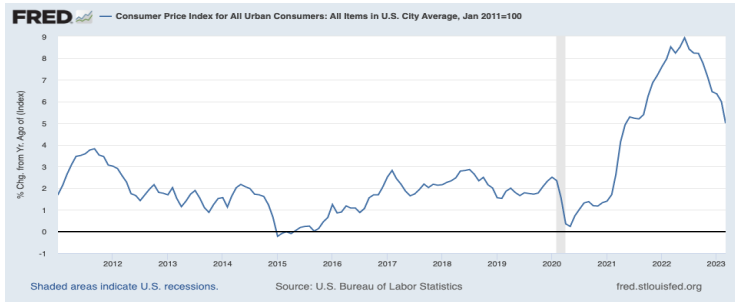


Table 12: Retiree Monthly and YoY Inflation Rate



Looking at the monthly change in inflation (in blue) for college students and retirees, there is a consistent pattern of inflation rather than deflation for most months in the year. The exception is in 2015 when motor fuel prices fell, and the monthly inflation rate reflects this change. Another notable exception begins in 2020 when the monthly inflation rate begins to rise and from January 2021 to January 2022 there are no months dropping below zero percent inflation. This reflects the COVID-19 supply chain issues and the subsequent rise of prices for many goods (Mead et. al.,2020).

Table 13: YoY change in CPI-U



Retrieved from: <https://fred.stlouisfed.org/series/CPIAUCSL#>

Table 13 shows the YoY inflation rate for the CPI-U with a base year of 2011. The YoY changes for both college and retirees (in red) follow the same patterns as the CPI-U. However, in 2015, the college and retiree’s YoY inflation rate dips below the CPI-U. This is likely due to the high weight of motor fuel expenditures each group has. Furthermore, the college index dips below the CPI-U and retiree YoY rate in the beginning of 2021. This is also likely due to college students’ higher weight of expenditures on motor fuel than retirees.

### Implications

The CPI influences monetary and fiscal policy (Consumer Digest, 2023). Policymakers may also adjust tax brackets and deductions based on inflation, so taxpayers are not unnecessarily shifted into higher tax brackets (BLS, 2023). Additionally, the CPI is used in many business decisions as well as individuals’ financial decisions and planning (BLS, 2023). The CPI is also used for cost-of-living adjustments for Social Security payments, so payments to the recipients will rise to accommodate inflation (BLS, 2023).

Just as the CPI has these important implications on policy making, business decisions, and personal finances, so do alternative indices. Examining differences in inflation on various groups can provide valuable insights and direction for businesses, policymakers, and individuals’ financial decisions. For example, prior knowledge of how spending will change as one moves throughout life, is helpful for personal financial planning decisions such as when and what to save and when to retire. Additionally, understanding how different groups experience inflation can help policymakers create programs relevant to the groups involved. Businesses can also understand which groups are more likely to allocate spending to their products or services and how sensitive they might be to changes in those prices.

### Limitations and Further Exploration

The BLS constructs the CPI-U using complex methods to aggregate the price indices and weigh them with the consumer expenditure surveys (BLS, 2023). Because the calculations for this analysis are based on the indices already created by the BLS, the one significant difference in the construction of the CPI-U and the construction of

the college and retired indices is the market basket and the resulting weights of this basket. For the purposes of this analysis, a constant market basket was used based on 2011 data, meaning the indices constructed are weighted solely on 2011 expenditure data. Contrarily, every two years the CPI-U uses a modified market basket to account for changes in consumer spending as well as reviews the items in the market basket to ensure they are still representative of items available to consumers (BLS, 2023).<sup>9</sup>

Additionally, the BLS uses both the interview and the diary survey data to construct their market baskets and resulting indices. This analysis only used the diary data to construct the weights, because of this, the weights constructed for each group may not be fully representative of expenditures that do not occur regularly within a two-week period.

While the indices may not represent the true nature of inflation for the two groups of interest, the differences in expenditures seen in the 2011 diary data between the two groups is still noteworthy. These differences also suggest that there are likely differences in their inflation, and further research should be conducted to continue to construct alternative indices to provide additional insights on the college students, retirees, and other subgroups of the American population.

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<sup>9</sup> According to the BLS, January 2023 data now reflects an annually updated market basket and corresponding weights.

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# THE EVOLUTION OF TELEMEDICINE THROUGH THE COVID-19 PANDEMIC

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ANDREW SMITH

The stay-home orders as a result of the pandemic of COVID-19 caused many physicians to utilize telemedicine as a method to monitor and treat patients. Prior to the pandemic of COVID-19, telemedicine was rarely used with the exception of rural care. However, this pandemic caused the utilization of telemedicine to skyrocket, becoming a popular method of consultation. New to the spotlight, the pandemic exposed many weaknesses within telemedicine, including technological errors and potential of inadequate communication.

*Keywords: Telemedicine, pandemic, COVID-19.*

## INTRODUCTION

Telemedicine can be defined as remote consultation, diagnosis and treatment of patients through the use of communications technology (Wootton, 1996). This can be conducted through audio/video call, direct messaging between a patient and physician, or transfer of data and images through online portals or messaging systems. When the pandemic of COVID-19 struck the United States, patient-doctor communication started relying heavily on communication technology such as telemedicine (Ftouni et al., 2022). With the pandemic leaving many individuals at home in fear of contracting the virus, this form of communication has become essential for the adequate delivery of medicine. The goal of this paper is to determine how communication technology such as telemedicine has changed as a result of the COVID-19 pandemic, and offer solutions to issues that telemedicine currently faces.

At the core, there are many different forms of telemedicine that are used as platforms for communication. For example, telemedicine can include the transfer of information through images, text, video and audio (Wootton, 1996). Telemedicine can involve remote monitoring of patients, such as monitoring blood pressure, or receive a third-party consultation from a physician in which they have never met (Spiegel, 2021). In this paper, I have focused strictly on the information transferred between patients and their physicians to analyze the changes in patient-doctor communication.

With technological advances seen in the 21st century, telemedicine allows for rapid



and remote consultations with patients, proving its necessity during COVID-19. As the pandemic of COVID-19 struck the United States, telemedicine usage skyrocketed and was forced to adapt to the new prevalent demand. Because of the drastically increased demand of telemedicine due to the COVID-19 pandemic, it is imperative that necessary improvements be made to the technology to increase the ease of telemedicine and patient-satisfaction.

A strong connection and good communication between a patient and physician has shown to be advantageous to both physicians and patients (Korz and Tsoikova, 2019). Good communication allows the patient to better understand directions, and often leads to improved patient-satisfaction and outcome of care (Korz and Tsoikova, 2019). For the physician, good communication allows for increased patient satisfaction, allowing for physicians to better cope with the stresses that they face at their workplace (Korz and Tsoikova, 2019).

I have reviewed multiple academic articles that discuss the utilization of telemedicine during the pandemic of COVID-19. Employing the information in these articles, I have further analyzed the different changes that telemedicine has made through COVID-19, the strengths and weaknesses, and future prospects of improvements. I have identified missing information that might prove vital to the further improvement of telemedicine. The in-depth literature review will allow me to determine the true impact that COVID-19 had on telemedicine, and what necessary changes must be made to improve patient-satisfaction with telemedicine consultations.

## RESEARCH RESULTS

### Overview

The sections below describes how telemedicine has changed as a result of the pandemic of COVID-19. Using information in published peer-reviewed articles, I have described how telemedicine has been used/is being used during the pre-pandemic era and post-pandemic era. I have described the growth in utilization of telemedicine, as well as discuss the weaknesses of telemedicine that were exposed during the pandemic of COVID-19.

### Pre-pandemic Era

An important aspect in the delivery of medicine is establishing and maintaining a patient-doctor relationship. An important step towards improving this relationship is to improve communication between patients and doctors. By allowing for more open conversation between a patient and physician, the patient will have an increased understanding of diagnosis and treatment, and will be more likely to ask questions regarding the treatment. (Korz & Tsoikoval, 2019). This aspect of patient-doctor communication is important as it will improve the outcomes of the consultation, better understanding of the treatment, as well as an increased patient-satisfaction with the care.

Before the pandemic of COVID-19, telemedicine as a method of healthcare was slowly being accepted as a common method to conduct a healthcare consultation (Walczak et al., 2022). Before COVID-19, telemedicine was mainly used as a method to provide care to rural areas which are often struck with physician shortages (Chu et al., 2021). The perceived usefulness and ease that telemedicine offers, as well as providing more opportunities for care in rural areas, allowed for the growth and acceptance of telemedicine. In recent decades, telemedicine has been supplemented with home diagnostic tools that allow for easier and more advantageous care to patients (Eikram, 2019). An example of this is a home HIV test kit, which allows for the home diagnosis of HIV. This information can then be shared with a physician through telemedicine, such as a video call, to begin planning for long-term care. This may change patient-doctor relationships from a traditional in-person form to a more modern, technology-enhanced one, telemedicine. This modern approach shifts the nature of medicine from the doctor to the patient, especially when supplemented with home diagnostic tools. It should be noted that this

approach is only successful when communication between the patient and doctor is excellent and proper. In other words, telemedicine has proven to be efficient in the delivery of healthcare services, such as a consultation or treatment plan, when used properly.

### **Post Pandemic Era**

The pandemic of COVID-19 acted as a catalyst for the growth of telemedicine, as many people refrained from in-person consultations with physicians due to the social-distancing suggestion (Rahman & Amit, 2022). It has been found in a study by Rahman and Amit (2022) that the use of telemedicine increased from a near-zero to 40% during the pandemic. Another study by Nittary et al. (2022) showed that the use of telemedicine before and after COVID-19 in the United States increased from 13,000 visits per week to 1.7 million per week. These statistics illustrate how telemedicine usage increased drastically when traditional in-person consultations were improbable, when living in rural areas or practicing social distancing such as seen during the COVID-19 pandemic. In fact, during the pandemic, telemedicine was often utilized as a method to triage patients who have contracted the virus and devise a treatment plan accordingly (Nittari et al., 2022). Telemedicine is also important to the treatment of chronically ill patients. People who suffer from Chronic Obstructive Pulmonary Disease (COPD) or chronic heart disease can be now treated virtually to decrease the risk of exposure to the virus, which is more likely to have complications for this population (Nittari et al., 2022).

Though the pandemic of COVID-19 significantly increased usage of telemedicine, studies have shown that telemedicine usage is still higher than the pre-pandemic levels after the stay-home orders were lifted, signifying the end-era of the pandemic (Speigel, 2021). A study introduced by Speigel (2021) showed this trend, in which telemedicine visits remained higher than pre-pandemic levels in June of 2020, when the number of in-person visits recovered to the level seen in February 2020. Spiegel (2021) noted that this could potentially be due to few reasons: people were still hesitant regarding in-person care, people grew accustomed to telemedicine's convenience, or that people preferred the cost advantages that telemedicine offered.

### **Pitfalls of Telemedicine**

Though the use of telemedicine has grown and improved tremendously as a result of the pandemic, many issues still need improvement to improve the care provided through technology. It was found in a study by Ftouni et al. (2022) that telemedicine could decrease patient-doctor communication due to the lack of essential elements such as touch and sense of body language. These nonverbal forms of communication are imperative to have a fully open and honest conversation. With such essential elements lacking, patient-doctor relationships are ultimately hindered, decreasing the effectiveness in healthcare consultations through the use of telemedicine.

With such rapid increase in the use of telemedicine, it was essential for the technological aspects of telemedicine to adapt and improve quickly as well. For example, a study showed that poor internet connections and the lack of widespread technological infrastructure led to poor experiences and dissatisfaction with telemedicine and telecommunication (Ftouni et al., 2022). Moreover, the quality of care provided through telemedicine is heavily influenced by the quality of image and audio within the virtual platform used (Bokolo, 2020).

The lack of widespread technological infrastructure produces a challenge between different healthcare specialties. Different specialties require different forms of consultation. For example, some specialties, such as family medicine, may simply require an in-depth conversation. Other specialties, such as dermatology and surgical specialties, may require deeper conversations supplemented with physical exams. With different infrastructure needed for different forms of consultations, patients may have difficulties learning to use the technology necessary. In order to allow for increased patient-satisfaction and further ease in the use of telemedicine, we must identify a method of consultation

that can be generalized across all specialties.

Singh et al. (2022) noted that even physicians may move away from the utilization of telemedicine. With the fear of misdiagnosis, some physicians feel that a face-to-face consultation is more desirable than providing care through technology and telemedicine. In-person consultations allow for physical (touch) examinations which may help form a diagnosis, whereas this is much harder to do through telemedicine. Additionally, with an existing busy schedule, some physicians prefer face-to-face consultations as they are more time efficient when compared to dealing with technology that telemedicine heavily relies on. Not only do the physicians have to navigate technology to conduct the consultations, but they must wait for the patients to do so as well. Moreover, as the utilization of technology increases in healthcare, different legal accountabilities change for the physician, such as changing the method of obtaining patient consent while maintaining ethical standards to ensure proper care. With video calls between patients and doctors, it is beyond important that privacy is still maintained, and this needs to be accomplished through multiple safeguards and secure virtual platforms. There have been instances where virtual consultations through zoom have been hijacked by other users, violating Health Insurance Portability and Accountability Act (HIPAA) and patient confidentiality (Bokolo, 2020). According to Iqbal et al. (2022), data breaches on virtual healthcare records increased by 40.63% in February 2021.

When technology fails, whether because of internet connections, poor quality, or hijacking, accountability, determination of the party (patient or doctor) at fault may become confusing (Eikram, 2019). There have been multiple solutions formulated to combat the issue of malpractice and dissatisfaction associated with telemedicine. First, it is found to be necessary to properly train physicians on utilizing technology to provide care. It may also be necessary to educate elderly patients, who may not be as familiar with technology and the related benefits, on how to properly use telemedicine platforms. This ensures that both the patient and doctor have the knowledge and are therefore capable of conducting a meaningful consultation while using telemedicine. It may also be beneficial, according to Bokolo (2020), that during telemedicine consultations, physicians provide documents (such as PDF's) that may guide the patient during the visit. This can allow for the proper guidance on how to use the technology for the telehealth visit. Moreover, it can decrease the stress of the patients by walking them through how to use certain diagnostic tools such as a blood pressure cuff.

### **Advantages of Telemedicine**

When used correctly, patient satisfaction with telemedicine has been high and increasing. In fact, according to Pogorzelska and Chlabicz (2022) 97.6% of patients in a study were satisfied with their telehealth experience. Additionally, 91% of patients were satisfied with video consultations, and 86% of patients were said to be satisfied with telephone (audio) consultations (Pogorzelska & Chlabicz, 2022). This high satisfaction can be due to the ease that telemedicine offers to patients who understood how to utilize it. Instead of having to drive to the local office and sit in a waiting room for thirty minutes, they can simply log into zoom or other platforms and immediately get the consultation. Additionally, it was found that 88% of patients found telemedicine to be a more convenient method of a healthcare consult when compared with traditional face-to-face consultations (Pogorzelska & Chlabicz, 2022). Significant patient satisfaction arises from the performance and ease of use of communications technology (technologies used to perform telemedicine consultations). When communications technology is complemented with outstanding communication abilities by the healthcare provider, information is more easily understood by the patient and leads to an increase in patient satisfaction. It has been found by Sharma et al. (2019) that there are fewer lawsuits associated with high quality communication when technology is used to transfer information from the doctor to the patient. This reinforces the idea that it is imperative to have exceptional communication skills as it often leads to higher clarification, transparency and standard of care.

## DISCUSSION

In this section I have focused on the findings of my research and its importance to the field of medicine. I have discussed the opinions on the pitfalls of telemedicine with potential future solutions. I have also discussed my thoughts on telemedicine, and the direction in which the use of telemedicine will go in future.

In order to understand the impact that the pandemic of COVID-19 on the use of telemedicine and telemedicine as a method of physician consultation, it is imperative to understand the effectiveness of telemedicine. When in-person consultation is limited, telemedicine must be adequately useful for giving/receiving healthcare. As society continues to develop and innovate new technologies, telemedicine may become a more preferred and popular form of healthcare. The importance of this research is to identify the effectiveness and usefulness of telemedicine when people were forced utilize it as a method of healthcare as the result of stay-home orders. Identifying weaknesses that telemedicine had throughout the pandemic of COVID-19 will allow physicians and software engineers to begin creating a more accessible and better method of delivering care through communications technology. My research was conducted with the intent to educate people about the growth of telemedicine throughout the pandemic of COVID-19, its weaknesses and strengths and the scope for improvement of telemedicine for providing effective and efficient healthcare to patients.

Telemedicine has shown to be extremely useful in times of need such of that as the pandemic of COVID-19. Its perceived ease of use and convenience allows for a large number of patients to receive adequate healthcare when in-person consultations may not be feasible. The sharp increase in the use of telemedicine illustrates telemedicine's effectiveness as a method of consultation. Telemedicine has proven itself as an efficient method to deliver healthcare when used properly. However, when telemedicine took the spotlight in healthcare, many flaws were highlighted and exposed, showing that telemedicine is not as efficient/user-friendly as it may seem.

It should be expected that telemedicine has flaws, especially considering its reliance on technology. Healthcare and patient information are highly protected under HIPAA, but the utilization of technology and technology itself, is prone to failure. There must be an easily accessible platform for people to use, that has various safeguards to protect information for telemedicine to be considered safe and reliable. Technology is innovated and invented rapidly. It is important to help users understand how to properly use innovative new technologies to receive or give care within telemedicine. Hence a common platform with clear and precise instructions on use is imperative for the continued success of telemedicine.

I believe that with the exposure of the telemedicine flaws by the pandemic, telemedicine will adapt and grow as a method of consultation. As solutions to the setbacks of telemedicine inevitably are solved, telemedicine will mimic in-person visits better and better. In a world encapsulated in technology, it is probably that telemedicine be used as a method of consultation. The time and money efficiency that telemedicine offers is highly attractive in the eyes of physicians and patients, potentially outweighing the technological difficulties that are currently present. Undoubtedly in-person visits are still more effective in the delivery of healthcare, but the ease and convenience of telemedicine will allow telemedicine to be accepted in healthcare provided we have new user-friendly technologies and proper training of doctors and patients to use these technologies and, above all have clear and transparent patient-doctor communication. The pandemic of COVID-19 gave telemedicine the new-found recognition and popularity, and telemedicine is here to stay as a popular healthcare delivery method in the post-pandemic period.

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# THE SOUL AS SUFFERING: THE EFFECTS OF TRAGEDY, VIOLENCE, AND SUFFERING IN AUGUSTINE'S *CITY OF GOD*

MEGAN TACKETT

For most, the sack of Rome meant the end of the world. The city, though no longer the major seat of power by the late fourth century and early fifth century CE, still remained the symbolic bastion of the Empire. Its three day ransack by the Visigoth forces in August of 410 CE staggered the entire western world. Even the Christian Church, long since incorporated into Roman culture, mourned the city. One man, however, stood at a unique crossroads between Roman culture and Christianity. Augustine of Hippo, the bishop of Hippo Regius and a prominent Christian philosopher, reacted to the city's misfortune in a different manner than his contemporaries. Out of this tragedy he produced *Concerning the City of God against the Pagans*, a lengthy text that urged Christians to abandon their love of Rome and look forward to the promise of Heaven. In doing so, the bishop both implements and opposes the Neoplatonic concept of the soul to understand suffering. The philosophy of Neoplatonism held that the soul is perfect but the body is corrupt. Although Augustine rejects this proposed dichotomy between body and soul, he does implement the idea that the mind, as a part of the body, is corrupt and can be warped but further connects it and these effects to the soul. The body does not hold perfection in his view, but it also does not experience ravishment as destruction. Instead the soul, will, and body maintain a firm grasp on the victim's spiritual, rather than physical, chastity and virtue. Suffering does, however, still affect the soul. Viewing and fixating upon another person's suffering as a spectacle harms and warps the soul by replacing the viewer's grief for the victim with pleasure.

To understand if the soul experiences and is harmed by suffering, Augustine must first establish what the soul is and how it differs from the body. The soul is, in a sense, immortal; when a person's physical body expires, the soul does not. However, it is immortal only in the sense that it does not experience physical death, what Augustine calls the "first death"<sup>1</sup>. While the mortal body is dead, the corrupt soul experiences the second

<sup>1</sup> Augustine, *Concerning the City of God Against the Pagans*, trans. Henry Bettenson (London: Penguin Books, 2003), 510.

death, which is spiritual death. This kind of death is not a ceasing of existence for the soul; instead, God abandons the soul as punishment<sup>2</sup>. The death here is not one of existence but one of relationship. The body and then the soul both undergo their separate deaths: the soul abandons the body, and God abandons the soul. However, Augustine argues, the opposite occurs for faithful Christians. Though the body still experiences the first death, this death is a result of the doctrine of original sin. The soul does not experience the condemnation of the second, spiritual death. God gives life to the soul of a Christian, and the soul gives life to the body<sup>3</sup>. When the body dies, Christian souls are sustained by God.

In life the body and the soul are “conjoined and interwoven<sup>4</sup>”. This is a direct rejection of the Neoplatonic belief that the body and the soul always maintain a degree of separation. Neoplatonic philosophers contended that the body was inherently corrupt, while the soul was inherently pure and good<sup>5</sup>. To explain how a body and a soul could have two opposing natures, the Neoplatonists argued that the soul was removed in a metaphysical sense from the body and its baser actions, allowing the soul to remain untainted<sup>6</sup>. Plato writes of the inferiority of the body and the superiority of the soul in several of his dialogues, especially in the *Phaedo*. In this dialogue, which narrates Socrates’ final moments before his execution, the philosopher debates the immortality of the soul, what happens to the soul after death, and the difference in desires of the body and of the soul. In his view, the body distracts the soul from gaining true knowledge. The body desires physical or worldly pleasures like food, drink, sex, and other comforts. To Plato, these desires are vices. The soul, in contrast, seeks true knowledge through inner reflection. It can only perceive this knowledge—which is what Plato calls the Forms—by removing itself from all bodily senses and desires<sup>7</sup>. If the soul fails to separate itself from the body, it will become like the body, clouded by desires and vice and unable to understand the Forms<sup>8</sup>. As Socrates says in the dialogue, “as long as we have a body and our soul is fused with such an evil we shall never adequately attain what we [philosophers] desire, which we affirm to be the truth<sup>9</sup>”. At most the body was essentially a tool for the soul<sup>10</sup>. The soul used the body and connected to it like a person’s hand may connect to a hammer or a screwdriver—they are intertwined, yes, but they are not the same substance and their existences are not equal. No one confuses a hammer with a person or believes that the hammer is somehow inexorably fused to the person.

Physical trauma, particularly rape and acts of nonconsensual violence, do not taint, condemn, or change the soul of the victim. A person’s spiritual virtues—characteristics indwelt or possessed by the soul—among which Augustine counts purity, chastity, and integrity<sup>11</sup>, are not harmed or stolen from a person who has been physically defiled<sup>12</sup>. Augustine intends this particular message primarily for Christian women who were victims of rape or sexual violence during the sack of Rome. The supposed loss of a woman’s purity or chastity (i.e., her “virginity”) was traditionally connected not just to physical damage of the body but also to the cultural value of honor in Roman society. Honor and virginity were connected to the ideal of modesty, which all Roman women were supposed to embody. Having the ideas of integrity and honor be connected to a physical and damageable body meant that when the body had violence enacted upon it, the victim, rather than the perpetrator, inevitably shouldered the blame<sup>13</sup>. Virginity as a physical characteristic (which, for the Romans, was generally tied to the state of a woman’s hymen<sup>14</sup>) also held a moral connotation. Retaining one’s virginity was connected to being “pure” and “good”. This also meant that virginity was a virtue expected not just from young women

2 Augustine, *City of God*, 511.

3 Augustine, 511.

4 Augustine, 515.

5 Augustine, 524–526.

6 Plotinus, *The Six Enneads*, I.1.3.

7 Plato, “Phaedo,” in *Introductory Readings in Ancient Greek and Roman Philosophy*, ed. C.D.C. Reeve and Patrick Lee Miller (Indianapolis: Hackett Publishing Company, 2015): 116.

8 Plato, “Phaedo,” 116–117.

9 Plato, “Phaedo,” 116.

10 Plotinus, *The Six Enneads*, I.1.3.

11 Augustine, *City of God*, 27.

12 Augustine, *City of God*, 26.

13 Augustine, 30.

14 Augustine, 28.

who had never had sex but from every Roman woman, regardless of age or status. A woman losing her integrity or a woman living through violence perpetrated against her engendered a sense of dishonor and shame.

When someone forces lust or violence upon another, the victim's body is harmed, inducing loss. The loss may be physical or mental. Bodily members may be destroyed or maimed, and feelings of innocence or worthiness may be tainted or destroyed as well. However, Augustine argues that the integrity of the victim is not lost even when the body is harmed. Holiness and chastity depend not upon the condition of the body but of the soul and mind. The mind holds a person's chastity (*pudicitia*) through the will; it is a virtue, not a physical aspect of the body<sup>15</sup>. Chastity as a virtue involves a right way of living and acting, honoring God and resisting sin. Even though he argues that the victims did not suffer spiritual loss, this does not mean Augustine does not acknowledge and address the damage done to their bodies and the strong emotions that accompany the aftermath. The sense of shame felt after violation is not an indicator of willful sin but an acknowledgment that the body has suffered<sup>16</sup>. Shame is not a punishment in this context but a diagnostic tool used to affirm the victim's endurance against sin.

While Augustine vehemently denies the soul being harmed through physical violence, it is not so for viewing and fixating on excessive suffering, especially that of another. Honoring and viewing suffering damages the soul. This particular theory of soul-damage began much earlier in Augustine's career, during the writing of the *Confessions*. While scholars debate the exact genre and purpose of this codex, the common consensus agrees it is part autobiography, part rhetoric, and part philosophical treatise. During the autobiographical sections, Augustine reflects on his past actions and reinterprets them in light of the wisdom he has gained. He develops this concept of voyeurism and soul-damage as he reexamines his and his friend's actions. As a young man in Carthage, Augustine first experienced theater shows, particularly staged tragedies. These performances intend for the audience to vicariously feel and experience the pain and misery of the characters in the play and then to derive pleasure from the experience. The audience was meant to self-identify with the characters on stage and experience a facsimile of their suffering and then release it with the end of the show as a kind of catharsis<sup>17</sup>. This feeling of release and relief was both attractive and addicting. It also created a displacement or disorderment of the emotions. Normally when suffering or pain is felt, one feels miserable. When others suffer, one feels mercy or compassion for the sufferer. But at these theater tragedies, there are no true sufferers and no true witnesses of the suffering. Sharing in this make-believe pain deadens the viewers towards real suffering.

Augustine's friend Alypius also found himself drawn towards the staged acts of violence and suffering in the gladiatorial shows. He and the rest of the audience found pleasure in watching the pain of others. Augustine experienced a strange pleasure in mirroring another's hurt, but Alypius enjoyed and found pleasure in the pain and brutality of others. Augustine's soul was overwhelmed by the potent emotions induced by the theater; Alypius' soul was overwhelmed by visual images<sup>18</sup>. Feasting one's eyes upon staged acts of misery, suffering, and violence as Augustine and Alypius did harms the soul<sup>19</sup>. This harming or deforming of the soul connects to the four "emotional disturbances of the mind: desire and fear, joy and grief, which [some call] the origins of all sins and moral failings<sup>20</sup>". These emotions are not inherently evil, but they have the potential to quickly grow disordered. These disturbances are linked not just to the body and mind but to the soul as well. The soul originates these emotions as well, as sin affects the body, the mind, and the soul in equal measure. All participate in the growth and corruption of these emotions through the viewing and taking on of the staged violence and tragedy. The eyes see the suffering, the mind understands, and the soul is harmed.

15 Tianyue Wu, "Shame in the Context of Sin: Augustine on the Feeling of Shame in 'De Civitate Dei,'" *Recherches de théologie et philosophie médiévale* 74, no. 1 (2007): 11.

16 Wu, "Shame in the Context of Sin," 12.

17 Augustine, *Confessions*, trans. Henry Chadwick (New York: Oxford University Press, 2008): 35-37.

18 Matthew Drever, "Entertaining Violence: Augustine on the Cross of Christ and the Commercialization of Suffering," *The Journal of Religion* 92, no. 3 (2012): 341.

19 Drever, "Entertaining Violence," 341.

20 Augustine, 551.



Although this discussion began much earlier in the *Confessions*, it is carried over to the *City of God* through the condemnation of the public displays of debauchery and shameful acts. Augustine first addresses the stumbling block of theater once more. He now refers to the temptation towards or addiction to the theater as a disease of the character<sup>21</sup>. It “degrades and deforms” the minds of its audience<sup>22</sup>. Character here refers not to the personality of a person but to both the mind and the soul, where a person’s desires originate. The soul and the mind both conceive the emotions that are so easily disordered, and just as viewing and taking pleasure in another’s pain twists and disorders these emotions, so too are the loves of the soul warped<sup>23</sup>. Following displays of pain leads a person to fix his or her love and sense of pleasure on another’s suffering, confusing and malforming the soul.

Augustine next shifts to condemning the Roman traditional pagan festivals. At these events the worshippers acted out cruel and shameful scenes from mythology to honor and venerate the gods. These displays were meant to be gazed upon and imitated<sup>24</sup>. Augustine attributes these perverse festival scenes as the cause of the Roman Empire’s moral decay. These festivals intentionally put on display one person tormenting another. These plays were performed at occasions of veneration and celebration, leading participants to feel joy and elation, all while watching another person’s suffering and pain. The viewers disassociate suffering with evil circumstances, leading them to no longer empathize with the sufferer; instead their grief for the victim is warped into joy and pleasure.

Both body and soul experience corruption, but the physical violation experienced by a person does not demean the wholeness and chastity of either one, so long as the will endures. However Augustine argues that staged tragedy and violence damages the soul by reflecting and amplifying the suffering into the soul or by twisting a person’s sense of joy into a base pleasure. Augustine may fear that, for those present in Rome during the sack, the act of witnessing and recounting the attacks on others may be hurting their souls, regardless of their bodies’ condition. This serves, then, as both a reassurance of sanctity for the victims and a warning for the physically unscathed audience. Experiencing physical suffering or violence perpetrated by another does not diminish the sanctity of the soul. Finding pleasure in a person’s tragedy and suffering harms the soul by inappropriately substituting the audience’s grief and compassion for the sufferer with hedonistic enjoyment.

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21 Augustine, 44.  
22 Augustine, 44.  
23 Drever, 341.  
24 Augustine, 82.

# PANDEMIC PROSPECTS: THE RAMIFICATIONS OF HUMAN ENCROACHMENT ON BIODIVERSITY HOTSPOTS AND EFFECTS ON PUBLIC HEALTH

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*KESIENA TUOYO*

**T**he risk of a global epidemic increases as humans continue encroaching on previously isolated ecosystems containing viral hotspots. German Environment Minister Schulze commented: “The coronavirus crisis shows us very emphatically that we must better protect the natural foundations of life and biodiversity to improve protection against future pandemics. We would be well advised to take the scientific findings on how pandemics emerge seriously and act on them promptly in addition to current crisis management measures. The prevention of future pandemics starts now by tackling the destruction of nature at home and worldwide and by reducing global anthropogenic environmental changes. The global biodiversity initiatives should be a targeted help here. The destruction of nature is the crisis behind the crisis” (Sokolow, 2019).

Pandemic disease emergence is driven by anthropogenic activities such as the conversion of forests into agricultural lands, intensification of livestock production, and increased hunting and trafficking of wildlife. Human encroachment on natural ecosystems poses the gravest single risk of zoonosis, accounting for 30% of novel disease emergence (Wolfe, 2012). As ecosystems are destroyed and fragmented, greater animal population density in the remaining habitat raises the risk of a viral spillover between species. When people and their domesticated animals enter habitat patches — for logging, mining, hunting, food production, or construction — the odds of transmission to humans become increasingly more likely. Historically, the destruction of tropical forests is associated with zoonosis, but zoonotic diseases could also come from the Arctic and Antarctic regions, where global-warming-induced melting of the permafrost can release dangerous pathogens. Consequently, the preservation of Earth’s ecosystems is essential for the survival of all animal populations, including humans. The efforts must become a priority to ensure a viable future for all life. For my thesis, I will discuss viral evolution amongst undomesticated organisms and the ecological interferences used to manage

zoonotic disease transmissions. Based on published research, the association between habitat destruction and the prevalence of epidemics, especially near global hotspots, supports preserving biodiversity.

## METHODOLOGY

A literature search for zoonotic diseases was conducted. Searches in online electronic databases were used to find articles. Using prior studies, the overlap between the destruction of wildlife and the prevalence of epidemics near global hotspots is depicted. In addition, data on emerging infectious diseases (EIDS) was collected and sorted by their continent of origin along with continental biological diversity.

## LITERATURE REVIEW

### Origin of Zoonotic Diseases

Humans have presumably suffered for millions of years from infectious diseases similar or identical to diseases of other primate populations. However, modern human populations' most important infectious diseases may have only emerged within the past 11,000 years in correspondence with the rise of agriculture (Diamond, 2012). These diseases could only have been sustained in large dense human populations supported by agricultural food production. Major infectious diseases of temperate zones likely arose overwhelmingly in the Old World (Africa, Asia, and Europe), often from diseases of Old World domestic animals. Historians increasingly recognize that infectious diseases have had significant effects on the course of history; for example, the European conquest of Native Americans and Pacific Islanders and the inability of Europeans to conquer the Old World tropics for many centuries. Evolutionary biologists recognize that infectious diseases, as a leading cause of human morbidity and mortality, have exerted important selective forces on our genomes.

The extent to which humans increasingly interact with and impact ecosystems has been a key contributor to the rise in the number and diversity of zoonotic diseases. Pathogen spillover refers to the transmission of infection between species (Aguirre, 2017). Zoonotic pathogen spillover is becoming more common and visible in recent years (Figure 1). Domesticated species, primates, and bats have been identified as the most susceptible to zoonotic virus transmission (Augeraud-Véron, 2021). The escalation of zoonotic risk is a result of the degradation of ecosystem services that aid in disease suppression. Humans' invasion and conversion of habitats have promoted transmission pathways by lowering natural barriers in ecosystems and facilitating practices such as the bushmeat trade and 'wet markets' that increase the risk of animal-human contact in developing nations.

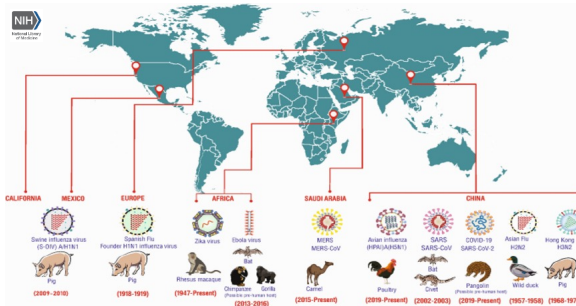


Figure 1. Global Zoonotic Pathogen Spillover Events

The ecological processes that govern pathogen spillover can be described as a series of barriers that a pathogen must overcome to eventually cross from the organis-

mal reservoir to the final spillover host. We now begin to explore some of the complex processes involved in creating effective solutions from ecological processes involved in zoonotic spillover by controlling the density, distribution, or infectiousness of vertebrate reservoir hosts; survival or spread of pathogens in the environment; or contact risk, susceptibility, or treatment success in the focal spillover host.

## **Viral Evolution**

Viruses eventually spread to give rise to epidemics and pandemics, but they must meet the parameters that determine a virus's persistence or extinction in nature. Viruses evolve at different rates depending on genome replication. Calculated rates of evolution in nature vary depending on the time interval between virus isolations. Intra-host evolution is generally more rapid than inter-host evolution, with several possible mechanisms for this difference.

All viruses have unique characteristics that set them apart from other self-replicating systems. Viruses are obligate molecular parasites that rely on only one type of genomic material (either DNA or RNA) to facilitate dispersal. Microbes are capable of evolving through time and to profound degrees. If the rate of evolution in viruses were applied to megafauna, the amount of time required to express the same genetic changes would be equivalent to hundreds of thousands to millions of years. Yet critical changes in habitat, morphology, and life-history characters are common within a few generations. As with all forms of life, the pace and direction of viral evolution are determined by the occupied selective environment. This environment is both multidimensional and continually changing, shaping the population's fitness. Because of the limited sequence space of genomes, the high probability of genetic drift during transmission bottlenecks, extremely large population sizes, and the high mutation and recombination rates for RNA viruses, viruses exhibit greater mobility through selective environments compared to more complex organisms (Domingo, 2016).

Evolutionary ecology is the study of how organisms respond evolutionarily to the selective environments in which they exist. The environment is the physical and biological elements an organism interacts with and determines the degree of natural selective pressure exerted. All viruses require the use of a host cell's ATP, ribosome, nucleotide, tRNA, and amino acid resources, in addition to other cell functions. Often viruses will utilize more advanced host characteristics, particularly when dealing with the demands of transmission. Viruses may take advantage of host ecology, feeding habits, sexual behavior, social structure, etc., to facilitate host–host transfer. All viruses' fundamental reproductive strategy is host exploitation. Although it is favorable for a host's biology to accommodate the perpetuation of a virus population, only a subset of phenotypes from that population will be able to survive. Although viruses are not typically subjected to the same natural selection pressures as species interactions, such as resource competition, their selective pressures are usually more unpredictable. Every extant species is thought to act as a viral host, and perhaps a thousand different virus types are known to infect humans alone. The study of viral evolutionary ecology aims to explain observed patterns of viral diversity by invoking mechanisms that take into account the evolutionary response to the environment(s) in which they exist. My discussion of viral evolutionary ecology will examine viral fitness and selection.

Evolution by natural selection is a process resulting from the varying reproductive success of phenotypes that allows the survival of corresponding genotypes through generations. The offspring of individuals or groups selected for reproduction in one biological circumstance is not guaranteed to thrive in the following generation since the selective environment may differ. Adaptation essentially refers to individuals that persist in the face of selection and thus acquire the ability to succeed genetically in a specific environment. These ideas must be applied to viruses at two distinct levels: within (intra-) hosts and between (inter-) hosts. In both cases, there is competition between viral strains for a reproductive substrate. In the case of intra-host evolution, this substrate is the cel-

lular and molecular host resources. It is the actual occupation of the hosts themselves in the case of interhost evolution. In general, intra-host evolution is faster than intra-host evolution. There are several possible mechanisms for this difference.

In zoonosis, the critical event is when an animal virus begins to replicate in the first human subject. Only at this stage will the animal virus encounter the selective environment of the human body, allowing for viral adaptation and refinement in humans. Furthermore, detectable viral load in this first human may allow infection of a second, thereby initiating selection for viral variants with increased spread capacity. Host genetics plays a critical role in determining which animal viruses in nature will replicate in a first human host. Animal viruses that pose the greatest threat to humans will have very few genetic barriers to replicating themselves in human cells, only requiring a few mutations to make this leap.

### Biodiversity Hotspots & Global Viral Hotspots

To qualify as a biodiversity hotspot, an area must meet two strict criteria: contain at least 1,500 species of vascular plants found nowhere else on Earth (known as endemic species) and have lost at least 70% of its primary native vegetation. There are currently 36 recognized biodiversity hotspots (Figure 2).

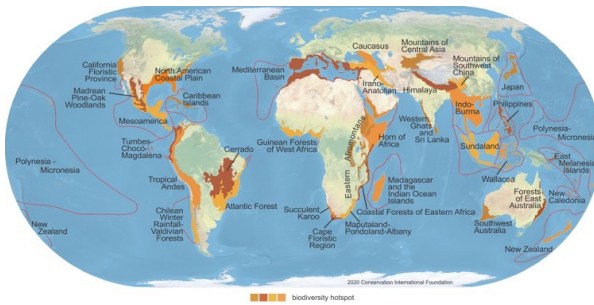


Figure 2. Global Biodiversity Hotspots

Biodiversity hotspots cover only 2.5% of the Earth’s land surface, but they are home to more than half of the world’s plant species and nearly 43% of bird, mammal, reptile, and amphibian species (Habel, 2019). The loss of biodiversity hotspots would undoubtedly accelerate and contribute to this sixth mass extinction event. In infectious disease epidemiology, global viral hotspots (Figure 3) are classified as areas of elevated disease transmission efficiency (Jones, 2008). Locations of biodiversity hotspots and viral global hotspots frequently overlap, particularly across the eastern hemisphere. Areas of greater biodiversity support more zoonotic reservoir hosts. Although high levels of biodiversity can be a source of pathogen transmission, biodiversity loss can also promote transmission by increasing the number of competent hosts for a pathogen.

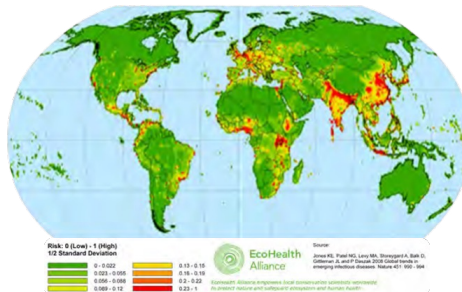


Figure 3. Global Viral Hotspots

## Ecological Interferences Against Zoonotic Outbreaks

A key contributor to the increase in the number and diversity of zoonotic diseases has been the extent to which humans increasingly interact with and impact ecosystems. Domesticated species, primates, and bats carry the greatest risk of zoonotic virus transmission (Domingo, 2016). Zoonotic spillover events are more likely to occur with humans' use and conversion of habitats because we facilitate practices that increase the risk of animal-human contact. Additionally, transmission pathways are further promoted by degrading ecosystem services that suppress disease proliferation, such as predation.

Pathogen spillover is governed by ecological processes that can be described as a series of barriers that a pathogen must overcome to cross from the organismal reservoir to the final spillover host (Defilippis, 2007). Controlling spillover in wildlife hosts can be managed via conventional solutions, such as culling, vaccination, and chemicals (i.e. drugs, insecticides, and disinfectants). However, these actions are challenging to implement and can have negative consequences, such as environmental damage and resistance evolution. In general, pathogen flow can be reduced across one or more potential barriers to prevent or limit spillover (e.g., managing reservoir host population size or prevalence, pathogen persistence in the environment, or vector abundance, or changing reservoir distribution or contact between the reservoir and spillover hosts to prevent pathogens and hosts from aligning in space and time.)

Control of zoonotic spillover consists of four major approaches: (1) controlling vertebrate reservoir hosts' density, distribution, or infectiousness, (2) pathogen survival or spread in the environment, (3) reducing contact risk and susceptibility, and (4) treatment for the spillover host. The first control method is to target the reservoir host, commonly by culling the population to reduce spillover risk from wild or domestic vertebrates. However, culling often results in devastating economic and/or ecological costs. The Nipah virus, for example, caused encephalitis outbreaks among commercial pig farmers in Malaysia and Singapore (Borremans, 2019). Culling the pigs effectively managed the transmission risk, but there were substantial economic losses, with approximately 36,000 farm jobs lost (Borremans, 2019). Later, scientists discovered that the natural reservoirs of the virus were several species of flying fox bats, and ecological intervention to reduce transmission from bats to pigs was devised as a more sustainable solution to manage spillover. Policies required fruit trees to be planted a minimum distance from pig sites, diverting the pathway for spillover events. The pig farming communities greatly affected by the outbreak experienced minimal costs from adopting this practice, preventing more outbreaks of the Nipah virus in Malaysia since 1998 (Borremans, 2019). Beyond culling, alternative non-lethal approaches are vaccinating reservoir hosts, manipulating contact, or controlling fertility. Natural enemies to control the disease are frequently employed, which may be more effective and less costly than culling, with additional environmental benefits, such as restoring threatened or endangered predators (Vandegrift, 2011). By preying on sick individuals and lowering the population size and density, predators can help manage disease.

Ecological approaches to the reservoir necessitate a sophisticated understanding of the structure and processes of the reservoir community's various components. Gaps in our understanding of the complex ecology of reservoirs have hampered progress in managing Ebola and rabies virus spillover, among other zoonotic pathogens. Interventions can help determine which reservoir components are most important to spillover (Vandegrift, 2011). In Zimbabwe, for example, sylvatic canids may play a role in some areas' maintenance and spread of human rabies. If domestic dogs are the main reservoir and source of human infection, vaccinating them within a region should significantly reduce human infection. However, if jackals are a secondary component main reservoir and source of human infection, oral baiting of jackals with a rabies vaccine may also be required to reduce human rabies (Vandegrift, 2011). Thus, when managing spillover risk, one strategy does not fit all situations, given the complexity of ecosystems.

The second approach, including ecosystems, habitats, and vectors, targets the

environment. To manage spillover risk, understanding pathogen persistence in abiotic environmental reservoirs can sometimes lead to simple interventions that operate on many interacting levels. For example, in live-bird market systems, spillover transmission of avian influenza can be managed by implementing rest days', during which no birds are brought to market. By reducing market stay time, birds are removed before the virus infects and becomes infectious in a new host, and outbreaks can be avoided. Limiting stay-time also significantly reduces viral gene shuffling that can result in novel strains with expanded host range or higher virulence in donor hosts of avian influenza in retail markets by limiting co-infection and thus reducing the likelihood of generating novel spillover strains (Borremans, 2019). Targeting environmental components in disease transmission ecology has a long history in vector management. For example, vector control with chemical pesticides has been a primary line of defense in reducing vector-borne disease risk, but this traditional intervention can lead to resistance evolution and environmental damage (Vandegrift, 2011).

Natural habitat manipulation has been used to reduce pathogen environmental persistence. Scavengers such as vultures, for example, compete with spillover pathogens for host tissue. In India and Pakistan, vulture population declines caused by the lethal effects of an anti-inflammatory drug, diclofenac, have resulted in increased volumes of uneaten carcasses, which serve as environmental breeding grounds for various zoonotic spillover pathogens (Borremans, 2019). Feral dog populations have also increased due to increased access to carcasses, and correlative evidence suggests that losing vultures indirectly led to increased dog and human rabies spillovers (Vandegrift, 2011). Recent policy changes in India and Pakistan, which prohibit the use of diclofenac, may allow for the restoration of wild vultures, benefiting both conservation and public health.

The third approach targets the interface between the reservoir and spillover hosts. When landscape modification, such as habitat encroachment, increases contact rates between the reservoir and spillover hosts, spillover can increase. Targeting this interface may provide the most effective interventions for reducing spillover, but interface controls may work at various scales. Biosecurity is an example of a traditional intervention to reduce spillover along the wildlife-domestic animal interface. For example, biosecurity efforts to reduce avian influenza virus transmission rates between wild birds and poultry have been an important component of avian influenza risk management (Vandegrift, 2011). However, identifying biosecurity measures that prevent exposure can be difficult because viruses may manage to elude detection.

Sometimes, ecological interventions aimed at the interface between donor and recipient hosts have targeted shared food resources. In Bangladesh, for example, the Nipah virus can be transmitted to humans by drinking contaminated, raw date palm sap. Limiting bat access to sap drip-collected in clay pots overnight can reduce viral contamination by bats. Widespread adoption of this approach, which relies on behavioral changes, has proven difficult in Bangladesh (Sokolow, 2019). Ecological interventions at the scale of habitat modification may also be used to alter the contact rate of reservoir and spillover hosts.

The fourth and final approach is targeting susceptibility and infection in spillover hosts. Conventional biomedical approaches continue to be an essential tool in spillover management. Treatment of human or livestock cases, treatment of co-infections to reduce susceptibility, and vaccination of recipient hosts continue to be necessary tools for public health. Taking advantage of synergies with ecological approaches along the spillover hierarchy may be beneficial, mainly where treatments or vaccines are not available or affordable, such as for understudied pathogens and in resource-poor settings (Vandegrift, 2011).

## RESULTS

Emerging zoonotic infectious viruses that have caused or have the potential to cause an epidemic have been assessed according to recent news and articles cited. These

viruses were then sorted by the continent from which it was derived. The number of biodiversity hotspots, as recognized by Conservation International, was also assigned to each continent (Table 1). The correlation is as depicted (Figure 4): continents with a higher number of biodiversity hotspots also have a higher number of emerging zoonotic viral pathogens. In other words, areas with abundant biodiversity hold more risk for zoonotic spillover events, and human encroachment in these areas further exacerbates that risk.

Continent of Origin	# of Biodiversity Hotspots	Emerging Zoonotic Viruses
Asia (Central Asia, East and West Asia, South Asia, South East Asia, and Asia-Pacific regions)	16	Avian Influenza A H5N1, Influenza A H1N1, Avian Influenza H7N9, Nipah Virus, SARS-CoV-1, SARS-CoV-2, MERS-Cov, Dengue Virus, Japanese Encephalitis Virus, Hantaan Virus (10)
Africa	8	West Nile Virus, Ebola Virus, Dengue Virus, Yellow Fever Virus, Monkeypox Virus, Rift Valley Fever Virus, Zika Virus, Chikungunya Virus (8)
Americas (North America, Central America, and South America)	5 (South) 4 (North/Central)	Junin Virus (Argentine Hemorrhagic Fever), Machupo Virus (Bolivian Hemorrhagic Fever), Guanarito Virus (Venezuelan Hemorrhagic Fever), Chagas Disease Virus (4)
Europe	1	Rabies, Influenza A H7N7 (2)

Table 1. Emerging Infectious Zoonotic Viruses and Biodiversity Hotspots on Each Continent

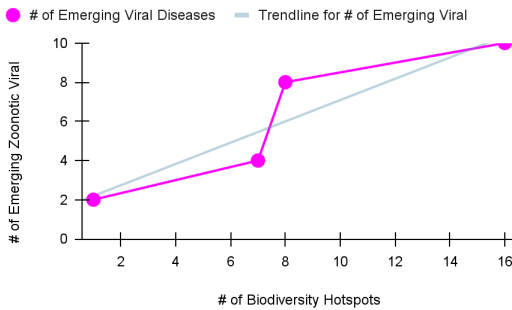


Figure 4. Correlation Between Biodiversity Hotspots and Viral Hotspots

## CONCLUSION

As our planet experiences its sixth mass extinction event in history, an estimated 140,000 species are to go extinct each year primarily due to human activities (Carlson, 2022). The most obvious correlation between disease prevalence and conservation is the need to protect the barriers that work as a buffer between humans and potential viral infections. Changes in climate and land use will create opportunities for viral sharing among previously geographically isolated wildlife species. However, while habitat loss and fragmentation are the primary causes of this high extinction rate, infectious diseases also contribute to animal population declines, independently by reducing population size or in combination with other processes. Human-caused habitat changes also contribute to a second biological crisis: an increase in the rate of emerging and re-emerging infectious diseases (EIDs); 75% of these EIDs are zoonotic (Carlson, 2022). These diseases have claimed hundreds of millions of lives and cost the global economy hundreds of billions of dollars. The negative consequences of emerging infectious diseases do not just affect humans; wildlife conservationists have documented several mass mortality events in other animal species (Borremans, 2019). For instance, the Ebola virus has decimated Western lowland gorillas, and calcivirus, a rabbit hemorrhagic disease virus, has spread through both domestic and wild rabbit populations, killing tens of millions (Sokolow, 2019). In some cases, the viruses have been diminished, while animal populations have been driven to extinction in others. It is critical to note that the risk of disease to humans



and animals should not be treated as separate problems. Because human, ecosystem, and animal health are inextricably linked, a multidisciplinary approach will be required to combat the extinction and disease emergence crises. Practices needed to reduce the risk of zoonotic pathogen spillover events include:

- (i) protecting tropical and subtropical forests,
- (ii) prohibiting or strictly regulating commercial wildlife markets and trade, especially of live birds and mammals,
- (iii) improving biosecurity when dealing with farmed animals (both domestic and wildlife) by enhancing veterinary care, increasing surveillance for animal disease, improving animal feeding and housing, and instituting quarantines to limit pathogen spread,
- (iv) providing people living in emerging infectious disease hotspots with access to improved healthcare services and educational and training opportunities.

In recent years, significant progress has been made in virology and disease ecology, particularly in understanding the mechanisms underlying the emergence and evolution of zoonotic viruses. Viruses and viral evolution can be used in disease ecology and conservation. Conservation biology relies on comprehensive and collaborative scientific approaches that cross disciplinary boundaries to address challenges. By understanding the mechanisms behind viral dynamics, improved techniques can be used by disease ecologists and conservation biologists, in addition to public health officials, to protect both humans and wildlife populations.

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# COMPARATIVE FINANCIAL ANALYSIS: COCA-COLA COMPANY AND PEPSICO, INC.

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ZOE WHEAT

**F**inancial analysis of a company's risks and returns, financial ratios, stock valuations, and capital budgeting can identify key aspects to aid in conclusions about its projected growth or downfall. Many personal preferences, such as music, food, clothing, religion, and politics, are dependent on where one grew up. Even the slightest differences can divide people into different groups based on their preference. A few examples include: country versus pop music, preppy versus street style, deep dish versus thin crust pizza, and, one most often thought of, Coke versus Pepsi. However, I evaluated this age-old debate through a financial statement analysis of both companies to draw conclusions on which company is truly 'better.' The analysis in this report will focus on capital budgeting, risk and return, financial ratios, stock valuations, and weighted average cost of capital using information from each company and three indices including the S&P 500, NYSE Composite, and NASDAQ. Initially, I will look at capital budgeting projects and overall economic climate of each company. Then, I will look at the risks and returns for each company compared against the three market indices. Then, I will calculate and compare the financial ratios for each company. Next, I will value each company's stock using the constant and non-constant growth models. Then, I will calculate the WACC for each company. Finally, based on the preceding analysis, I will show the following. Financial Analysis based on Annual 10K reports from 2017-2022 of Coca-Cola Company and PepsiCo, Inc. shows Coca-Cola Company holds a more accurately valued stock and is more financially stable than PepsiCo, Inc.

The Coca-Cola Company (KO) was founded in 1886 and is headquartered in Atlanta, GA. It operates in the consumer defensive sector, and is part of the non-alcoholic beverages industry. It currently employs approximately 79,000 people. The company manufactures, markets, and distributes sparkling beverages, flavored water and sports drinks, juice, tea, coffee, and energy drinks worldwide. It also provides syrups and concentrates to restaurants and convenience stores to use in soda fountains. Some brands produced by The Coca-Cola Company include Coca-Cola, Fanta, Fresca, Schweppes,

Sprite, Aquarius, Dasani, Powerade, Minute Maid, Simply, and Gold Peak. Operations include independent bottling partners, distributors, wholesalers, and retailers (finance.yahoo.com, 2022).

PepsiCo, Inc. (PEP) was founded in 1898 and is headquartered in Purchase, New York. It operates in the consumer defensive sector, and is part of the non-alcoholic beverages industry. It currently employs approximately 309,000 people. It manufactures, markets, and distributes dips, cheese snacks and spreads, chips, cereals, rice, pasta, oatmeal, beverage concentrates, fountain syrups, coffee, juices, and sparkling beverage products. PepsiCo, Inc. operates through seven segments which include Frito-Lay North America; Quaker Foods North America; PepsiCo Beverages North America; Latin America; Europe; Africa, Middle East and South Asia; and Asia Pacific, Australia and New Zealand and China Region. It services wholesale and other distributors, grocery stores, mass merchandisers, and restaurants (finance.yahoo.com, 2022).

For the following analysis, three indices will be used: the S&P 500, NYSE Composite, and NAS-DAQ. Each hold a different structure and measure different companies. The S&P 500 measures 500 large-cap U.S. stocks and is weighted by market capitalization, which gives the largest companies the greatest influence (Caplinger, 2020). The NYSE Composite measures the performance of all stocks traded on the New York Stock Exchange using market capitalization to calculate the weights of the index constituents (CFI Education Inc, 2020). The index is not limited by company size and includes four industry categories: industrial, utility, transportation, and financial corporations. It includes over 2,000 stocks of which 1,600 are from U.S. companies. The NASDAQ Composite measures all common stocks listed on the NASDAQ and includes more than 2,500 companies (NASDAQ, 2020). It has a high concentration of technology stocks, 49.71%, making it more sensitive to that industry than other sectors. The top five stocks include Apple, Microsoft, Amazon, Facebook, and Alphabet (Google). The five companies consisting of six stocks account for 39.31% of the index weight. This means the index shows strong correlation with technology stocks, but still provides an index for total market comparison.

## LITERATURE REVIEW

As stated previously, Coca-Cola Co. and PepsiCo, Inc. are top performers in the beverage industry. However, before evaluating and drawing conclusions on financial reports from 2022, I must review the companies' backgrounds in previous years to understand the current economic climate for each. I will explore the contracts and agreements, financing and strategies, SWOT analysis, and revenues and financial policies of each company from 2017 to 2022 to develop a baseline understanding of each companies' financial position.

Both Coca-Cola Co. and PepsiCo, Inc. have undergone many contractual agreements between the years 2017 to 2022 in efforts to help stabilize and grow the prospects of the companies. According to the MarketLine Company Profile published in 2018, Coca-Cola Co. had three major contract agreements in 2017 including the collaboration with Sidel on the spiral PET bottle project. In 2018, the most notable contract was the extension of their long term partnership with NASCAR. According to the MarketLine Company Profile published in 2018 for PepsiCo, Inc., seven major contracts were developed including the acquisition of a 60% stake in American Greetings, a partnership with Madison Square Gardens to provide non-alcoholic beverages and snack to their venues, and a partnership with the NFL, Aramark, the US Bank Stadium, and the Minnesota Sports Facilities Authority through the Rush2Recycle program to recover "more than 90% - more than 40 tons - of the stadium waste at Super Bowl LII" (6).

In 2019, both companies had acquisitions and implemented contracts to aid in environmental impacts. Coca-Cola Co. acquired Costa for \$4.9 Billion and Honduran Brewery and El Salvador for \$26 Million (MarketLine, 2019). They also entered into an agreement with Ioniqa Technologies to "develop proprietary technology to reduce

waste and increase recyclability” (MarketLine, 2019, 5). PepsiCo, Inc. acquired 100% ownership in Knjaz Milos a.d. and partnered with Feed the Children’s to deliver “daily essentials to supplement meals for a week for 800 Detroit families” (MarketLine, 2019, 7). In 2020, despite the Covid-19 pandemic, both companies entered into many contractual agreements.

According to the 2020 MarketLine Company Profile published in 2020 for Coca-Cola Co., the company acquired the remaining 5.7% ownerships in Fairlife, LLC, partnered with JD.com to encourage recycling and “drive the circular economy in China,” and partnered with United Way Mumbai to provide PPE to frontline workers in India (5). PepsiCo, Inc., partnered with Regal Entertainment Group to become the primary soft drink provider in all US facilities, agreed to acquire Be & Cheery for \$705 million, and agreed to acquire Rockstar energy beverages for \$3.85 Billion (MarketLine, 2020). They also had a \$20 Million partnership with the US Agency for International Development to “support a gender inclusive supply chain in agriculture” (MarketLine, 2021, 9). 2021 proved to be a slow year for Coca-Cola Co. in terms of contracts as the only major acquisition was the remaining 85% in BodyArmor (MarketLine, 2021). PepsiCo, Inc. had several contracts in 2021 including collaborating with Closed Loop Partners to advance composting infrastructure and with Guidehouse, Mars, McCormick, & Company to “help engage suppliers in climate action and solutions” (8).

In 2022, both companies focused on sustainability efforts. According to the MarketLine Company Profile for Coca-Cola Co. in 2022 the company partnered with O-I Glass to recycle used glass into new glass bottles. PepsiCo, Inc. had several sustainability initiatives including partnering with Lebron James to “inspire communities, culture, and the creative spirit to thrive through hydration,” with Canadian University Dubai to reduce single-use plastic and with Schneider Electric to “achieve net-zero emissions by 2040” (MarketLine, 2022, 5, 9). Coca-Cola Co. and PepsiCo, Inc. had many contractual agreements and partnerships since 2017 which shows the growth both companies have undergone. Along with many contracts, both companies have also conducted financing agreements and other strategic plans since 2017.

In 2017 Coca-Cola Co. awarded \$1 million in grants to “11 organizations which serve more than 75,000 veterans across the country” (MarketLine, 2018, 10). Coca-Cola described their objective as focusing on people, portfolio, partners, planet, profit, and productivity. PepsiCo, Inc. launched The Hive in 2018 to stimulate innovation for its niche brands (MarketLine, 2018). In 2018, the company also planned its Results with Responsibility initiative to improve the nutritional value of their products and planned to invest \$100 million to renovate a factory in Shanghai, China. PepsiCo, Inc. described their strategies to stabilize their distribution system to include “fun-for-you,” “better-for-you,” and “good-for-you” products and minimize their environmental footprint (52). In 2019 Coca-Cola Co. announced plans to open a research and development center in India (MarketLine). This same year PepsiCo, Inc. announced plans to invest \$1 billion in Pakistan’s food sector, \$4 billion in Mexico, \$74 million in India, and \$77.6 million in a manufacturing facility in India (MarketLine, 2019). They also introduced their foodservice digital lab to cater to online needs of foodservice operators.

In 2020, despite the Covid-19 pandemic, both companies continued to invest in many strategic plans. Coca-Cola Co. invested \$22 million to maintain its labor forces in the Philippines (MarketLine, 2020). They also stressed commercial and finance leadership through “unique and innovative customer experiences, product availability and delivery systems, and beverage merchandising and displays” as well as focusing on “the financial health and success of [our] bottling partners” (61). In 2020, PepsiCo, Inc. invested \$100 million in Egypt to expand their presence, planned to rename the Aunt Jemima brand and logo, and introduced SodaStream Professional, “an eco-friendly hydration platform” (8). They also invested \$170 million in Hispanic business to promote diversity (MarketLine, 2021). Coca-Cola Co. followed this same trend in 2021 by planning to double its investment in minority-owned media companies (MarketLine). PepsiCo, Inc. launched the Juntos Crecemos platform to aid Hispanic owned businesses in 2021

(MarketLine).

In 2022, both companies focused on rebuilding and sustainability efforts. According to the 2022 MarketLine Company Profile for Coca-Cola Co., the company invested over \$250 million to build a new 800,000 square foot facility and announced plans for “industry leading reusable packaging” (8). PepsiCo, Inc. announced plans to build its largest plant in the US, a \$1.5 million grant to Water Replenishment District of Southern California to help “protect local groundwater resources to more than four million residents” and invested \$35 million in the Closed Loop Local Recycling Fund (MarketLine, 2022, 12). Both companies showed a focus on sustainability and conducted many investing activities since 2017.

Even with all of the contractual agreements, sustainability effort, and investing activities from both companies they still have weaknesses and threats they can focus to minimize. Analyzing these strengths, weaknesses, opportunities and threats through SWOT analysis shows companies where to focus their efforts in order to grow to their maximum potential. In all years from 2018 to 2022, Coca-Cola Co. has strengths of billion-dollar brands and comprehensive bottling and distribution system, opportunity for growth in soft drink consumption and threats of water scarcity, stringent regulations, and intense competition (MarketLine). The company’s weaknesses change every year from legal issues and bottling investments in 2018, to product recalls in 2019, to liquidity position in 2020, to revenue decline in 2021, and operational performance in 2022.

In all years since 2018, PepsiCo, Inc. has strengths of market position, revenue growth/operational efficiencies, R&D activities, and connecting with consumers, opportunities for global soft drinks consumption and global savory snacks market, weaknesses of liquidity concerns and threats of competitive pressures and water scarcity (MarketLine). The company’s weaknesses show some changes throughout the years adding lawsuits and product recalls in 2018, operational performance in 2019, trade receivables in 2020, and product recalls in 2022. Both companies show strengths in market position, opportunities for soft drink consumption, and threats of water scarcity and competition. They have also had weaknesses dealing with legal issues, product recalls, and operational performance at some point in recent years. Similarities in each company’s SWOT analysis over the years shows the comparability in company structure between Coca-Cola Co. and PepsiCo, Inc. While the companies have similar basic operational structures, financial analysis will pinpoint the differences in financial structure and how operations are recorded through company financial statements and stock valuations.

After looking at the previous years’ operations I can draw conclusions about the economic climate of the companies. Both companies showed steady growth between 2017-2022 and focused heavily on sustainability efforts following 2021. They also show similarities within SWOT analysis proving they are close in operations and a true financial comparison is needed to see which is valued more accurately and is financially stable.

## METHODS

Qualitative and quantitative data was gathered from the 10K Annual Reports of Coca-Cola Company and PepsiCo, Inc from 2017-2022. Quantitative data was also gathered from the regressions of the three indices: the S&P 500, NYSE Composite, and NASDAQ. Most of the financial analysis was based on quantitative data. This includes the risk and return calculations, financial ratios, and stock valuations. The qualitative data was used to analyze the capital budgeting projects of each company.

## Risk and Return

I used a five-year monthly regression to calculate the beta coefficient ( $\beta$ ) for Scotts Miracle-Gro relative to three select indices: the S&P 500, the NYSE Composite, and the NASDAQ Composite as well as the NASDAQ Composite versus the S&P 500 (Appendix 1). This data was calculated based on stock indices and company prices listed on

Yahoo! Finance. According to Ehrhardt & Brigham, the beta coefficient is a measure of the amount of risk that an individual stock contributes to a well-diversified portfolio. The results of my calculations are illustrated in Table 1a: Coca-Cola Company and PepsiCo, Inc vs: S&P 500, NYSE Composite, and NASDAQ Composite; and Table 1b NASDAQ vs. S&P 500.

Table 1a	Coca-Cola Company Systematic Risk	PepsiCo, Inc. Systematic Risk
Index	Coca-Cola Company Beta ( $\beta$ )	PepsiCo, Inc. Company Beta ( $\beta$ )
S&P 500	0.56	0.57
NYSE Composite	0.35	0.27
NASDAQ Composite	0.28	0.29

Table 1b	NASDAQ Systematic Risk
Index	NASDAQ Beta ( $\beta$ )
S&P 500	0.58

I would consider the S&P 500 the best index when analyzing Coca-Cola Company and PepsiCo, Inc. The S&P 500 is the most commonly used market proxy (Investopedia.com, 2022). The S&P 500 tracks large-cap stocks, and both companies are considered large cap stocks. The S&P 500 provides a wide range of industry sectors, and both companies are in the non-alcoholic beverage industry.

I used Yahoo! Finance as my published source for comparison. The beta calculation for Coca-Cola Company from the S&P 500, my preferred index, is 0.56, which is 0.02 higher than Yahoo! Finance beta. The beta calculation for PepsiCo, Inc. is 0.57, which is 0.03 higher than Yahoo! Finance beta. Both Yahoo! and my calculations are based on five years of stock prices. For Coca-Cola Company the beta calculation from the NYSE Composite is 0.19 lower than Yahoo! Finance and the beta calculation from the NASDAQ Composite is 0.26 lower. For PepsiCo, Inc. the beta calculation from the NYSE Composite is 0.27 lower than Yahoo! Finance and the beta calculation from the NASDAQ Composite is 0.25 lower.

There are many factors that create differences in betas across services: there is more than one way to calculate beta based on the historical period used, the return intervals used, the index used as the market, and the adjustments made to regression betas (Mills, 2020). As I stated previously, the S&P 500 is the best index to compare to both companies. Usually, the NYSE Composite tracks with, and produces a similar beta to, the S&P 500. However, this semester it tracked closer to the NASDAQ likely due to the recent volatility of the stock market as a whole.

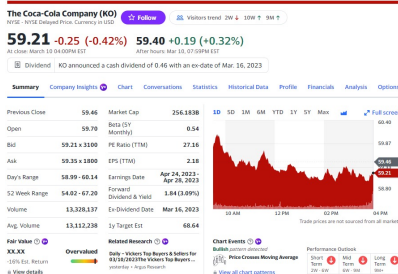


Figure 1 shows Coca-Cola Company's beta as calculated by Yahoo! Finance at close on March 11, 2023

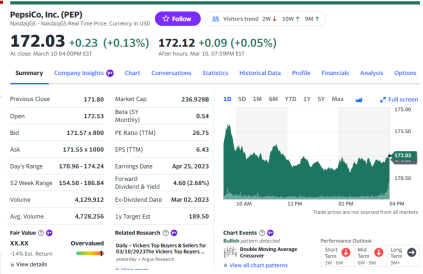


Figure 2 shows PepsiCo, Inc.'s beta as calculated by Yahoo! Finance at close on March 11, 2023

### Total Risk

NASDAQ's monthly standard deviation is 6.22% vs. Coca-Cola Company's monthly standard deviation of 5.45% and PepsiCo, Inc.'s of 5.06% as shown in Table 2. With standard deviation being a measure of total risk, both companies have lower total risk than NASDAQ due to the lack of volatility of one stock versus a portfolio of stocks.

Table 2	Total Risk (Standard Deviation)
NASDAQ Composite	6.22%
Coca-Cola Company	5.45%
PepsiCo, Inc.	5.06%



*Risk per Unit of Return*

The coefficient of variation (CV), which is the risk per unit of return for the NASDAQ index, Coca-Cola Company, and PepsiCo, Inc. are shown in Table 3. Some say CV is useful as it measures stand-alone risk for two different investments that have different returns. My Professor disagrees. The values in Table 3 show that both companies are riskier than the NASDAQ Composite when evaluating for risk per unit of return.

Table 3	Risk per Unit of Return (Coefficient of Variation)
NASDAQ Composite	824.11%
Coca-Cola Company	950.61%
PepsiCo, Inc.	709.54%

*Systematic Risk*

Systematic risk aka “un-diversifiable risk” or “market risk” is defined as the risk inherent to the entire market or entire market segment (Fontinelle, 2019). Systematic risk, as opposed to systemic risk, is inherent to the market as a whole and is affected by economic, geo-political, and financial factors. These risks cannot be diminished through diversification. The market risk of a stock is quantified by its beta (b). A beta equal to 1.0 is determined to be as risky as the market. Beta >1, indicates the stock is more risky than the market and a beta <1 is less risky (Mills, 2020). In Table 4a, the beta coefficients for Coca-Cola Company and PepsiCo, Inc. are displayed. In Table 4b the beta for NASDAQ is displayed for the S&P 500 Composite. We are using the S&P 500 to signify the market. These beta coefficients indicate that the NASDAQ Composite is more less than the market (less than 1). Both companies have lower betas in the NASDAQ composite than NASDAQ has in the market, and in the market than NASDAQ; therefore, the required return for both companies stock should be less than the required return from the NASDAQ.

Table 4a	Coca-Cola Company Systematic Risk	PepsiCo, Inc. Systematic Risk
Index	Coca-Cola Company Beta (β)	PepsiCo, Inc. Company Beta (β)
S&P 500	0.56	0.57
NYSE Composite	0.35	0.27
NASDAQ Composite	0.28	0.29

Table 4b	NASDAQ Systematic Risk
Index	NASDAQ Beta (β)
S&P 500	0.58

Historical data of monthly average returns from the last 60 months are displayed in Figure 4 for Coca-Cola Company, PepsiCo, Inc., NYSE Composite, NASDAQ Composite, and the S&P 500.

Table 5	Expected Returns			
Coca-Cola Company	PepsiCo, Inc.	S&P 500	NYSE Composite	NASDAQ Composite
0.57%	0.71%	0.76%	0.36%	0.76%

In comparing these values, the NYSE has the lowest return, Coca-Cola Company has the second lowest return followed by PepsiCo, Inc. and NASDAQ and S&P 500 had the highest returns. In finance theory, the expected returns can be calculated by examining the systematic risk/beta of both companies versus the market, which as we saw previously in Table 4a has a beta lower than 1. If markets are efficient, then securities with betas higher than one have higher expected/required returns when compared to the market portfolio (Mills, 2020). Due to both companies having lower risk, it is expected that they would have lower returns. We will analyze further the potential causes for this under Financial Analysis. The inverse is true of the NASDAQ, which has a higher risk than both companies and therefore a higher return. This is what we expect to see.

**FINANCIAL ANALYSIS**

## Market Value to Book Value

Current Capitalization (Millions of USD)		USD
<b>Current Capitalization</b>		
Share Price		\$59.21
Shares Out.		4,326.7
<b>Market Capitalization</b>		
- Cash & Short Term Investments		11,631.0
+ Total Debt		42,279.0
+ Pref. Equity		-
+ Total Minority Interest		1,721.0
- Long Term Marketable Securities		-
= Total Enterprise Value (TEV)		288,552.4
<b>Book Value of Common Equity</b>		
+ Pref. Equity		-
+ Total Minority Interest		1,721.0
+ Total Debt		42,279.0
= Total Capital		68,105.0

Current Capitalization (Millions of USD)		USD
<b>Current Capitalization</b>		
Share Price		\$172.03
Shares Out.		1,377.3
<b>Market Capitalization</b>		
- Cash & Short Term Investments		5,348.0
+ Total Debt		41,487.0
+ Pref. Equity		-
+ Total Minority Interest		124.0
- Long Term Marketable Securities		-
= Total Enterprise Value (TEV)		273,191.5
<b>Book Value of Common Equity</b>		
+ Pref. Equity		17,149.0
+ Total Minority Interest		124.0
+ Total Debt		41,487.0
= Total Capital		58,760.0

Table 6a: Coca-Cola Company Current Capitalization

Table 6b: PepsiCo, Inc. Current Capitalization

By dividing the market price per share by the book value per share, the market/book ratio is determined. For Coca-Cola Company the market/book is 10.63, and for PepsiCo, Inc. the market/book is 13.82. In this case the book value leverage ratios are much lower than the market value leverage ratios. Coca-Cola Company has market value of 288.55 billion, while its book value is only 68.11 billion. Its book value of equity is 24.11 billion, while its book value of debt is 42.28 billion, meaning that the company is financed with approximately 35.40% equity on the books. However, on a market-value basis, the equity is worth 256.18 billion or about 88.78% financed by equity. PepsiCo, Inc. has market value of 273.19 billion, while its book value is only 58.76 billion. Its book value of equity is 17.15 billion, while its book value of debt is 41.49 billion, meaning that the company is financed with approximately 29.19% equity on the books. However, on a market-value basis, the equity is worth 236.93 billion or about 86.73% financed by equity. Market value can be thought of as the values of financial assets as determined in the markets – the price that a willing buyer will pay to a willing seller. These major differences suggests that both companies have much less leverage than is indicated on a Book Value basis.

## Balance Sheet and Income Statement Trend Analysis

A six-year analysis (2017 – 2022) was created utilizing data from Coca-Cola Company's balance sheet and income statement as provided in Table 7a, and PepsiCo, Inc. in Table 7b.

Balance Sheet												
Balance Sheet as of:												
Currency	Dec-31-2017	Dec-31-2018	% Change	Dec-31-2019	% Change	Dec-31-2020	% Change	Dec-31-2021	% Change	Dec-31-2022	% Change	
USD	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD		
<b>ASSETS</b>												
Total Current Assets	36,545.0	24,930.0	-46.59%	20,411.0	-22.14%	19,240.0	-6.09%	22,545.0	14.66%	22,591.0	0.20%	
Total Assets	87,826.0	83,216.0	-5.62%	86,381.0	-3.66%	87,226.0	1.05%	94,354.0	7.48%	92,763.0	-1.72%	
<b>LIABILITIES</b>												
Total Current Liabilities	27,194.0	28,782.0	5.82%	26,973.0	-6.71%	14,697.0	-84.73%	19,590.0	26.81%	19,724.0	-1.15%	
Total Liabilities	68,919.0	64,588.0	-7.42%	65,932.0	1.92%	66,092.0	0.10%	69,054.0	4.51%	66,937.0	-3.82%	
Total Common Equity	17,072.0	16,881.0	-0.54%	18,981.0	10.54%	19,299.0	1.65%	22,999.0	16.09%	24,105.0	4.59%	
Total Equity	18,277.0	15,058.0	-0.43%	21,898.0	9.87%	21,284.0	-0.87%	24,860.0	14.38%	25,826.0	3.74%	
Total Liabilities And Equity	87,826.0	83,216.0	-5.62%	86,381.0	-3.66%	87,226.0	1.05%	94,354.0	7.48%	92,763.0	-1.72%	
<b>Income Statement</b>												
For the Fiscal Period Ending												
Currency	12 months	12 months	% Change	12 months	% Change	12 months	% Change	12 months	% Change	12 months	% Change	
USD	Dec-31-2017	Dec-31-2018	2017-2018	Dec-31-2019	2018-2019	Dec-31-2020	2019-2020	Dec-31-2021	2020-2021	Dec-31-2022	2021-2022	
<b>Revenue</b>												
Total Revenue	36,219.0	34,300.0	-5.57%	37,269.0	7.96%	33,014.0	-12.88%	38,555.0	14.93%	43,004.0	10.11%	
Gross Profit	22,491.0	21,233.0	-5.82%	22,447.0	5.65%	19,981.0	-10.85%	23,298.0	16.95%	25,004.0	6.82%	
Operating Income	9,340.0	10,203.0	8.64%	10,631.0	4.03%	9,999.0	-6.32%	11,438.0	12.58%	12,250.0	6.83%	
Net Income	1,480.0	6,454.0	80.96%	8,920.0	27.87%	7,147.0	-18.14%	9,111.0	20.71%	9,546.0	-2.40%	
Basic EPS	\$9.29	\$1.51	80.79%	\$2.02	27.75%	\$1.8	-16.11%	\$2.25	20.35%	\$2.2	-2.73%	

Table 7a

Balance Sheet												
Balance Sheet as of:												
Currency	Dec-30-2017	Dec-29-2018	% Change	Dec-28-2019	% Change	Dec-26-2020	% Change	Dec-25-2021	% Change	Dec-31-2022	% Change	
USD	USD	USD	USD	USD	USD	USD	USD	USD	USD	USD		
<b>ASSETS</b>												
Total Current Assets	31,027.0	21,893.0	-41.72%	17,645.0	-24.07%	23,001.0	23.29%	21,783.0	-5.59%	21,539.0	-1.13%	
Total Assets	79,804.0	77,468.0	-2.78%	78,547.0	1.14%	92,910.0	15.47%	92,377.0	-0.59%	92,187.0	-0.21%	
<b>LIABILITIES</b>												
Total Current Liabilities	20,502.0	22,138.0	7.39%	20,461.0	-0.20%	23,372.0	12.46%	25,220.0	10.86%	26,785.0	2.11%	
Total Liabilities	68,823.0	63,046.0	-9.16%	63,679.0	0.99%	79,366.0	19.77%	76,226.0	-4.12%	74,914.0	-1.75%	
Total Common Equity	11,405.0	14,578.0	23.32%	14,786.0	1.87%	13,484.0	-9.90%	16,843.0	16.14%	17,140.0	1.64%	
Total Equity	10,981.0	14,022.0	24.80%	14,868.0	1.78%	13,559.0	-0.77%	16,151.0	16.09%	17,273.0	6.60%	
Total Liabilities And Equity	79,804.0	77,468.0	-2.78%	78,547.0	1.14%	92,910.0	15.47%	92,377.0	-0.59%	92,187.0	-0.21%	
<b>Income Statement</b>												
For the Fiscal Period Ending												
Currency	12 months	12 months	% Change	12 months	% Change	12 months	% Change	12 months	% Change	12 months	% Change	
USD	Dec-30-2017	Dec-29-2018	2017-2018	Dec-28-2019	2018-2019	Dec-26-2020	2019-2020	Dec-25-2021	2020-2021	Dec-31-2022	2021-2022	
<b>Revenue</b>												
Total Revenue	63,529.0	64,661.0	1.76%	67,161.0	3.72%	70,372.0	4.95%	79,474.0	11.45%	86,392.0	8.01%	
Gross Profit	34,729.0	35,289.0	1.58%	37,176.0	5.11%	38,637.0	3.93%	42,429.0	9.84%	46,056.0	7.95%	
Operating Income	10,627.0	10,376.0	-2.42%	10,719.0	3.20%	10,931.0	1.94%	11,859.0	7.76%	12,252.0	3.28%	
Net Income	8,813.0	12,153.0	61.79%	7,316.0	-71.87%	7,180.0	-0.72%	7,616.0	6.54%	8,010.0	4.20%	
Basic EPS	\$3.41	\$8.84	61.43%	\$2.21	-69.02%	\$2.14	-5.51%	\$2.17	0.72%	\$2.46	14.71%	

Table 7b

## Balance Sheet

A few observations can be made from the companies balance sheets. Coca-Cola Company's assets decreased slightly from 2017 to 2018 by 2.78%, but then increased slightly each year until decreasing again from 2021 to 2022. There was a slight increase in current liabilities from 2017 to 2018 of 5.52% followed by a slight decrease of -6.71% the next year. From 2019 to 2020 there was a significant decrease of current liabilities of 84.73% followed by an increase of 26.81% the next year. PepsiCo, Inc.'s assets decreased by 2.78% from 2017 to 2018 followed by a slight increase of 1.14%. The most significant increase occurred from 2019 to 2020 of 15.47% before slightly decreasing less than 1% in the following years. There was only one year of decreasing current liabilities, 2018 to 2019, of 8.2%. All other years showed increasing current liabilities with the highest increase being 12.46% between 2019 to 2020.

As we can see from Figure 2A and Figure 2B, both companies assets remain higher than liabilities indicating the companies should remain viable.

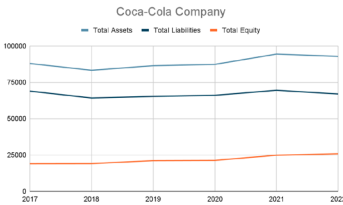


Figure 2A

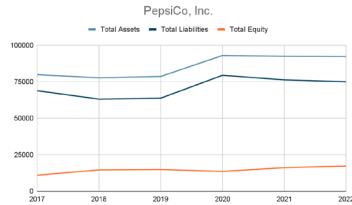


Figure 2B

## Income Statement

As we can see in Figure 3A, Coca-Cola Company's sales alternate between increasing and decreasing until steadily increasing beginning in 2020. Gross profits follow the same trend. Operating income and net income ultimately increase between 2017 and 2022. As we can see in Figure 3B, PepsiCo, Inc.'s sales are increasing year-over-year. The gross profits also follow this same trend. Operating income stays roughly the same, while net income spikes in 2018 before slowly increasing from 2019 to 2022. The gross profit, operating income, and net income increased at a lower rate than revenue for both companies. This is likely due to acquiring new supply chains and we would expect to see this ratio improve as both companies continue to increase production. Two factors affecting operating income growth and net income decline is due to restructuring charges and high interest expenses resulting from major increases in long-term debt financing.

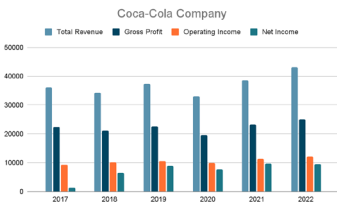


Figure 3A

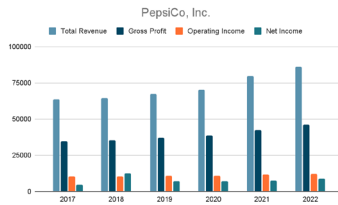


Figure 3B

## Trend/Historical and Benchmark/Competitive Ratio Analysis

### Profitability Ratios

Profitability ratios show the combined effects of liquidity and asset management on operating and financial results. It is an overview of the firm's operations (Ehrhardt/Brigham,

2020, 2017). I have created separate charts for the return on assets, return on capital, and return on equity.

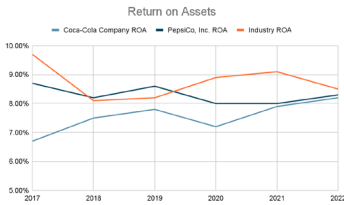


Figure 4

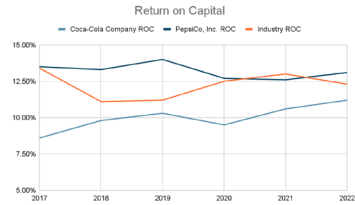


Figure 5

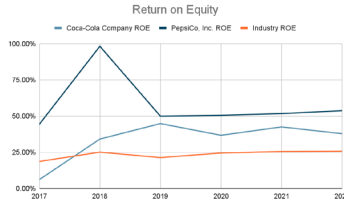


Figure 6

Both companies showed lower return on assets than the industry for all years, except for 2018 and 2019 when Coca-Cola Company was higher. Coca-Cola Company had higher return on capital than the industry average except for a brief dip below in 2021, while PepsiCo, Inc. was lower in all years. Both companies showed higher return on equity for all years after 2018. Coca-Cola Company showed higher profitability ratios than PepsiCo, Inc. in all years. Coca-Cola Company has the highest spike in return on equity in 2018 which follows the net income increase of 80% between 2017 and 2018.

### Debt Management Ratios

Debt management ratios (leverage ratios) tell us how the firm uses debt relative to equity as well as the firm's ability to pay interest and principal (Ehrhardt/Brigham, 2020, 2017). The following data was compiled to highlight leverage ratios for both companies from 2017 to 2022.

	2017	2018	2019	2020	2021	2022
Coca-Cola Company	251.5%	232.2%	209.4%	208.7%	178.0%	163.7%
PepsiCo, Inc.	357.7%	221.3%	226.2%	338.3%	262.4%	240.2%
Industry	166.2%	148.2%	108.9%	118.6%	103.8%	90.0%

The debt-to-equity ratios for both companies were consistently above industry averages, with PepsiCo, Inc.'s being the highest. This shows that both companies are financed primary through long term debt, and has kept the level of debt considerably high year to year. As one would suspect, the amount of debt is the reason why the debt to equity ratio is so much higher than the industry. This means that both companies are highly leveraged, which stockholders prefer as it raises their returns, as evidenced by their ROE being much larger than industry standards. However, creditors usually prefer much lower debt ratios and would have reason for concern if revenue decreased.

Because both companies have such large debt-to-equity ratios, it is important to understand the times-interest earned ratio (TIE). The ratio is calculated by dividing

earnings before interest and tax into interest expense. This tells us how many times the company has earned its pre-tax interest obligation. In other words it tells us the extent to which operating income can decline before the firm cannot meet its annual interest costs.

Table 9: Competitive Times-Interest Earned						
	2017	2018	2019	2020	2021	2022
Coca-Cola Company	10.9x	10.7x	11.2x	7.0x	7.2x	13.9x
PepsiCo, Inc.	9.2x	8.5x	11.6x	8.7x	6.6x	15.7x
Industry	6.0x	5.3x	7.3x	10.0x	14.9x	14.8x

The times-interest-earned ratios for both companies are above industry averages from 2017 to 2019, then below in more recent years. Though creditors would not have been concerned from 2017 to 2019, they may become slightly concerned if the trend continues and the companies TIE continues to fall below the industry's.

### Asset Management Ratios

Asset management ratios (efficiency ratios) measure how well a firm manages its assets (Ehrhardt/Brigham, 2020, 2017). The fixed asset turnover ratio reflects how effectively a firm generates sales from fixed asset investments, e.g., property, plant, and equipment. The ratio is calculated by dividing sales into total assets. Both companies are below industry averages, with Coca-Cola Company fluctuating between 2.5x and 4.0x and PepsiCo, Inc. between 3.0x and 4.0x. This difference is most likely from both companies making large investments in fixed assets over recent years that have not yet begun to generate sales.

Table 10: Competitive Fixed Asset Turnover						
	2017	2018	2019	2020	2021	2022
Coca-Cola Company	3.8x	3.9x	3.4x	2.7x	3.3x	3.8x
PepsiCo, Inc.	3.8x	3.7x	3.5x	3.2x	3.3x	3.4x
Industry	6.4x	5.8x	5.2x	14.2x	18.9x	16.5x

The Inventory Turnover Ratio is a ratio showing how many times a company has sold and replaced inventory during a given period. It is calculated by dividing the cost of goods sold into ending inventory. Coca-Cola Company's inventory turnover, a four-year average of 4.58x, is consistently lower than the industry's four-year average of 8.42x signifies Coca-Cola may be carrying too much inventory. PepsiCo, Inc.'s average of 9.13x is consistently higher than the industry's signifying they may be carrying too little inventory. This could also mean a percentage of their inventory is current.

Table 11: Competitive Inventory Turnover						
	2017	2018	2019	2020	2021	2022
Coca-Cola Company	5.1x	4.6x	4.5x	4.0x	4.6x	4.7x
PepsiCo, Inc.	10.2x	9.7x	9.3x	8.5x	8.7x	8.4x
Industry	9.4x	8.5x	8.6x	8.5x	8.0x	7.5x

### Liquidity Ratios

Liquidity ratios attempt to tell us whether a company's liquid assets can cover the liabilities due in the near future. The current ratio is calculated by dividing current assets into current liabilities. Both companies current ratios are consistently equal to or slightly lower than the industry average. As both companies are highly leveraged with long-term debt, additional outside financing to cover short-term debt might not be available or the

costs may be too high. A lower-than-average current ratio is a troubling sign as it means they can't cover short-term liabilities without relying solely on revenue should additional financing be unavailable.

Table 12: Historical Trend/Benchmark Current Ratio						
	2017	2018	2019	2020	2021	2022
Coca-Cola Company	1.3x	0.9x	0.8x	1.3x	1.1x	1.1x
PepsiCo, Inc.	1.5x	1.0x	0.9x	1.0x	0.8x	0.8x
Industry	1.6x	1.5x	1.6x	1.7x	1.6x	1.7x

Though the current ratio measures current assets to current liabilities, inventory is not considered to be as liquid as other current assets so the quick ratio, or acid test, is a good measure of a firm's ability to cover current liabilities using current assets that are easily converted to cash. The quick ratio is calculated by deducting inventory from current assets and dividing the result by current liabilities. Both companies quick ratios are consistently lower than the industry average. Both companies maintain average inventory levels which explain why their current ratio is equal to the average while their quick ratio is below. Creditors do not like to see a low quick ratio, which may result in an increased weighted average cost of capital.

Table 13: Historical Trend/Benchmark Quick Ratio						
	2017	2018	2019	2020	2021	2022
Coca-Cola Company	0.9x	0.7x	0.6x	1.0x	0.8x	0.8x
PepsiCo, Inc.	1.3x	0.7x	0.7x	0.8x	0.6x	0.6x
Industry	1.2x	1.1x	1.2x	1.3x	1.1x	1.2x

### Statement of Cash Flows

The statement of cash flows provides the results of the net cash increase or decrease in an accounting period by analyzing the sources and uses of cash from three categories: cash flows from operating activities, cash flows from investing activities, and cash flows from financing activities. Following are the cash flows for Coca-Cola Company and PepsiCo, Inc. for the periods 2017 through 2022.

Table 14A: Coca-Cola Company Cash Flow (in millions)						
	2017	2018	2019	2020	2021	2022
Cash from Ops	7,041.0	7,627.0	10,471.0	9,844.0	12,625.0	11,018.0
Cash from Investing	(2,312.0)	5,927.0	(3,976.0)	(1,477.0)	(2,765.0)	(763.0)
Cash from Financing	(7,447.0)	(10,347.0)	(9,004.0)	(8,070.0)	(6,786.0)	(10,250.0)
Net Change in Cash	(2,477.0)	2,945.0	(2,581.0)	373.0	2,915.0	(200.0)

Table 14A: PepsiCo, Inc. Cash Flow (in millions)						
	2017	2018	2019	2020	2021	2022
Cash from Ops	10,030.0	9,415.0	9,649.0	10,613.0	11,616.0	10,811.0
Cash from Investing	(4,403.0)	4,564.0	(6,437.0)	(11,619.0)	(3,269.0)	(2,430.0)
Cash from Financing	(4,186.0)	(13,769.0)	(8,489.0)	3,819.0	(10,780.0)	(8,523.0)
Net Change in Cash	1,488.0	112.0	(5,199.0)	2,684.0	(2,547.0)	(607.0)

## Cash Flows from Operating Activates

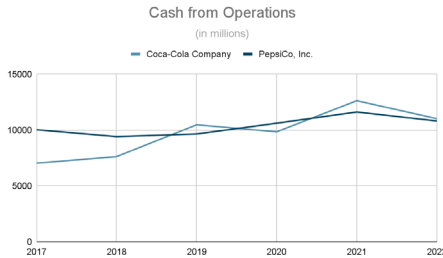


Figure 7

Coca-Cola Company and PepsiCo, Inc. showed increasing cash from operations during the period. The largest change for Coca-Cola Company was a change in accounts payable of 1.318 million in 2019 2.843 million in 2021. The largest changes for PepsiCo, Inc. come from a gain on sale of assets of 3.321 million and restructuring costs of 3.805 million in 2022.

## Cash Flows from Investing Activities

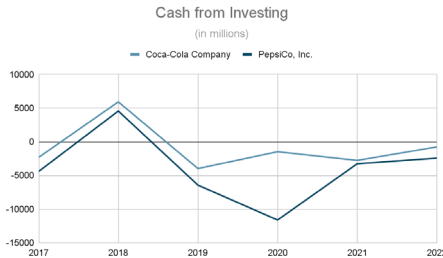


Figure 8

Investing activities provided positive cash flows for both companies in 2018 and negative cash flows in all other years. There were capital expenditures for both companies all four years, further depleting cash. For Coca-Cola Company, investing in marketable and equity securities were sources of funds in in all years, and cash acquisitions were a use of funds in all years. For PepsiCo, Inc., investing in marketable and equity securities was a use of funds in 2017, 2020 and 2022 and a source of funds all other years. Capital expenditures were a large use of funds in all years.

## Cash Flows from Financing Activities

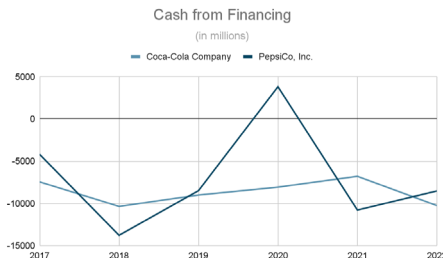


Figure 9

Coca-Cola Company had negative cash flows in all years, while PepsiCo, Inc. had neg-

ative cash flows in all years except for 2020. For both companies, there were no sources of funds from financing activities from 2017 to 2022.

### Net Change in Cash

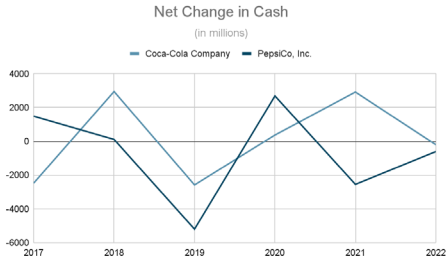


Figure 10

Overall, Coca-Cola Company maintained positive cash flows in 2018, 2020, and 2021 and negative cash flows in 2017, 2019, and 2022. PepsiCo, Inc. maintained positive cash flows in 2017, 2018, and 2020 and negative cash flows in 2019, 2021, and 2022. The steep decline in cash flows in 2019 for both companies is likely due to cash from financing activities.

## STOCK VALUATION

To determine the value of the companies stock, I will apply two models: the constant growth model and the non-constant growth model. To apply this model, one requires three types of inputs: estimated dividends, growth rates, and required rate of return.

To compute the required rate of return, I am using my beta as computed using the S&P 500 index. This was the beta that I determined to be the best estimate of beta for both companies. I am also using assumptions that the risk free rate is 4.5% and the market risk premium is 6.5%. Due to the Federal Reserve raising interest rates, this is volatile period for interest rates. Thus the estimates for CAPM inputs are more uncertain than in the recent past. Please note that the Yahoo! Finance data used in part one was run several days before the Yahoo! Finance data for this section.

### Coca-Cola Company

Determine the discount rates using the CAPM model

$$R_{rf} = 4.5\%, \text{RPM} = 6.5\%, \text{beta (b)} = 0.56$$

$$R_s = R_{rf} + (\text{RPM} \times \text{beta}) = 4.5\% + (6.5\% \times 0.56) = 8.14\%$$

Determine the Growth Rate

Growth Estimates	KO
Current Qtr.	1.60%
Next Qtr.	4.30%
Current Year	4.40%
Next Year	8.10%
Next 5 Years (per annum)	6.06%
Past 5 Years (per annum)	4.42%

Figure 11, Used past five years - Yahoo 3/23/23



To determine the growth rate I used analyst earnings forecasts from Yahoo! Finance at [finance.yahoo.com](http://finance.yahoo.com). In this situation, the past five-year growth of 4.42% and the forecasted five-year growth of 6.06% are lower than the expected return of 8.14%. I chose to use the past five-year growth to be on the conservative side of estimations. The growth rate I will be using is 4.42%.

### Constant Growth Model

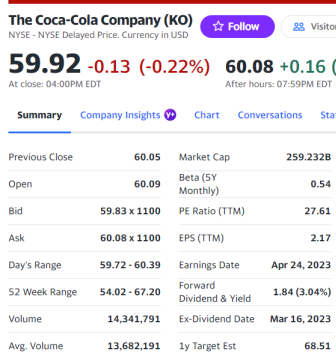


Figure 12

I used the most recent annual dividend of \$1.84 as my D0. Applying the constant growth model yields a valuation of:

$$P_0 = (D_0 (1 + g)) / (r_s - g) = (1.84(1 + 4.42\%)) / (8.14\% - 4.42\%) = \$51.65$$

As of the market close on 3/23/2023, the stock price was \$59.92, and I computed a value of \$51.65, so according to this valuation method, the stock is overvalued by \$7.56 per share. However, if we were to use an average of the past five years and next five years growth rates, we would see that the stock is undervalued. The growth rate in this scenario is 5.24%.

$$P_0 = (D_0 (1 + g)) / (r_s - g) = (1.84(1 + 5.24\%)) / (8.14\% - 5.24\%) = \$66.77$$

Using the average growth rate, the stock is undervalued by \$6.85 per share. Both valuations are in line with the Capital IQ analysis of the present value of equity as shown in Figure 13 below.

Present Value of Equity at 03/23/2023	
PV of 2023 Free Cash Flow Stub(1)	7,448.9
PV of 2024-2027 Free Cash Flows(1)	37,726.8
PV of Terminal Value(1)	259,242.9
Enterprise Value	304,418.6
Less:	
Total Debt	(42,279.0)
Preferred Stock	0.0
Minority Interest	(1,721.0)
Plus:	
Cash and Equivalents	11,631.0
Equity Value	272,049.6
Shares Outstanding	4,326.3
Implied Per Share Value	62.88
Current Price	59.92
Premium/(Discount) to Current Price	4.9%

Figure 13

### Non-Constant Growth Model

For the non-constant growth model I used the following inputs: Dividend at time 0 remained \$1.84. My expected growth rate from year 0 to 1 was 4.40%, years 1 to 2 is

8.10%, and the long run growth rate remained at 4.42%.

$$D1 = \$1.84 * (1 + 4.40\%) = \$1.92$$

$$D2 = \$1.92 * (1 + 8.10\%) = \$2.08$$

$$P2 = \$2.08(1 + 4.42\%) / (8.14\% - 4.42\%) = 2.171936 / 0.0372 = \$58.39$$

$$NPV = 53.48$$

I calculated the NPV using the following calculation:  $NPV = cf_0 = 0, cf_1 = 1.92, cf_2 = (2.08 + 58.39), i = 8.14$  which gives a net present value of the stock of \$53.48. This indicates that Coca-Cola Company's stock is overvalued by \$5.73 per share according to this valuation.

Based on both the constant growth model and the non-constant growth model, Coca-Cola Company's stock is overvalued. Due to the Federal Reserve raising interest rates, this is a volatile period for interest rates. Thus the estimates for CAPM inputs are more uncertain than in the recent past. Because I believe stock markets are generally efficient, I would not expect to see large differences between a stock's value and the market price.

## PepsiCo, Inc.

*Determine the discount rates using the CAPM model*

$$R_{rf} = 4.5\%, R_{PM} = 6.5\%, \text{beta (b)} = 0.57$$

$$R_s = R_{rf} + (R_{PM} * \text{beta}) = 4.5\% + (6.5\% * 0.57) = 8.21\%$$

*Determine the Growth Rate*

Growth Estimates	PEP
Current Qtr.	7.80%
Next Qtr.	7.50%
Current Year	6.80%
Next Year	8.70%
Next 5 Years (per annum)	7.55%
Past 5 Years (per annum)	6.41%

Figure 14, Used past five years - Yahoo 3/23/23

To determine the growth rate I used analyst earnings forecasts from Yahoo! Finance at [finance.yahoo.com](https://finance.yahoo.com). In this situation, the past five-year growth of 6.41% and the forecasted five-year growth of 7.55% are lower than the expected return of 8.21%. I chose to use the past five-year growth to be on the conservative side of estimations. The growth rate I will be using is 6.41%.

*Constant Growth Model*



Open	176.06	Beta (5Y Monthly)	0.54
Bid	175.02 x 800	PE Ratio (TTM)	27.62
Ask	176.45 x 900	EPS (TTM)	6.36
Day's Range	175.02 - 177.22	Earnings Date	Apr 25, 2023
52 Week Range	154.86 - 186.84	Forward Dividend & Yield	4.60 (2.59%)
Volume	4,655,692	Ex-Dividend Date	Mar 02, 2023
Avg. Volume	4,750,746	1y Target Est	190.22

Figure 15

I used the most recent annual dividend of \$4.60 as my D0. Applying the constant growth model yields a valuation of:

$$P0 = (D0(1 + g))/(rs - g) = (4.60(1 + 6.41\%)) / (8.21\% - 6.41\%) = \$271.94$$

As of the market close on 3/23/2023, the stock price was \$175.65, and I computed a value of \$271.94, so according to this valuation method, the stock is undervalued by \$99.91 per share. If we were to use an average of the past five years and next five years growth rates, we would also see that the stock is undervalued. The growth rate in this scenario is 6.98%.

$$P0 = (D0(1 + g))/(rs - g) = (4.60(1 + 6.98\%)) / (8.21\% - 6.98\%) = \$400.09$$

Using the average growth rate, the stock is undervalued by \$228.06 per share. Neither valuation is in line with the Capital IQ analysis of the present value of equity as shown in Figure 16 below.

Present Value of Equity at 03/23/2023		
PV of 2023 Free Cash Flow Stub(1)		5,953.1
PV of 2024-2027 Free Cash Flows(1)		311,481
PV of Terminal Value(1)		252,922.7
Enterprise Value		<u>290,024.0</u>
Less:		
	Total Debt	(41,487.0)
	Preferred Stock	0.0
	Minority Interest	(124.0)
Plus:		
	Cash and Equivalents	<u>5,348.0</u>
Equity Value		<u><u>253,761.0</u></u>
Shares Outstanding		1,377.3
Implied Per Share Value		184.24
Current Price		175.65
Premium/(Discount) to Current Price		4.9%

Figure 16

### Non-Constant Growth Model

For the non-constant growth model I used the following inputs: Dividend at time 0 remained \$4.60. My expected growth rate from year 0 to 1 was 6.80%, years 1 to 2 is 8.70%, and the long run growth rate remained at 6.41%.

$$D1 = \$4.60 * (1 + 6.80\%) = \$4.91$$

$$D2 = \$4.91 * (1 + 8.70\%) = \$5.34$$

$$P2 = \$5.34(1 + 6.41\%) / (8.21\% - 6.41\%) = 5.682294 / 0.018 = \$315.68$$

$$NPV = 670.70$$

I calculated the NPV using the following calculation:  $NPV = cf_0 = 0$ ,  $cf_1 = 4.91$ ,  $cf_2 = (5.34 + 315.68)$ ,  $i = 8.21$  which gives a net present value of the stock of \$670.70. This indicates that PepsiCo, Inc.'s stock is undervalued by \$143.65 per share according to this valuation.

Based on both the constant growth model and the non-constant growth model, Scott's Miracle-Gro's stock is undervalued. Because I believe stock markets are generally efficient, I would not expect to see such large differences between a stock's value and

the market price. That leads me to believe there is a problem with the estimated growth rates. As result I do not have confidence in these models.

## WEIGHTED AVERAGE COST OF CAPITAL

### Coca-Cola Company

To determine the weighted average cost of capital (WACC) for Coca-Cola Company I used data from the financial statements analyzed by Capital IQ as shown in Figure 17. The WACC is the overall return the firm must earn on its existing assets to maintain the value of its stock.

WACC	
Market Risk Premium (Rm - Rf)	7.3%
Multiplied by: KO Bottom-Up Beta	0.580
Adjusted Market Risk Premium	4.2%
Add: Risk-Free Rate of Return (Rf)(1)	4.3%
Add: Size Premium	0.0%
<b>Cost of Equity</b>	<b>8.5%</b>
Multiplied by: KO E/(D+P+E)	86.0%
Cost of Equity Portion	7.3%
KO Cost of Debt (Rd) - Average of Last 5 Issued Bonds	3.5%
Tax Rate (5 Year Average)	19.5%
<b>After-Tax Cost of Debt</b>	<b>2.8%</b>
Multiplied by: KO D/(D+P+E)	14.0%
Cost of Debt Portion	0.4%
<b>KO Cost of Preferred (Rp)</b>	<b>0.0%</b>
Multiplied by: KO P/(D+P+E)	0.0%
Cost of Preferred Portion	0.0%
<b>WACC</b>	<b>7.7%</b>

Figure 17

To calculate the WACC one needs to know the cost of debt, cost of equity, yield to maturity on debt, tax rate, and the required return on stock. The cost of debt given in Figure 17 is 2.8% and when converted to market value this yields 14.0%. The cost of equity given in Figure 17 is 8.5% and when converted to market value this yields 86.0%. The yield to maturity used in the WACC calculation is 3.5% which was produced using the average of the coupons of the most recent five issued bonds. The tax rate used is 19.5%, which is the 5-year average. Lastly, the required return on the stock was calculated using the Capital Asset Pricing Model. The market risk premium, 7.3%, was multiplied by the levered beta, 0.58, then added to the risk-free rate of 4.3%. When calculated using all these values, the WACC is equal to 7.7%. This means for Coca-Cola Company to continue to satisfy investors, they need a return of at least 7.7%.

### PepsiCo, Inc.

To determine the weighted average cost of capital (WACC) for PepsiCo, Inc. I used data from the financial statements analyzed by Capital IQ as shown in Figure 18.

WACC	
Market Risk Premium (Rm - Rf)	7.30%
Multiplied by: PEP Bottom-Up Beta	0.713
Adjusted Market Risk Premium	5.2%
Add: Risk-Free Rate of Return (Rf)(1)	4.3%
Add: Size Premium	0.0%
<b>Cost of Equity</b>	<b>9.5%</b>
Multiplied by: PEP E/(D+P+E)	85.4%
Cost of Equity Portion	8.1%
PEP Cost of Debt (Rd) - Average of Last 5 Issued Bonds	4.5%
Tax Rate (5 Year Average)	20.0%
<b>After-Tax Cost of Debt</b>	<b>3.5%</b>
Multiplied by: PEP D/(D+P+E)	14.6%
Cost of Debt Portion	0.5%
<b>PEP Cost of Preferred (Rp)</b>	<b>0.0%</b>
Multiplied by: PEP P/(D+P+E)	0.0%
Cost of Preferred Portion	0.0%
<b>WACC</b>	<b>8.6%</b>

Figure 18

The cost of debt given in Figure 18 is 3.6% and when converted to market value this yields 14.6%. The cost of equity given in Figure 18 is 9.5% and when converted to market value this yields 85.4%. The yield to maturity used in the WACC calculation is 4.5% which was produced using the average of the coupons of the most recent five issued bonds. The tax rate used is 20.0%, which is the 5-year average. Lastly, the required return on the stock was calculated using the Capital Asset Pricing Model. The market risk premium, 7.3%, was multiplied by the levered beta, 0.713, then added to the risk-free rate of 4.3%. When calculated using all these values, the WACC is equal to 8.6%. This means for PepsiCo, Inc. to continue to satisfy investors, they need a return of at least 8.6%.

According to the risk and return analysis, financial analysis, ratio analysis, and stock valuations Coca-Cola Company holds a more accurately valued stock and is more financially stable than PepsiCo, Inc. Coca-Cola Company has a higher return on assets, return on equity, and return on capital. Overall, I think both Coca-Cola Company and PepsiCo, Inc. are healthy, growing companies. The WACC of 7.7% means Coca-Cola Company's cost of making an additional \$1 is \$0.07. The WACC of 8.6% means PepsiCo, Inc.'s cost of making an additional \$1 is \$0.09. I would say these are relatively strong WACCs and if they take this into consideration with their capital projects discussed in the beginning they will both continue to grow. According to the constant growth model, Coca-Cola Company's stock is overvalued by \$7.56 per share, whereas PepsiCo, Inc.'s stock is undervalued by \$99.91 per share. Though PepsiCo, Inc. tracks marginally better with the S&P 500, Coca-Cola Company tracks better with all three indexes when looked at simultaneously. Though Coca-Cola Company has lower revenues than PepsiCo, Inc. they have higher net income showing a better balance of revenues to expenses. Overall, Financial Analysis based on Annual 10K reports from 2017-2022 of Coca-Cola Company and PepsiCo, Inc. shows Coca-Cola Company holds a more accurately valued stock and is more financially stable than PepsiCo, Inc.

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# TRAVEL ABROAD AND ITS EFFECT ON COLLEGE STUDENTS' EATING HABITS AND FAST-FOOD CHOICE

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STEPHANIE WOODS

In 2019, the United States spent 5 billion dollars on food marketing and advertising (Rudd Center, 2021). On the other hand, countries that spend much less on consumer-related food marketing reflect a much lower obesity rate than the U.S. (World Population Review, 2022), which is no surprise. Based on different cultural traditions and norms, other countries eat less yet more fulfilling food than United States consumers. Travel to countries outside of the United States can heavily impact the awareness of food intake. As a result of increased travel experience to Spain and Portugal, students have the chance to experience a firsthand change in their habits and food choice selection which causes a change in their diet upon return from their travel abroad. This awareness can lead to a change in habits, particularly within the college student age group. Analyzing the habits of college students pre- and post-travel abroad will help us better understand the food epidemic in the United States and the impact of travel abroad on this subject.

To complete this research, the author conducted qualitative research by surveying 45 participants' perceptions of fast-food chains outside the United States. This sample went on the Richards College of Business spring study abroad program to Spain and Portugal. The data collected was only from students at the University of West Georgia. We collected 28 responses from students who traveled and concluded that fast food options easily influence students in their area.

*Key words: food marketing, eating habits, food choices, healthy eating, college students, Spain, Portugal*

## INTRODUCTION

In 2019, the United States spent 5 billion dollars on food marketing and advertising (Rudd Center, 2021). Eating in the United States has become something we do mainly at our



convenience, whether it be drive-throughs, microwaved meals, or takeout. On the other hand, based on cultural differences, our Spanish and Portuguese counterparts find the time to enjoy the meals they eat and the company of those with whom they eat (Ultreya Tours, 2021). Convenience means little to nothing to them as they carve specific time out of their days, including a one to three-hour lunch, or “siesta,” breaks during the day to go home, eat, and be with family and friends.

Over the past few decades, Americans’ eating habits and food choices, specifically for college students, have become worse due to the limited availability of healthy alternatives, options, and time (Pew Research Center, 2016). As a college student, my interest in this topic sparked due to drastically changing my eating habits from eating meat to going vegan and seeing how it affected my body. During the height of the COVID-19 pandemic, millions of people across the globe were patiently waiting in their homes, awaiting a possible cure or end to the confinement of quarantine. Because of the increase in time in my day, I could take more time to think about what I would eat and change my diet. From being vegan, I experienced drastic changes in energy, visible weight loss, brighter skin, and an increased sense of health. Due to the wide experiences of post-quarantine time constraints, I am no longer a raw vegan; however, through continuous research, evaluation of options, and cultural experiences, I am now aware of the many options available to me that would be healthier besides fast food and highly valued convenience foods.

Recently, my continued interest in this topic peaked during my travel abroad to Rome, Florence, and Milan, Italy, and seeing the many healthier, cheaper options available to everyone. Even though there are fast food markets in the more popular cities such as Rome, most Italians prefer to go to a local pizzeria or mom-and-pop shop to grab a meal instead of any fast-food choice. In the Spring of 2022, while visiting Rome with the study abroad program of Richards College of Business, we had the chance to visit the Rome Business School. Right in the heart of the city, we were able to talk with students from Italy and other European countries. Knowing I was pursuing this research, I began to ask one of the students their opinion on American fast food and whether or not they saw this as a worthwhile option compared to the traditional Italian street or fast food, sit-down restaurants, or home-cooked meals. Though the students I asked raved about American fast-food chains like Chipotle and Starbucks, she began to say the quality and price of the food were not worth it compared to the food she could get from the local shops or even cook at home. We didn’t even touch how much more nutrient-dense food is compared to the fast-food option. From this conversation, I began to wonder how my classmates perceived this change in food choice within the foreign country of travel. Many of them seemed like they adapted quite well to the limited availability of Americanized fast-food chains; on the other hand, some of the students actively sought a McDonald’s to have something that “tastes like home.”

As previously stated, my interest in this topic sparked due to drastically changing my eating habits from eating meat to being a raw vegan and seeing how it affected my body. After assessing my old eating habits, I wanted to research how this negatively affected our perceptions of availability, habits, and food choice regarding fast food and to whom this was mainly happening. Since the fast-food industry in the United States has made over 1 billion dollars in the past several years, I am curious to know how the food marketing industry has affected the health of Americans based on their travel experiences.

After completing my study abroad, I wanted to find a way to keep up with the healthy options presented to me while abroad. I was even more curious to know how my classmates were adjusting to life in the States and whether their eating habits and food choices stayed the same as pre-travel or if they were inspired to change theirs. This curiosity prompted my current research on how fast food affects college students’ eating habits and whether or not these change due to travel.

To complete this thesis project, I went with my classmates at the Richards College of Business at the University of West Georgia on their spring study abroad trip to Spain and Portugal. Here we explored the world of tapas and the beautiful mix of European cuisines. While on the trip, I took note of the bountiful American fast-food chains we saw

there. This list includes Burger King, McDonalds, KFC, Taco Bell, Popeye's, Dominoes, and even Little Caesars. I was extremely intrigued by the number of fast-food chains they had in these cities, and I was even open to trying them myself. However, I did not let this take away from my thesis research.

I hope to help American college students realize the vast number of options when it comes to food and the importance of choosing those healthier alternatives. Fast food has taken over the food industry in the United States as more people prefer to hop in a quick line rather than sit down and either enjoy a home-cooked meal or even be waited on. The ongoing growth of the fast-food industry in the United States allows college students to make negative food choices and develop negative eating habits. In this project, I hope to prove that travel experiences such as a study abroad opportunity can positively affect a college student's food choices and eating habits upon return from their international program.

## LITERATURE REVIEW

While reviewing the literature, studies relating to how fast food has affected the eating habits of college students stood out. In fact, there are numerous studies on this topic, yet few studies on the relevance of traveling abroad to changing those perceptions of fast-food options. The first literature review was a study completed in 2013 by Susan Stockton and David Baker, where they gauged the perceptions of college students' views and their intake of fast food in the Midwestern region. This region included two community colleges in Missouri and the University of Central Missouri. In this study, Stockton and Baker successfully surveyed nearly 500 students and asked about their usual orders when they visit fast food restaurants, the timing of visits, frequency of visits, drink choices, and perception of health. From this study, the main takeaways are that students' fast food intake habits revolve highly around the convenience of fast food. The survey results found that 218/499 students (43.70%) visited fast food restaurants at dinner time (Stockton and Baker 2013). It can be gathered that most students decided not to go during lunchtime as they were still on campus taking classes, in meetings, and more. The consistent ease of fast-food drive-through lines and low wait times alleviate students' time constraints after classes and before bed. This also varies student by student as some have heavier workloads than others, leaving little to no time to cook or prepare healthier meals. Not only were students mostly visiting during dinner time, but 334 out of 499 students surveyed also stated they visited fast food restaurants at least 1-2 times per week (Stockton and Baker 2013).

Furthermore, this study points out the students' perception of health with the fast-food items on the menu and the impact they had on students' choices. The researchers asked students which fast food items they would regularly get on the menu. These items came from the following list: bottled water, tap water, diet soda, regular soda, potato purchase (baked potato, fries, loaded potato, and more.), hamburger purchase, dessert purchase, lettuce salad with vinegar, baked potato with salsa, chili, yogurt, scrambled eggs, fish sandwich with cheese, hamburger with condiments, cheeseburger, and chicken sandwich with mayo (Stockton and Baker, 2013). From all the above options, students were asked to rate how often they get these items on a Likert scale ranging from "never" to "always." The researchers noticed that though 161 out of 499 (32.20%) frequently bought a hamburger, 305 out of 499 (61.10%) rated this item to be one of the most harmful on the menu (Stockton and Baker, 2013). From this study, these takeaways include that the students seemed extremely perceptive; however, this study does not touch on the implications of travel regarding food. Because of this, one of the main research questions for this thesis relates to how students view fast food before and after international travel. This study does a great job of identifying the habits of college students' fast-food intake and choices, but it does not specify whether or not these habits can be changed. We saw that students rated the hamburger as the most harmful on the menu, yet half regularly chose it as their main dinner item. Here there are clear gaps in education and

exposure to new foods, which could be a limiting factor for their choices. Based on the results from this survey, it seems the availability of fast food in the area constantly affects students' food choices and intake habits. Students actively know what they are doing, but options are limited, and so is time.

Overall, this first study was very insightful when surveying college students predominantly between the ages of 18-24 and seeing their perceptions, intake, and choices regarding fast food in their area. However, this study did not touch on travel and the relation of culture to food choice; thus, the following research will provide more insight into the impact of travel on college students. As a result, this study will continue to aid and support the research of recognizing students eating choices, habits, and intake of fast-food pre-travel on a study abroad trip.

The next study highlights the importance of food as it relates to culture and travel. Founded in 1986 in Rome, Italy, the Slow Food movement began spreading educational awareness concerning food, specifically as it relates to culture (Lendvai et al., 2014). The slow food movement started when McDonald's finally moved into the international Italian market. Some would have celebrated this grand opening, but more importantly, locals were especially frustrated with the desire of the fast-food company to open this McDonald's right near the famous tourist destination of the Spanish Steps (Lendvai et al., 2014). Italian natives felt that bringing an American fast-food chain to this culturally significant area would not only modernize but westernize the area by taking away from the authentic Italian culture and cuisine already offered (Lendvai et al., 2014). Through many efforts, Italians tried their best to protest the opening of McDonald's in this area; however, despite their efforts, the popular American-owned fast-food establishment still opened against their wishes. Ever since this momentous occasion, the Slow Food Movement has started to rise and spread across the globe.

The Slow Food Movement promotes clean, healthy eating of local cuisines. Since its spread, this cuisine has been specific to whatever area of the world people visit, such as Europe, Africa, and even Asia. The movement's goal is for people not to lose their taste of authentic culture due to the rapid takeover of the fast-food industry in different and developing countries (Lendvai et al., 2014). Though the movement started in 1986, it is still gaining popularity, but with the current awakening surrounding consumer concerns in the food industry around the world, it is now more prevalent than ever. This study helped to bring awareness to the cultural importance food has in countries all around the world. It helped prove that people still value those meals cooked at home with family or prepared by themselves. Though fast food is becoming popular due to convenience and accessibility, it is not always the way to go for some people. Though this study was extremely insightful on the impact and start of the Slow Food Movement, it did not touch much on how this movement has affected the college student population. Hopefully, the following research will provide more insight into the Slow Food Movement and college students.

Next, the authors highlight the implications of slow food versus fast food for teenagers across the globe. Lendvai, Gal, and Panyor (2014) started a survey asking about what teenagers already know about fast food and their habits when it comes to food choices.

The study surveyed 465 teenagers from all around the globe, capturing the international perspective of how fast food has taken over. The 465 participants' demographics were 57.7% male and 43.3% female (Lendvai et al., 2014). The researchers started off by asking simple questions such as which fast-food restaurants were most popular in their area, whom they would visit with, how often they would visit, and regular food and drink choices (Lendvai et al., 2014). This study helped to prove that males are more impacted by the negative health effects of fast food and are highly impressionable when it comes to deciding where to eat because the majority of fast-food consumers are male (Lendvai et al., 2014). Next, the authors found that most teenagers used these fast-food restaurants as meet-up spots to convene and hang out with friends. It seems that these restaurants are more than a place to eat to them as they hold a greater meaning of freedom and the ability to be away from home with their friends.

At the beginning of the study, Lendvai et al. (2014) asked about their previous knowl-

edge from school about healthy nutrition and food. A shocking 80% of participants say they have learned about health and nutrition concerning food. Purposefully asking this question, the researchers were curious about how their knowledge of healthy foods and nutrition can affect their eating choices and habits in fast food decision-making. It can be perceived as common knowledge that there is more to fast food menus than burgers and fries. The last question asked by researchers was about their typical fast-food order. Though 80% stated that they learned about making healthier choices, especially regarding food, 78.5% of those students still would choose a hamburger with French fries and a sugary beverage as their meal option (Lendvai et al. 2014).

Overall, this study painted the picture for global comparison. With the rise of the slow food movement around the world, it was interesting to see if this played a part in the lives of teenagers or more health-conscious individuals. We see similar points in this study as compared to the last one that though students might know the health effects associated with that item, they would still choose those foods regardless in order to satisfy a temporary craving and need. The following research will fill in the gap of how other cultures' food options will help play a role in how we see our own food items and the health ratings that come along with them. The next study did a good job of outlining demographics and recognizing who was more health-conscious about their eating habits and who was not. In this next study, Racine et al. (2022) collected data from 6 semesters at the University of North Carolina at Charlotte to observe the food health score of fast-food dining options on campus. This research used the data from students who signed up for at least one meal plan at any point in the semester during their tenure at the university and considered demographics such as grade point average, economic status and use of financial aid, gender/sex, and whether they were an international student.

This study gave each food item on campus a "Fast Food Health Score" (FFHS), which ranges from 0-6, with 0 being poor and six being quite healthy. To paint a better picture, on their campus, the 16 oz. Monster Energy Drink had a score of 0, while the Peet's Turkey Sandwich on Wheat Bread had a score of 6. On the University of North Carolina at Charlotte campus, these researchers gathered data from over 35,000 students. They could analyze all the food transactions through their student IDs, whether this is a meal plan or even using their Declining Balance Dollars (DBD) to make food purchases at cafes or restaurants. From the 35,449 students surveyed, the average FFHS was between 2-3. Despite the lowest possible score being zero, the range of 2-3 is still a very low score even though students were exposed to other healthier options.

Furthermore, this study took a deep dive into the demographics of decision-making. As previously mentioned, because everything was linked to the student ID system, this study was able to tell us the income status, identifying race, gender, country of origin, and more for over 35,000 students. To start, they could identify which gender had the highest FFHS. The average FFHS between both genders was 2.85, with females taking the lead at a score of 2.87. This is what the researchers predicted as studies have shown and proven that females are usually more concerned with food's health implications than males. However, 2.87 is still low on a scale of 0-6. Next, we found that many of the students identified as White, but the second majority were Black/African American students. Around 33.1% of students in this study were low-income, so it was useful to see how they spent their DBD on campus at fast-food restaurants or even in the dining halls. There was an incredibly low number of international students in this study, but diving deeper into the international student population could help further research on how culture plays a role in the food choices we make.

Overall, this study helped play an instrumental role in providing demographics to prove that females are more health-conscious than males in the college environment. It was incredibly useful to see how the students used their DBD on campus even though there was almost an unlimited availability of options to students. Though better opportunities and chances to make better choices were presented to them, they only went with these choices sometimes. My research will help fill in the gaps of how culture will play a role in the choices students make regarding food as it relates to cultural experiences. It

would have been interesting to see what the menu options were like in the dining halls and if they ever had any meals or cuisines centered around culture. Some schools do international fests where they have food from different cultures, and it would be nice to see how many students show up to that as opposed to a regular night in the dining hall.

Overall, the three studies provided great insight into what has already been done regarding college students and their decisions when it comes to fast food. My research will provide much more insight into fast-food decision-making and habits around food as it relates to cultural awareness and travel experiences. In the following sections, I will discuss the research questions and hypotheses.

## RESEARCH QUESTIONS

I have three research questions:

1. Do college students choose fast-food options because of the convenience of fast-food options in their area?
2. Does travelling abroad affect the eating habits and food choice of college students once they have returned to the states?
3. Are the students that more adapt to travel experiences more likely to be impacted by the cultural food experience they had on their trip?

## HYPOTHESES

- **H1:** The convenience of fast-food options in the students' area has a significant impact on their food choices.
- **H2:** Traveling abroad experiences will have a significant impact on students' food choice: they will less likely eat fast food after their travel abroad.
- **H3:** Students who are willing to adapt to foreign cuisines will more likely change their eating habits when they return home than students who are unwilling to adapt.

After the study abroad trip, college students have been able to experience food from a different culture, opening their eyes and horizons to different food options post-travel. Their travel has negatively impacted their perception of fast food, and they will likely see a difference in their eating habits relating to fast food upon return from travel. Secondly, travel has not positively impacted the college students' experience relating to their perception of fast food, food choices, and eating habits. There has not been much change in how they eat and their habits when purchasing fast food. Their travel experiences have positively impacted their perception of fast food, and they are likely not to see a change in habits upon return from travel abroad.

## METHOD & RESEARCH DESIGN

To conduct this research, we collected quantitative data using two surveys on Qualtrics, and surveyed 46 students about their experience and views on fast food before and after their trip abroad.

I noticed that all the literature reviewed provided survey results, but this is due to the scale of research and the ability to sort out information quicker. In the survey, it considered demographic questions about gender and travel experiences outside the United States. The survey questions asked more about their experiences with the fast-food industry inside and outside the United States. Knowing if students have had access to or visited countries outside of their native country and had a chance to get a feel for the food of another culture besides their own would be very helpful to see if it truly impacted their decision to this day.

## DATA COLLECTION

The sample collected consisted of undergraduate students at Richards College of Business of UWG who were Spring 2023 participants of study abroad programs in Barcelona, Spain, and Lisbon, Portugal. This program is ten days long, allowing students to learn and see the culture they are visiting. The itinerary includes eating at local restaurants, visiting local businesses, and even some authentic cooking classes. This population size was around 46 students, including myself.

One survey was sent out four weeks after returning home for data collection. This survey included experiences with fast food before and after travel, cultural adaptability, travel preferences and consistency, previously mentioned demographics, and previous and current eating habits. The hope was to gauge how often students visit fast food chains and view their options compared to time constraints and whether or not they evaluate the healthier alternatives. These healthier alternatives could be menu items such as fruit or a salad, smaller portions, less frequent visits, or even cooking at home. Subsequently, the goal was to find that after travel, students consider more options related to food after their travel experiences. Maybe even the different cuisines have inspired them to make simpler meals at home instead of choosing fast food.

Additionally, this survey touched on the implications of the slow food movement, such as cooking at home or how likely they are to eat out on a busy or slow day. After data collection finished, we then analyzed the survey results. We saw if we could find a correlation between how students become impacted by travel and how it affects their eating habits.

Because of the timing of the survey and results, there might be a recency effect associated with the study. This effect means that things will change for the first month or two, but slowly their habits will start to go back to normal or how they were pre-trip. However, that is only to speak for some students as some might truly become impacted because of the travel. Additionally, due to the small, limited sample size, we did not touch on demographics such as race, age, income, and classification.

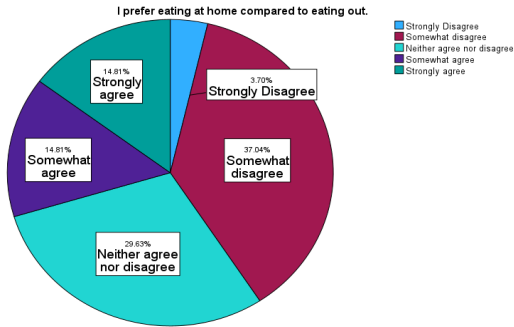
I look forward to researching this topic as it is not heavily covered. Due to the lack of research on how travel relates to fast-food choices and eating habits, this thesis will be one of the first to provide that information to researchers. The college student population is impressionable enough to help change how they view eating in their everyday life. The goal is to see that travel has positively impacted their lives and choices when it comes to fast food. Upon return from their travel, hopefully, students to see options besides fast-food as other cultures can embrace this lifestyle. Because of how rapidly the fast food industry has taken over America, people have to be smarter about their food choices if their goal is to live a healthier lifestyle.

## RESULTS

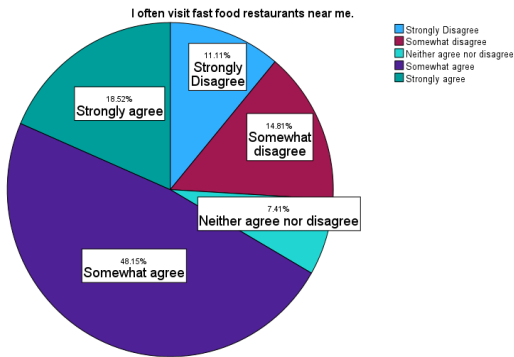
### Please select your gender: - Selected Choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	10	35.7	35.7	35.7
	Female	18	64.3	64.3	100.0
	Total	28	100.0	100.0	

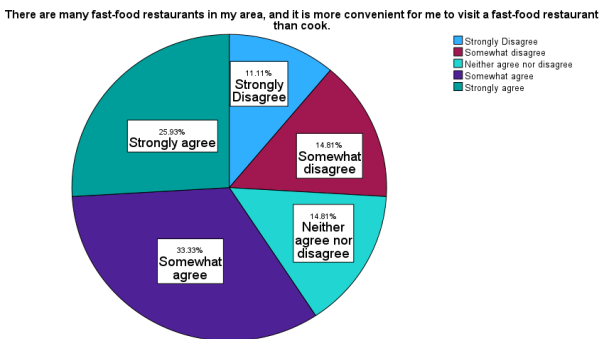
In my survey, I collected 28 responses from all students who went on the Spring break trip. This includes both the Management and Marketing trip. Of those responses, 64% were female and 36% were male. I asked for gender to see if there was a correlation between fast-food eating habits and food choices in the survey between females and males.



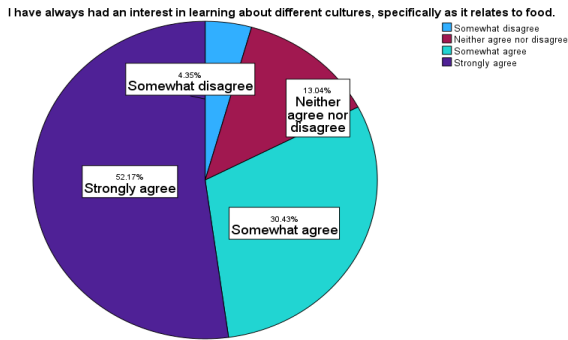
To my surprise, 40.74% of students did not like eating or cooking at home. Being that the majority of the survey participants were female, I was actually surprised at this. I asked this question to see if students preferred to cook, meal prep, and put something together themselves as opposed to a fast-food restaurant.



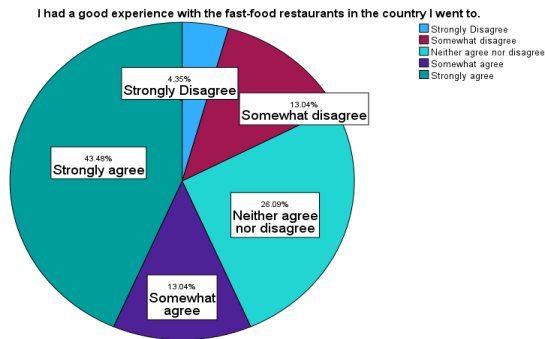
An overwhelming 66.67% of students stated they visit fast food restaurants near them often. We can attribute this to the convenience of students accessing fast food options in their area. We reached this conclusion because the next question surveyed whether the fast-food options in their area easily influenced students. This question is not pictured in the graphs; however, the result was that 40.74% of students stated that fast food options easily influenced them in their area.



In an even further analysis, 59.26% of participants stated it was much more convenient to visit a fast-food restaurant than to cook regularly. Being a college student in a constantly fast-paced environment can lead to little time to prepare meals. Many resort to fast food since it is probably the easier option. This study does not even touch on whether or not it is the less expensive option either; however, this could be a significant reason why students choose fast food instead of getting groceries or cooking.



When asking students about their preferences for learning about culture aside from their own, 83.14% stated they were interested in learning about international foods and culture. This result was great news because it showed that I had a sample interested in learning about the culture around them.



In this survey question, we asked whether or not students had visited the fast-food options in Spain and Portugal and whether or not they had a good experience with them. The results of this question stated that 56.52% of students tried and liked the fast-food options outside of the United States. An important thing to note about these fast-food restaurants is the difference in menu options. Since the restaurants are tailored to different markets in each country, the menu vastly differed at restaurants like Burger King and McDonald's. They even have vegetarian and vegan options on their menu instead of these same fast-food chains in the United States.

I ran a set of independent samples t-tests to examine if any of the variables showed significant gender differences. Some of the numerical results showed expected results such as:

- Females gave a higher score on “I prefer eating at home compared to eating out,” and
- Males gave a higher score on “I often visit fast food restaurants near me.”



However, *none* of the variables, including the two mentioned above, showed statistically significant results. This is very likely an indication of the small sample sizes of both sub-samples rather than the true absence of gender segments.

Next, I ran regression analyses. Here, I would see if there was any relation of any of the dependent variables to the independent variables in the survey.

The first dependent variable was “I often visit fast food restaurants near me.” In this regression, the only significant variable was found to be “My food choices are easily influenced by the fast-food options.” The Adjusted R2 value was 0.303 which indicates that we have successfully explained 30.3% of the variation in the dependent variable, “I often visit fast food restaurants near me.” The ANOVA shows that there is a linear relationship between these variables, significant at the 0.004 level.

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.125	1	13.125	10.563	.004 <sup>b</sup>
	Residual	26.092	21	1.242		
	Total	39.217	22			

a. Dependent Variable: I often visit fast food restaurants near me.

b. Predictors: (Constant), My food choices are easily influenced by the fast-food options.

As seen in the following table, the regression shows a significant and strong influence of “My food choices are easily influenced by the fast-food options” on the dependent variable, “I often visit fast-food restaurants near me.”

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.469	.623		2.357	.028
	My food choices are easily influenced by the fast-food options.	.655	.201	.579	3.250	.004

a. Dependent Variable: I often visit fast food restaurants near me.

The next regression used the dependent variable, “I prefer eating at home compared to eating out.” In this regression, the only significant variable was found to be “There are many fast-food options in my area, and it is more convenient for me to visit a fast-food restaurant than cook.” The Adjusted R2 value was 0.311 which indicates that we have successfully explained 31.1% of the variation in the dependent variable, “I prefer eating at home compared to eating out.” The ANOVA shows that there is a linear relationship between these variables, significant at the 0.003 level.

ANOVA <sup>a</sup>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.583	1	9.583	10.928	.003 <sup>b</sup>
	Residual	18.417	21	.877		
	Total	28.000	22			

a. Dependent Variable: I prefer eating at home compared to eating out.

b. Predictors: (Constant), There are many fast-food restaurants in my area, and it is more convenient for me to visit a fast-food restaurant than cook.

As seen in the following table, the regression shows a significant and strong negative influence of “There are many fast-food options in my area, and it is more convenient

for me to visit a fast-food restaurant than cook” on the dependent variable, “I prefer eating at home compared to eating out.” The negative coefficient makes sense because if respondents give a higher rating on “... it is more convenient for me to visit a fast-food restaurant than cook,” they are less likely to say that they “...prefer eating at home compared to eating out.”

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.667	.541		8.631	<.001
	There are many fast-food restaurants in my area, and it is more convenient for me to visit a fast-food restaurant than cook.	-.479	.145	-.585	-3.306	.003

a. Dependent Variable: I prefer eating at home compared to eating out.

## CONCLUSION

To conclude, I had the privilege of researching the beautiful cultures of Spain and Portugal. I had the opportunity to visit these countries, try all these fantastic different foods, converse with locals, and talk to my classmates about their experiences as they related to food and travel.

As a result of my research, I hoped to prove that college students will experience a positive change in how they view the fast-food industry as it relates to health based on their travel experiences. Their recent travel has caused them to think more about what they eat daily instead of going to fast food as an accessible resort.

From the data presented, we did not find strong relationships between many variables because of the small sample size from the trip. However, the data from which we could draw correlations proved solid and practical. From the data presented, we can conclude that students branched out and tried different foods in the countries they visited; however, these foods and experiences were not strong enough to change eating habits at home when they returned. Many of them have resorted to frequently eating fast food though they enjoyed the experience of trying different foods on the trip.

I hope to do a study similar to this with a much larger sample size to see if there is a stronger correlation between travel and healthy eating. This research is still important in helping movements like the Slow Food Movement spread to other countries and continents worldwide. I hope this research can help other professionals determine how to structure their study as well.

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HONORS COLLEGE