REDEFINING DISPROPORTIONATE ARREST RATES: AN EXPLORATORY QUASI-EXPERIMENT THAT REASSESSES THE ROLE OF SKIN TONE

by

Soren Geoffrey Brockdorf

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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APPROVED BY:

Jade Pumphrey, PhD, MFS, MSCJ, Committee Chair

Christopher Sharp, PhD, aPHR, Committee Member

ABSTRACT

The *New York Times* reported that Black Lives Matter was the third most-read subject of 2020. These articles brought to the forefront the question of disparity in arrest rates for darker-skinned people. Questioning arrest disparity is understandable because virtually everything known about disproportionate arrest rates has been a guess, and virtually all prior research on disproportionate arrest rates is questionable because of improper benchmarking (the denominator effect). Current research has highlighted the need to switch from demographic data to skin tone data and start over on disproportionate arrest rate research; therefore, this study explored the relationship between skin tone and disproportionate arrest rates. This study also sought to determine which of the three theories surrounding disproportionate arrests is most predictive of disproportionate rates. The current theories are that disproportionate arrests increase as skin tone gets darker (stereotype threat theory), disproportionate rates are different for Black and Brown people (self-categorization theory), or disproportionate rates apply equally across all darker skin colors (social dominance theory). This study used a quantitative exploratory quasi-experimental design using linear spline regression to analyze arrest rates in Alachua County, Florida, before and after the county's mandate to reduce arrests as much as possible during the COVID-19 pandemic to protect the prison population. The study was exploratory as no previous study has used skin tone analysis to examine arrest disparity. The findings of this study redefines the understanding of the existence and nature of disparities in arrest rates and offer a solid foundation for additional studies about the relationship between disproportionate arrest rates and skin color.

Keywords: Stereotype threat theory, self-categorization theory, social dominance theory, denominator effect, disproportionate arrest rates, skin tone, suspicion

REDEFINING DISPROPORTIONATE ARREST RATES: AN EXPLORATORY QUASI-EXPERIMENT THAT REASSESSES THE ROLE OF SKIN COLOR

DEDICATION

This dissertation is dedicated to Vernon Townes Grizzard III (3.17.1944–10.6.2011). I am filled with profound gratitude and admiration as I pen this dedication, acknowledging the immeasurable influence you have had on my intellectual and moral journey. Little did I anticipate that my fervent objections to the notion of injustice would lead me down a path strikingly similar to the one you traversed. Your presence in my formative years has left an indelible mark, propelling me toward a deeper understanding of the struggle for equality.

Vernon T. Grizzard, you bore witness to the harrowing events of August 27, 1960, forever etching in your memory the horrific chapter known as “Ax Handle Saturday.” On that fateful day, a seething mob of 200 White individuals mercilessly beat Black protesters who sought refuge within the sanctity of a church. The brutality and injustice of that moment shook the very foundation of your conscience, igniting a passion within you to fight against such pervasive darkness.

As fate would have it, you stood as an eyewitness to the aftermath of a heinous act of lynching. The weight of that grisly sight imprinted upon your soul, unveiling the deeply entrenched racism that continues to plague our society. Compounded by the incendiary revelation from your pastor that no Black family would ever be welcomed in your church, the stark reality of inequality became an undeniable truth, forever driving you to challenge the status quo.

With unwavering resolve, you found yourself at the center of the historic Chicago 7 trial, defended by none other than the esteemed William Kunstler. In that crucible of justice, you dared to confront the very forces that perpetuated systemic oppression. Your courageous stance

exemplified your commitment to the cause, an unyielding determination to be a catalyst for change.

In 1982, you fearlessly took legal action against the Port St. Joe paper company, which callously maintained segregated facilities in the form of separate bathrooms and water fountains for Black and White individuals. Your lawsuit reverberated through the halls of power, demanding that the ideals of equality be upheld in every corner of our society. Through this landmark case, you amplified the voices of those who were silenced, ensuring that their struggle would not be in vain.

It is with immense gratitude that I dedicate this work to you, the man who subtly implanted within me the seeds of inquiry long before I openly contemplated the concept of equality. Your unwavering dedication to the cause of justice has served as an unwavering beacon of inspiration, guiding me through the intricacies of my own intellectual and moral development. Your inexhaustible patience in tackling this pressing issue was exemplified by you.

ACKNOWLEDGMENTS

Completing this doctoral dissertation has been a transformative journey, and I am indebted to numerous individuals who have played pivotal roles in its realization. Among them, one individual stands above all the others, and that is John Wesley Wilkes. His influence, guidance, and unwavering support have been instrumental in shaping the trajectory of my career.

From the moment I met him to the point he stood with me when I received my badge, it was evident that John Wesley Wilkes was not just an ordinary person but an extraordinary Special Agent. His dedication to duty, his unwavering commitment to justice, and his unparalleled expertise ignited a spark within me, propelling me toward a profound interest in pursuing a career in law enforcement.

Amidst my wandering path toward becoming a geologist, John Wesley Wilkes recognized a latent potential within me that I was yet to discover. With astute insight into my core nature, he guided me toward a new direction, one that resonated deeply within me but had remained unknown until then. In his wisdom, he understood that it takes a warrior to recognize another warrior, and he revealed to me that I belonged not among the sheep but among the sheepdogs, the protectors, and the guardians.

John Wesley Wilkes became the catalyst for my transformation, igniting a passion within me to embrace the challenges, responsibilities, and purpose that come with a life dedicated to safeguarding society. His mentorship, guidance, and unwavering belief in my potential propelled me toward pursuing a career that aligned with my true calling.

To John Wesley Wilkes, I express my deepest gratitude and appreciation for the profound impact he has had on my life. His unwavering support, sage counsel, and relentless

encouragement, as well as his belief in my abilities, guidance through the intricacies of the field, and unwavering dedication to my growth, have been invaluable.

This dissertation stands as a testament to the unwavering support and guidance of John Wesley Wilkes, who has shaped the trajectory of my career. His mentorship and belief in my abilities have been a driving force in my pursuit of knowledge and excellence. No other words have shaped my life more than, ‘If you want to be a special agent with the FBI, you first need to be a Certified Public Accountant.’ To him, and to all those who have contributed to my academic and personal growth, I extend my deepest gratitude.

Additionally, I would like to acknowledge my family, friends, and loved ones whose unwavering support, love, and understanding have sustained me throughout this demanding process. Their encouragement, patience, and belief in my abilities have been a constant source of strength and inspiration.

Rhymes With Orange © RWO Studios, Dist. by King Features Syndicate

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LIST OF ABBREVIATIONS

Disproportionality Index (DI)

Officer Lenient Discretion (OLD)

Red-Green-Blue (RGB)

Randomized Controlled Trials (RCT)

Stereotype Threat Theory (STT)

Self-Categorization Theory (SCT)

Social Dominance Theory (SDT)

Bases for Urgent Decisions Under Extreme Circumstances Inventory (BUDECI)

Functional Magnetic Resonance Imaging (fMRI)

Deoxyribonucleic Acid (DNA)

Alachua County Sheriff's Office (ACSO)

Portable Document Format (PDF)

Joint Photographic Experts Group (JPG)

Photoshop Document (PSD)

Information Architecture (IA)

Race-Out-Of-Place (ROOP)

CHAPTER ONE: INTRODUCTION TO THE STUDY

According to *U.S. News & World Report* (2021), the United States has a significant amount of racial inequality, which is reflected in its disproportionate arrest rates (Piquero, 2008; Sugarman et al., 2020). Disproportionate arrest rates are now at the point where one in three U.S. Black men born in 2001 will go to prison (Hinton et al., 2018; The Sentencing Project, 2018). Florida incarcerates almost 1% of its people, one of the highest rates in the U.S. and worldwide (Widra & Herring, 2021; World Population Review, 2022). Black people make up 16% of the population in Florida but constitute 46% of the prison and jail population (Prison Policy Initiative, 2021). Mounting evidence shows that these disparities increase as skin tone becomes darker (Monk, 2019). Prior research points to three categories of reasons for the disparity, but no research has addressed the problem of which category of research best predicts arrest disparity. The problem is that past research was based on racial demographics. The solution to the problem is using the entire spectrum of skin colors in research.

After adjusting for crime type, neighborhoods, crime levels, personal appearances and mannerisms, population distributions, social status, local law enforcement policies, exposure to violence, and parental relationships, skin tone arrest disparities persist (M. E. Campbell et al., 2020; Chamberlain et al., 2021; Schleiden et al., 2020; Ward, 2022). Police contact can have a negative effect on any person, but it is not entirely understood why some groups are more affected than others (Larson, 2000; Massey & Whitley, 2021). General research has shown, however, that Black people face substantially different treatment from law enforcement than White or Brown people due to socialization practices associating darker skin with negative stereotypes (Corra, 2020; Monk, 2021).

Although the multidimensional social construct of race disparities in the criminal justice system has been documented, research is sparse on skin tone disparity (Finkeldey & Demuth, 2021). Stereotype threat theory suggests discriminatory treatment increases as skin tone darkens, but the slope and makeup of the relationship are currently unknown (Barlow & Hickman Barlow, 2002; Finkeldey & Demuth, 2021; Georges-Abeyie, 1989). Georges-Abeyie (1989) stated that people distance themselves from others based on skin color, and the larger the difference in skin color, the larger the emotional distance between them. With the distancing of people, there is less empathy, less of a connection, and worse treatment. Although researchers are just beginning to understand the issues surrounding skin tone and policing, the foundational theory, when considering inequality between groups, is that being darker skinned intensifies disparities (Monk, 2019, 2022).

Research results from Guluma and Saperstein (2022), Hutchison et al. (2018), and Monk (2022) aligned on incorporating the skin tone factor to measure the differences in arrest levels resulting from police contact. Monk (2019) further suggested that research on disproportionate arrest rates should focus on skin tone over dichotomous categorization or self-identification because skin tone is profoundly implicated in biases. However, skin tone is still underutilized in research. COVID-19 created an opportunity to expand the investigation of disproportionate arrest rates in police contact through policy changes in police agencies. On March 11, 2020, the World Health Organization declared COVID-19 a pandemic (Ghebreyesus, 2020). COVID-19 disrupted the world, including Alachua County, Florida, where it led to changes in policing protocols that included maximizing police use of discretion in arrests to reduce the jail population. Across the United States, prisons and jails have reduced their populations to prevent the spread of COVID-19 (Lofaro & McCue, 2020). The present study considered changes in arrest rates across skin

tone groups before and after March 24, 2020, when Alachua County instigated its mandate to lower arrest levels.

Background of the Study

Many Americans are demanding new policies to solve the adverse effects of disproportionate arrest rates. The discussion of policing Black people is a main discussion of U.S. policy (Hunter, 2022). There already exists a large body of research on the existence of disproportionate arrest rates, but there is a gap in the research associating arrest rates and skin tone (Finkeldey & Demuth, 2021; Khan et al., 2021). This gap is of critical importance because disproportionate encounters create fear of law enforcement among dark-skinned communities, which creates hostilities between groups (Schutte et al., 2021).

Cobbina-Dungy (2021) found that 30% of Black people fear the police, of which 92% signified the fear developed from negative contact. Black people are 5 times more likely to be stopped without cause (Laurencin & Walker, 2020). Unarmed Black men are shot 20 times more often than Whites (Gilbert & Ray, 2016; Milner et al., 2016; Radebe, 2021; Trawalter et al., 2020). Among Black adults, 65% have felt targeted by the police because of their race, and 84% felt they were treated worse than other groups and that law enforcement was unjust toward them. This negative police contact also correlates with the social-emotional development of low confidence in local government (Bundy, 2019; Silva et al., 2022). With three million people in jail or prison in the United States, even small biases in police arrests can have enormous repercussions for darker-skinned populations (National Association for the Advancement of Colored People, 2021).

It is important to understand disproportional mass incarceration, the COVID-19 mandate, the disproportionality index (DI), and the grouping of skin tone on disproportional arrest rates

relevant to the present study are not about mass incarceration. The police officer often introduces people to the criminal justice system, but any problem with disproportionality in the prison system is an issue to address with prosecutors and judges. The War on Drugs, the War on Crime, the War on Poverty, the 1994 Violent Crime and Law Enforcement Act, Barack Obama, Eric Holder, Ronald Reagan, lead paint, and the Black "enthusiasm" for punitive law enforcement have each had a place in discussions about mass incarceration, but this study was interested in the role the officer plays. The officer swears an oath to arrest people without skin tone coming into the decision-making process. This study investigated whether skin tone plays a role in that decision-making process. The negative effect of arrest bias is that it creates arrest records for some Black people who would not otherwise have arrest records if they were White; this is unjust because there are negative life consequences for having an arrest record.

The War on Drugs directly impacted arrest rates, as would be expected by major national policy changes. The Anti-Drug Abuse Act of 1986 made 5 grams of crack and 500 grams of powder cocaine carry the same 5-year mandatory minimum sentence. This was not intended to reduce crime but to establish sentencing disparities for Black people (Alapo & Rockefeller, 2019). These massive distortions were brought about and sanctioned by the court system even though it is well-known that drug use is similar between Black and White people (Douglas Pond Cummings & Ramirez, 2022). The War on Crime was not only a mandate from the Reagan policy initiatives, but Black conservatives and Black women activists fought hard for tougher sentencing for violent crime and sexual assaults (Rose, 2022). It is reasonable to assume that these major policy initiatives explain the majority of disproportionate arrest rates, but this study examines the individual interactions at the time of arrest as a potentially important and less-explored aspect of understanding disproportionate arrest rates (Campos, 2018).

Neil and Winship (2019) asserted that virtually everything thought to be known about disproportionate arrest rates is, at best, a logical guess or an approximation due to the faulty and problematic use of benchmarking in disproportionate arrest rate research. They also recommended new techniques toward a clearer understanding of disproportionate police arrests. The present study examined whether darker-skinned people experience different levels of disproportionate arrest rates. This study used a quasi-experimental design to solve the problem of small denominators creating large fractions (i.e., the denominator effect) that is inherent to virtually all prior research on disproportionate arrest rates.

Understanding Skin Color

Skin tone is the key determinant of ethnoracial categorization (Abascal & Baldassarri, 2015). It is strongly associated with educational attainment, earnings, and health and significantly predicts disproportionate arrest rates (Monk, 2022). Even slave data from 1860 accurately predict life expectancy inequality (Reece, 2022). Research has consistently revealed that people with darker skin colors experience more discrimination and negative stereotypes, have lower income levels and a more precariat work life, settle for lower-tiered health care, and achieve lower education levels (Yadon & Ostfeld, 2020). Being darker skinned brings significant disadvantages compared to the lighter-skinned population, but it is also disadvantageous compared to medium-skinned people's experiences (Monk, 2021).

The new field of intergroup inequality provides a way to analyze disproportionate arrest rates. Even though the International Monetary Fund and the World Bank recommend its use, the field is in its infancy (Seguino, 2021). It is known that when groups work more closely together, there is less disparity (Nier et al., 2001), but the unique characteristics that the police associate with darker-skinned groups have not been studied. The darker-skinned group homogeneity thesis

implies that police would likely see Black and Brown people as all one group. However, Hannon (2020) has shown that the brain still tends to see a continuum of skin tone due to the unique way it processes skin tone variations. Considering this, it is unclear if this disparity in disproportionate arrests increases as skin tone darkens, if disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity.

Disproportionate Police Arrest

Police officer bias plays a role in disproportionate arrests, with Black people getting arrested at a rate 10 times higher (Tucker, 2018). According to studies by Fields (2019) and other research, police are affected by bias in the same way as the rest of the population through increased scrutiny, negative interpretations of ambiguous behavior, and unequal treatment of those with darker skin colors. These biases could make officers less lenient in using their discretion and create disproportionate arrest rates. Coining the term “officer lenient discretion” (OLD) for this study will clarify the mandate’s effect. When OLD is at 100%, the officer uses their discretion to arrest the fewest number of people possible. When OLD is at 0%, the officer uses their discretion to arrest the greatest number of people possible.

An accurate benchmark is the most useful tool in determining if bias exists. Once an appropriate benchmark of expected arrest rates is established, Dolan Consulting Group’s DI can be used to gauge disproportionate arrest rates (Johnson & Chopik, 2019). The DI is calculated by dividing the percentage observed in a skin tone category by the percentage expected in that same skin tone category.

The present study considered mugshot data to analyze the skin tone of those arrested. Past studies on disproportionate arrest rates have faced significant problems in benchmarking expected arrest rates (Bonner & Stacey, 2018). Arrest mugshot data can provide insights into

which skin tone arrest rates were most inelastic after the mandate. By looking at mugshots across skin colors, this study addressed the point when the disparity in disproportionate arrests began or increased. Alachua County boasts only one sally port for all agencies in the county, so it was expected that red-green-blue (RGB) data obtained from mugshots would be consistent across all arrests from all departments in the county. The purpose of this study was to determine if the disparity in arrest increases as skin tone darkens, if disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity.

Problem Statement

Although the literature indicates that dark-skinned people are disproportionately arrested, it is unknown whether this disparity increases as skin tone darkens, if disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity. It is well-established that there are comparatively negative outcomes for darker-skin-toned people when interacting with the police (Blitz et al., 2020; Caraballo-Cueto & Godreau, 2021; Crutchfield et al., 2021; Kiang et al., 2020; McCleary-Gaddy & James, 2020; Mitchell et al., 2020; Parks & Kirby, 2021; Seaton, 2020; Zhirkov, 2021). One of the most common research platforms in the law enforcement context has been factors that predict police use of discretion in arrests, but understanding bias in police behavior has proven difficult to study (Bowling & Iyer, 2019; McCamman & Mowen, 2018). Arrests are highly correlated to structural racism and colorism, and research that uses categories of race hides differences in arrests based on skin tone (Finkeldey & Demuth, 2021). New research is essential because past research on arrests and skin tone has been inconclusive (Alcala & Montoya, 2018; Branigan et al., 2017; Kizer, 2017; White, 2015). Although it is one of the most researched topics, virtually all prior research on

disproportionate arrests is invalid because of the denominator effect. This study explores the answer to this problem, which lies in using quasi-experiments.

Arrests are highly correlated with disparities in housing, education, employment, earnings, benefits, credit, media, health care, and criminal justice, and research that uses categories of race hides differences in arrests based on skin tone (Finkeldey & Demuth, 2021). New research is essential because past research on arrests and skin tone has been inconclusive regarding why criminal justice disparities exist (Alcala & Montoya, 2018; Branigan et al., 2017; Kizer, 2017; White, 2015). It was expected that body-worn cameras would provide clearer insights by utilizing randomized control experiments and quasi-experimental research (Ariel, 2016; Braga et al., 2018; Grossmith et al., 2015; Hedberg et al., 2017; McCamman & Mowen, 2018; Ready & Young, 2015; Wallace et al., 2018; Yokum et al., 2017). However, in a review of 70 empirical studies, of which 32 specifically examined officer behavior, there were no consistent findings (Lum et al., 2019). Darker-skinned people have significant disadvantages, but it has not been shown that negative criminal justice system outcomes for darker-skinned Americans are associated with police officer bias. Monk (2019) noted that future research should not use a dichotomous analysis (i.e., Black or White) because it truncates and distorts the complex nature of biases. This quasi-experiment removes that factor to focus solely on skin color.

Absent from the literature is quasi-experimental research on disproportionate arrest rates. Criminal justice research indicates that Black women and men are disproportionately overrepresented in the criminal justice system (Yelnur et al., 2021). Quasi-experimental research using the full spectrum of skin tones is essential in understanding how the Alachua County mandate impacted discretion in arrests. Although many factors can lead to disproportionate

police arrests, this project also focused on how the police officers' skin tone impacts arrest rates (Gaston & Brunson, 2020). Monk (2021) agreed that to advance the field, future research should switch from racial demographic data to skin tone data.

Even though it is widely understood that being arrested has negative consequences, there is a lack of research focused on correcting disproportionate police arrests (Baughman, 2021; Long et al., 2019). Expected arrest levels directly correlate with the probability of arrest, and being unable to account for actual arrest levels is a significant problem (Monk, 2019). Although skin tone is associated with increased arrest rates (Finkeldey & Demuth, 2021), current research has not demonstrated how and to what extent the gradual darkening of skin tone is correlated with the DI and arrest rates in Alachua County during the COVID-19 police discretion mandate. This research seeks to fill that gap by exploring how and to what extent skin tone between groups is predictive of the DI and arrest rates in Alachua County during the COVID-19 police discretion mandate and how and to what extent skin tone is predictive of arrest rate in Alachua County during the COVID-19 mandate. The data gleaned from this study may offer a solid foundation for additional studies about the relationship between police discretion and disproportionate arrest rates based on skin color.

The fundamental issue that this study addressed is ambiguity. Prior research has used race as an independent variable to develop theories about why disproportionate arrests occur, and that renders the findings on disproportionate arrests ambiguous (Cesario, 2022; Chamberlain et al., 2021) because it only detects if disproportionate rates exist. When data reveal only if disproportionate arrest rates exist, then the problem is not resolved. To understand why disproportionate arrest rates exist, the full spectrum of skin colors must be considered. To understand if disproportionate rates increase as skin tone gets darker, if they are grouped by

ranges of skin color, or if they apply equally across all skin colors, research must use the entire spectrum of color, not race. This research is important because it addressed a major unknown topic in criminal justice, one that affects not only darker-skinned people but the community as a whole. Additionally, the topic of this study is significant because, as previously discussed, police officers make contact with people over 40 million times a year in the United States (Nix & Pickett, 2017).

Purpose Statement

This quantitative quasi-experimental linear spline regression analysis research aimed to determine which categories of theories on disproportionate arrest rates are most predictive of the dependent variable DI using skin tone as the independent variable. Skin tone research has been limited by focusing mainly on traffic stops (Tillyer et al., 2021). This research expanded the field by examining the skin colors of every arrested adult in Alachua County 2 months before and 2 months after the Alachua County Mandate. This study also aimed to show how a quantitative quasi-experimental linear spline regression analysis can solve a fundamental issue with existing research on disproportionate arrests. Quasi-experiments eliminate the need to estimate benchmarks, as has been the norm in past research. Neil and Winship (2019) stated, “The magnitude of the problems we have discussed should not be underestimated: In our view, they pose severe challenges to virtually all existing research on police discrimination” (p. 90).

This study analyzed arrest rates based on skin tone before and after Alachua County required police officers to reduce arrests as much as possible during the COVID-19 pandemic. Using the results from this research, a new understanding of disproportionate police arrests may be revealed. This research added to “the debate over whether U.S. policing should be reformed,

transformed, or abolished" as presented by Cobbina-Dungy and Jones-Brown (2021, p. 8). The study did this by using a spectrometer to numerically calculate skin color.

This research addressed racial bias among police, including implicit racism (unconscious attitudes and stereotypes based on race) and explicit racism (conscious beliefs and attitudes that are based on race; Russell-Brown, 2018) because Calvert et al. (2020) have shown that increasing self-recognition of prejudices can help the police and the community. The present study also challenged the belief that all law enforcement officers treat all skin colors equally and investigated a perceived inequality that has been highlighted nationally (Jones, 2020). Even though skin tone may provide insight into the ongoing issue of disproportionate arrest rates, it remains an area that is not extensively researched. This study's findings suggest that future research should focus on the cues of categorization, like skin color, as opposed to the actual membership inside those categories (Monk, 2022).

Variables, Research Questions, and Hypotheses

A digital scan of the arrested person's forehead was collected from each of the mugshots curated for the present study. The scan produced data that numerically described the skin tone on the RGB scale. The three data points of the RGB were averaged to create a singular data point for skin color. As seen in Table 1, the singular independent variable was RGB skin color, and the dependent variable was the DI. This study was a quantitative quasi-experimental linear spline regression analysis, but it was also exploratory because it is groundbreaking to use RGB data to understand disproportionate arrest rates. It was also exploratory because of the tools it relied on and the use of the DI; additionally, although the use of linear spline regression in criminology research is sparse, Dr. Andrew F. Hayes, the creator of the statistical tool PROCESS, recommended spline regression for this study (A. Hayes, personal communication, February 3,

2023). Moreover, Dr. Lawrence C. Marsh, the author of Spline Regression Models, verified the ability to also use SPSS for analysis of linear spline regression (L. Marsh, personal communication, March 20, 2023).

Table 1

Summary of Study Variables

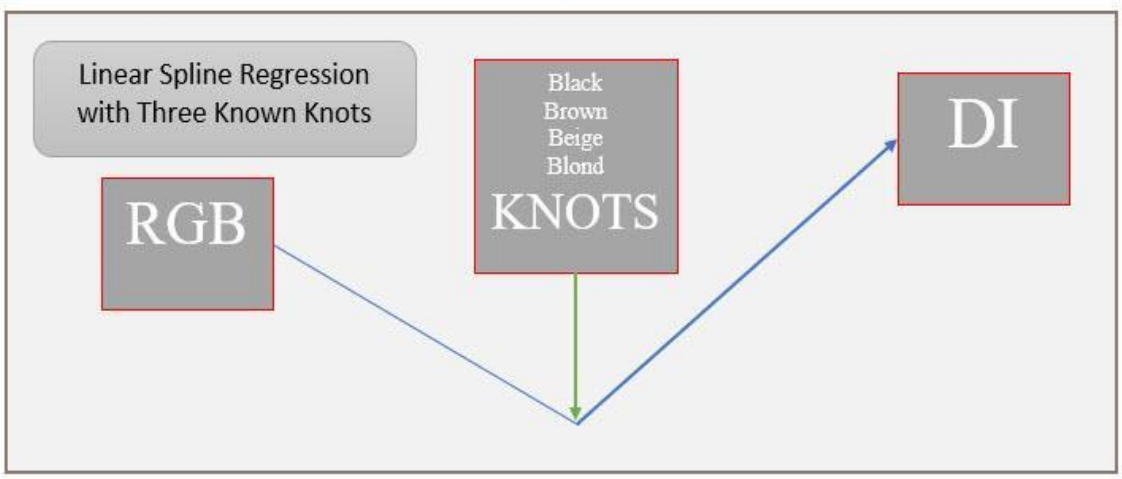
Variable	Conceptual definition	Operational definition	Measurement level	Instrument/ data source	SPSS variable name
Skin color (IV)	Visual perception of how dark someone's skin appears	Measured skin color	Scale	Reading from mugshot photos	avgRGB
DI (DV)	Level of disparity in arrest rates for different skin tones	Measure of unequal arrest rates across skin color	Scale	Calculated ratio	DI
Skin color group	Skin color groups based on RGB scale	Black (RGB < 85); brown (85 ≤ RGB <112); beige (112 ≤ RGB < 171); blond (RGB ≥ 171)	Nominal	Categorized by researcher based on prior literature	SkinColor

Note. IV = independent variable; DV = dependent variable; SS/KC = spline segments; knot categorization; DI = disproportionality index; RGB = red-green-blue. This table presents the variables used in this study.

This study calculated the DI based on the before and after mandate arrest data. This was an exploratory use of RGB, which capitalized on the growing use of the DI, as is represented in Figure 1.

Figure 1

Conceptual Framework for Linear Spline Regression Analysis



Research Questions & Hypotheses

The quasi-experiment is one step down from the gold standard of randomized controlled trials (RCT), but it is a significant improvement in the field of criminology. The one-group design is one of the best choices to use for a quasi-experiment. Miller et al. (2020) asserted that quasi-experiments are particularly beneficial for research on government policy mandates. The hypotheses provided here help facilitate using evidence-based practices to fill the gap in what is known about disproportionate police arrests. Hypotheses are built on the idea that research on disproportionate arrest rates can be categorized into three groups, and these groups can be labeled by the most encompassing theories related to the groups: the stereotype threat theory (STT), the self-categorization theory (SCT), and the social dominance theory (SDT). Spline linear regression with three known knots can capture nonlinear relationships between the predictor and outcome variables by allowing for changes in the slope of the regression line at the knots. It is a flexible modeling approach that can be used to fit complex data sets and is

commonly used in a variety of fields, including criminology. To test the null hypotheses for this study, IBM SPSS 29 was used. To perform a spline regression predicting DI based on RGB with three knots (four segments corresponding to each skin tone group), the study used piecewise polynomials connected at these knots. The knot locations are defined as $k_1 = 85$, $k_2 = 112$, and $k_3 = 171$. The study defined four linear functions, each corresponding to a specific interval.

RQ1: *Is there a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups (black, brown, beige, and blond) defined by the knots?*

- $H_0 1$: There is no significant difference in the slopes of the relationships between RGB and DI across the skin tone groups ($\beta_2 = \beta_3 = \beta_4 = 0$).
- $H_a 1$: There is a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups (at least one of the β coefficients β_2, β_3, or β_4 is significantly different from 0).

Model 1: $\widehat{DI} = \beta_0 + \beta_1 * RGB + \beta_2 * (RGB - k_1) * I(k_1 \leq RGB < k_2) + \beta_3 * (RGB - k_2) * I(k_2 \leq RGB < k_3) + \beta_4 * (RGB - k_3) * I(RGB \geq k_3)$

RQ2: *If there are significant differences in the slopes, which will be determined in RQ1, is there a significant difference in the slopes of the relationships between RGB and DI between the black and brown skin tone groups, specifically?*

- $H_0 2$: There is no significant difference in the slopes of the relationships between RGB and DI between the black and brown skin tone groups ($\beta_2 = 0$).
- $H_a 2$: There is a significant difference in the slopes of the relationships between RGB and DI between the black and brown skin tone groups ($\beta_2 \neq 0$)

Model 2: $\widehat{DI} = \beta_0 + \beta_1 * RGB + \beta_2 * (RGB - k_1) * I(k_1 \leq RGB < k_2) + \beta_3 * (RGB - k_2) * I(k_2 \leq RGB < k_3) + \beta_4 * (RGB - k_3) * I(RGB \geq k_3)$

The three spline knots, k_1, k_2, and k_3, define four segments that correspond to the black, brown, beige, and blond skin tone groups. The primary objective was to test whether the slopes

corresponding to each skin tone group were significantly different from each other, specifically between black and brown skin colors.

Significance of the Study

It is important to investigate arrest rates based on skin color. To date, there have been no research studies that have investigated disproportionate arrest rates using RGB data. Direct insight into officer discretion contributes to this new area of law enforcement research, and this study added to the body of work on whether policing policies, like discretion mandates, can impact disparities in darker-skinned groups. Previous research has considered how Black people are disproportionately affected by police contact (Beck et al., 2022; Bowen-Reid & Tulloch, 2021; Dunbar & Jones, 2021; Gregory & Clary, 2022; Hoover & Lim, 2021; Welsh Carroll & Flanigan, 2022), but the present study more narrowly defined who is affected and simultaneously expanded the scope of who could potentially be affected.

This research can help officers increase self-awareness, which could change the treatment of those with whom they interact (Demir et al., 2020). Specifically, observing changes in police officer arrests is relevant because that is where law enforcement discretion lies (Bowling & Iyer, 2019). Overall, law enforcement could be improved if a better understanding of disproportionate arrest rates existed.

This study may benefit those communities most affected by disproportionate arrests because it presents a potential model for federal, state, county, and local agencies to gauge their treatment of people with darker skin colors and to work toward overcoming personal biases in law enforcement that influence officer decisions. The study also demonstrates how a darker-skinned group is negatively affected by skin tone bias in officer discretion when making arrests. Finally, this study contributes to research on the elasticity of disparities in arrests according to

skin color. Although problematic, the Massey-Martin scale (2003) has been used in the past as the gold standard in skin tone research (Branigan et al., 2019; Fuentes et al., 2021; Hannon et al., 2021), but scholars such as Hannon and Defina (2016) have scrutinized its reliability. This research added to the validity of skin tone research.

Definitions

1. *Availability cascade* - The mind utilizes immediate examples instead of evidence-based information that is harder to recall or acquire. This is related to what Daniel Kahneman refers to as "what you see is all there is," or WYSIATI (Givens et al., 2018).
2. *Color-blind racism* - These are the perceptions and reasoning that are racist despite the self-perception of nonracists (Neville et al., 2000).
3. *Colorism* - Colorism is the discrimination that privileges lighter-skinned people over darker-skinned people (Hunter, 2007; Monk, 2021).
4. *Ethnoracial* - This refers to looking at the characteristics of race and ethnicity because race often does not paint a clear picture of true diversity (Abascal & Baldassarri, 2015).
5. *Disproportionality index* - The DI is calculated by dividing the percentage observed before the mandate by the percentage observed after the mandate (expected rate; Johnson & Chopik, 2019).
6. *Disproportionate minority contact* - The share of minorities that come in contact with police is higher than their percentage makeup in the community (Piquero, 2008).
7. *Officer discretion* - An officer's flexibility to decide whether to act can include decisions to issue citations or make arrests (Holman & Hummer, 2020).
8. *Officer lenient discretion* - This refers to the use of individual officer discretion to reduce the probability of arrest to the lowest possible level. When an officer's OLD is set to

100%, the only decision variability remaining is individual officer bias. This term is coined in this research.

9. *Racism* - Bonilla-Silva (2015) declared that racism "is above anything, about practices and behaviors that produce a racial structure—a network of social relations at social, political, economic, and ideological levels that shapes the life chances of the practices and behaviors that produce a racial structure. This structure is responsible for the production and reproduction of systemic racial advantages for some (the dominant racial group) and disadvantages for others (the subordinated races)" (p. 3).

Anticipated Limitations

The most significant limitation of the study relates to the unique circumstances of COVID-19: The study is not repeatable due to the unique one-time characteristics of the pandemic. It is reasonable to expect that similar situations would have a diminished response to government mandates, likely due to the world being prepared for such an event so that the responses to it would be less accurate than during the first occurrence.

Due to the nature of quasi-experiments, this study is limited in its ability to make causal associations from the mandate. This limitation was controlled by the large number of data points collected for this study and that all arrests were included. In addition, the long history of arrest data and the magnitude of the fall in arrest levels after the mandate point to a reduced risk level for making associations.

Summary and Organization of the Remainder of the Study

This study investigated whether the substantial drop in arrests after Alachua County, Florida, mandated that officers reduce arrest levels was distributed equally across skin colors. Although the facts and circumstances of a call for service set the boundaries for police officers'

use of discretion, discretion can also be used to change arrest rates inside those boundaries. This research explored how disproportionate police arrests can be impacted by mandates, which could meaningfully affect future evidence-based law enforcement policies to reduce racial disparities in policing. This research adds to the body of research on disproportionate arrest rates in using discretion regarding skin color. This research used RGB data, for the first time, to study what groups of skin tone are more disproportionately arrested over others.

The body of research on disproportionate arrest rates can be categorized into three groups, which are labeled by the most encompassing theories related to the groups: STT, SCT, and SDT. In the same order, these theories predict that disproportionate arrests increase as skin tone becomes darker, disproportionate arrests show two groups of disparities, one for Black and one for Brown people, and all darker skin people experience the same level of disproportionate arrest rates. The literature surrounding these theories and studies on policing and disproportionality reflects the relevance of such theories vis-à-vis the hypotheses presented in this chapter.

Prior research has almost exclusively relied on using race to predict disproportionate arrest rates. The literature review in this dissertation highlights the flaws and possible moral consequences of using race instead of skin color, then additional content shows how using skin tone would still prove to be a more scientifically valid independent variable over race, which is a social construct and not a biological truth.

New research is casting doubts on the validity of any prior research related to the prediction of disproportionate arrest rates because much of it relied on constructed benchmarks. New methods are regularly recommended to combat these problems, but the number one way is through quasi-experiments, which are emerging as the most recommended approach for a

quantitative study. The present study used a quasi-experimental design and the DI to overcome the problems with existing research and tested the hypotheses against the three main categories of theories surrounding disproportionate arrest rates.

CHAPTER TWO: LITERATURE REVIEW

This literature review provides background into the broad concepts around police coming into contact with people with darker skin colors. The first section of the literature review includes a theoretical discussion that will focus on skin tone and visual cognitive cues to categorize the broad categories of theories to test disproportionate arrest. This theoretical discussion sets the foundation for exploring how Black and Brown people experience increasing levels of arrest disparity as skin tone becomes darker (STT), how Black and Brown people experience different levels of arrest disparity (SCT), and how Black and Brown people experience the same level of arrest disparity (SDT). Second, a critique of the literature on how and why skin color, as opposed to reported race, is an appropriate way to examine inequalities in police arrests is presented. A general knowledge of the literature on policing is essential for understanding the lens of the police officer and that of the arrestee, as well as the arena in which they interact. Third, a presentation and critique of the research on stereotypes, skin tone self-categorization, and social dominance is presented. These general categories of research related to disproportionate police arrests are critical as they align with the hypotheses developed for this study. The literature review ends with the conceptual framework. Within the conceptual framework, the connections between the problem being explored, the variables, and the theoretical frameworks are represented visually.

Modern DNA research shows that using race in criminology research is problematic and scientifically flawed (Duster, 2006, 2015; Ossorio & Duster, 2005; Skinner, 2020). Although there exist large bodies of criminology research studying the concepts of disproportionate police arrests, gaps remain in understanding disproportionate arrest rates from the lens of skin tone and

police discretion. Focusing on skin tone concerning police discretion and arrest rates provides a new way to analyze relevant past research.

To understand disproportionate arrest, researchers should avoid the race platform to instead focus on skin color. Decisions people make can be biased (decision bias) based on visual cues, not demographics. Decision science looks to understand decision-making, and Curley et al. (2019) have made clear that dual process theorists separate decision processes into intuitive decision-making and rational decision-making. They also pointed out that a decision is between two or more options; that said, for the police officer, the choice is to arrest or not to arrest. Dual process theory is a famous framework for understanding decision-making, and it continues to gain additional traction as neuroscientific evidence sheds more light on how the brain makes a decision (Bellini-Leite, 2018).

Theoretical Framework

Implicit (System 1) Theories Related

People of all skin colors see all other people's skin tone over a full range of skin colors, from dark to light. If a lighter-skinned person sees a darker-skinned person, the initial reaction to skin tone is to either place that person somewhere on a continual range of colors or place that person in a group that covers a range of colors.

Explicit (System 2) Theories Related

If police officers make System 2 decisions, they are slowing the decision-making process and analyzing the situation and its outcomes. If this is true, then research should show results similar to times of blatant racism, during which bias should be equal across all skin colors. Reminiscent of the times when one drop of black blood made a person Black, System 2 decisions should show dichotomous results: one is either a Black person or a White person.

Review of Literature

To understand disproportionate arrest rates, it is essential to know how police officers formulate suspicion, citizen contact, and their lines of questioning. Gaston and Brunson (2020) coded their suspicion in appearance, behavior, time, place, and information for their research to show that race plays a significant role in police–citizen contact, but suspicious behavior displayed by people arouses suspicion in the police officers, which was observed in 66% of the encounters. Race was not the main reason behind arrests; instead, the use of alcohol or drugs was the main factor that led to arrest and was associated with a ten-fold likelihood of being resistant to an officer. Officers respond to suspicious behavior less frequently, but there is a lack of research on the effect of suspicious behavior or how officers become suspicious (Dunham et al., 2005).

Stereotype Threat Theory and the Rainbow Effect

Stereotypes and racist opinions can affect decision-making. In particular, those beliefs can influence how people interpret ambiguous behaviors (Puddifoot, 2019). Even in the case of unambiguous decisions, these stereotypes can lead to harsher judgments for Black people in the criminal justice system, with harsher punishments, more culpability, and the likelihood that they will re-offend (Jacobson, 2019; Kovera, 2019; Levinson & Young, 2010).

Negative Consequences of Bias

Burke (2022) showed how STT is similar to SDT in that the more often error arrests occur (i.e., arrests that should not have happened), the more often they will occur. Burke provided an example: if an officer approaches a dark-skinned contact and if the officer becomes nervous, that officer could be interpreted as racist. This nervousness turns to anxiety, then

cognitive depletion, then a lack of empathy, and then it leads to an increased risk of another error arrest.

Although rare, Monk et al. (2021) searched specifically for national data that utilized verbiage on color scales and palettes. They identified research to support the idea that the slope of increasing negative consequences of having darker skin colors is dramatically steeper for those with black or brown skin colors than for white skin colors. Thus, the concern is that darker-skinned Black people experience higher exposure rates to the criminal justice system than Brown people.

According to STT, one inadvertent outcome of social influence is that the more one identifies with a group, the more one is inclined to act like the stereotype of that group. This could cause a darker-skinned person to become more aggressive toward the police and the police officer to show less discretion toward darker-skinned subjects (Burke, 2022). This theory explains much about what people see on social media. The present study presents hypotheses regarding how bias decreases as skin tone becomes lighter and that the police give more discretion to Brown people than they do to Black people on a continuum. If the STT (H1) is highly applicable, then the media shares a role in the problem.

Stereotypes have profoundly negative consequences for Black and Brown people. Stereotypes create a fear of dark-skinned people or law enforcement, resulting in disproportionate arrests. Orelus et al. (2020) suggested that the fear of black and brown skin tones is worsening and that there is an emerging stereotype of dark-skinned people because of the content on social media and the school system in the United States. Stanic (2021) has further asserted that today's popular music can incite aggression and fear in people, and Beckett (2000) has claimed that in U.S. culture, there stands a long-established presumption that Black people

are criminals. Undoubtedly, there are ramifications to associating Black people with crime, the worst of which would be disproportionate incidences of the shooting of Black unarmed suspects by police (Chua-Eoan, 2000).

Laws must be enforced without bias to ensure equal rights in the United States. The government has reduced discrimination but has done little with explicit and implicit subtle bias that leads to discrimination (Bilotta et al., 2019). Pryor et al. (2020) stated that black faces are viewed as more violent than white faces; in fact, in a review of past research, after first pointing out the gap in research on police discretion, Pryor et al. explained that the stereotypes of Black people are associated with violence and crime and are responsible for the disparity in police arrests. They concluded that training would go a long way in helping, but that disparity remedies must also be associated with the courts, lawmakers, and police executives. Notably, Gomes and Williams (1990) claimed that the news media facilitates the belief that the typical crime is committed by a Black person, reinforcing the stereotype that Black people disproportionately commit a crime.

Salience bias is defined as a bias that is easily emotionally striking. More salient images include noticeable tone, texture, and contrast (Clinehens, 2020). There is a skin categorization between the shades of jet black and creamy white that demonstrates how stereotypes increase the perceived danger, incompetence, dominance, untrustworthiness, decrease in health, and unattractiveness as the skin becomes darker (Chen et al., 2021; Monk, 2021). Research by Dixon and Telles (2017) and Dockery-Sawyerr (2022) has shown that the criminal justice system associates a criminality stereotype with Black people, resulting in discrimination, and Roth (2016) asserted that when police lack information on a person, it is normal to rely on stereotypes

to draw assumptions. The more a person possesses features associated with a particular racial group, the stronger the stereotype will play on those assumptions (King et al., 2016).

The Media and Stereotypes

An ethnographic content analysis by Colburn and Melander (2018) that studied newspaper crime stories showed that minorities were overrepresented, but their images were different. In the *Gazette*, minorities' mugshots were used, but for Whites, a yearbook photo was featured. Colburn and Melander discovered that the *Gazette* did this intentionally. In a study of 433 news documents about mass shootings, Duxbury et al. (2018) showed in logistic regression that Whites were more likely to be declared mentally ill than Blacks. Doing this shifts the blame from targeting the person and redirects it toward mental illness. In another study of mass shootings between 1966 and 2016, Silva and Capellan (2019) showed that Black-on-Black shootings were less likely, and Black nationalists and Black perpetrators were more likely to make the news; however, most perpetrators are middle-aged White men, with few victims, at the workplace, and involving handguns.

From the analysis of major networks' news programs in Orlando, Florida, Chiricos and Eschholz (2002) determined that the media was responsible for the criminal typification of Black people. Their study showed that Black people and White people were on the news a reasonably consistent number of times compared to their demographics, but an analysis of the information provided in the news reports revealed that Black people were overrepresented as violent and dangerous offenders. Black people were almost twice as likely to be viewed negatively by the media. A disturbing nuance on racism in the media was that White suspects were never shown to commit offenses against Black people, but instances in which Black people were shown

committing offenses against other races were almost three times more prevalent (Grunwald et al., 2022; Ogden et al., 2020; Parham-Payne, 2021; Zhang, 2021).

Black people might be underrepresented as criminals in comparison to their population. The media projects Black people as violent criminals, and they are four times more likely to be shown in a negative light, in a more threatening context, and in menacing content. Only 1 in 20 times were White people shown as suspects in the news media, but for Black people, it was 1 in 8 times (Chiricos & Eschholz, 2002). The media is partially responsible for the fear that White people have for Black people, and hence, Whites do not prefer to live where Black people are residing. Many citizens of the United States are afraid of Black people because of their association with criminal offenses and even because of a general increase in fear of crime (Chiricos et al., 1997; O'Keefe & Reid-Nash, 1987; Skogan, 1995; R. B. Taylor & Covington, 1993; Thompson et al., 1992).

Entman and Rojecki (2001) determined that the news media is responsible for associating Black people with crime, and through social cognition concepts, other research has confirmed that the news media is part of the problem (Brown, 2021; Ghazi-Tehrani & Kearns, 2020; Holt & Carnahan, 2020; Pollock et al., 2021; Roberts & Rizzo, 2021). Roberts and Rizzo (2021) reviewed a large body of research across cognitive, developmental, and social areas of psychology to gain a broad statistical understanding of the power of the media and the continual disproportionate representation of Black people as criminals and rarely as victims; by contrast, representation of White people in the news media is the opposite. Roberts and Rizzo also showed that only 5% of commercials feature Black people as models, and most often, blackness is associated with poverty through alignment of low-cost and poor nutrition foods. The news media

associating Black people with crime increases clicks and followers, but it pushes a false narrative.

The media's constant negative portrayal of police personnel has led to growing anti-police sentiment, which has changed how police work, made the criminals bolder, made police interactions more volatile, and caused an increase in the crime rate (Nix & Pickett, 2017). Among officers, 80% have reported that constant negative media coverage has made their jobs more difficult. Nix and Pickett (2017) attempted to fill a gap in the literature about why and how media coverage divides the police and community by increasing hostility and fear of crime. From a survey of 251 police officers, they concluded that the news media had played a significant role in establishing negative views and fear of crime and reported that no respondents believed the news media was a positive force.

Police officers, in general, have been observed to be cognizant of their public image and fear getting involved in scandals. For example, 67% of officers believed that media-hyped police encounters with Black people are isolated, but only 39% of the general public feels this way. There are more than 18,000 police agencies in the United States (Engel et al., 2020b). Police officers make contact with people over 40 million times a year in the United States and use force in less than 2% of these interactions (Nix & Pickett, 2017). Out of these 40 million total interactions, 990 led to fatal shootings by the police in 2015, and of those, 38 were deadly shootings of unarmed Black people (Nix et al., 2017). Over 50% of fatal shootings occurred in places with fewer than 50,000 residents, and two thirds of fatal shootings happened in areas with fewer than 250,000 residents (Engel et al., 2020a). Wertz et al. (2020) reported that more than half of these shootings were the result of violent, in-progress events involving a gun or the result

of a call about a suicide threat involving a gun. In 2021, 302 White people were shot to death by police, and 177 Black people were shot to death (Statista, 2022).

The news media is an antagonist of both people of color and the police by perpetuating stereotypes declaring that police are brutal and Black people are criminals. All too often, the media fails to seek the truth but rather a version of the truth that sells news, and this does not reduce disproportionate outcomes. The Zoot Suit Riots that began on June 3, 1943, are an example of the power the media holds and its obdurate ways. Through an independent investigation, the governor of California concluded that the media was responsible for inciting more than 50 sailors to take to the street and beat Mexican and Black people with clubs over the course of 5 days (A&E Networks, 2022).

Past research has shown that media makes a particularly strong impact and plays a substantial role in shaping people's fear of crime (Weitzer & Kubrin, 2004). These researchers then conducted a survey of a random sample of 480 people and asked about their level of fear and media engagement. One important finding was that the media makes the constituents living in high crime areas significantly more fearful of crime than those living in low crime areas. This finding may shed light on why overpoliced neighborhoods continue to call 911. Weitzer and Kubrin went on to assert that large gaps remain in the literature about how the media increases fear. Because article is dated, I reached out to Kubrin via email to inquire about the contemporary viability of the study, and he stated, "I suspect the findings wouldn't change much, especially because, if anything, local TV has only gotten worse when it comes to crime reporting" (C. Kubrin, personal communication, July 13, 2022). As their article pointed out, even in 2004, the internet was cited by those polled as one of the top two places to gather news.

Understanding disproportionate contact is vital, especially because of the tendency for the media to frame racial protests as threats to the public (Reid & Craig, 2021).

System 1 processing is based on two main themes: that people of color are put into groups and that the media plays a dramatic role in shaping stereotypes (this section). Although society at large plays a role, as is made clear in the discussion about SCT (H2) to follow, a police officer must take responsibility for the cognitive process of categorizing people with darker skin colors. If the SCT is the dominant process (H2) in the dual-process model, then the changes in arrest rates before and after the mandate would change in steps, representing the differences in groups. If the media is primarily responsible (H1), then the change in arrest rates to be close to a linear relationship with skin color. The cultivation thesis adds that the media portrays a different reality than is statistically correct, pushing people's views toward what the media portrays (Weitzer & Kubrin, 2004).

Self-Categorization Theory

Self-categorization theory describes the circumstances under which an individual will view collections of people (themselves included) as a group, as well as the consequences of group perception based on race, gender, ethnicity, or skin color; it also prioritizes how people act in this highly specific and fluid process (Spears, 2021). The present study sought an understanding of who "they" are based on skin color. Once researchers know who "they" are, SCT will help explain why there is more discretion for some groups than others, based on skin color.

Creating Groups

In a 2021 study, Awuor included insights from Henri Tajfel about analyzing light-skinned groups and darker-skinned groups, and in her review of other research pointed out that

social identity is particularly useful for predicting behaviors between ingroups and outgroups. Bai (2022) agreed that the social identity of police officers can modify their behavior, based on the social group to which they belong, and conducted multiple studies to understand whether White ingroups are more aligned with other Whites or with those who hold the same values of White identity. The research showed that ingroups rank ideology above skin color. One way to identify where law enforcement needs improvement is to look at skin tone and social identity.

Categories are created in social environments where police and the public interact, and they are dynamically created to classify people in a situational context. Categories help people understand what is happening in certain situations (Yoong & Syed, 2020). Some categories are easy to identify, such as "police officer," but others are more difficult, like "bad guy" or "good guy." To analyze police interrogations, Yoong and Syed (2020) used membership categorization analysis as ethnomethodology, an approach used to explain labeling to justify behavior. They concluded that both the officer and the detainee categorize the other to fulfill their specific objectives.

Self-categorization theory is an innovative methodology that can be used to understand behavior in social influences of skin tone categories (Reynolds, 2019). Police use these categories to provide better officer safety in their line of work. Holmes and Smith (2018) have shown that police officers' high level of discretion in low-level crimes exposes them to greater levels of social influence; these social influences on discretion, unlike persuasion, can have inadvertent, inconsistent, and accidental outcomes (Gass, 2015). Holmes and Smith also pointed out that conflicts between police and minority neighborhoods have been in existence for a long time, and ingroup and outgroup dynamics are thought to have existed for several million years.

Understanding group dynamics was first introduced by Charles Darwin in 1871 and Sigmund Freud in 1915 via their work on tribal groups and tribal instincts (Freud, 1915; Mizzoni, 2009; van der Dennen, 2000). Van Zijl (2017) outlined where the tribal instinct hypothesis stands today, which mainly revolves around the work of Mark Van Vugt and Justin Park. Specifically, from a tribal perspective, groups form deep emotional attachments, support their ingroup members, dislike disloyalty from ingroup members, and dislike outgroup members. They justify aggression toward outgroups based on stereotypes.

Tribal instinct might later prove to be fundamental in instilling prosocial behavior in law enforcement; unfortunately, this is an emerging research platform and remains absent in criminology. Knowing the characteristics of a group is important because, as Sarpong (2020) has shown, advances often come to groups rather than to individuals. Tribal instinct clearly is relevant once disproportionate groups are better defined because it can be used to push these groups toward prosocial behavior. Lastly, and most importantly to the present study, it explains why humans classify people based on skin color. Even though extensive research has been conducted on social constructionism, no defined theory has emerged to help understand disproportionate police arrest, which is about behavior (Machery & Faucher, 2017).

Negative Consequences of Being in a Group

Some assertions try to rationalize disproportionate police arrests. One is that Black people, on average, live in more violent communities, but the risk factors are not predictive factors for criminality (Goldner et al., 2015). Latzer (2018) claimed that Black people immigrated through the South for the most part, which has a “culture of honor,” and they created a subculture of Black-on-Black violence. Latzer went on to present other assertions, such as the

frustration-aggression theory, the vigilante theory, and the preemption theory, but also explained that no structural analysis has been conducted to explain the reasons for the correlation.

It is known that happiness is reduced as one goes from light black to medium black to dark black and that there is not a rainbow effect, that is, a gradual change in color across skin colors, with color on the negative consequences of having darker skin (Darity et al., 2002, 2018; Diette et al., 2015, 2018; Goldsmith et al., 2006). Notably, Diette et al. (2015) stated that the existing research has used few skin tone categories. In their study of stratification economics, which relied on the National Survey of American Life, they used a Likert scale with five categories of skin tone (*very dark*, *dark*, *medium*, *light*, and *very light*). They found that although brown skin colors experience negative economic and health costs because of their skin color, dark-skinned Black people experience a significantly greater negative experience. Although this speaks explicitly to H2, it is still unknown at what point skin tone becomes part of the group of medium and dark-skinned tones that experience increased arrest bias from the criminal justice system.

Latzer (2018) detailed many of the assertions about why Black people are associated with crime and in particular the notion that they have a crime culture. The study revealed that all attempts to associate Black people with a culture of crime are problematic and noted that the Black community experiences a disproportionate rate of incarceration, but the actual percentage of the Black community involved in violent crime is small—not as small as the White population, but reasonably close (Agee, 2020; Carbado & Richardson, 2018; Heikkila, 2020; Johnson & Chopik, 2019; Kalunta-Crumpton, 2018; K. Moses, 2021; Mpofu, 2020; Najdowski & Goff, 2022; I. Taylor, 2008). A foundational assumption in this study is that Black, Brown, and White people have the same natural predispositions to crime.

Being a police officer is a difficult job that only those involved in it can understand. Sometimes, police officers gain too much appreciation for what they do, and at other times they are the brunt of misplaced criticism. This is why being part of a close-knit group is important. Unfortunately, there are negative consequences to being so close, even if that closeness offers protection from those that want to do harm. One way to push back on these deeply rooted cognitive processes is to rely on a new method that casts a much brighter light on details of the negative treatment of minority neighborhoods.

If particular types of people are drawn to police work, then it is more likely they will form closer and tighter groups. According to the male warrior hypothesis, in a meta-analysis of ingroups and outgroups, the adverse effects of being in the outgroup of police officers are proven significant. It causes the officer to pay closer attention to cues of violence, be more harmful, have a heightened sensitivity to fighting, and express more anger or fear (Ji et al., 2019). The methods used in this dissertation study can determine which officers are responsible for the disparity; if it is true that the negative outcomes emanate from a small fraction, then further exploration of the data is recommended.

Social Dominance Theory

It might be that disproportionate arrests are a result of society and not directly related to law enforcement actions, meaning that instead of the police creating the disparity, the police are reacting to what the community did. White elites would be threatened by the increasing power of Black people post-Jim Crow. This conforms to Blalock's Racial Threat Theory, which states that these communities want to exert more social control on these neighborhoods (Gray & Parker, 2020).

Negative Consequences of Social Dominance

The idea of punishment must also speak beyond the individual arrest and understand the total punitive role as a social cost paid by families, neighbors, communities, offenders, and victims (Chiao, 2017). The extreme social cost incurred on people of color from mass incarceration is consequentially unconscionable. No other group has had their civil rights rolled back more than Black men in the age of mass incarceration (Kennedy, 2009). A hypothesis is needed that speaks specifically to when a police officer makes contact and considers arrest because police contact is associated with emotional ill-being, loneliness, poor health, and unhappiness (Bacak & Apel, 2020). This can, in part, be explained by labeling; McGlynn-Wright et al. (2022) have shown that police contact with Black children is correlated with increased adult arrest, whereas the same is not true for White children.

Social dominance theory (H3) states that hierarchical beliefs lead to inequalities based on age, sex, and color, in which power is used to maintain this hierarchy. People with a high social dominance orientation tend to look for jobs in law enforcement (Bilotta et al., 2019). Social dominance theory (SDT) also conflicts with the democratic theory, in which the government should draw limits on individual rights, human development, and civic freedom. Dzur (2014) has asserted that the democratic theory should better align with the efficacy of punishment and the building of consensus concerning restorative justice; Dzur also pointed out that the United States is the world's leader in incarceration and that those in power use imprisonment to put down others.

Outgroups, ingroups, and subordination all fail to fully explain arrest disparity. Although the ingroup–outgroup phenomenon encompasses the idea of not belonging, it does not work for this study because outgroups imply hostility or dislike (Leippe et al., 2022; Parker & Janoff-

Bulman, 2013; Rae et al., 2021; Vezzali et al., 2021). Vezzali et al. (2021) found that the negative consequences of ingroups working with outgroups can become ingrained unless positive interactions are created between groups, and the more time that goes by without positive interactions, the stronger the negative relationship becomes. Again, SDT requires implicit bias as a comprehensive hypothesis for police bias, and Vezzali further explained that SDT is when intergroup contact impacts the attitudes of a group toward a secondary outgroup because of their interaction with a primary outgroup.

Racial Oppression

In its most basic sense, colorism is observed when social and economic privileges and disadvantages are allocated based on skin tone (Moffitt, 2020). Critical race theory holds that White society has created racial inequalities to maintain white privilege. The theory recognizes that racism exists throughout American lives and denies colorblindness. The theory also states that racism has created broad racial oppression, and it should be acknowledged and eliminated like all forms of oppression (Miller & Harris, 2018).

Colonialism has been a cause of oppression for people of color and has created a feeling of vulnerability that has led to resistance and anger. This anger has led to violence and reinforced a structure of colonialism (Watts & Erevelles, 2004). In their article, Watts and Erevelles (2004) argued that school shootings are now getting ample attention because they now affect urban, middle-class neighborhoods. They also stated that this results from the uncorrected negative outcomes for Black children in schools and that schools are just another institution of social control. Postcolonialism is a state of pretense that exists due to the absence of a colonial political and economic policy. Juridical–political decolonization as a policy has not yet worked. Global

colonialism is the remnant of a world that is still seen today (Grosfoguel, 2007). In other words, the postcolonial world has not yet emerged.

Hall (2018) described critical skin theory as a method that stresses skin tone and moves away from concentrating on race and continuing to label people by race. Researchers using critical skin theory seek to understand the negative effects on people with darker skin colors, but these are theories that mediate the behaviors of both darker-skinned people and law enforcement personnel. Hall concluded that a notion of race is only used to create the idea that dark-skinned people are inferior and light-skinned people are superior. Critical race theory is fundamentally flawed because it focuses on the negative consequences of being "black," but humans are all the same race. Humans have categorized dark-skinned people and have implied they are a different race. As Hall pointed out, when considering race, researchers are targeting oppression; when researchers consider skin color, they are dealing with stereotypes.

Disproportionate Contact

The police officer works in an environment of variable constraints. Donald Black (1976) stated that the police officer will work under the direction of the constraints of rank, status, and social integration. Discretion will change according to rank, status, and social integration as continuous variables (Campbell et al., 2022).

Police officers disproportionately contact Black people. In 2015, Alachua County, Florida, had a student population consisting of 35.7% Black and 43.8% White students. Out-of-school suspensions in Alachua County showed that of 2,374 suspensions, 69.5% were related to Black students, and 18.1% to White students. Of those suspensions, 580 children (2% of the student body) were also referred to law enforcement, aiding in the school-to-prison pipeline (ProPublica, 2018). Alachua County is where massive problems exist for minorities in

economics, education, law enforcement, and employment (Sandoval, 2018). Within a community described this way, it should be expected that stereotypes and racist opinions are prevalent.

From 2004 to 2012, officers with the New York Police Department stopped 4.4 million people and frisked half of those (2.3 million). Although White people made up about 33% of the city's total population and 10% of the stops, Black people made up about 25% of the population but 52% of the stops (Girvan, 2015). White officers also issue more tickets to Black drivers than White drivers (West, 2018). These statistical differences have not been rectified in the court system because, in McCleskey v. Kemp, the Supreme Court made it impossible to bring statistical data to show discrimination in criminal court (Murphy, 2018), and the local bureaucrats are unlikely to discourage racial biases (Olsen et al., 2020; Spencer et al., 2016).

If the courts and bureaucrats will not discourage bias, then it must be addressed before or during police contact. Siegel (2018) suggested one way to moderate police contact is to effectively train officers in bias and discrimination, but not all officers need bias training; in a study conducted on the Florida Highway Patrol, it was found that only 40% of the troopers displayed a habit of discrimination (Goncalves & Mello, 2021). That is a large percentage, especially if that holds across the United States.

The United States saw many changes in 2020: riots (D. B. Taylor, 2021), calls to defund the police (CBS News, 2021), tearing down of statues (Schneider & Vozzella, 2021), and the renaming of historical sites (Chervinsky, 2020). A report in *The New York Times* conveyed that Black Lives Matter was the third most-read topic of 2020, surpassed only by the U.S. presidential election and the COVID-19 pandemic (Moses, 2020). The United States also began a debate about whether racism occurs in isolated incidents or whether racism is a systemic problem (Miller et al., 2021). Both the media and the academy pay inadequate attention to the

important correlation between negative outcomes and skin color. Still, Monk (2021) declared it the most important aspect of understanding ethnoracial inequality. Communities of color have disproportionate contact with police, and it is recommended that police develop new police training and policy changes to correct this (Hofer et al., 2020).

Disproportionate Minority Contact and Police Department Training

Research has made clear that police departments can substantially affect biased discretion, but there are still no clear training strategies that may directly impact officer bias (Adams et al., 2021; Engel et al., 2022; Mason & Petrie, 2021; Oberfield, 2019; Richardson et al., 2019b; Su, 2021; Vernon & Lynn, 2021; Vito et al., 2020). Policies and interventions to reduce skin tone bias can also solidify the institutional practices that confer disadvantages to others (Dovidio et al., 2016). Despite changes, which policies affect officer bias remains unclear. Body-worn cameras, de-escalation training, implicit bias training, early treatment systems, civilian oversight boards, and banning certain practices have all been attempted, but Peeples (2020) has shown that what works remains unclear. At best, the research on the effectiveness of implicit racial bias training for police officers is mixed (Atewologun et al., 2018; James et al., 2019; Machado & Lugo, 2021). If a department could see which officers were responsible for the bias, that might change the research results.

Disproportionate minority contact is affected by law enforcement administration. When it comes to how an officer will treat suspects on the street, initial training influences the treatment of suspects in the real world (Labrecque & Smith, 2017). The real-world experience of a patrol officer is most often initiated through a Field Training Officer or, later, a senior officer or sergeant. Coaching is a fundamental practice that can yield better officers (Alexander et al., 2013). Coaching has long been considered an essential means of imparting knowledge and

providing information regarding changing practices (Joyce & Showers, 2003). The effect of training diminishes after required training units if the protocols are not followed by real-world coaching. Yet, Labrecque and Smith (2017) have provided evidence that training and coaching do not serve as practical tools for the officers on the use of their authority. An officer's use of authority is influenced by the early years of education or other sources such as peers. It is often the case that officers do not want to become field training officers, or the department does not give the job the respect it deserves; both are problems if an agency wants to reduce bias in the police department.

Police departments have long been aware of the need to implement evidence-based policies and training. This kind of training could reduce fatal police contact and shootings and create support in the community. Effective tools to achieve this are body cameras, de-escalation techniques, bias training, intervention tools, and civilian feedback (Engel et al., 2020). This perspective differs from what Peeples (2020) stated about cameras and training.

Unlike many other countries, the United States has a decentralized police system. This system makes it difficult to institute a systematic plan to implement consistent change, and it is problematic to attempt a reduction in incidences of shootings by police officers (Engel et al., 2020). Peeples (2020) asserted that limiting the number of White officers in neighborhoods with over 95% Black residents would have a drastic effect on reports of White officers using force against Black people and argued that small cities with a population under 10,000 have almost 5 times the chance of exposure to fatal shootings by police.

The criminal justice system has three main types of exposure: police contact, arrest, and incarceration. All three are linked to individuals' lower well-being, but even being stopped and frisked by police impacts a person (Sundaresh et al., 2020). In fact, being contacted by police has

a negative impact on socioeconomic status and can lead to deeper involvement with the criminal justice system (Finkeldey & Demuth, 2021). Pretrial incarceration disrupts employment, and unemployment is associated with recidivism and reduced father–child relationships (Larson, 2000; Massey & Whitley, 2021).

One fundamental idea of policing emphasized in the police academy is the idea of a Terry stop, which allows the police to detain a person based on reasonable suspicion. If having dark skin alone increases the chance of being suspicious, then there is a problem. Carvalho et al. (2022) conducted a systematic, worldwide search for articles related to investigations into disproportionate police stops. They reviewed 16 of the best studies that looked at traffic stops and the disproportionality of those stops and concluded that Black men with low incomes were more prone to being victims of racial bias. They also stated that they could not find a study that focused on methods to reduce disproportionate traffic stops.

Officer Arrest Discretion

In a review of the literature on disparity, Kovera (2019) showed how little police officers are responsible for and how dramatically they are involved in creating arrest disparity. They pointed out that the best way to eliminate the disparity in arrests is to intervene in police behavior and reiterated a current belief about police officers' implicit bias being responsible for the disparity. Most important to the present study, Kovera stated that disproportionate police arrests cannot be remedied until there is a method to determine what is responsible for the implicit bias; accordingly, this study presents a new approach that may prove significant in determining if the skin tone of people who are arrested predicts disproportionate arrests.

Department policies are the baseline for enforcing misdemeanor crimes, but policies require acceptance from the affiliated officers. Officer discretion can change because of an

officer's attitudes and understanding of criminality. Chanin et al. (2018) noted that if discretionary outcomes result from implicit bias, it is a worthwhile investigation. They went on to find that Black people were subject to traffic stops at a higher rate, but they were not subject to higher rates of arrests. The authors also noted that more nuanced research is needed because many conflicting, logical hypotheses can be formulated from that finding. For decades, studies on the lived experiences of being black have encompassed the immense ethnoracial inequalities of being black, but skin tone inequality has been ignored according to Monk (2021); this dissertation relied on that knowledge to clarify which skin colors most often prompted negative lived experiences.

A study of law enforcement prearrest diversion found that police officers showed no bias in offering discretionary prebooking diversion for low-level offenders (Worden & McLean, 2018). This could prove an important policy factor if there is no bias in officer discretion when providing diversion programs. Implicit biases may still play a substantial role in police officers' discretionary decisions with misdemeanor arrests (Chauhan & Travis, 2018), and increasing diversion programs for misdemeanors might be a way to reduce disparities. Determining where discretion exists is a substantial move forward in research on this topic. The ability to associate skin tone to arrest level base rates will provide many new approaches to identify where discretion exists.

Pryce and Chenane (2021) asserted that the police need the trust of their communities, which requires them to treat all people equally, regardless of skin tone. They interviewed 77 dark-skinned people living around Durham, North Carolina and found that less than 5% of those interviewed felt that the relationship between the community and police could not be fixed, and that the relationship can be fixed through community policing. Community policing, according

to Pryce and Chenane, means interacting positively with the community in nonenforcement activities.

According to a study by Madon and Murphy (2021), the degree to which people believe police are biased in their discretionary authority is directly related to their trust in local law enforcement. Their factor analysis of telephone survey data from 398 interviews was the first study to examine how procedural justice is associated with police bias and showed that as people believe procedural justice is fairer, their trust in police increases and their belief that police are biased decreases.

Law enforcement officers can also use their discretion to create a sense of community security (Fadillah et al., 2020). When no bias in police discretion is believed to be evident, the community can build trust, reduce the potential for civil unrest, and bridge the gap in views that divide the community. In their review of the literature on discretion, Fadillah et al. concluded that discretion is a complicated process and is best understood as one that takes place over a defined period. They point out that sound discretion is done by police officers who understand what is right, understand the situation they are in, and understand how to make good use of decision processing in the limited time that they have.

Police discretion should not be viewed as a negative trait, as it can build citizen participation, equity, and accountability, and it can result in a minimum use of force. This can be done when police discretion considers respect for citizens' rights (Gomes de Almeida, 2021). If a police officer fails to arrest someone, it can even lead to someone else's death. Judgment calls are complex psychological processes, but the decision process becomes more complicated if mistakes increase the risk of adverse outcomes (Tetlock et al., 1994).

Police officers exhibit much discretion during traffic stops—often much more than during other aspects of police work. Disproportionate outcomes concerning minorities in traffic stops are more related to the police organization than social issues. It was also found that the larger the Black population, the smaller the disproportionate outcomes, and future research should consider how police rectify the apparent disproportionate contact (Nowacki & Spencer, 2019). Officer discretion was a hot topic in the seventies and eighties; however, discussions of officer discretion have all but disappeared from current discourse. Using new technology to forge new methods to analyze discretion could new research on officer discretion.

In a study of six southern cities, results from a questionnaire indicated that there is a significant disparity in police officers' discretionary decision-making. This was particularly evident in deciding whether a person should or should not be arrested and more so in lower-level offenses (Powell, 1990). One of the most significant reasons for this is a lack of understanding about police activities, another platform that would benefit from more research. It is well established that police officers have great latitude, but there remains little research toward an insightful way to effectively control discretion. The highest priority would be to promote research to direct law enforcement agencies on investigating police discretion and the baseline for its measurement and progress (Mastrofski, 2004; Pasha et al., 2023).

Few studies have examined how a police department affects a police officer's arrest decision. It has not been shown that the formal structure of agencies can have a statistical influence (Caplan et al., 2021; Chalfin & Kaplan, 2021; Engel et al., 2020; Owens, 2020; Pasha et al., 2023). Also, police training studies are problematic because of the voluminous regulations and directives already placed on officers, making the directives difficult to be gauged (de Lint, 1998).

In a study of minor criminal incidents, Mendias and Kehoe (2006) showed that even though an arrest could always be justified, an arrest only occurred 56% of the time. This rate included the 10% of officers who made 100% of the arrests. Mendias and Kehoe also noted that the main reason why police officers make arrests is to enforce the law, followed by peace maintenance, procedural compliance, and failure to accept one's responsibility. Police prejudice is not a result of police training but more of the experiences they develop in the early stages of their career (Wortley & Homel, 1995).

The majority of discretion research is dated to 30 to 40 years ago. There has been a recent revival on the subject, most likely from renewed interest in bias in law enforcement. Although past research, even old research, provides a good base for understanding discretion, future research should reinvestigate old ideas and use new techniques to answer more modern questions.

Visual Cues

Dual-process theory is especially relevant for visual cues. System 1 works in the background, but Pohl (2018) noted that it remains a complex system of well-defined algorithms that are place-specific and rely heavily on past knowledge and experiences. Pohl also made an important distinction that all too often, research defines System 1 as a gut reaction. This is inaccurate because System 1 works on visual analytics to understand what is immediately happening in the world; System 1 attempts to explore the world and make sense of the visual clues by taking in the visual data, applying knowledge to the data, verifying this information against visual analytics, and then exploring behavior. Often, a lack of knowledge creates errors, not cognitive bias. Of particular interest to future research is what Pohl calls bias mitigation strategies.

The dual-process theory applies to policing because it encompasses the environment in which police work, at times slow and mundane, and at other times, fast-paced, dynamic, and dangerous. This environment is even more complex than initially thought due to the uncertainty, variety, and ambiguity at work. Within this environment, people and the police work from two processes. Surprisingly, the complex process of officer decision-making has received little research considering its enormous social implications and public interest (Akinci & Sadler-Smith, 2020).

Skin Color

Police use skin tone to categorize people by ethnicity and race (Irizarry et al., 2022). Skin tone can also create ingroups and outgroups, resulting in discriminatory behavior toward the outgroup (Melnikoff et al., 2021). For the present study, the ingroup consisted of White, Black, and Brown police officers, and the outgroups are Black and Brown people.

One's core values are the basis for emotional experiences, including attitude, prejudice, and decision-making (Serenko & Turel, 2019). Emotional concept knowledge is the storehouse of one's visceromotor experience of feelings such as anger, disgust, fear, and sympathy (Lee et al., 2018). Children as young as 24 to 47 months old can understand social context, facial expressions, and stereotypical context cues, and young children can develop intentions, desires, and beliefs that in turn guide their behavior (Conte et al., 2019).

Skin tone is a standard variable used to understand the negative social consequences of having darker skin (Bailey et al., 2021; Ching & Wu, 2022; Parker et al., 2022; Rohimi, 2022). Parker et al. (2022) stated that skin tone as a variable in research around police discretion is uncommon, and the practice of using skin tone as a continuous data type is nonexistent. This gap in the research is now addressable because of the advances in RGB technology, which can easily

capture detailed skin tone data. With continuous color data obtained from RGB technology, new ways to study arrest disparity and more accurate ways to study arrest disparity are possible.

The shortage of research stems from the absence of studies using a spectrum of skin colors and inadequacies to analyze skin tone gradients. Research that can determine precisely at what point skin tone categories begin and end is needed, and this will be impossible until research on colorism in the criminal justice system is stronger and considers the combination of literature on colorism and subordinate groups. Past research (such as the National Survey of American Life, which is discussed below) has used skin tone categories, but the categories are general and do not have specific borders like those achieved with a continuous RGB scale (Jackson et al., 2004; Landor et al., 2013; Marquez-Velarde et al., 2020; Monk, 2021; Mouzon et al., 2020; Oh & Jacob et al., 2021; Oh & Lincoln et al., 2021; Ostfeld & Yadon, 2022).

This specific categorization can be done by looking at a histogram's valleys and skin color peaks over the RGB color scale range. For example, it has been shown that Brown people have an easier time getting married compared to Black people, but no scientific delineation between the two regarding what is light compared to medium skin color has been proposed (Hamilton et al., 2009). According to Korver-Glenn (2018), delineation is essential because stereotypes accumulate and compound as more layers are involved in criminal justice. Their study of over 100 case studies of the housing market showed how the housing market, like most aspects of daily life, involves not just one transaction but multiple interactions and a stream of decisions and consequences; these in turn produce snowballing negative consequences (e.g., less contentment with education, health care, and employment) for having darker skin. The present study specified where these delineations in skin color exist. Current research implies that the separation between black and brown skin color nears an average RGB of 85, but there is no

definitive scientific answer. There are also no descriptive statistics about the groups that would fall into categories. Chapter Four of this dissertation offers further discussion of this idea through an exploration of the data.

The National Survey of American Life from 2001 to 2003 calculated the chance of arrest for African Americans by looking at the skin tone of inmates. The study created seven categories from very light (40% chance of arrest), light (44%), somewhat light (48%), medium (53%), somewhat dark (57%), to dark (60%), to very dark (65%; Monk, 2019), but this still lacks detail. Monk (2018) provided a clue in support of this study's H1: Even though there has been a call to research arrest rates based on colorism over the broader concept of race, it has not happened. Colorism is vital because there is a dramatic difference in outcomes within the skin tone ranges of darker-skinned toned Americans (Ibanez et al., 2019; King & Light, 2019). The present study attempted to drill down the effects of skin tone on officer decisions and used new tools to investigate the misunderstood phenomenon.

Researchers persist in asking questions about the disparity, and the academy remains unsure about how to answer them (Apata, 2020; Bakhrom & Toshbekov, 2022; Bowden & Buie, 2021; Hamed et al., 2020; Laurencin, 2022; Lopez & Jean-Marie, 2021; Rucker & Richeson, 2021; Valdez, 2020). This study anticipated that future and past results would become clearer once there existed a process for studying disparities in arrest rates through color instead of race. Past research using race averages the consequences of Black and Brown people to paint a less clear picture. An understanding of color is particularly important because the stereotypes associated with visual skin tone are what most intensely affect System 1 processing in police decision-making.

A perfect theory explains variations in police behavior due to the skin tone of the arrestee. No theory has been developed that can explain police behavior due to skin tone. This is true primarily because of the lack of attention to skin tone. Prior research on disproportionate arrest rates can be divided into three mutually exclusive categories; only one category can be the most predictive. Two of the categories are similar in that they are both System 1 processes, and the other is dissimilar from the first two in that it is a System 2 process. The three categories and the theories that express them are the stereotype threat theory, the self-categorization theory, and the social dominance theory.

These three conflicting categories of literature are related to disproportionate arrest rates and each is distinct in what its authors believes is responsible for disproportionate arrest rates. Content included in the first category suggests that as skin gradually becomes darker, disproportionate arrests become greater. The second category presents studies that explain how groups within skin tone ranges have similar disproportionate arrest rates but different disproportionate arrest rates from other groups based on skin tone. The third category consists of research promoting the idea that all darker-skinned people are part of one group that experiences a similar level of disproportionate arrest rates (Arndt et al., 2020; Ashtiani, 2021; Bahraini et al., 2021; Barideaux et al., 2021; Bowleg et al., 2022; Carpenter, 2021; Finkeldey et al., 2022; Hannon, 2020). For the present study, each category of theories was given an applicable label and associated with a related hypothesis.

Police Decision Making

Bias is when people make systemic errors (inherent consistent errors over time). P. L. Taylor (2019) explained that systemic errors can be calculated because they appear in particular circumstances. Taylor carefully studied the errors committed by police officers in police

shootings and found that police errors could be reduced by having more cognitive training on the use of force. Taylor's research also discovered that police officers sometimes choose not to shoot a suspect even when shooting the suspect was the correct decision, but that those errors could be reduced by more practice around the skill of firing the officer's weapon. Finally, Taylor pointed out that the main reason to survey errors in police work is to learn from them and produce better future research. Per Griffith et al. (2021), people perform better when given accuracy goals.

As previously noted, System 1 is not the inferior system; this might be inferred because it is the first system. System 2 is not well suited for making urgent judgments that police officers need to make. System 1 is much better than System 2 at making an uncertain and fast decision (Cosentino et al., 2020). With the Bases for Urgent Decisions Under Extreme Circumstances Inventory (BUDECI) and other inventories, Cosentino et al. (2020) compared the decision-making of 416 military cadets. They reviewed the characteristics of the cadets that made them better System 1 decision-makers and found that cadets who had good intuition reflected on their decisions and could quickly calculate the probabilities of the best utilitarian outcome. The authors concluded that this new field of police work under dual-process urgent decision-making requires real-life research. To this end, the present study is a real-life quasi-experiment design that looks directly at bias in a dual-process decision-making arena.

Disproportionate Arrest Rates

The debate on the disproportionate arrest rate is complex but revolves around two general themes, including the notion that a disproportionate amount of crime is committed by people with darker skin tones and that there is bias in law enforcement toward darker skin tones (Dawson-Edwards & Higgins, 2013). Skin tone more equitably frames the understanding around disproportionate arrest rates (Schroedel & Chin, 2020) and has become the appropriate method to

understand the social and economic disadvantages experienced by people with darker skin tones (White, 2015). Hannon (2021) declared that skin tone research is also essential in understanding racism and colorism and determined that the notion that White people cannot see darker skin tone variation is incorrect. They also proposed that more nuanced skin tone measurements will be used in the future. It can be reasonably inferred that much of the past research on colorism should be revisited with more exact tools.

Disproportionate Arrest Outcomes

Disparities in arrests are the remnants of social control established by slavery. To fix the issue, researchers should concentrate on the black economy, segregation, and the many disadvantages still facing the Black community, such as health, housing, and jobs (Ward, 2022). For an in-depth exploration of experiences with racism, scholars could survey the health care community, as there has been remarkable expansions in research exploring the adverse outcomes of racism in that arena (Williams et al., 2019). Much research has been conducted to understand the rampant prevalence of racism in health care, in part due to the extensive interpersonal contact required in that context, a point that arguably aligns with police work (Hicken et al., 2018). A telephone survey found that 22% of Black people, compared to 3% of White people, avoided available health care facilities because of a fear of poor treatment (Benson et al., 2019). However, traditional survey methods are believed to underreport the amount of racism (Chae et al., 2018).

There has been increased attention on understanding the determinants of disproportionate police arrests. Street involvement and drug use are more related to disproportionate police arrests than skin tone (Greer et al., 2021), but this may only indicate that the War on Drugs and predictive policing are distorting disproportionate arrest research (Corbett-Davies & Goel, 2018;

Richardson et al., 2019a; Robertson et al., 2020; Tillyer, 2018; Yen & Hung, 2021). Additional quasi-experiments are needed to simplify the process, as Lantz and Wenger's (2020) study showed arrest rate disparity when Black people and White people are co-offenders in a crime. Their study restructured the data from the National Incident-Based Reporting system to show that traditional dichotomous regression may be incapable of answering questions about arrest rate disparity.

Law enforcement's discretionary power significantly influences disproportionate arrest rates (Jeffers, 2019). Due to a lack of scholarly research on lower-level crimes, the Misdemeanor Justice Project sponsored nine papers centered around four themes, one of which was officer discretion and misdemeanors (Chauhan & Travis, 2018). Instead of solving issues, these articles pointed to issues of officer discretion and directions for future research. Officer discretion and misdemeanor arrests are complex, but there appear to be distinct differences in police departments, allowing researchers to identify which has more control over discretion, the agency or the officer (Lum & Vovak, 2018). Though much research has examined disparities in arrests (Chamberlain et al., 2021; Jahn et al., 2022; Owusu-Bempah & Luscombe, 2021), the issues around disproportionate arrest rates snowball when White defendants are 25% more likely to have their charges dropped than Black defendants (Berdejo, 2018).

A Complicated Problem

As of 2020, the reason why police kill more Black people than White people remains unknown; exploration of whether it stems from racial bias is crucial. Holmes (2020) blamed a lack of reliable data and the structure of the data that is maintained on such incidents for the failure of past research to provide an adequate answer. No research has predicted the reasons behind the use of force by looking at individual police officer data. Racial diversity in the police

force has had little influence on officer shootings. Holmes also noted that there are higher rates of shootings of Black people in areas defined by segregated neighborhoods. The reason behind this might be more complicated than expected. These neighborhoods are less likely to report a crime, might suffer from the unavailability of required resources, and might be subjected to higher force levels (Gray & Parker, 2020).

When reviewing expected police shootings, Whites, Hispanics, Asians, and all other groups are shot at about the expected rate; however, when reviewing the number of Black people shot by police, the rate is over twice the expected shooting rate. This implies that about 12 Black people are unnecessarily shot every month. Mentch (2020) found that when adjusting the data for police activity in communities, this effect is nullified and concluded that racial consequences come from the administrative application of officers in certain areas. Racially motivated shootings can be analyzed by studying the incidences of shootings of unarmed Black people. Per Ross et al. (2021), "Across all crime benchmarks in all years, we find substantial evidence of anti-Black racial disparities in killings of unarmed civilians by police" (p. 5).

Using the multilevel Bayesian model to analyze data in the United States Police-Shooting Database, research has reported significant bias in police shootings of unarmed Black people. The probability of being black, unarmed, and shot by police is 3.5 times higher than the chance of being white, unarmed, and shot by police (Ananthakrishnan et al., 2021; Johnson & Wright, 2021; Lave, 2022; Nix & Shjarback, 2021). The degree of difference in different areas is substantially different from the average. Some areas are reaching 20 times the risk of being black and unarmed as opposed to white and unarmed. In the case of largely populated communities with a more significant disparity in income, low median incomes, and large Black populations, they are more likely to experience racially biased shootings.

More recently, COVID-19 has redirected and reduced personnel, restricted police contact, changed policing strategies, and reduced citizens sense of security. In St. Louis County, Missouri, it was shown that due to COVID-19, residents engaged with police more, heard gunfire more often, and saw a reduced police presence. That being true, citizens reported having more satisfying encounters with police because of less enforcement of minor offenses (Nouri & Kochel, 2021). COVID-19 has offered new ways to research the complex problem.

Research and the media highlight the arrest ratio for Black men (1:3) compared to White men (1:18) being disproportionate, but the arrest ratio for Black women (1:18) is substantially higher than for White women (1:11; Hinton et al., 2018). Black people experience higher rates of exposure to the criminal justice system. The vast amount of literature on the negative life consequences of being black in the United States is undeniable (Monk, 2019). Women's criminality has long been thought to be significantly different from men's; the fact that Black women are substantially more disproportionately affected than men poses additional questions.

Colorism

The study of colorism is essential because skin tone is not a biological issue; it is a social issue that can differently affect people of the same race or ethnicity. Colorism can also play a role in discrimination in communities featuring miscegenation that makes it difficult to categorize people according to race (Hunter, 2007). Even while accounting for other differences such as class or family history, discrimination is evident in the stratification of skin tone. The educational gap between White and Black people is the same as between light and dark-skinned Black people (Hunter, 2016).

The Multi-City Study of Urban Inequality shows that wage disparity is still related to skin tone. A critical detail of the study was that it was not what they called the rainbow effect. The

results implied that wages did not depend on skin tone (i.e., lower wages for dark-skinned people). There seems to be a multi-model effect in which darker-skinned Black people face more disparity than lighter-skinned Black people (Goldsmith et al., 2006) and in which dark-skinned Black people are less likely to earn promotions (Uzogara et al., 2014). Fair-skinned Black people make 65% more income than dark-skinned Black people, and fair-skinned Black people are more educated and report half as much discrimination. These phenomena play out at work and in the home life as well.

There exists ample anecdotal evidence that lighter-skinned Black people are considered more attractive than darker-skinned Black people. There is an indication that males are considered more attractive if they are darker-skinned and females are considered more attractive if they are lighter-skinned; however, skin tone did not affect the self-confidence of individuals with either of the skin tones (Wade, 1996). Although Black people did not report more discrimination, lighter-skinned Black people did report more favorable treatment from White people (Hersch, 2006). Lighter-skinned Black people receive almost 2 years more schooling than darker-skinned Black people, which can mean the difference between graduating high school or not (Hersch, 2006). Colorism, or the color stratification advantages of light-skinned people, not only affects income, education, housing, and relationships of Black people but also of Latinos and Asians.

Dark-skinned Black people have lower socioeconomic status, have more negative experiences with the police, and have less prestige in society (Hochschild & Weaver, 2007). Moreover, dark-skinned Black people have long been known to believe they have fewer civil liberties (Seltzer & Smith, 1991), earn lower wages, are offered worse jobs, face higher unemployment, gain less access to health care, and struggle to amass wealth than lighter-skin-

toned Black people (Gyimah-Brempong & Price, 2006). This under-researched topic has significant implications for Black people in all aspects of their lives (Hunter, 1998), including that the lack of employment in a suspect increases the perceived threat to a police officer (Vallejo-Martin et al., 2020).

The lack of employment affects not only the incarceration rate and wage growth but also officers' discretion. In their 472-participant sociodemographic questionnaire utilizing hierarchical regression with the SPSS PROCESS macro, the authors point out that intergroup threats explain the relationship that when outgroups are seen as a threat, hostility can be created within the ingroup. They also show that this aggression can originate with two sources, real and symbolic. Symbolic threat comes from the perceived outgroup differences in values and beliefs, and the stereotype content model suggests that perceived morality has the most weight (Constantin & Cuadrado, 2021; Lantos & Molenberghs, 2021; Walsh & Tartakovsky, 2021).

Mechanisms Leading to Disproportionality

The mechanisms that have led to poor results are complex and not fully developed, but the most dramatic difference in skin tone for darker-skinned Black people is not unfair police treatment, attractiveness, or expected intelligence but rather people's level of fear. As skin tone gets darker, people become substantially more afraid of the person (Hersch, 2006). Skin tone has been the subject of research in many disciplines but has also been ignored in certain fields, even though variations in skin tone play a vital role in people's perceptions of Black people. It is crucial because stereotypes require categorization, and skin tone plays a vital role in defining subdimensional racial categories. Researchers must reflect on racism because skin tone plays a much more complex role than it is perceived to play (Maddox & Gray, 2002).

Pigmentocracy is the idea that certain skin tones control governments and society. Even without the belief that the United States is a pigmentocracy, there is no doubt disproportionate outcomes exist for dark skin. Researchers have consistently reported this but have yet to show why or how, pointing mainly to the stereotype that Black people are dangerous. Researchers have little idea if that stereotype applies evenly across skin color, changes in steps, or grows as skin becomes darker. However, researchers do know that the disparities within the Black population are comparable to or exceed the disparities between what has been shown between Black people and White people (Monk, 2019). This dissertation continued the seminal work of White (2015) to better understand the salience of skin tone on arrest rates.

Bias

People hold an inherent racial bias toward different ethnic groups (Howard-Waddingham, 2018). Starting at a young age, people are socialized to distance themselves from others they feel are not as good as themselves, creating an ingroup and an outgroup (Mijic, 2022; Stengelin et al., 2022). The larger the distinction between the groups, the larger the cognitive distancing effect. Cognitive distancing is when someone or some group ignores or minimizes their interactions with another person or group (Cooley et al., 2022). It is important to understand that racial statements are harmful regardless of if the statements are factually correct (Basu, 2019).

Uenal et al. (2020) noted that discrimination is experienced when one is part of a group that is not in a particular culture, religion, institution, or ideology. What surprised the researchers was that when fear is applied, people who do not score high in social dominance become more dominant and discriminatory. This difference can even be seen through functional magnetic resonance imaging (fMRI) studies examining how people process information differently for ingroups and outgroups. Using the magnetic properties of blood, fMRI can determine brain

activity by measuring blood flow. When White people watched white and black faces for 30 min, they exhibited an increased emotional response to black faces with activity in the amygdala. The study by Uenal et al. also revealed that people are highly sensitive to outgroups because they pose a threat. When there is extreme identity with an ingroup, the members of the ingroup can even experience pleasure from outgroup pain (referred to as Schadenfreude; Levy, 2020). This can be an issue when police see themselves as a group.

The U.S. Supreme Court has confirmed broad police discretion powers, which historically led to racial inequalities in the U.S. criminal justice system (Ristroph, 2020). The Fourth Amendment's Due Process Clause has failed to protect Blacks against the carceral state (Hunter, 2022). The carceral state refers to the punitive practices and structures devised for different groups. The government can continue to follow discriminatory practices, as demonstrated by the persistence of segregation across communities and mass incarceration by placing one in four Black people in jail (Munger & Seron, 2017). The United States has the largest prison system, with 35% of the world's prisoners. Mass incarceration was not a war on drugs but political repression of Black society, which put one in nine Black people between the ages of 20 and 34 in prison (Berger, 2013). For decades, the United States imprisonment rate was .1%. In the 1970s, the imprisoning rate rapidly increased and by 2008 had reached .76%, with another five million others on probation or parole (Beckett & Francis, 2020), and today the nation experiences an imprisoning rate of .64%.

Review of Variables

A digital scan of the arrested person's forehead was collected from the arrest mugshots, and the scan produced data numerically describing the skin tone on the RGB scale. The three data points of the RGB were averaged to create a singular data point for skin tone, and the

singular independent variable was RGB skin tone. This X variable was labeled Average RGB, and in the formula, it was represented as RGB. The dependent variable was the DI. This y variable was DI, and in the formula, it was represented as DI as is shown in Table 1. Although the present study was quantitative and quasi-experimental, it was also exploratory because it was considered groundbreaking to use RGB data to understand disproportionate arrest rates. It was also exploratory based on the tools it used. Typically, a pretest-posttest looks to see if there are statistically significant changes after the interventions, but this study calculated the DI based on the before and after, representing an exploratory use of the pretest-posttest that capitalized on the growing use of the DI. The observations were divided into skin tone groups and in the formula take the names Black, Brown, Beige, and Blond. The formula used, with all the variables, was:

$$\widehat{DI} = \beta_0 + \beta_1 * RGB + \beta_2 * (RGB - k_1) * I(k_1 \leq RGB < k_2) + \beta_3 * (RGB - k_2) * I(k_2 \leq RGB < k_3) + \beta_4 * (RGB - k_3) * I(RGB \geq k_3).$$

Conceptual Framework

Prior research has almost exclusively relied on the social construct of race. Race is scientifically defined as the level below subspecies, not by skin tone (Duello et al., 2021; Hochman, 2019, 2021; Jablonski, 2021; Spencer, 2018). Modern deoxyribonucleic acid (DNA) shows that all humans share 99.9% of the same DNA (Chou, 2017; Johnson, 2022; Jones et al., 2020; Minnis, 2020; Possin et al., 2021; Rosenberg, 2008), but people have different characteristics that develop from a highly complex process, including the process of determining skin tone. There is a general confusion that this statistic shows that Black people and White people have DNA that is not shared, and as such, infer they are different races. The 99.9% is for everyone compared to everyone, regardless of skin tone or any other trait with which society tries to categorize people.

Using race in research has been an essential sociological tool; however, it poses a moral cost (Mugg, 2020). It is wrong to signify people with dark skin tones as separate people (Rutherford, 2021). Instead, a better approach is to group individuals based on skin tone coloration and then examine arrest disparity based on skin tone. The theories addressing disparities in arrest rates between groups are the stereotype threat theory, self-categorization theory, and social dominance theory; all are expanded upon in this section. First, the dual-process theory was the general conceptual framework because it encompasses the idea that behavior can form from two processes, System 1 and System 2. Second, the theories related to disproportionate arrests and the hypotheses proposed for this dissertation study were categorized as either System 1 or System 2 theories and hypotheses.

Dual-Process as a Conceptual Framework

Three main theories were investigated to identify the ideal theory for this study: the theory of planned behavior, dual-process theory, and symbolic interactionist theory. A perfect conceptual framework would explain variations in police behavior due to the skin tone of the arrestee. To date, no theory has been developed that can explain police behavior due to skin tone, primarily because of a lack of attention to the issue (Huff, 2021; Mastrofski, 2004).

Dual-process theory, as a conceptual framework for disproportionate arrest rates, uses base rates to analyze arrest errors created by implicit bias (a System 1 process) and explicit bias (a System 2 process). Dual-process is the idea that people make decisions from two cognitive processes, process one (System 1: S1–hot and fast), the intuition process, and process two (System 2: S2–cold and slow), the analysis process (Reese et al., 2020). Stereotype threat theory and self-categorization are System 1 processes, and social dominance theory is a System 2 process.

The Theory of Planned Behavior

The theory of planned behavior explains what influences a police officer's intentions in using their discretion. The theory of planned behavior looks at how factors affect intentions, which can control behavior (del Pozo et al., 2021). Intentions can also be a small part of behavior, especially when most research has pointed to discretion being situational based (Huff, 2021). The theory of planned behavior is one of the most common applied theories in the social and behavioral sciences that believe behavior is guided by behavior consequences, expectations, and expected performance (Bosnjak et al., 2020). Unfortunately, the theory is a work in progress, may not be as predictive with implicit bias, and is untested in police work, though Compton et al. (2021) has claimed it shows promise with police training.

Dual-Process Theory

Dual-process theory better predicts the merger of implicit and explicit bias. Although the theory of planned behavior is useful, dual-process theory is an effective predictive behavioral guide (Phipps et al., 2022). Dual-process theory is a better choice for understanding implicit bias, and understanding implicit versus explicit bias was essential to the present study.

Symbolic Interactionist Theory

Symbolic interactionist theory states that police play out their roles as they interact with people based on symbols created from their own lived experiences (Anderson et al., 2022; Husin et al., 2021). Symbolic interactionist theory is critical because it emphasizes that police are individuals, but they are also on a sort of stage playing a role directed by government agencies and watched by a global audience.

Dual-Process Theory

Dual-process theory shapes the framework for analyzing disproportionate arrests. Disproportionate arrest rate research is disorganized due to the use of an ordinal variable for the independent variable. When the answer to the research question is framed in black and white, the hypothesis can be valid, but the conclusion is suspect. Specifically, past conclusions do not inform whether disparity increases as skin tone darkens, if disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity.

Dual-process theory was first introduced in 1890 by Harvard's William James (Clarke, 2021; Robins, 2022) and was popularized by Nobel-prize winner Daniel Kahneman's book *Thinking, fast and slow* (Gordon, 2021; Kahneman, 2013; Robins, 2022). Dual-process theory describes that the brain has two distinct systematic ways of making decisions. System 1 encompasses implicit, unconscious, and automatic decision-making, and System 2 encompasses the slow, heavily considered decision-making process (Robins, 2022).

The dual-process concept originated from the idea that during the late Pleistocene era (between c. 129,000 BP and c. 11,700 BP), the human brain created a distinct System 2. Humans still have System 1 (which is still shared with other animals). System 1 is pragmatic and associative, and System 2 is abstract and based on rules. Around 70,000 years ago, when modern humans dispersed from Africa, complex cultures began developing. It was during this period that the brain size of H. sapiens increased by 17%, and it is believed that this was also when the type two section of the brain was created (Clarke, 2021). This area of research is still evolving.

System 1 is the automatic and quick response system based on pattern recognition and reacts to objects, hostility, voice, color, and sound. Gordon (2021) has described System 2 as the deliberate mental process that includes complex decision-making, including choice and self-

control, and what takes over if concentration and complex logical behavior is needed. Gordon also argued that it is important to understand and differentiate between implicit bias (System 1 process) and explicit bias (System 2 process); this distinction is necessary for the present this study, which separates implicit bias and explicit bias based on skin tone. Prior research has purported that it is possible to influence both systems' process accuracy once bias is identified (Worden et al., 2020). Researchers also contend that once errors are recognized, System 1 processes will often lead to effective decision-making, even in complex situations, and that feedback can be used to make better System 1 decisions.

Dual-process theory aligns with situations where someone makes judgments about others with stereotyping (H1) and categorization (H2). It speaks to skin tone judgments because salient stereotypes are particularly applicable to dual-process theory (Vaisey, 2009). Although dual-process theory is rarely used in criminology, it is particularly beneficial to understanding police work because it incorporates the ideas of fear management and distal and proximal defenses, and it has gained enormous support recently (Poon, 2020). In the first-ever study of dual-process on adolescent delinquents, Poon (2020) showed that dual-process is adept at illuminating not only police behavior but also the behavior choices of delinquent decision-making.

Although dual-process theory has had a large impact on cognitive psychology, it only made its way into the field of sociology in the last decade (Bursell & Olsson, 2021). Many themes need to be understood in conjunction with dual-process theory because implicit stereotypes have both attitude and stereotype associations. Dual-process theory is not only valuable for understanding disparity in police arrests but also for understanding why communities continue to contact 911 when they distrust the police, a concept Hagan et al. (2018) applied to study the phenomenon. Neighborhoods that are overpoliced face a dual problem of

distrusting the police yet also hating crime. Like the Hagan et al. research, the present study reviewed the most common theories of disproportionate arrest rates but through the lens of dual-process theory.

System 1 and System 2 are understood through the framework of the triune brain, which looks at System 1 as the paleomammalian brain (hypothalamus, amygdala, and hippocampus) and System 2 as the neomammalian brain (cerebral neocortex). It is believed that the systems are hierarchal in which the lower systems provide processing to the higher systems, meaning System 1 would process inputs before being processed by System 2 (Roozeboom, 2021). This also implies that information is not eradicated, meaning information helps System 2, but only after System 1 has played a role. When bias lies in decisions that are fast, ambiguous, and have subjective criteria, then research needs to debias the process. Debiasing is only done by purposefully working to make new mental associations from research that can show what causes the bias.

Summary

Theories are fundamental in helping understand bias. Research on disproportionate arrest rates has been based on race, a dichotomous variable that assumes all people of color fit into a single coequal category. The state of the research has reached a point where some scholars are claiming virtually all prior research on the subject should be considered suspect. The present study aimed to create a path for making disproportionate arrest rate research viable by applying dual-process theory to separate disproportionate arrest rates into two general processes: System 1 processes and System 2. The System 1 process has two categories of theories that are labeled stereotype threat theory and self-categorization theory. The System 2 process has one category

labeled social dominance theory. These three categories directly align with the three questions posed in the present study to arrive at the following guide.

System 1 Processes

Dual Process System 1–Implicit: Category 1–Stereotype threat theory

Research Question 1: *Is there a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups (Black, Brown, Beige, and Blond) defined by the knots?*

Dual Process System 1–Implicit: Category 2–Self-categorization theory

Research Question 1: *Is there a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups (Black, Brown, Beige, and Blond) defined by the knots?*

System 2 Processes

Dual Process System 2–Explicit: Social dominance theory

Research Question 2: *If there are significant differences in the slopes, which will be determined in RQ1, is there a significant difference in the slopes of the relationships between RGB and DI between the Black and Brown skin tone groups, specifically?*

Gaps in the Literature

The existing literature does not provide an understanding of the workings of colorism, which makes it more difficult to fight (Reece, 2019). More nuanced research on police discretion is required (Chanin et al., 2018), and the highest priority should be investigating police discretion and the benchmarks for its measurement and progress (Mastrofski, 2004; Pasha et al., 2023). The present study used dual-process theory to benchmark base rates. This marks an important step

because thus far, research trends have proved inconclusive about disproportionate arrest rates (Lantz & Wenger, 2020).

Huff (2021) has noted a paucity of research to guide police training. Darker skin tones are disproportionately in contact with the police because they are more likely to be in areas of more police patrol (overpatrolling) and are stopped and searched more frequently (oversearching) due to police bias. These two issues account for the disparity between darker and lighter skin tones in police contact (Lofaro & McCue, 2020; Ugwudike, 2022; Vomfell & Stewart, 2021).

Skin tone disparities are most obvious when surveying police shootings. When surveying contents relevant to police shootings in *The Tampa Bay Times* via an online database, Nazaretian et al. (2021) observed that the "police are shooting at two very different populations" regarding Black people and White people (p. 1). Not only are they two different populations, but Black people and White people are also experiencing different criminal justice systems (Monk, 2019).

The Chamberlain et al. (2021) study took place in an undisclosed city in the South and involved approximately 250,000 people, of which 69% were White and 24% were Black; this constitution is similar to Alachua County, Florida. It might seem counterintuitive, but a Black person in a 90% White neighborhood might have almost 10 times the chance of getting arrested than in a 50% or more Black neighborhood. The identical but less dramatic effect would be for a White person in a Black neighborhood.

Research does not fully explain how police officers become suspicious (Dunham et al., 2005), but what research has made clear is that as skin tone gets darker, people become substantially more fearful (Hersch, 2006). Pryor et al. (2020) explained that the stereotypes of violence and crime, and how Black people are associated with is, responsible for the disparity in

police arrests. Categorizing people by skin tone is a unique process (Hugenberg et al., 2010; Levin, 2000).

The dominant group uses the criminal justice system to negatively affect subordinate groups (Lofaro & McCue, 2020). Arrests represent one of those suppression methods, but more research is needed to understand and identify them (Huff, 2021). One way to do this is through skin tone experiments, but skin tone research has been sluggish (Reece, 2019). The role that racism plays in police encounters also requires more research (Calvert et al., 2020; Cooley et al., 2020; Simckes et al., 2021). Once that is clearer, researchers can demonstrate to police departments ways to help officers recognize their biases (Calvert et al., 2020). This is essential because police biases significantly impact lower-level infractions (del Pozo et al., 2021).

It is known that police departments can substantially affect biased discretion, but research does not reveal what strategies will work (Adams et al., 2021; Engel et al., 2022; Mason & Petrie, 2021; Oberfield, 2019; Richardson et al., 2019; Su, 2021; Vernon & Lynn, 2021; Vito et al., 2020). This has been shown with hard statistics (Caplan et al., 2021; Chalfin & Kaplan, 2021; Engel et al., 2020; Owens, 2020; Pasha et al., 2023), but at best, research results regarding the effectiveness of implicit racial bias training for police officers are mixed (Atewologun et al., 2018; James et al., 2019; Machado & Lugo, 2021).

Understanding the correlation between negative outcomes and skin tone is the most important aspect of understanding ethnoracial inequality (Monk, 2021). Skin tone assessment more equitably frames the understanding of disproportionate police arrests (Schroedel & Chin, 2020) and is an appropriate method to understand the social and economic disadvantages experienced by those with dark skin colors (White, 2015) as well as racism and colorism (Hannon et al., 2021). Cosentino et al. (2020) looked at decision-making among military cadets,

and concluded that decision-making in urgent situations needs real-life research. The present study used a real-life quasi-experiment design that looked directly at disproportionate arrests in an urgent, dual-process decision-making arena.

Problem Statement

Although the literature indicates that dark-skinned people are disproportionately arrested, it is unknown if this disparity increases as skin tone darkens, if disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity. It is well-established that there are comparatively negative outcomes for people with darker skin tones when interacting with the police (Blitz et al., 2020; Caraballo-Cueto & Godreau, 2021; Crutchfield et al., 2021; Kiang et al., 2020; McCleary-Gaddy & James, 2020; Mitchell et al., 2020; Parks & Kirby, 2021; Seaton, 2020; Zhirkov, 2021). One of the most researched topics in law enforcement has been about factors that predict police use of discretion in arrests, but understanding bias in police behavior has proven difficult to study (Bowling & Iyer, 2019; McCamman & Mowen, 2018). Arrests are highly correlated with structural racism and colorism, and research that uses categories of race hides differences in arrests based on skin tone (Finkeldey & Demuth, 2021). New research is essential because past research on arrests and skin tone has been inconclusive (Alcala & Montoya, 2018; Branigan et al., 2017; Kizer, 2017; White, 2015). Although it is one of the most researched topics, virtually all prior research on disproportionate arrests is invalid because of the denominator effect. This study explores the answer to this problem, which lies in using quasi-experiments.

It was expected that body-worn cameras would provide clearer insights by utilizing randomized control experiments and quasi-experimental research (Ariel, 2016; Braga et al., 2018; Grossmith et al., 2015; Hedberg et al., 2017; McCamman & Mowen, 2018; Ready &

Young, 2015; Wallace et al., 2018; Yokum et al., 2017). However, in a review of 70 empirical studies, of which 32 specifically examined officer behavior, no consistent findings emerged (Lum et al., 2019). Darker-skinned people have significant disadvantages, but it has not been shown that negative criminal justice system outcomes for darker-skinned Americans are associated with police officer bias. Monk (2019) noted that future research should not use dichotomous analysis of Black versus White populations because it truncates and distorts the complex nature of biases. This quasi-experiment design removed that factor to focus solely on skin tone bias.

Arrests are highly correlated with disparities in housing, education, employment, earnings, benefits, credit, media, health care, and criminal justice, and research that uses categories of race hides differences in arrests based on skin tone (Finkeldey & Demuth, 2021). New research is essential because past research on arrests and skin tone has been inconclusive as to why criminal justice disparities exist (Alcala & Montoya, 2018; Branigan et al., 2017; Kizer, 2017; White, 2015).

Absent from the literature is quasi-experimental research on disproportionate arrest rates. Criminal justice research indicates that Black women and men are disproportionately overrepresented in the criminal justice system (Working Chance, 2021; Yelnur et al., 2021). Quasi-experimental research using the full spectrum of skin tone is essential in understanding how the Alachua County mandate impacted disproportionate arrests. Although many factors can lead to disproportionate police arrests, few focus on how routine police discretion impacts arrest rates (Gaston & Brunson, 2020). Monk (2021) agreed that to advance the field, future research should consider switching from racial demographic data to skin tone data.

Even though it is widely understood that being arrested has negative consequences, there is a lack of research focused on correcting disproportionate police arrests (Baughman, 2021; Long et al., 2019). Expected arrest levels directly correlate with the probability of arrest, and being unable to account for actual arrest levels is a significant problem (Monk, 2019). Although skin tone is associated with increased arrest rates (Finkeldey & Demuth, 2021), current research has not demonstrated how and to what extent the gradual darkening of skin tone was correlated with the DI and arrest rates in Alachua County during the COVID-19 police discretion mandate. This research sought to fill that gap by exploring how and to what extent skin tone between groups was predictive of the DI and arrest rates in Alachua County during the COVID-19 police discretion mandate and how and to what extent skin tone was predictive of arrest rate in Alachua County during the COVID-19 mandate. The data gleaned from this study offers a solid foundation for additional studies about the relationship between police discretion and disproportionate arrest rates based on skin tone.

The fundamental issue that this study addressed is ambiguity. Prior research has used race as an independent variable to develop theories about why disproportionate arrests occur. Using race makes findings on disproportionate arrests ambiguous. Race-based research is ambiguous because it only detects whether disproportionate rates exist without seeking an understanding of why they exist, which requires the full spectrum of skin tones. To understand if disproportionate rates increase as skin tone gets darker, if it is grouped by ranges of skin tone, or if it applies equally across all skin tones, research must use the entire spectrum of color, not race. This research proved important because it answers a major unknown topic in criminal justice, targeting an important issue that affects not only darker-skinned people but the entire

community, and the topic is significant because police officers interact with constituents over 40 million times a year in the United States.

Chapter Summary

Police officers make judgments about those with whom they interact while working. These judgments can be influenced by the skin tone that they see and have been influenced from their upbringing and how their department conducts field training. It is not the police officer that should be directly studied; that scrutiny lies with the courts, lawmakers, and police executives. Scrutiny should start with the elementary school system, which plays a pivotal role in shaping how people view each other and a direct and substantive role in defining ingroups and outgroups. It is crucial to remember that schools are one of the best venues in which to fight colorism, and the judicial system serves as the final protection of human rights. It is also crucial to remember that during formative years, System 1 information is obtained about how to react to objects, hostility, voice, and sound. The police officer makes the arrest, and it is at this level that the literature attempts to understand disproportionate arrest rates. The literature can be categorized into three main categories: stereotype threat theory, self-categorization theory, and social dominance theory.

The stereotype threat theory speaks to the erroneous notion that Black people are violent criminals, muggers, and drug addicts and an underclass made up of homeless people (Pryor et al., 2020). Americans' segregated lives make it easy for the media to propagate this false narrative (Nix & Pickett, 2017), for it was Randolph who said that segregation was the racist link to the continual imbalance in the economy for millions of people of color. This literature review clarifies that the media plays a significantly more substantial role than commonly believed. The literature has been short on theories around negative media, and there have been few calls for

gaps in the literature to be filled. The literature is replete with articles on disproportionate outcomes, stereotypes, discretion, and policing. Nonetheless, there are large gaps in an understanding of discretion and policing and even bigger gaps in theories and pivotal articles surrounding discretion and policing. The media makes it difficult to make unbiased decisions about complex issues.

The self-categorization theory shows that skin tone can create two or more categories of darker-skinned people (Diette et al., 2015). These categories help people make decisions (Yoong & Syed, 2020), but they also can cause people to pay closer attention to cues of violence and express more anger or fear (Ji et al., 2019). The social dominance theory speaks to the idea that all darker-skinned people can suffer from the historically more dominant position of having lighter skin tone. The lighter-skinned dominant group wishes not to lose that power and to exert more social control over all darker-skinned people (Gray & Parker, 2020). One way to continue this dominance would be to disproportionately arrest darker-skinned people (Kennedy, 2009). The highest court in the United States has confirmed broad police discretion powers, which has been identified as one reason for the carceral state (Ristroph, 2020). The carceral state consists of punitive practices and structures devised for darker-skinned groups represented in mass incarceration by placing one in four Black people in jail (Munger & Seron, 2017).

It seems reasonable to assume that the three theories can be ranked by how well each category predicts disproportionate arrest rates. This study used an experiment to statistically rank each category and used spectrometers to examine the effects of skin tone on arrest rates building on the work of Karletta M. White. White (2015) was the first to study whether skin tone affects police officers' decisions about whether to make arrests, and since the release of her study, no additional studies have sought to fill the large gaps remaining. The vast amount of literature

points to two possible causes for disproportionate arrest rates: implicit bias, which is a result of either the media and stereotypes or of the societal grouping people by skin tone, and explicit bias, which is the result of White society suppressing Black society.

CHAPTER THREE: METHODS

The preceding chapters show the significance of disproportionate arrest rates, significant gaps within the field, and the history and development of the three major categories of theories in disproportionate arrest research. The previous chapters build the foundation for this study by showing omissions in the research and the need for further research on disproportionate arrest rates. The current chapter explains the methodology for the present study, including the research design, research questions, hypotheses, population and sample, instruments, procedures, and data. The focus of this study was disproportionate arrests. Although researchers have found that dark-skinned people are disproportionately arrested, it is unknown if this disparity increases as skin tone darkens, if disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity. More specifically, this study examined which general categories of theories of disproportionate arrest rates are most predictive of disproportionate arrest rates based on skin tone. Virtually all prior research on disproportionate arrest rates is questionable because of the denominator effect. This study used a quasi-experimental design to examine the problem with the denominator effect.

Purpose of the Study

This quantitative, quasi-experimental research aimed to determine which categories of theories on disproportionate arrest rates are most predictive of disproportionate arrest rates (dependent variable) using skin tone (independent variable). This study also aimed to show how a quantitative, quasi-experimental method can solve a fundamental issue with existing research on disproportionate arrests because quasi-experiments eliminate the need to estimate benchmarks. According to Neil and Winship (2019), “The magnitude of the problems we have discussed should not be underestimated: In our view, they pose severe challenges to virtually all

existing research on police discrimination" (p. 90). The present study supplements the existing body of research about disproportionate arrests by examining the skin tone of every adult arrested in Alachua County in the 2 months before and the 2 months after the Alachua County mandate of 2020. This study analyzed arrest rates based on skin tone before and after Alachua County mandated that the police reduce arrests during COVID-19. Arrest rates were analyzed using a spectrometer to numerically calculate the skin tones of all individuals arrested during the study period.

Identifying which categories are most predictive should in turn reduce the fundamental issue of guessing about benchmarks, which is a material issue in most research on disproportionate arrest rates (Neil & Winship, 2019). The academy has concluded that arrest rates are disproportionate because of this benchmarking problem, commonly called the denominator effect. The DI is a tool that addresses the denominator problem (Bonner & Stacey, 2018). Using the DI and a quasi-experimental design generated new research questions to address the denominator problem. A quasi-experimental design is similar to a randomized controlled experiment in that both designs have pre- and postperiods. However, a quasi-experimental design is unlike a randomized controlled experiment because the researcher does not create the treatment design, implementation, and probabilities (Titiunik et al., 2020).

Design

An Exploratory Quasi-Experiment

Unlike a randomized controlled experiment, the researcher does not create the treatment design, the implementation, and the probabilities (Titiunik et al., 2020). Quasi-experiments are used in many fields, and the American Society of Criminology has recommended that this method be used whenever possible (Farrington et al., 2020; Henderson, 2021). Research using

quasi-experiments has been highlighted during COVID-19 (Burki, 2020), and Alachua County created a quasi-experimental opportunity when it mandated the reduction of arrests during pandemic.

A quasi-experimental design shares some characteristics with experimental design, but researchers lack the same degree of control over the study environment that they have in true experimental designs. In quasi-experimental designs, researchers cannot randomly assign participants to groups or manipulate the independent variable as they can in a true experimental design. In a quasi-experimental design, the researcher selects existing groups and compares them to the dependent variable of interest. This might involve comparing groups that have or have not already been exposed to an event or intervention. This study examined arrest rates in Alachua County based on skin tone before and after the Alachua mandate and then calculated a continuous disparity index to compare the mandate's effect on arrest rates.

Data on arrest rates and skin tones within Alachua County before and after the mandate were collected for this study. The pretest data established a baseline for arrest rates before the mandate, and the posttest data allowed the researcher to determine whether the mandate influenced the arrest rate. Such posttest data captured the baseline for police bias in that the mandate forced officers to limit arrests as much as possible, which made it the benchmark for the least amount of bias. Whereas the general formula for disproportionality is (pretest/total)/(posttest/total), in this study, the DI formula was DI = (posttest/total)/(pretest/total).

When researchers want to evaluate the impact of the mandate, they should have a comprehensive understanding of how it has affected different racial groups. To do this for the present study, pre- and posttest data were collected and analyzed. The pretest data were used to

determine the baseline arrest rate for different race groups before the mandate, and the posttest data were used to calculate the change score for each race group. The change score was calculated as the ratio of the arrest rate after the mandate divided by the arrest rate before the mandate, with the change score measuring the change in the arrest rate over the 4 months. However, given that data are limited to Alachua County, the change score did not necessarily provide a nationwide picture of the mandate's impact on racial disparities in arrest rates. Other factors may also contribute to changes in arrest rates, such as differences in how the mandate was enforced across different areas or changes in the overall crime rate in other areas. Nonetheless, by collecting and analyzing pre- and posttest data, it may be possible to begin to identify the mandate's impact on different racial groups and to address any potential disparities.

If the resulting ratio of the DI is greater than 1, then the arrest rate is categorized as being disproportionately high; a ratio less than 1 indicates a disproportionately low arrest rate. A ratio of 1 would suggest that there were no differences in arrests; therefore, the DI can be interpreted as a measure of the extent of disproportionality in arrest rates and bias in arrest as DI relates to skin tone. Although a DI greater than 1.2 signifies bias, the DI ratio alone may not provide a complete picture of the mandate's effects. Other factors may have influenced the changes in arrest rates during the study period, and the ratio should be interpreted in the context of other future similar studies.

The present research was also deemed exploratory because no quasi-experiment on arrest rates using skin tone analysis had yet been conducted. Exploratory research utilizes a flexible working hypothesis, and what is learned during the research can guide revisions. With exploratory research, researchers rely less on existing knowledge because the knowledge itself does not exist, making it is beneficial to explore deductive reasoning from adjacent research

(Casula et al., 2021). Exploratory studies also lay the foundation for other studies to replicate the original exploratory study and to build on knowledge from the original study to find similar relationships or investigate differences (LaFrance et al., 2021).

In this study, skin tone was determined by averaging the RGB levels in the skin tone of mugshot data from arrest records. Disproportionate arrests were calculated by using the DI. The dependent variable was grouped skin tone: black, brown, beige, and blond. Although researchers have generally found that dark-skinned people are disproportionately arrested, it is unknown whether this disparity increases as skin tone darkens (stereotype threat theory), if the disparity increases in steps as skin tone darkens (self-categorization theory), or if all dark-skinned people face the same rates of disparity (social dominance theory). Although it is well-established that outcomes for people with darker skin tones are more negative when they interact with the police, the researcher in this study developed the tools to address these questions and identify which category of theories proved most effective for understanding disproportionate arrest rates.

Research Design

This study was a quantitative study with a quasi-experimental design and examined arrests in Alachua County, Florida, before and after a governmental mandate that called for a reduction in arrests (i.e., the treatment); this treatment was effective and reduced the number of daily arrests. Quasi-experiments are a powerful tool for investigating the effects of policy change and treatments. Quasi-experiments, in particular, reveal real-world data and add new knowledge to a research field (Kontopantelis et al., 2015).

Randomized controlled studies are the gold standard in researching causal effects. A quasi-experimental design is the most robust alternative to a randomized design if randomization is unavailable (Hudson et al., 2019). The quasi-experiment fixes the denominator effect in

disproportionate arrest research. The denominator effect refers to the problem of comparing arrest rates without considering the size of the population being studied. When studying disproportionate arrest rates, using a denominator that does not accurately reflect the at-risk population can lead to inaccurate conclusions about the extent of the problem. For example, if the denominator includes only the population of a certain race, it will inaccurately reflect the population at risk of arrest, as other factors such as socioeconomic status, age, and location also contribute to arrest rates. Additionally, it is important for researchers to consider the number of crimes committed in the population when comparing arrest rates, as a higher number of crimes will result in a higher arrest rate regardless of the population size. Overall, the denominator effect highlights the importance of considering the population at risk and crime rates when studying disproportional arrest rates to ensure that conclusions are supported by research evidence.

For this research, the arrests made after the mandate served as the expected rate of arrests, and the observed percentage reflected the arrests made before the mandate. The DI formula for this study was the arrest rate in the skin tone category after the mandate divided by the arrest rate in the skin tone category before the mandate. This method avoided the denominator problem of census data. The mandate created the possibility for a critical benchmark to address a problem in racial disparities and police discretion research, which is the failure to have an adequate statistical benchmark (Smith et al., 2017). For example, in Bonner and Stacey's (2018) study of 11,621 traffic stops, a DI over 1.10 indicated a moderate disparate impact.

Researchers have previously used quasi-experimental designs to study whether terrorist attacks have become more lethal against the United States since the events of September 11,

2001 (Hsu et al., 2020), to evaluate predictive policing programs (Saunders et al., 2016), to study the effects of cannabis on crime (Lu et al., 2021), to evaluate the effectiveness of de-escalation training (Engel et al., 2020), to evaluate the effect of an assault weapons ban (Berk, 2021), to study the impact of body-worn cameras on the use of force (Koslicki et al., 2019), and to determine the impact of training and policy changes on police use of force (Rockwell et al., 2021). Most similar to this specific research was the study of the effects of COVID-19 stay-at-home orders on domestic violence calls for service (Nix & Richards, 2021).

Since COVID-19 emerged in March 2020, researchers have shown that for COVID-19 disruption analysis, the quasi-experimental design is the most appropriate choice (Campedelli et al., 2021; Carter & Justice, 2021; Demir & Park, 2021; Diaz et al., 2021; Huebner et al., 2020; Koper et al., 2021; Piquero et al., 2022; Sorenson et al., 2021). Researchers favor this design because it controls for extraneous variables and is suitable for addressing questions related to the impact of events such as the COVID-19 pandemic. The quasi-experimental design allows researchers to examine the effect of an intervention, such as the implementation of COVID-19-related policies, on a particular outcome, such as arrest levels. Compared to experimental designs, quasi-experimental designs are more feasible for real-world studies where it is impossible to randomly assign participants to control and treatment groups. For these reasons, the quasi-experimental design should prove a useful design for researchers studying the disruptions caused by COVID-19, as was the case in this study.

Variables, Research Questions, and Hypotheses

This study examined the relationship between skin tone, as the dependent variable, and various outcomes, measured by the DI, with the skin tone grouped spline knots. This study investigated whether there are disparities in outcomes for individuals with different skin tones

and whether the relationship between skin tone and outcomes varies depending on the skin tone category. The data and methods used to analyze this relationship are discussed in detail in this chapter as well as the results and implications of the findings.

Variables

This study investigated the relationship between skin tone, DI, and skin tone category. In this study, the independent variable was skin tone (i.e., a characteristic of an individual's physical appearance and is a better measure than race). The dependent variable was the DI, which measures the extent of overrepresentation or underrepresentation of a specific group in a particular outcome. The grouping variable was based on skin tone, which is a way of categorizing individuals based on their calculated skin tone. The grouping variable reflected whether the relationship between skin tone and the DI varies depending on the skin tone category.

The present study aimed to investigate the relationship between the variables, with the goal of understanding disparities and inequalities in arrest rates for individuals with different skin tones. Skin tone and disparity in arrest levels are the variables that were explored (see Table 1). The purpose of this study was to gain a better understanding of how skin tone and skin color categories may impact arrest rates, as shown in Figure 1. The results of this study have the potential to provide valuable insights into the complexities of skin tone and its impact on arrest disparities. Furthermore, the findings of this study may advance future research in the disparity field by providing a foundation for investigating the relationship between skin tone and various outcomes. In turn, results can be used to develop policies and programs that promote equality and reduce arrest disparities for individuals with different skin tones.

Research Questions and Hypotheses

Randomized controlled trials are the gold standard in research (Miller et al., 2020). The quasi-experiment is one step below the gold standard but is an improvement over the typical methods used in criminology research. Quasi-experiments are particularly beneficial for research on government policy mandates (Miller et al., 2020). The hypotheses in this study relied on evidence-based practices to fill the gap in knowledge about disproportionate police arrests. The research questions for this study included the following:

RQ1: *Is there a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups (black, brown, beige, and blond) defined by the knots?*

- $H_0 1$: There is no significant difference in the slopes of the relationships between RGB and DI across the skin tone groups ($\beta 2 = \beta 3 = \beta 4 = 0$).
- $H_a 1$: There is a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups (at least one of the β coefficients $\beta 2$, $\beta 3$, or $\beta 4$ is significantly different from 0).

Model 1: $\widehat{DI} = \beta_0 + \beta_1 * RGB + \beta_2 * (RGB - k_1) * I(k_1 \leq RGB < k_2) + \beta_3 * (RGB - k_2) * I(k_2 \leq RGB < k_3) + \beta_4 * (RGB - k_3) * I(RGB \geq k_3)$

RQ2: *If there are significant differences in the slopes, which will be determined in RQ1, is there a significant difference in the slopes of the relationships between RGB and DI between the black and brown skin tone groups, specifically?*

- $H_0 2$: There is no significant difference in the slopes of the relationships between RGB and DI between the black and brown skin tone groups ($\beta 2 = 0$).
- $H_a 2$: There is a significant difference in the slopes of the relationships between RGB and DI between the black and brown skin tone groups ($\beta 2 \neq 0$)

Model 2: $\widehat{DI} = \beta_0 + \beta_1 * RGB + \beta_2 * (RGB - k_1) * I(k_1 \leq RGB < k_2) + \beta_3 * (RGB - k_2) * I(k_2 \leq RGB < k_3) + \beta_4 * (RGB - k_3) * I(RGB \geq k_3)$

The three spline knots, k_1, k_2, and k_3, define four segments that correspond to the black, brown, beige, and blond skin tone groups. The primary objective was to test whether the slopes corresponding to each skin tone group proved significantly different from each other and specifically between black and brown skin tone.

Participants and Setting

The data for this study was derived from Alachua County, Florida. In 2020, the county had a total population of 268,000, with a median age of 31.7. The median property value was $201,600, with a homeownership rate of 54.6%, and the median household income was $50,089. Non-Hispanic Whites comprised 60.5% of the population, followed by 19.8% Black, 6.75% Hispanic, and 6.03% Asian. Of the county's residents, 94.7% were U.S. citizens, and it is home to the University of Florida (Hidalgo, 2021).

Alachua County has a high crime rate compared to the rest of the state. In Florida counties that boast over 50,000 residents, Alachua County has the third highest violent crime rate per population in Florida and the highest violent crime rate in Florida. It ranks fifth in Florida for property crimes by county and ranks second in the state for the overall crime. Alachua County ranks third in total firearm use and robbery, fourth in forcible sex, and fifth in aggravated assault while using a firearm (Florida Department of Law Enforcement, 2020).

Sample Size

In 2020, the total reported crime rate in Alachua County, Florida, was 3,209, which was 49% higher than the state average. Alachua County had 660 violent crimes in 2020, which was 73% higher than the state average. Based on the county's population, the number of crimes expected in a year would be 8,700 crimes (Alachua County Sheriff's Office [ACSO] 2020 population estimate was 271,588), or approximately 725 crimes per month (ACSO, 2020). This

study considered the skin tone of individuals arrested for the 2 months before and the 2 months after the Alachua County mandate (4 months total); this would imply a total sample size of 2,900 before the mandate and 1,450 after the mandate. This study assumed that the number of arrests 2 months after the mandate should be substantially lower than the 2 months before the mandate. Without other research on which to base the postmandate number, it proved difficult to predict what that number could be. In addition, there was no way to predict the nature or the length of the decline. Assuming that the 2-month postmandate was at half the prior levels, the total sample for all 4 months would amount to 2,175.

Instrumentation

The data for this study was obtained from public mugshot data using the Google Chrome Eye Dropper extension (https://eyedropper.org/). The extension utilized Datacolor's SpyderX monitor calibration tool (https://spyderx.datacolor.com/) to calibrate the computer monitor to represent the actual true colors. Samples from before and after the calibration were taken to determine if there were any differences in digital color measurements from a computer monitor. Once photos were presented on the monitor, the Eye Dropper took six readings from the image and average sample data. There is no variation when taking readings from skin tone sample cards, but actual images can produce differences that disappear after averaging six samples.

Once the Eye Dropper color picker takes a reading from the digital image, it copies the color data into the clipboard, which can be pasted into Microsoft Excel. The Eye Dropper visually gives information, as in this example: RGB (115, 80, 60). The eye dropper also provides the hexadecimal color code; in this example, the decimal value would be #73503, and the hexadecimal value would be #11F1F. There may be a reason to understand the hexadecimal system for complex computer calculations, but it was unnecessary for this study. The

hexadecimal system is better for computer computations because it is based on a 16-number scale instead of a base 10 scale. The first 16 numbers of a base 10 system are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10; for the hexadecimal system, they are 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10. For example, 26 would be 1A, and 42 would be 2A. Once the RGB data were obtained, the three numbers were averaged. In this example, the average would be (115 + 80 + 60) / 3 = 85, and the skin tone would be 85. This is the same number that the literature review supported as the cutoff between Brown and Black people's skin tone.

Public Examples of Skin Tone

The images presented in Figure 2 were sourced from the 2023 spring football roster of the University of Florida in Alachua County, Florida. Each image can be found at https://floridagators.com/sports/football/roster. The images provide examples of how the data were obtained, with the tables showing the six measurements and the calculated avgRGB.

Figure 2

Sample Images for Skin Tone Analysis

41 Ara Emerzian

Height: 6-0

Class: Freshman

Highschool: Deerfield

202	144	108
205	148	115
201	148	113
199	138	103
200	139	103
202	142	105
1209	859	647
202	143	108

151 avgRGB

38 Sebastian

Height: 6-1

Class: Sophomore

Highschool: Oviedo

214	158	136
213	161	133
211	156	128
211	158	127
214	165	134
214	160	130
1277	958	788
213	160	131

168 avgRGB

Study Procedures: Quasi-Experiment

Phase I: Defining the Problem

Phase I involved a thorough literature review to understand the problem and to identify research gaps. After the literature review, the problem became apparent. In this case, there appeared to be a significant gap in what researchers understand about disproportionate arrest rates.

A gap in research on disproportionate arrest rates is in the research itself, as opposed to the data. This study adds to the research on disproportionate arrest rates because it utilized a quasi-experimental design, which is an approach that other researchers have not yet used in this area. Instead, past researchers have had to estimate or make an educated guess about the benchmark arrest rate. Without a quasi-experiment, researchers must create a benchmark based on educated guesses or rational calculations. This has been called the denominator effect, and it shows how even small arrest rate errors in an estimated denominator can pose larger consequences.

Phase II: Designing the Research and Making Predictions

All data for this research study were publicly available and based on the skin tone of individuals arrested as taken from their mugshot photos. Securing permission to proceed with the study was straightforward because the data were publicly available. For the quasi-experiment, there were 2 months of data that represented arrests before the cut point of when the mandate was implemented. The mandate was the cut point, after which another 2 months of arrest data were collected. Typically, researchers focus on the intercept, but it was reasonable to assume in this experiment that the slope of the line for darker-skinned people could be statistically different. This study not only addressed whether the mandate had an effect but went further because it was exploratory and utilized the DI to address the two gaps presented in Phase I.

Phase III: Collecting the Data

The data were collected from digital mugshots by scanning the center of the person's forehead to obtain the image's RGB values. The data were entered into a Microsoft Excel sheet, which was the file imported into SPSS for analysis. Additional data that were entered into Excel from the mugshot include the person's booking number, sex, and each highest Florida arrest

level. Many people who are arrested have multiple charges, so the highest level of crime was recorded.

Phase IV: Analyzing, Interpreting, and Reporting

The DI was calculated from the arrest data and served as the dependent variable, with skin tone serving as the independent variable. Although a paired-samples *t* test would be a traditional choice for analyzing pretest-posttest research, because the DI was used as a benchmark in this study, the analysis used linear spline regression. This study focused on darker-skinned tones, so Hypothesis 1 can be analyzed with linear spline regression. A scatter graph with LOESS fit line may also help understand the data.

Data Collection

Step 1: Define the Problem

Although the literature reviewed in Chapter Two indicated that dark-skinned people are disproportionately arrested, it remained unknown if this disparity increases as skin tone darkens, if the disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity. This study took publicly available mugshot data to analyze arrest rates by skin tone as arrest rates decreased after the Alachua County mandate.

Step 2: Identify Data and Define the Variables

A digital scan of the arrested person's forehead was collected from their mugshots. The scan produced numerical data that reflected the person's skin tone on the RGB scale. The three data points of the RGB were averaged to create a singular data point for skin tone. The independent variable was RGB skin tone, and the dependent variable was the DI. Although this is a quantitative quasi-experimental study, it was also exploratory because no other study using RGB data to understand disproportionate arrest rates had yet been conducted. It was also

exploratory because of the use of a spectrometer in disparity research. Typically, an analysis based on a quasi-experiment would assess if there were statistically significant changes after the intervention; however, this study calculated the DI based on arrest rates before and after the mandate. This was an exploratory use of the pretest-posttest, which capitalizes on the growing use of the DI.

Step 3: Define the Outcome, Inputs, Granularity, and Boundaries

Results from this study can add to knowledge about disproportionate arrests. As stated, as long as dark-skinned people are disproportionately arrested, all current theories can display validity, but they cannot all be the most valid. This study was expected to show which category of current research surrounding disproportionate arrests had the most validity evidence. Findings from this study were expected to show disproportionate arrest rates and if darker-skinned people are equally affected, increasingly affected, or categorically affected. This study did not seek to validate disproportionate arrests but instead determine which theories are most predictive.

The two inputs into this study were skin tone, as measured by the average RGB score obtained from mugshot images of people arrested in Alachua Country, and arrest rates based on those colors.

This study did not address questions about disproportionate arrests, but rather addressed the theories underpinning disproportionate arrests. This study addressed whether the disparity increases as skin tone darkens, increases in steps as skin tone darkens, or all dark-skinned people face the same rates of disparity.

Researchers examining disproportionate arrests have taken three paths. Research in the field of disproportionate arrests has been stymied due to researchers relying on demographic data. Thus, researchers have questioned prior findings on disproportionate arrests. The present

study was expected to provide evidence regarding the paths and show how new tools can be used for future research. This new research addressed the denominator problem that has affected past research and is the reason researchers have questioned prior findings on disproportionate arrests.

Data Analysis

Step 4: Prepare the Data and Perform an Exploratory Analysis

This section provides an example of how data in the study was analyzed. The following example assumes that there are only 10 skin tones worldwide, with colors ranging from 74 to 198. The mugshot data were captured in the order they are listed in the ACSO bookings. The person's booking number, sex, average RGB score, booking date, and highest arrest level were recorded. Table 2 presents a simplified data input sheet for 10 hypothetical arrests occurring on February 1, 2020.

Table 2

Example of SPSS Input Data Color Coded to Match RGB Data

BOOKING #	Male (1) Female (0)	RGB AVG	BOOKED ON
ASO1	1	97	2/1/2020
ASO2	1	197	2/1/2020
ASO3	1	198	2/1/2020
ASO4	1	126	2/1/2020
ASO5	1	133	2/1/2020
ASO6	1	99	2/1/2020
ASO7	1	74	2/1/2020
ASO8	1	124	2/1/2020
ASO9	1	135	2/1/2020
ASO10	1	75	2/1/2020

Note. RGB = red-green-blue

The chart was color-coded to show the skin tones associated with the RGB average of data points. For purposes of this example, if it is assumed that there are only 10 skin tones and 90 arrests were made before the mandate and 46 arrests were made after the mandate, the DI can be calculated by dividing the before-arrest rate by the after-arrest rate (see Table 3).

Table 3

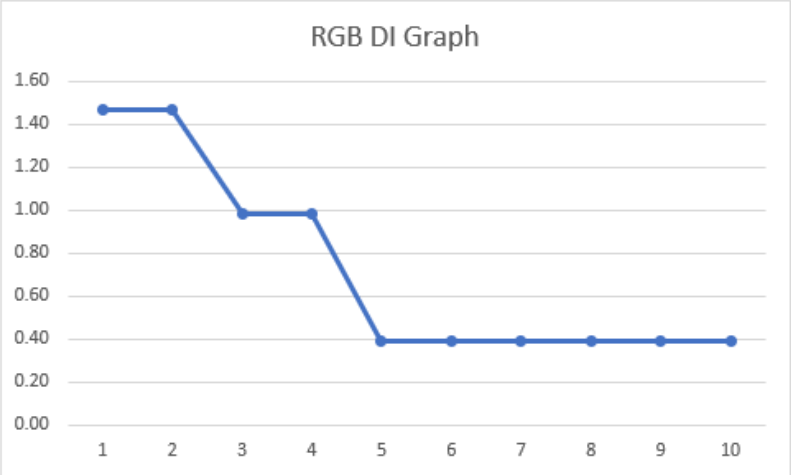
Example of Disproportionality Index Calculation Color Coded to Match Data

		Number Arrested		Percent of Arrests		Disproportionality
	Average RGB	Before	After	Before	After	Index
1	74	20	15	22%	33%	1.47
2	75	20	15	22%	33%	1.47
3	97	10	5	11%	11%	0.98
4	99	10	5	11%	11%	0.98
5	124	5	1	6%	2%	0.39
6	126	5	1	6%	2%	0.39
7	133	5	1	6%	2%	0.39
8	135	5	1	6%	2%	0.39
9	197	5	1	6%	2%	0.39
10	198	5	1	6%	2%	0.39
		90	**46**	**100%**	**100%**	

The data can then be calculated or entered into a statistical package to run the linear spline regression analysis. Results from the hypothetical data are presented in Figure 3; results from the completed study are presented in Chapter Five.

Figure 3

Skin Tone Graphed to the Disproportionality Index



Note: DI = disproportionality index; RGB = red-green-blue. Skin tone is on the x-axis and the DI is on the y-axis. In this example, the data would point to Black and Brown people being treated as two separate groups.

If this hypothetical example were data from this study, it would suggest that the self-categorization theory is the theory that best explains disproportionate arrests. For this study, it would be hypothesized that Black and Brown people experience different levels of arrest disparity. The self-categorization theory describes the circumstances under which an individual will view people as a group. The graph clearly shows that Black and Brown people have two distinct and separate levels of disproportionate arrest rates.

Step 5: Justify the Data Model

The data for this study were continuous with an independent variable (i.e., skin tone), which is why a linear spline regression analysis was appropriate. RGB data and arrest rates were used to analyze the predictive strength of the relationship between the RGB (x-axis) and the DI (y-axis). Because groups in the model were based on skin tone, a linear spline regression model was used.

Step 6: Allocate Resources for Data Analytics

The time needed to collect data for this study was less than 1 week because each data point can be collected in under 150 s. The total number of data points was expected to be approximately 1,000 arrests over the 4 months. The initial testing of images used six readings of digital pictures and then recorded the readings in Microsoft Excel in less than 1 min. Adding 2.5 times that amount of time to account for fatigue and to create a reasonable long-term working pace, 150 s is estimated to be reasonable. This would imply a total time commitment of 2,500 min, or less than 42 hr of work.

Uploading the Excel file into SPSS was expected to take less than 15 min, and the preliminary analysis was expected to take less than 5 hr to complete. An additional 10 hr was expected to be sufficient to complete the data analysis. It was not anticipated that the arrest data

would need to be cleaned. One potential issue was the distribution of skin tone across the spectrum in the county. For digital images that are problematic to scan, five images were allocated to be acceptable and not to be scanned. However, if more than 10 images were difficult to scan, data point acquisition would be paused, and possible solutions would be reviewed. The total time needed was significantly shorter, and there were only three problematic images.

Step 7: Plan for Postdata Analysis Actions

To handle groups for the hypothesis, additional fields to distinguish blond, beige, brown, and black skin tones were necessary. The distinction of the knots location for black and brown skin tones was evident from the changes in DI, not by demographics. Setting up the variable in SPSS by entering them into an SPSS linear spline regression model expression to determine which hypothesis is the most predictive. Legacy plots and interpolation lines were analyzed visually to help with understanding the data. Adding a linear fit line with mean confidence intervals provided an intuitive graph for analysis.

Assumptions

The study had the following assumptions. First, it will be conducted in a field setting where random assignment and control groups are difficult. Because this study uses after-the-fact public data, random assignment, and control groups are less relevant. Second, because of the pretest-posttest design of public data, the participants should not be affected by the researcher or the study instruments. Third, normally a quasi-experiment is weakened by the absence of nonrandom assignment. However, because all the data will be obtained from the study period, random assignment is less problematic. Finally, it was also assumed that having control groups would not alter the findings in a material way and that not having control over how the quasi-experiment was designed poses no material concern.

Limitations

The most significant limitation is that the study was only possible due to the unique circumstances of COVID-19, and, therefore, it cannot be replicated. However, it is reasonable to expect that government mandates in other places would have also yielded diminished responses. This diminished response would most likely be due to the world being prepared for another pandemic, and it is most likely that the responses would be fewer than during the first occurrence.

Due to the nature of quasi-experiments, this study is limited in making causal associations from the mandate. This limitation was controlled by the large number of data points collected and because all the data were collected during the study period. In addition, the long history of arrest data and the magnitude of the fall in arrest levels after the mandate pointed to a reduced risk level for making associations.

Delimitations

The limits placed on this study were material. Specific characteristics of Alachua County may lead to results that would be inconsistent across the United States. Alachua County is a liberal county in a mostly conservative Southern state. The largest city Alachua has a Democratic majority, but the rural parts of the county are more conservative. The county has a substantial proportion of students from one of the largest universities in the United States. Alachua County also has some of the highest crime rates in Florida.

In addition to county limitations, it is possible that the Southern United States (i.e., the South), in general, would have different results than other parts of the country. The crime rates of the South might be different, but also the response to COVID-19 might have also been different. Alachua County had one of the strictest COVID-19 policies in the area. Although the COVID-19

policy was one reason for the government mandate and what led to the ability to study disproportionate arrest rates, it might also mean that the conclusions are not generalizable to other counties in Florida or other states. All of Alachua's surrounding counties, including Columbia, Union, Bradford, Putnam, Marion, Levy, and Gilchrist, had substantially lower COVID-19 restrictions.

Ethical Considerations

The *Belmont Report* (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1979) is a landmark document that outlines the ethical principles and guidelines for protecting human subjects in research; the document remains a widely recognized and respected ethical framework for human subject research (Shea, 2020; Sisk & DuBois, 2020). The core purpose of the report was to ensure that human subjects are protected from harm and that their privacy is respected. This is achieved by setting standards for informed consent, confidentiality, and protecting personal information. The *Belmont Report* outlines ethical principles that guide human subject research on respect for persons and justice (Arkow, 2021).

Respect for persons requires that individuals are treated with dignity and that their autonomy is respected by allowing them to make informed choices about involving themselves in research. It also requires researchers to maximize benefits and minimize harm to research subjects. Justice requires that the selection of research subjects be fair and equitable and that the benefits and burdens of research be fair. To achieve justice, researchers must avoid exploiting vulnerable populations and ensure that the benefits of the research are not disproportionately distributed to one group over another group. Researchers must consider the potential impact of their research on society as a whole and ensure that the distribution of benefits and burdens is

aligned with social values and priorities. These principles of respect for persons, beneficence, and justice are fundamental to ethical research practices and must be carefully considered throughout the entire research process (Arkow, 2021; Dutka & Astroth, 2022; White, 2020).

In this study, the data displaying photos and personal information, including the name and crime committed, are publicly available. Because the data used in this study are not private and do not require either IRB approval or IRB review (see Appendix A), the data are not subject to the *Belmont Report* guidelines. However, it is important to note that using public data raises important ethical considerations, including privacy concerns and the potential for harm to individuals. As such, it is important to ensure that the use of public data is done in a responsible and ethical manner that considers the rights and dignity of individuals.

Research Data

Validity

Other factors could affect the validity of the observations that were made after implementing the mandate. This is known as confounding. In this study, confounding could have occurred if other variables, in addition to the mandate, influenced the results. For example, confounding can arise if factors affecting the outcome were unevenly distributed across groups before and after the mandate or if there were systematic differences between the two groups that were unrelated to the mandate.

When examining the effects of the mandate in this study, other factors might have affected the outcomes, such as changes in neighborhoods, socialization patterns, or economics. These factors could influence the results, making it difficult to determine the true effect of the mandate. To avoid the effect of confounding variables, extraneous variables were controlled when possible. The threat to the validity of observations made after implementing a mandate is

another factor that may affect the results. Researchers must be aware of these potential confounding factors and try to control them to yield accurate and valid conclusions about the effects of the mandate. However, the effect of disparity from reducing total arrests in the county is unknown. The disparity might have been reduced because of unaccounted consequences of lower arrest rates and not attributable to changes in police behavior.

Time Periods and Seasonality

Instead of taking an observation at a specific time, the observations for this study spanned a 4-month period reflecting 2 months before and 2 months after the mandate. It is possible that over this time, events could have occurred that would lead to a different outcome than if the observations were taken closer together in time. Crime levels also fluctuate throughout the year, and the more time between observations, the more likely such fluctuations could affect the data. The main concern regarding validity is that police behavior changed suddenly after the mandate was implemented but that police behaviors gradually returned to patterns observed prior to the study as time passed.

Augmentation

In addition to time affecting the study, time can also change the study. Officers join and leave the force, officers age, and officers and citizens experience new things and develop new perspectives. It is particularly relevant to this study that the time when the mandate occurred was an unusual time for society and police departments; therefore, observations that came from closer to when the mandate was implemented should have been less affected by validity issues.

Measuring

During a study, the acts of measuring and observing can change those being measured and observed. The tools used to measure and observe can also affect the outcomes of the data

(Kassem et al., 2021; Megally & Ghoneim, 2020). This study utilized public mugshot data from arrest records. No one was interviewed or contacted for this study.

The most important way to gain validity evidence for the study is to use the same measurement tool for the pretest and the posttest. Using different measurement tools could introduce differences in observations. This threat to validity in this study was low because the same measurement tool was used for the pretest and posttest. The same equipment and procedures were used, and the standardized calibration equipment ensured that acquiring data were consistent.

Sampling

Sampling can affect validity in two ways. Sampling by nature is a concern in research. A pretest-posttest design has two sets of samples that might not be representative of the population (Gaffney et al., 2022; Hui & Ma'rof, 2019; Littman et al., 2022; Lund, 2021; Okhovat et al., 2022). It is possible that because of the mandate and COVID-19, the population of would-be criminals changed, thereby threatening the validity of the data. It is reasonable to predict that the type of crimes could change in response to COVID-19; for example, when it rains, and people are cooped up and domestic violence seems to increase. One strength of this study was that the observations captured all the arrests during the study period.

Attrition

Normally, in a pretest-posttest design, the study would include the same individuals in the study. Because of this, people leaving a study is a concern. However, in this study, people leaving was not a concern. Nonetheless, because Alachua County contains many students, professors, and others who started working from home during COVID-19, there was a general change in the population as many students decided to go home rather than stay in Alachua

County; the effects of such a population shift might be challenging to determine. However, most arrests were not University of Florida students and student housing occupancy remained high.

Regression Toward the Mean

The sample size issue in a pretest-posttest design is particularly important in maintaining the validity of the data and conclusions. When samples are too small, atypical samples that regress toward the mean can have a significant impact on an analysis and the conclusions drawn from the study. In the context of evaluating the impact of a policing mandate, it is possible that the period prior to the mandate may have been atypical in terms of police activity. However, this concern can be partially mitigated by a large amount of historical data available for arrest rates in Alachua County. By drawing from this historical data, researchers can calculate typical arrest rates in the area and reduce the potential influence of atypical samples. Overall, careful consideration of sample size and the use of appropriate statistical tools are essential for ensuring the validity of research findings.

As pointed out in a report from the Colorado Springs Police Department's study (which included a period of COVID-19) that utilized the DI, the better the denominator, the more valid the conclusions are from the study (Brown et al. 2022). Based on the standards outlined in the report, it was expected that this study would have the highest level of validity for a pretest-posttest design using benchmarks.

Reliability

When research is reliable, it is repeatable. This section outlines the steps that were taken to ensure reliability in this study and how this study may provide a benchmark for the reliability of future studies. This section also details the data collection process for the study. Capturing the RGB color from individual photos was the most important aspect of data collection; however,

establishing clear and consistent criteria for coding and analysis and maintaining clear and thorough records of the analytical process ensures that researchers produce quality research (Angelopoulou et al., 2001; Cugmas & Struc, 2020; Howard et al., 2021; Kikuchi et al., 2020; Ly et al., 2020; Rezk et al., 2022; Scalisi et al., 2020; Su, 2020). Given the uniqueness of the present study, a detailed description of the data collection and analysis methods aids other researchers reproduce the study's methodology and to variability in future studies. Being transparent about perspective and how this might influence the research findings helped to enhance the credibility and trustworthiness of the research.

Alachua County Police Department is unique in that additional work to make sure the photos are captured consistently across departments is unnecessary because there is only one sally port for all departments across the entire county. All arrest photos from Alachua County are taken in the same building using the same lighting and equipment. The most important part of the data collection process, then, became capturing the data from the digital images (Khan et al., 2022; Manovich, 2021; Redi et al., 2015; Reeves et al., 2021; Taskiran et al., 2020). This study utilized the Eye Dropper Version 0.5.15 Google Chrome extension, which can be downloaded from Google Chrome (https://eyedropper.org/).

The Eye Dropper Google Chrome extension provides an accurate method for collecting data from digital images. This tool allows the researchers to capture the data consistently and reliably, which is essential for maintaining the accuracy and validity of the study's findings. The use of consistent methods for capturing arrest photos and reliable tools for collecting data from digital images is crucial for ensuring the reliability of the data collected in the study. These steps help to ensure that the data are accurate and that this study's methodology can be replicated in future studies, which is important for building knowledge and advancing research in the field.

The Eye Dropper can be tested against any Pantone skin tone. Figure 4 shows a color representation of Pantone 3R07, which is an example of a skin tone with an average RGB skin tone of 150. The image can be viewed at https://flic.kr/p/2o1Zx4U.

Figure 4

Example Skin Tone Represented by Color, Pantone Number, and RGB

Note. RGB = red-green-blue.

To test the Eye Dropper, a web-based image should be selected. One source of Pantone colors is www.myperfectcolor.com. The color can be tested using the color picker in software programs like Microsoft Excel. Documents can also be tested by saving the color in portable document format (PDF), joint photographic experts group (JPG), and photoshop document (PSD) file types. The preferred document type to test for color would be a PSD that is created in an Adobe Photoshop environment.

PSD file types are preferred over PDF and JPG file formats for information architecture (IA) purposes. This is because PSD files offer several advantages, such as a layered structure, that allows for greater flexibility in managing different components of the IA. Additionally, nondestructive editing in PSD files enables designers to experiment with different design options without permanently altering the original design. PSD files can also be easily integrated with other software, allowing for seamless transfer between different applications. PSD files can store high-resolution images with greater detail and clarity as compared to PDF and JPG files, which is particularly useful when working with complex images that require high precision; PSD files also provide researchers with greater flexibility, nondestructive editing capabilities, and higher-

quality images, making them an appropriate choice for skin tone research projects (Adobe, 2023).

Taking 10 samples of the color chart also shows the consistent reliability of the instrument. Using the Eye Dropper plug-in and myperfectcolor.com, the following data were obtained all 10 times, RGB (182,141,125). This gave a reliable and consistent average RGB of 149. When dividing the average RGB score by 2, both the official color and the sample color became the same data point of 75. Some data points could still have slight differences due to rounding. Although this difference is immaterial, dividing the score by 4 significantly reduces the chance of data points being different from official Pantone colors.

The photo in Figure 5 was lighted using a Raleno softbox photography lighting kit 20” X 28” and a photography continuous lighting system with 5500K bulbs. The photo was captured using a Sony NEX-7 camera and 50mm F1.8 lens set to f/4.0, ISO 1000, at 1/80. The color board was held up as a reference by the model, but the background color provided the most accurate white balance, although 5500K was manually set for the white balance. A more accurate color photo can be viewed at https://flic.kr/p/2o21S6t.

Figure 5

Facial Image Taken Behind a Standard Photographic Color Board

Note. This image serves as a tool to test and compare equipment. It represents a standard color board that is used in photography to capture the accuracy of equipment through a wide range of standard colors.

Large areas in a photo can be selected to calculate skin tone; however, that large range may result in unusually dark and light areas being included in the average. This study took six readings from the center of the forehead in small sections, taking care to exclude dark or light spots such as moles or skin tags. Once the RGB average was calculated, the average of the averages was calculated (2AVG,) and then again, the average was calculated (3AVG). Even though skin tone can contain variations, taking multiple readings and averaging the data produced consistent and reliable results. See Table 4 for an example of how the averages were calculated using the RGB values.

Table 4

Reasoning Behind Taking Multiple Readings From One Sample

Reading	R	G	B	AVG	2AVG	3AVG
1	191	126	105	140.7		
2	170	108	85	121.0	130.8	
3	184	121	92	132.3	131.3	131.1
4	168	104	72	114.7	127.2	129.8
5	187	120	100	135.7	128.9	129.6
6	171	104	74	116.3	126.8	129.0
7	184	122	96	134.0	127.8	128.8
8	190	129	105	141.3	129.5	128.9

Note. RGB = red-green-blue.

Summary

The purpose of the study was to determine which theory on disproportionate arrest rates are most predictive of disproportionate arrest rates, the dependent variable, using skin tone, the independent variable. The study used a quantitative, exploratory quasi-experimental design to analyze arrest rates in Alachua County, Florida, before and after a mandate to reduce arrests during the COVID-19 pandemic. In this chapter, the study's design, data procedures and analysis, and instrumentation were detailed. This study was exploratory as no previous study has used skin tone analysis to examine arrests. The study was designed to answer questions about the relationship between skin tone and disproportionate arrest rates and to show which theory category is most accurate in understanding disproportionate arrest rates.

Using a quasi-experiment design, the researcher sought to analyze arrest rates based on skin tone. The skin tone of arrested individuals was determined by analyzing RGB levels in the skin tone of mugshot data. The disproportionate arrests were calculated using the DI. The dependent variable was grouped by four skin tone categories: black, brown, beige, and blond. An

estimated sample of the skin tone of those arrested 2 months before and 2 months after a mandate was used, which resulted in a total estimated sample size of 2,900 (1,450 before and 1,450 after the mandate). The data were obtained from public mugshot data using the Google Chrome Eye Dropper extension and calibrated using Datacolor's SpyderX monitor calibration tool. The Eye Dropper took six readings from the image and average them to obtain the skin tone. The data were stored and analyzed in SPSS, with the RGB data being converted to a single average value. The mugshot data were recorded in the order of the ACSO bookings and included information such as the booking number, sex, average calculated RGB, and booking date.

An exploratory analysis was performed where the DI was calculated by dividing the arrest rate before the mandate by the arrest rate after the mandate. The analysis results were entered into the statistical package to determine which self-categorization theory best describes the disproportionate arrest rates between Black and Brown individuals. The study sought to determine which of the three current theories surrounding disproportionate arrests proved the most accurate.

The potential confounding factors, such as changes in neighborhoods, socialization patterns, and economics, were considered to draw appropriate conclusions about the effects of the mandate. Crime levels over 4 months, 2 months before and 2 months after the mandate, and the passage of time were factors that could have changed the study results. As sample selection and attrition are potential threats to validity, the observations were designed to capture all the arrests during the study period. The threat of regression toward the mean was reduced by using a large historical data set.

The findings of this study are reported in Chapter Four, and the discussion focuses on the results of the statistical analysis, including the relationship between skin tone and

disproportionate arrest rates and the accuracy of the three current theories surrounding disproportionate arrests. Chapter Four also provides a critical evaluation of the study's limitations and recommendations for future research in this area. With these discussions, this study lays the foundation for a more informed understanding of racial disparities in arrest rates and how to reduce these disparities.

CHAPTER FOUR: DATA ANALYSIS AND RESULTS

Overview

The objective of this chapter is to examine the issue of disproportionate arrests in relation to skin tone and provide an overview of the findings. Existing literature consistently emphasizes negative outcomes for darker-skinned individuals and a higher likelihood of dark-skinned individuals being arrested during interactions with the police. However, comprehending the role of police behavior presents challenges, and prior studies utilizing race as an independent variable have produced inconclusive results. To address this gap in knowledge, this study adopted a quasi-experimental research design and focused specifically on skin tone to investigate the relationship between skin tone and disproportionate arrest rates.

This chapter presents the findings of a comprehensive analysis of the relationship between skin tone and disproportionate arrest rates. It is organized into several sections to provide a thorough examination of the research objectives, including descriptive statistics, assumption tests, spline regression results, and research questions and hypotheses. The Descriptive Statistics section provides an overview of the data collected, including summary measures such as means, standard deviations, and frequencies. This analysis offers a descriptive understanding of the variables under investigation, specifically skin tone and arrest rates. The Assumption Tests section assesses the underlying assumptions of the statistical methods used in the study to ensure that the chosen analytical techniques were appropriate for the data and declared research questions. Assumption testing helps establish the validity and reliability of the findings.

The Spline Regression Results section presents the main findings derived from the application of spline regression analysis, which is a method that captures potential effects to

allow for a more nuanced examination of the relationship between skin tone and disproportionate arrest rates. The results are presented clearly to highlight significant relationships or patterns observed. The Research Questions and Hypotheses section revisits the research objectives and hypotheses formulated at the outset of the study. All findings were evaluated in relation to these research questions and hypotheses, providing a comprehensive analysis of the relationship between skin tone and disproportionate arrest rates.

By adhering to this structured approach, this chapter offers a rigorous and systematic examination of the research topic, employing descriptive statistics and hypothesis testing to support the research objectives and contribute to the existing body of knowledge.

Research Questions and Hypotheses

RQ1: *Is there a significant difference in the slopes of the relationships between RGB and the DI across the skin tone groups (black, brown, beige, and blond) defined by the knots?*

- $H_0 1$: There is no significant difference in the slopes of the relationships between RGB and the DI across the skin tone groups.
- $H_a 1$: There is a significant difference in the slopes of the relationships between RGB and the DI across the skin tone groups.

RQ2: *If there are significant differences in the slopes, as determined in RQ1, is there a significant difference in the slopes of the relationships between RGB and the DI between the black and brown skin tone groups, specifically?*

- $H_0 2$: There is no significant difference in the slopes of the relationships between RGB and the DI between the black and brown skin tone groups.
- $H_a 2$: There is a significant difference in the slopes of the relationships between RGB and the DI between the black and brown skin tone groups.

Linear Spline Regression

Linear spline regression is grounded in the same statistical theories that govern standard linear regression. In this study, a comprehensive exploratory examination of linear spline

regression delved deeper than the basic requirements typically necessitated by conventional linear regression analyses (model fit, two-way analysis of variance sum of squares error [ANOVA SSE], and significance). Linear spline regression is inherently piecewise; thus, it involves the fitting of separate linear regressions within different intervals of the predictor variable to allow for the capture of nonlinear relationships without the need for higher-degree polynomials. Although linear spline regression features distinctively different segments, it is still analyzed as one model. Given this intricate nature, ensuring the robustness and validity of the analysis is paramount.

Although most statistical software packages would suffice with the standard regression model summary to deduce the model fit represented by the value, the ANOVA SSE epitomized by the *F* statistic, and the significance denoted by the *t* statistic, the present study ventured further (Burks et al., 2018; Darlington & Hayes, 2016; Fox, 2015; Greene et al., 2015; Harrell, 2017; Marsh & Cormier, 2001; Mendenhall et al., 2003; Ryan et al., 2007; Seber & Wild, 2003). In recognition of the importance of understanding the underlying data distributions when working with spline regressions, preliminary visual inspections were undertaken. A density plot and box plot served as the study's initial tools, offering an immediate appraisal of data distribution, outliers, and correctness of the knots for the splines.

Further preliminary, exploratory data analyses beyond the basic requirements were crucial, given the potential for data inconsistencies in piecewise regressions. Both the Kolmogorov-Smirnov and Shapiro-Wilk tests were employed, ensuring that the data subsets conformed to the essential assumptions of normality, a crucial consideration when determining the efficacy of the study's spline knots. The P-P plot was also incorporated into the methodology

for a rigorous test of model assumptions, especially given the potential for heteroscedasticity in spline models.

It may seem unconventional to pair a P-P plot with a Q-Q plot; however, the latter was provided to offer a more nuanced view of the quantile comparisons of the residuals, further emphasizing a commitment with this study to conduct a thorough and rigorous examination of the linear spline regression model. This expanded version provides a broader perspective on linear spline regression, its complexities, and the reasons behind the chosen analysis methods.

Linear spline regression relies on the same underlying concept as standard linear regression but divides the range of the independent variable into segments and fits a separate linear regression within each segment. Linear spline regression is often better than polynomials at approximating complex curves (Darlington & Hayes, 2016). Spline regression often achieves better approximations of intricate curves, compared to polynomial models. Spline regression can be viewed as an improvement over polynomial approximation (Seber & Wild, 2003).

Linear spline regression is a form of linear regression. The key difference lies in the handling of the independent variable, not in the fundamental nature of the regression itself. In standard linear regression models, the dependent variable is a linear function of the independent variable. For example, if there is one independent variable, the model might have a model $y = a + bx$, where y is the dependent variable, x is the independent variable, and a and b are parameters to be estimated. In linear spline regression, there is still a linear model, but it has “knots” in the independent variable, creating different segments (Darlington & Hayes, 2016). For each segment, there is a different linear relationship between the dependent and independent variables. The linear relationship changes, but the model remains a singular model. This is achieved by transforming the independent variable using a binary indicator variable and coding; for example,

if there is one independent variable, x, it has a knot at x = c (Harrell, 2017). In regression analysis, a knot signifies a notable transition or alteration in the association between variables, giving rise to distinct regression models for various segments of the data (Marsh & Cormier, 2001). Spline regression creates a binary indicator, d, such that d = 0 if x < c and d = 1 if x > = c. Then the spline linear regression model might be y = a + b1x + b2d*(x − c). Greene et al. (2015) have made clear that this is still a linear model in terms of the parameters a, b1, and b2 (Fox, 2015). The term d*(x − c) is 0 when x < c (y = a + b1x), and it is equal to (x − c) when x > = c (y = a + b1c + b2*(x − c).

Spline linear regression is a method to render a linear regression model more flexible by allowing different slopes for different ranges of the independent variable in a single model (Darlington & Hayes, 2016). However, it is still linear regression because the model is linear in the parameters, and because it is still linear regression, all statistical theories related to linear regression apply (Mendenhall et al., 2003). Linear spline regression is grounded in the same statistical theories that govern standard linear regression. The lens in which a linear spline regression model is viewed should be the same in which a linear regression model is viewed.

There is only one R^2 in linear spline regression; it is required to report a single R^2 value for the entire model rather than individual R^2 values for each linear segment between the knots. The rationale for this approach lies in the conceptual unity of the spline model. Despite being composed of multiple linear segments, these segments collectively constitute a single, unified piecewise linear model designed to approximate the underlying relationship between the dependent and independent variables. Providing a single R^2 value serves as a holistic measure of how well this integrated model fits the data, thereby simplifying interpretation and facilitating comparisons with other types of models. Furthermore, a single R^2 value avoids the

computational complexity and potential ambiguity associated with calculating multiple R^2 values for each segment. Specifically, partitioning the data according to spline knots to compute individual R^2 values could lead to reliability issues, especially when there are insufficient data points in each segment. Moreover, reporting multiple R^2 values could give rise to misleading conclusions and the inability to compare other models. A high R^2 value for a specific segment may incorrectly suggest an exceptional fit, without accounting for the number of data points in that segment or its representativeness in the broader context of the model. Therefore, a single R^2 value is required to be reported to summarize the model's overall goodness-of-fit.

Descriptive Statistics

Overview of Arrest Data and Classification Criteria

A total of 728 (186 female, 542 male) premandate arrests occurred between January 30, 2020, and March 24, 2020, and a total of 344 (71 female, 273 male) postmandate arrests occurred between March 25, 2020, and May 4, 2020, for a total of 1,086 data points (see Table 5). A total of 150 skin tone categories were represented and included in this study, and skin tone was classified using the previously defined ranges based on RGB values.

Table 5

Distribution of the Study Samples Before and After the Mandate

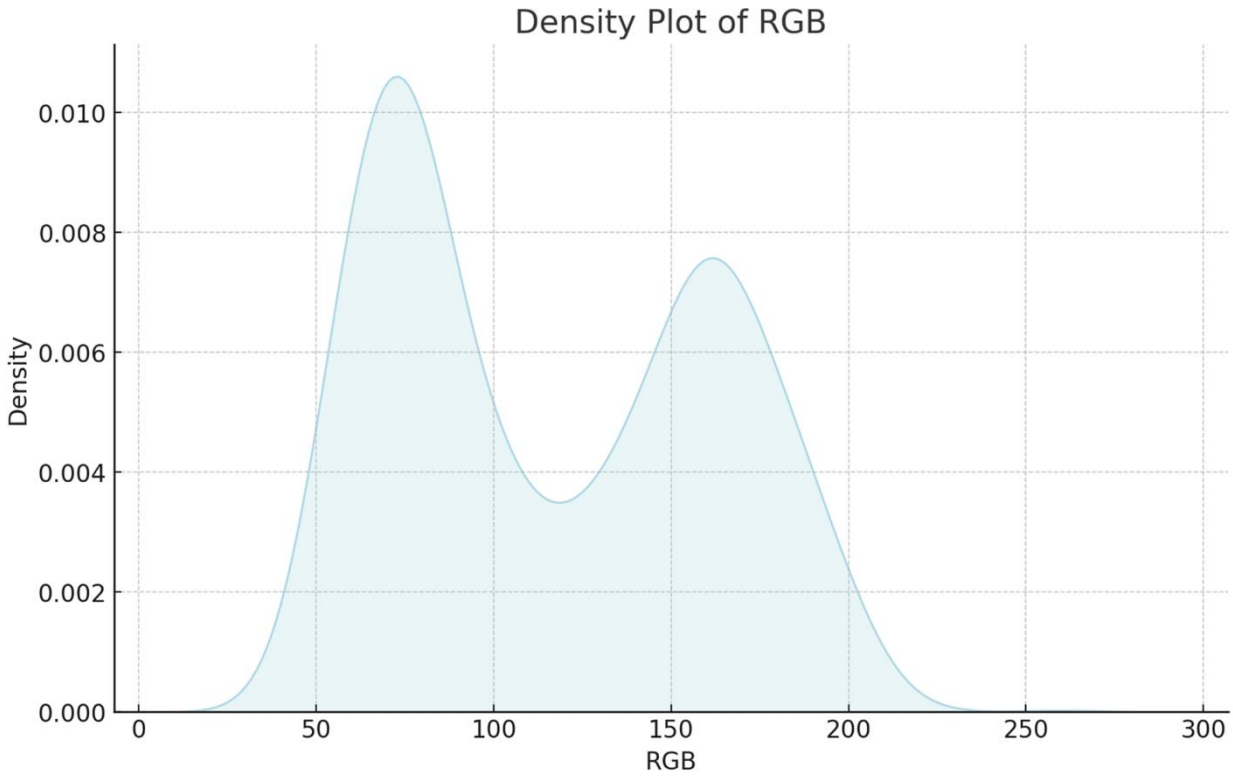
	Charge Level	Black Before		Black After		Brown Before		Brown After		Beige Before		Beige After		Blond Before		Blond After	
Female	1	36	69%	10	50%	12	67%	15	94%	40	68%	7	50%	36	69%	13	62%
	2	2	4%	0	0%	0	0%	0	0%	1	2%	1	7%	3	4%	0	0%
	3	3	6%	0	0%	1	6%	0	0%	7	12%	1	7%	10	6%	3	14%
	4	3	6%	2	10%	1	6%	1	6%	3	5%	2	14%	1	6%	0	0%
	5	2	4%	2	10%	1	6%	0	0%	1	2%	0	0%	3	4%	2	10%
	6	4	8%	5	25%	1	6%	0	0%	5	8%	1	7%	2	8%	2	10%
	7	1	2%	1	5%	2	11%	0	0%	1	2%	2	14%	1	2%	0	0%
	8	1	2%	0	0%	0	0%	0	0%	0	0%	0	0%	1	2%	1	5%
	9	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
	10	0	0%	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%	0	0%
Total Before	186	52	28%			18	10%			59	32%			57	31%		
Total After	71			20	11%			16	23%			14	20%			21	30%
Total	257																
Male	1	128	68%	69	54%	56	66%	13	35%	141	68%	43	56%	44	71%	15	48%
	2	3	2%	1	1%	3	4%	1	3%	5	2%	0	0%	0	0%	1	3%
	3	18	10%	9	7%	8	9%	3	8%	13	6%	6	8%	8	13%	4	13%
	4	12	6%	6	5%	5	6%	5	14%	11	5%	6	8%	1	2%	5	16%
	5	2	1%	6	5%	4	5%	2	5%	15	7%	3	4%	1	2%	2	6%
	6	9	5%	16	13%	3	4%	5	14%	10	5%	9	12%	1	2%	2	6%
	7	13	7%	11	9%	3	4%	3	8%	7	3%	5	6%	4	6%	1	3%
	8	2	1%	6	5%	1	1%	1	3%	1	0%	3	4%	1	2%	0	0%
	9	0	0%	2	2%	1	1%	2	5%	2	1%	0	0%	2	3%	0	0%
	10	2	1%	2	2%	1	1%	2	5%	1	0%	2	3%	0	0%	1	3%
Total Before	542	189	35%			85	16%			206	38%			62	11%		
Total After	273			128	24%			37	14%			77	28%			31	11%
Total	815																
All Total	**1072**	**241**	**22%**			**103**	**10%**			**265**	**25%**			**119**	**11%**		
				20	**2%**			**16**	**1%**			**14**	**1%**			**21**	**2%**

The classification criteria used were as follows: RGB values between 47 and 85 were classified as black, values between 86 and 112 as brown, values between 112 and 171 as beige, and values between 172 and 196 as blond. The literature provides strong indications for the separation between black and brown, but few studies exist regarding the separation of beige and

blond. For this study, the National Survey of American Life was used for that purpose. The density of the skin color can be seen in Figure 6.

Figure 6

Probability Density Function of RGB



Skin Color Disparities

The mugshots provided the necessary information to separate the data by female and male designations and by charge level of the arrest. As expanded on in detail in earlier chapters, the state of Florida categorizes its arrests by increasing harm from one to 10. The collection of the RGB data and the known knots were used to categorize arrests into black, brown, beige, and blond. As Table 5 shows, a bigger study from a large metropolitan area would lend itself to a better investigation into disparity in arrest rates. Table 5 also reveals the dramatic fall in number of arrests. There were a total of 728 arrests before the mandate and 344 arrests after the mandate;

specifically, 186 females were arrested before the mandate and 71 females were arrested after the mandate. There were 542 male arrests premandate and 273 males arrested postmandate. Female arrests fell by a much greater rate (postmandate arrests were 38% of premandate arrests) than male arrests (postmandate arrests were 50% of premandate arrests). Although this study focused on skin color, a future investigation into the disparity surrounding females is warranted. Women made up 26% of the premandate arrests and 21% of the postmandate arrests. The number of arrests for both genders decreased after the mandate, but the decrease was clearly more pronounced for females. One dramatic surprise in the data was how brown female arrest rates remained low, but the black, beige, and blond female arrest rates dropped significantly and became fairer postmandate. The opposite was true for males, which dropped consistently across skin tones, but brown male arrest rates increased, and the other groups fell. Changes in the number of arrests for each gender and skin color group due to the mandate were as follows: beige female −76.27%, black female −61.54%, blond female −63.16%, brown female −11.11%, beige male −62.62%, black male −32.28%, blond male −50.00%, and brown male −56.47%. The mandate to lower arrests has had a significant impact across all groups, with a reduction in arrests ranging from approximately 11% to 76%. The reduction is generally more substantial for females, across all skin colors, than for males.

Analysis by Crime Severity Levels

The distribution of crime severity levels among females before and after the mandate shows that arrests for Black females occur most often at a Florida arrest severity level of 1. The number of arrests has decreased significantly across all charge levels after the mandate. Brown females are similar to Black females; most arrests are at a charge level of 1, and there was a decrease across all charge levels after the mandate. For females in the beige skin tone category,

the number of arrests has decreased across all charge levels, especially at level 1. For females in the blond category, most arrests are ranked at charge levels 1 and 3. There was a noticeable decrease postmandate, particularly at charge level 1.

The distribution of crime severity levels among males before and after the mandate shows that for black males, most arrests occur at a charge level of 1. There was a decrease in arrests across all charge levels after the mandate, but the numbers remain relatively high. Males in the brown skin tone category showed the highest number of arrests at charge level 1 and a decrease postmandate across most charge levels. Males in the beige category present similar outcomes to those in the black and brown categories: most arrests are at a charge level of 1, and there a significant postmandate decrease was obvious. Blond male arrests are distributed across various charge levels, and there was a decrease in some levels but an increase in others postmandate. The mandate to lower arrests has led to a significant decrease in the number of arrests for both males and females across all skin colors, and the decrease in arrests was generally more pronounced for females. Most arrests before and after the mandate occurred at a charge level of 1 for both males and females across all skin colors.

Implications and Future Research Avenues

Crime Severity and the Mandate's Impact

The existing literature has indicated that the most dramatic change in arrest disparity relates to charge level 1 crimes. In addition, most police officers would report that when people are mandated to remain indoors, there is an increase in fights and domestic violence, which are level 6 crimes; the gaps in the data related to these crimes present ample potential for future research. In an analysis of arrest data segmented by gender, skin color, and crime severity, notable patterns emerged both before and after the implementation of a mandate aimed at

reducing arrests. At charge level 1, which represents the most common level of crime severity, there was a universal postmandate decrease in the number of arrests across all demographic groups. Females, in particular, experienced a more pronounced reduction, ranging from 11% to 76%, compared to their male counterparts, who saw a decrease ranging from approximately 32% to 63%. However, the data for charge level 6 present a more complex picture. Although the mandate led to a decrease in arrests among beige females, the number of arrests remained static for blond females and even increased for females in the black skin tone category. Conversely, arrests of brown females were reduced to zero. Among males, there was a postmandate uptick in arrests at charge level 6 for Black and Brown individuals, but the numbers slightly decreased for beige males and doubled for blond males, albeit from a low base. These findings suggest that the impact of the arrest-reduction mandate is nuanced, with significant variations dependent on charge level, gender, and skin color of the arrested individuals.

In the realm of criminal justice, the impact of policy changes often manifests in complex and varied ways across different demographic groups. This complexity is particularly evident when examining the consequences of a mandate aimed at reducing overall arrests. Although the mandate led to a universal decrease in arrests at charge level 1, the most common level of crime severity, its impact on charge level 6, which encompasses fights and domestic abuse, was not as straightforward. Among females, the postmandate data showed a decrease in arrests for individuals in the beige skin tone group but an increase specifically for Black females. Arrests of brown females dropped to zero, and the number remained static for blond females. It is noteworthy that females in the black and beige skin tone categories, who had seen significant reductions in arrests at charge level 1, experienced diverging trends at charge level 6, a category that involves interpersonal violence and domestic issues.

For males, the arrest patterns at charge level 6 were also varied. Notably, there was an increase in postmandate arrests for males in the black and brown skin tone groups, contrasting with the general downward trend seen at charge level 1. Arrests for males in the beige category slightly decreased, and males in the blond category saw a doubling in arrests, albeit from a low base. This divergence raises questions about the effectiveness of a broad mandate to address specific types of crime that may be deeply rooted in complex social and interpersonal dynamics. Given that fights and domestic abuse are often influenced by a host of factors, including social stressors, economic conditions, and mental health, the observed arrest patterns at charge level 6 suggest that a one-size-fits-all approach to reducing arrests may pose limited efficacy in addressing the nuanced challenges associated with interpersonal violence.

In analyzing the impact of an arrest-reduction mandate, it is crucial to explore how the policy influenced different groups. This study found stark variations in the responsiveness to the mandate among eight groups, with four each among males and females, categorized by skin color. Among females, the beige and blond groups exhibited the most similar responses, marked by a drastic reduction in arrests by 76.27% and 63.16%, respectively. Conversely, the beige female and brown female groups were the most dissimilar; arrests among beige females decreased by 76.27%, but brown females saw a more modest reduction of only 11.11%. In the male category, the beige and brown groups were closely aligned, experiencing reduced arrests by 62.62% and 56.47%, respectively. However, the reactions were notably dissimilar between males in the black and blond groups; the former saw a 32.28% decrease, whereas the latter experienced a 50% decrease in arrests. These findings indicate that the effectiveness of broad criminal justice reforms can differ substantially across demographic lines. Clearly, some groups saw significant reductions in arrests, and others were less affected, thus pointing to the multifaceted challenges

of implementing one-size-fits-all policies in diverse communities. The variations underscore the necessity for more nuanced, targeted approaches to criminal justice reform.

The dataset under consideration provided a multifaceted view of the complexities of the criminal justice system, particularly in the context of a mandate to reduce arrests. Although the mandate yielded a significant decline in arrests for less severe crimes, represented by charge level 1, it had a disparate impact on more severe offenses, such as those categorized under charge level 6, encompassing fights and domestic abuse. This dichotomy suggests that the efficacy of broad policy measures may vary based on the nature and severity of the crime. Further, the data revealed intriguing gender disparities, with females experiencing a more pronounced reduction in arrests compared to males across almost all charge levels. The variation in the mandate's impact across different skin color groups adds another layer of complexity; for instance, although arrests among beige females plummeted, those among brown females decreased at a markedly lower rate. Certain charge levels, notably levels 6 and 8, diverged significantly from the overarching trend seen at charge level 1; although only limited data are available, this outcome still raises questions about the mandate's effectiveness in addressing specific types of crimes. Additionally, incremental increases in arrests for specific crimes, notably among Black males at charge level 6, hint at potential unintended consequences of the policy measure. Lastly, some groups exhibited dramatic percentage changes in arrest rates, but the actual numbers in many crime levels were relatively small, which suggests taking caution to not overinterpret the culled data. These nuanced findings underscore the need for more targeted, context-specific interventions in criminal justice reform, and they open several avenues for further academic investigation into the complex interplay of policy, crime severity, and demographic factors.

Aggregated Analysis by Skin Color

When merging female and male data together, the analysis reveals significant variances in the impact of an arrest-reduction mandate across different skin color groups. Premandate, individuals with beige skin had the highest number of arrests (265), followed by those with black (241), blond (119), and brown (103) skin. Postmandate, all groups saw a decline in arrests, but the magnitude of these declines differed substantially. The beige group experienced the most significant reduction, with arrests plummeting by 65.7%, whereas the black group saw a comparatively more minor decrease of 38.6%. The brown and blond groups also exhibited sizable reductions, with arrests falling by 48.5% and 56.3%, respectively. These disparities raise important questions about the equitable impact of broad criminal justice reforms. The mandate proved effective in reducing arrests across all skin color groups, but its effects were most pronounced for the beige skin tone group and least pronounced for the black skin tone group. Such divergent outcomes suggest that the mandate's effectiveness may be modulated by a host of factors, potentially including systemic inequities, community policing strategies, and socioeconomic conditions. These findings again underscore the importance of designing nuanced, targeted interventions that account for the complex interplay of demographic factors in the criminal justice system.

The investigation into arrest patterns takes on added nuance when the data are aggregated into broader demographic categories. Specifically, when combining the black and brown groups, as well as the beige and blond groups, distinct trends emerge. Prior to the mandate, both aggregated groups showed similar arrest rates: 344 for the black and brown groups and 384 for the beige and blond groups. Postmandate, however, the percentage reduction in arrests was notably different between these groups. The black and brown categories experienced a 41.6%

reduction in arrests, and the beige and blond group witnessed a far more substantial decline of 62.8%. These differing outcomes underscore the complex interplay of factors that influence the efficacy of broad criminal justice reforms. Despite starting from similar baseline arrest numbers, the two aggregated groups reacted differently to the mandate, with the beige and blond groups benefiting more significantly. This disparity points to the possible influence of systemic factors, community dynamics, and perhaps even enforcement biases in shaping the outcomes of criminal justice policies.

Viewing the data through the lens of aggregated skin color groups to include black, brown, and beige in one category and restricting the other to blond individuals brought the efficacy of the arrest-reduction mandate into sharper focus. Before the mandate, the black, brown and beige groups accounted for a significantly higher number of arrests (609) compared to the blond group (119). Following the mandate, both groups experienced a substantial decline in arrests, but the percentage reduction was somewhat comparable at 52.1% for the black, brown and beige groups and 56.3% for the blond group. This parallel in percentage reduction is noteworthy considering the initial disparity in arrest numbers, suggesting that although the mandate was effective in reducing arrests across both aggregated groups, the relative impact was fairly uniform despite the significant difference in initial arrest volumes. This equitable percentage reduction across disparate demographic groups raises important considerations for policy effectiveness and social equity. It implies that the mandate's impact was not disproportionately beneficial or detrimental to any one group when categorized this way but instead had a more uniform effect. These insights affirm the need to scrutinize policy impacts across various demographic lenses to ensure equitable outcomes in criminal justice reform.

An alternative aggregation of the data that grouped individuals with black, brown, and blond skin tones in one category and beige individuals in another category yielded additional enlightening results on the impact of the arrest-reduction mandate. Initially, the black, brown, and blond groups had 463 arrests, and the beige group had 265. Postmandate, both groups saw a significant drop in arrests; however, the percentage decrease was notably different between these two categories: the black, brown, and blond groups experienced a 45.4% reduction, but the beige group saw a markedly larger decrease of 65.7%. This divergence in percentage reduction is striking and raises pivotal questions about the equitable effectiveness of broad policy measures in the criminal justice system. Despite a fairly similar mandate impact on groups in previous categorizations, this particular aggregation reveals that the beige group benefited more significantly from the mandate.

Policy Implications

This study aimed to scrutinize the impact of a criminal justice reform mandate designed to reduce arrests. Utilizing a dataset that categorized arrests by gender, skin color, and crime severity, a multilayered analysis was conducted to assess the mandate's effectiveness and its varying impacts on different demographic groups. Initial findings revealed that the mandate was broadly effective in reducing arrests, particularly for less severe crimes categorized under charge level 1. However, the impact was different across all demographic and crime categories. Females, for example, experienced a more pronounced reduction in arrests compared to males. This trend was not, however, consistent across all levels of crime severity. At charge level 6, which pertains to fights and domestic abuse, the patterns were more complex, with some demographic groups experiencing increased arrest rates. Further examination by skin color exposed stark disparities in the mandate's impact. The number of arrests decreased across all

skin color categories, but the magnitude of this reduction varied widely. Recategorization of these groups into broader categories (i.e., first black and brown versus beige and blond then black, brown, and beige versus blond, and finally black, brown, and blond versus beige) revealed nuances that would otherwise have been obscured. These aggregated analyses highlighted the importance of examining policy impacts through various demographic lenses to ensure equitable outcomes. The present study brings to the fore the complex interplay of factors such as crime severity, gender, and skin color in shaping the outcomes of criminal justice policies and calls attention to the limitations of broad, one-size-fits-all mandates, suggesting the need for more targeted, context-specific interventions. These findings open multiple avenues for future research, particularly in examining the systemic factors that contribute to these disparities. In summary, the data underscore the need for a multifaceted approach to criminal justice reforms that accounts for the complex demographic factors at play.

Broadening the Perspective

Although this study offers a comprehensive analysis of the arrest-reduction mandate's impact across various demographic groups, it also opens the door to further inquiry. One significant limitation is the absence of temporal granularity; understanding the immediate versus long-term effects of the mandate could offer nuanced insights into its efficacy. Additionally, the study did not account for geographic variations, which could prove pivotal in understanding the localized impacts of criminal justice policies. Factors such as age, education, and employment status, not covered in the dataset, might also influence arrest patterns and should be included in future studies. Understanding the specific policy context around the mandate, including its implementation strategies and related initiatives, could also shed light on its relative success or failure. Qualitative data, obtained through interviews or surveys, would offer a more holistic

view of the mandate's impact, complementing the quantitative findings presented. Comparative analysis with similar policies in other jurisdictions could serve as a valuable benchmark.

Furthermore, the broader legal, social, and economic landscapes during the period of the mandate could provide contextual explanations for observed changes in arrest rates. Based on these multifaceted findings, future work could focus on formulating targeted policy recommendations aimed at ensuring more equitable and effective criminal justice reforms. Although the current study provides valuable insights into the complexities of implementing broad criminal justice reforms, it also highlights the need for a multifaceted, context-specific approach in future research and policy design.

Table 6 shows the distribution of the study's sample across these skin tone groups.

Table 6

Distribution of the Study Sample Skin Tone Classification

Skin tone group	*n*	%
Black	39	26
Brown	27	18
Beige	59	39.3
Blond	25	16.7

Table 7 presents the descriptive statistics for the DI within each skin tone group. The DI represents the measure of disproportionate arrests, with higher values indicating a greater level of disproportionality.

Table 7

Descriptive Statistics of Disproportionality Index

Skin tone group	*M*	*SD*	*SEM*	Minimum	Maximum	Skewness	Kurtosis
Black	0.89	0.45	0.07	0.40	1.90	0.74	−0.67
Brown	1.37	0.76	0.15	0.55	2.99	0.91	−0.23
Beige	1.58	0.81	0.11	0.41	3.16	0.27	−1.28
Blond	1.31	0.61	0.12	0.54	2.44	0.68	−0.86

The black skin tone group displays a moderately low mean DI of 0.89. However, the range of values, from a minimum of 0.40 to a maximum of 1.90, shows considerable variability in this group. For the brown skin tone group, the mean DI is notably higher at 1.37, indicative of greater disproportionality compared to the black skin tone group. The dispersion of values, skewness, and kurtosis all suggest a higher variability and a skew to the right, with the shape of the distribution appearing closer to normal. The beige skin tone group presents the highest mean DI of 1.58, suggesting the highest degree of disproportionality in this study. The distribution's skewness is nearly symmetric, indicating a balance between lower and higher scores. However, the negative kurtosis suggests a leptokurtic distribution. Lastly, the blond skin tone group's mean DI is similar to the brown skin tone group at 1.31. This group exhibits a slight right skewness and a flatter distribution, as indicated by the negative kurtosis.

To further explore these observations, normality tests were conducted on the DI for each skin tone group. Kolmogorov-Smirnov and Shapiro-Wilk are statistical tests commonly used to assess the normality of data distributions. They are generally not directly related to spline regression itself, but they can be helpful in checking the assumption of normality when performing spline regression or any other regression analysis. Kolmogorov-Smirnov and Shapiro-Wilk tests are valuable tools to evaluate the normality assumption of residuals in spline regression and aid in ensuring the validity of statistical inferences drawn from the model and help diagnose potential issues with the model's fit. The Kolmogorov-Smirnov and Shapiro-Wilk tests are helpful with spline regression in checking for normality of residuals, model diagnostics, and detecting outliers.

In the present study, the Kolmogorov-Smirnov and Shapiro-Wilk tests revealed significant departures from normality for the black and beige skin tone groups. For the brown

and blond skin tone groups, the tests suggest a slight departure from a normal distribution, indicating minor irregularities. The results of these tests are provided in Table 8.

Table 8

Normality Test for Disproportionality Index Across Different Skin Tone Groups

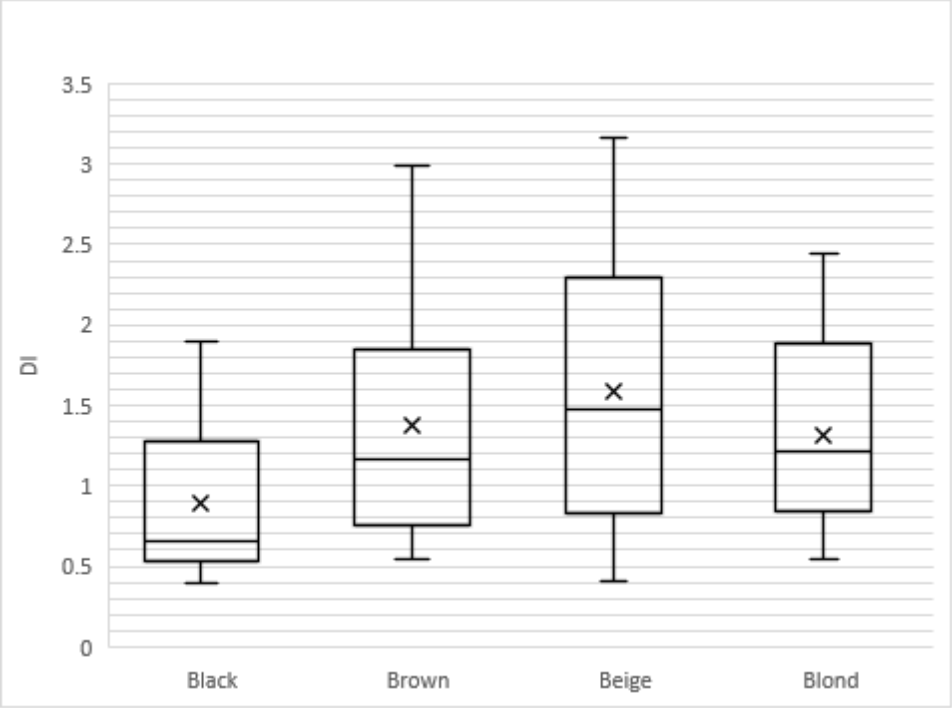
Color	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	*df*	*p*	Statistic	*df*	*p*
Black	.236	39	<.001	.873	39	<.001
Brown	.162	27	.067	.883	27	.006
Beige	.127	59	.018	.929	59	.002
Blond	.169	25	.063	.895	25	.014

These findings, both from the descriptive analysis and the normality tests, reveal differing levels of disproportionality across the skin tone groups. As seen in Figure 7, the beige skin tone group presents the greatest disproportionality, and the black skin tone group exhibits the least. The departures from normal distribution observed in each group suggest unique characteristics within each skin tone group that influence the DI.

It is important to note that the observed deviations from normality in the DI distributions across the skin tone groups do not necessarily pose a problem for subsequent regression analyses. This is because the assumption of normality in regression analysis pertains to the distribution of the residuals (i.e., prediction errors), not the distribution of the dependent variable itself. Hence, even if the DI distributions are not perfectly normal, the regression results can still be reliable and valid as long as the residuals from the regression model follow a normal distribution.

Figure 7

Boxplot Disproportionality Index per Skin Tone Group



These descriptive statistics and normality tests provide insights into the distribution and normality assumptions of the DI within each skin tone group. They contribute to a better understanding of the relationship between skin tone and disproportionate arrest rates and inform further analyses in this study.

Table 9 presents the descriptive statistics for the DI within each skin tone group. The table shows the strength and direction of the correlations between RGB and DI for each skin tone group. The correlations are statistically significant ($p < .001$) in all groups. The negative correlation coefficients for the black and beige groups (−0.84 and −0.78, respectively) indicate a strong negative linear relationship between RGB and DI. Conversely, the positive correlation coefficients for the brown and blond skin tone groups (0.79 and 0.91, respectively) indicate a strong positive linear relationship between RGB and DI. These findings suggest that there is a

significant association between RGB and DI within each skin tone group. These relationships look different depending on the skin tone group being analyzed.

Table 9

Unadjusted Correlations Between RGB and Disproportionality Index

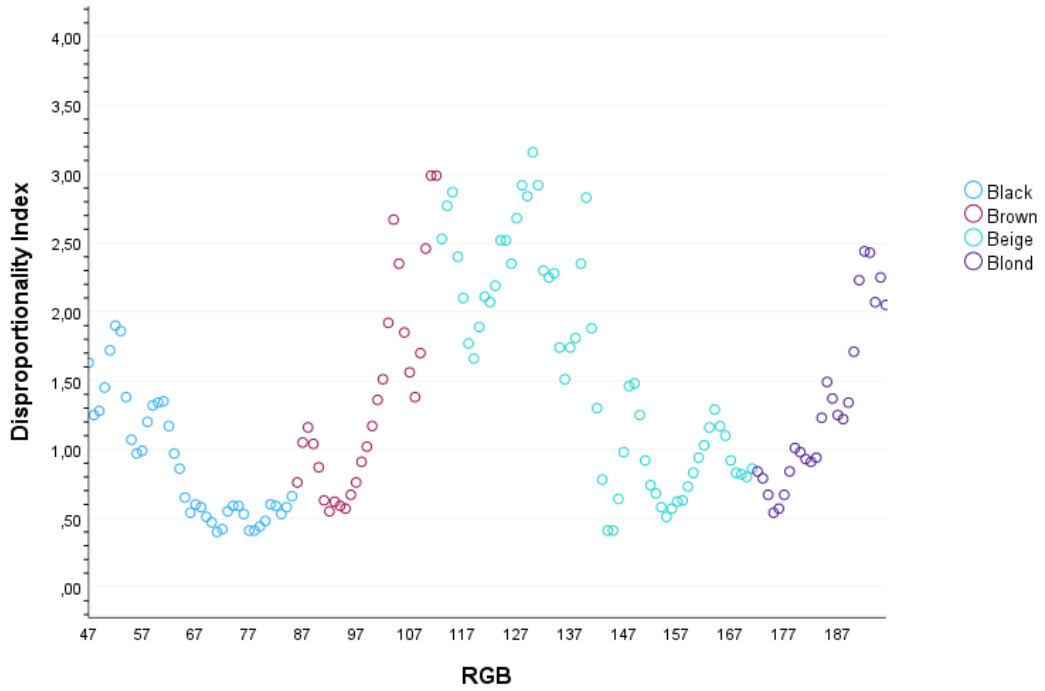
Skin tone group	*r*	*p*
Black	-0.84	<.001
Brown	0.79	<.001
Beige	-0.78	<.001
Blond	0.91	<.001

Note. RGB = red-green-blue.

A visual depiction of the relationship between RGB and DI is shown in Figure 8.

Figure 8

Scatterplot of RBG and Disproportionality Index



Assumption Tests

No observations showed standardized residuals greater than |3| when included in the regression models. The residual statistics, as shown in Table 10, provided information on the distribution and characteristics of the residuals. The mean of the residuals was 0.00, and the standard deviation was 0.41. The minimum and maximum residuals were −1.05 and 1.22, respectively.

Table 10

Residual Statistics

Statistic	Minimum	Maximum	*M*	*SD*
Predicted value	0.23	2.59	1.32	0.61
Std predicted value	−1.78	2.08	0.00	1.00
Std error of predicted value	0.05	0.15	0.07	0.02
Adjusted predicted value	0.20	2.58	1.32	0.61
Residual	−1.05	1.23	0.00	0.41
Std residual	−2.54	2.95	0.00	0.99
Stud residual	−2.56	2.97	0.00	1.00
Deleted residual	−1.07	1.24	0.00	0.42
Stud deleted residual	−2.61	3.06	0.00	1.01
Mahal distance	1.04	17.33	3.97	2.92
Cook’s distance	0.00	0.04	0.01	0.01
Centered leverage value	0.01	0.12	0.03	0.02

Note. Std. = standard; Stud. = student; Mahal. = Mahalanobis distance.

Linearity was satisfied as established by the significant correlations in Table 9, as well as visual inspection of the scatterplot in Figure 9. Testing for homoscedasticity is assessed by visual inspection of a plot of standardized residuals versus standardized predicted values. If there is homoscedasticity, the spread of the residuals will not increase or decrease as the predicted values increase. In this study, there was approximate homoscedasticity.

Table 9 prompts the interpretation of residual statistics within the context of linear spline regression, a nuanced form of regression analysis designed to offer enhanced flexibility. It

achieves this by capturing nonlinear relationships through the introduction of knots within the predictor variable range. This approach divides the predictor variable into segments, with each segment being modeled by its linear relationship. The provided table elucidates various facets of the study's linear spline regression model's predictions and the associated uncertainties. Within this model, the predicted values represent the outcomes forecasted across the different spline segments. These values are foundational in discerning how the spline model maps the relationship between predictors and the outcome, with the nuance of changing slopes at specified knot points.

The standardized predicted values are a normalized version of these predictions. By scaling these values to have a mean of zero and a standard deviation of one, inferences can be made about the model's predictions that are agnostic to the original unit scale. This normalization ensures that any patterns or anomalies identified are not merely artifacts of the data's scale but pertain to the model's structural characteristics. Every model prediction is accompanied by inherent uncertainty, which in the context of the linear spline regression is captured by the standard error of predicted value. This measure can be particularly informative in spline regression, as it may reveal segments (between) where the model's predictions are more or less certain. Adjusted predicted values might be derived to account for known external influences or biases that were not integrated into the initial spline model. By comparing these adjusted predictions with the original ones, deductions can be made about the potential impact of these externalities on the study model's forecasts.

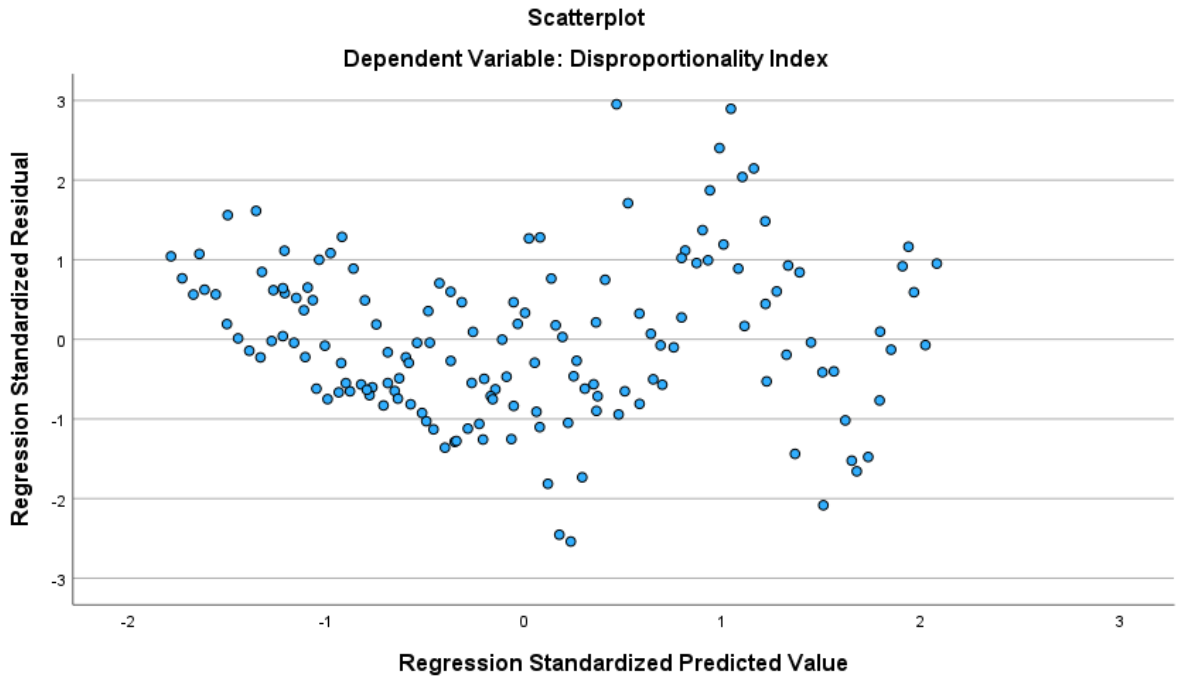
The residuals testify to the model's predictive accuracy. In the context of linear spline regression, the distribution and patterns within residuals can also hint at whether they are appropriate or if there remains the need to introduce additional tests. Ideally, these residuals

should be randomly scattered around zero across all spline segments, indicating unbiased predictions.

Table 9 provides comprehensive insight into the predictive performance of the study's linear spline regression model. A meticulous examination of these metrics secures a better understanding of the nuances of the segmented linear relationships, potentially guiding further refinements in knot selection and model structure.

Figure 9

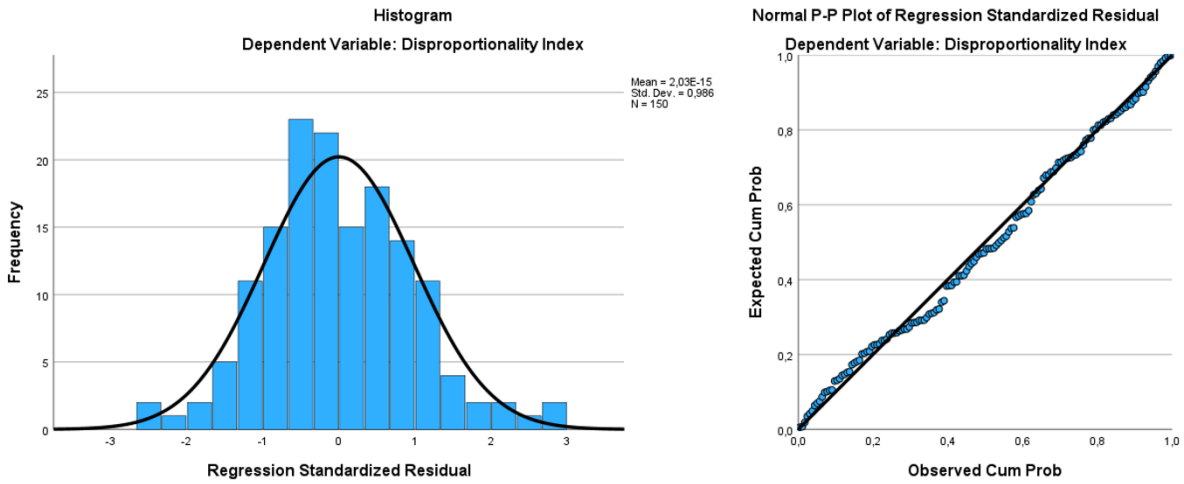
Standardized Residuals Versus Standardized Predicted Values



Checking for normality is assessed by visual inspection of a histogram of the standardized residuals, as well as a normal P-P plot presented in Figure 10. The mean and standard deviation have values of approximately 0 and 1, respectively. Although some deviation from normality is present, it is not large enough to be worrisome.

Figure 10

Histogram of the Standardized Residuals and Normal P-P Plot



In the domain of linear regression analysis, the Q-Q plot emerges as an indispensable graphical instrument that facilitates the assessment of the conformity of a dataset to a specified theoretical distribution. Particularly in regression, this tool proves pivotal in gauging the extent to which residuals—the discrepancies between observed and predicted values—adhere to a normal distribution.

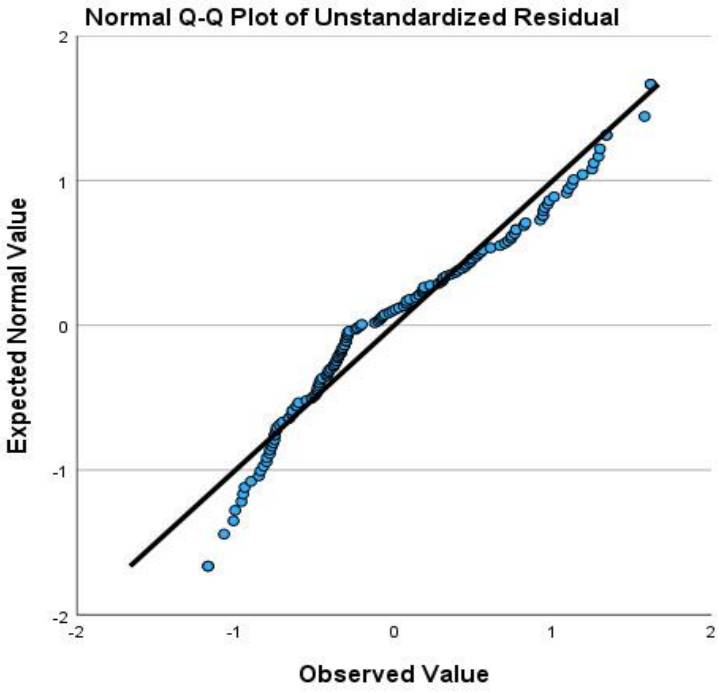
A primary hallmark of residuals that approximate a normal distribution is the tendency for the data points in the Q-Q plot to align closely with a straight line, symbolic of the line of equality. Deviations from this prototypical straight line indicate particular quirks in the residuals. For example, a discernible curvature at the extremities, particularly one that assumes a concave shape, signifies that the residuals possess tails that are more pronounced than those of a normal distribution—a phenomenon termed leptokurtosis. Alternatively, an s-shaped trajectory in the plot alludes to the possibility of skewness in the residuals. Furthermore, conspicuous outliers are pinpointed as individual data points that manifest a stark deviation from the straight line.

The supposition of normality in residuals is not a mere academic exercise; it is nestled in the foundational tenets of linear regression. Such normality is essential for the accurate execution of hypothesis testing and construction of robust confidence intervals. An infraction of this assumption could compromise the integrity of inferential statistics derived from the model.

Nonlinearity might be inherent in the relationship between the predictors and the dependent variable, necessitating the exploration of nonlinear modeling techniques. With its nuanced diagnostic capabilities, the Q-Q plot is a cornerstone in regression analysis, as seen in Figure 11. It equips researchers with the means to visually ascertain the normality of residuals and guides them in instituting appropriate corrective measures when anomalies arise.

Figure 11

Normal Q-Q Plot



The edifice of empirical research stands on the bedrock of statistical power. Power analysis, a methodological apparatus, determines the sample size necessary to detect a particular

effect size with a specified level of confidence, ensuring efficient allocation of resources and reduction in the risk of Type II errors. Power analysis is crucial in spline regression, especially given this study, where $N = 85$ was calculated with both SPSS Power Analysis and G*Power. Several considerations underscore its relevance, including model complexity, the potential for overfitting, effect size detection, knot and predictor considerations, economical use of resources, and research integrity.

With the flexibility in capturing intricate data relationships inherent to spline regression, it was paramount to ensure that the present study's sample size of 85 was robust enough to delineate these nonlinear relationships. A nuanced balance is vital in spline regression. With its mentioned flexibility, there remains a risk of overfitting, mainly if the dataset needs to be adequately sized. The sample size, as determined by power analysis, ensures minimal overfitting while still capturing underlying structures. Given the granular relationships that spline regression might unveil, achieving statistical power is crucial. Setting the actual power at .803 for this study made it possible to detect effect sizes with reliability. Spline regression's intricacy, driven by predictors, demands careful power considerations. With four total predictors in the study's model, and with all four being test predictors, power analysis ensured that the study's sample was sufficient to render statistically valid inferences.

Spline regression can be computationally intensive, especially as the number of predictors grows. The decision to have substantially more data points than $N = 85$ was informed not just by statistical considerations but also by the practicality of computational resources. Ensuring adequate power reduces the risk of false negatives. This study was powered above the conventional threshold of .8, which reinforced the reliability of the study's findings. For the assumptions tested, the target power was set at .8 with an effect size of .15 and a significance

level of .05. These parameters, grounded in established research norms, bolster the robustness and reproducibility of the study's findings, and the use of power analysis ensured the findings would contribute meaningfully to the academic discourse and confirmed statistical and methodological rigor.

Results

The present study employed spline regression analysis to explore the relationship between average RGB values and the DI across different skin tone groups. The results of the spline regression analysis are presented in two formats: the marginal effects of each skin tone group (representing the slope per segment) and the full form of the spline regression model. The full form of the spline regression model provides the complete equation of the spline regression model, including the coefficients for each skin tone group as well as the constant term. This format allows for a more comprehensive understanding of the relationship between average RGB values and the DI within the entire model. The marginal effects format allows for the coefficients to be interpreted as the change in slope from the preceding segment modeling (Burks et al., 2018). The spline piecewise linear regression was estimated with the knot locations set to 85, 112, and 171. The resulting four linear functions are connected at these marks, which represent the boundaries between the different skin tone groups.

Full Form of Spline Regression Model

A segmented linear regression was performed to predict the DI based on skin tone groups (black, brown, beige, and blond). The regression analysis revealed a significant effect of RGB on the DI ($F(4, 145) = 81.32$, $p < .001$). The model explained 69.17% of the variance in the DI ($R^2 = .69$), with an adjusted R^2 of .68.

A two-way analysis of variance (ANOVA) and R^2 are methods used in statistics to understand and quantify the relationship between variables. They are often encountered in the context of linear regression, among other techniques. Both ANOVA and R^2 are frequently used to assess the fit of a linear regression model to data. Both methods decompose the variation in the dependent variable: ANOVA breaks down the total variation into variation explained by the model (between-group variation) and variation due to error (within-group variation), and R^2 quantifies the proportion of total variation that the model explains. Both can indicate how well the independent variables explain variation in the dependent variable. A significant *F* statistic in ANOVA indicates that at least one predictor is related to the dependent variable, and R^2 quantifies the proportion of the total variation in the dependent variable that is accounted for by the independent variables.

ANOVA and R^2 are different in that ANOVA primarily yields an *F* statistic, which is used to test the hypothesis that the group means are equal (i.e., no effect). In the context of regression, ANOVA tests whether the model explains more variance in the outcome variable than would be expected by chance; R^2 is a coefficient of determination that explains the proportion of the variance in the dependent variable that is predictable from the independent variables, and its value ranges from 0 to 1, with higher values indicating a better fit of the model. ANOVA is primarily used for hypothesis testing. It tests whether the means of two or more groups are statistically different and measures how well the predictors explain the variation in the outcome. R^2 will always increase (or remain the same) as more predictors are added to a model, regardless of whether those predictors are actually meaningful. This can be misleading, suggesting a better fit than actually exists. ANOVA's *F* test in the context of regression will indicate if the added predictors bring significant explanatory power.

In practice, both ANOVA and R^2 provide insights into the relationships between variables and the fit of a model, and they offer complementary perspectives and are often used together when evaluating regression models. ANOVA can be used in the context of spline regression, but the interpretation and implementation might be slightly different than in traditional linear regression. Each piece of the spline (defined between) can be considered analogous to a term in a regression model, and ANOVA can be used to test the significance of these spline components. Similar to linear regression, a study may rely on ANOVA to determine if the spline regression model as a whole is significantly better at explaining variance in the dependent variable compared to a model with no predictors. Spline regressions can become complex, especially with multiple or higher-degree splines, making ANOVA tables more challenging to interpret. ANOVA can be applied in the context of spline regression, mainly for model comparison or to assess the significance of individual model components. However, interpretation should be approached with caution.

Linear regression in IBM SPSS Version 29 was used to obtain the ANOVA table to essentially test the hypothesis that the model adds something beyond what would be expected by chance. If the significance level associated with the *F* statistic is small (typically less than 0.05), it suggests that the regression model predicts the dependent variable better than would be expected by chance. An ANOVA table produced in the context of regression analysis in SPSS is similar in structure to a traditional ANOVA table that compares means across different groups, but the context and interpretation are different. Both typically show the sum of squares, degrees of freedom, mean square, the *F* statistic, and its significance level. In both contexts, the *F* statistic is used to test hypotheses. In a simple one-way ANOVA, the *F* statistic tests whether group means are all equal; in regression, it tests whether the model explains more variance in the

outcome variable than would be expected by chance. Traditional ANOVA compares the means of a dependent variable across different levels of a categorical independent variable. The *F* statistic tests if there are significant differences between group means. Regression ANOVA assesses the fit of a regression model. The *F* statistic tests if the predictors in the model explain a significant amount of variance in the dependent variable. In traditional ANOVA, the total variation is partitioned into between-group variation (variation explained by group differences) and within-group variation (variation not explained by group differences). In regression ANOVA, the total variation is partitioned into variations explained by the regression model and variation left unexplained (residuals or error). In traditional ANOVA, the degrees of freedom for the between-groups are based on the number of groups minus one. The within-groups degrees of freedom are based on the total number of observations minus the number of groups. In regression ANOVA, the degrees of freedom for the regression (model) are based on the number of predictors. The residual (error) degrees of freedom are based on the number of observations minus the number of predictors minus one.

Although they look similar, the context and interpretation for ANOVA in traditional group comparison versus regression are different. In regression tables like Table 10, the ANOVA table helps determine if the predictors in the model are useful for explaining variance in the dependent variable, whereas in traditional ANOVA, it is about comparing means across different groups. In this study, comparing means was unnecessary and added no helpful information.

Table 11

Spline Regression ANOVA (Dependent Variable: Disproportionality Index)

Model	*SS*	*df*	*MS*	*F*	*p*
Regression	56.00	4.00	14.00	81.33	<.001
Residual	24.96	145.00	0.17	–	–
Total	80.97	149.00	–	–	–

The results from the full form of the spline regression model, examining the relationship between RGB and the DI across skin tone groups, are presented in Table 11. The table displays the estimated coefficients, standard errors, 95% confidence intervals, *t* values, and *p* values for each skin tone group and the constant term.

Table 12

Full Form of Spline Regression Model

Model	*B*	*SE*	95% CI		*t*	*p*
			LL	UL		
Black	−0.04	0.01	−0.04	−0.03	−7.10	<.001
Brown	0.12	0.01	0.10	0.14	13.30	<.001
Beige	−0.12	0.01	−0.14	−0.12	−17.55	<.001
Blond	0.10	0.01	0.08	0.12	10.93	<.001
Constant	3.17	0.34	2.49	3.84	9.26	<.001

Note. B = estimated coefficients; CI = confidence interval; LL = lower limit; UL = upper limit.

The model can be represented by the following equation: DI = 3.167 − 0.035 * RGB + 0.122 * (RGB − 85) * I(RGB ≥ 85) − 0.123* (RGB − 112) * I(RGB ≥ 112) + 0.100 * (RGB − 171) * I(RGB ≥ 171) where I (condition) is an indicator function that equals 1 if the condition is true and 0 otherwise. Table 12 shows how the model can be broken down per skin tone group.

Table 13

Model Equations per Skin Tone Group

Skin tone group	Formula
Black	DI = 3.167 − 0.035 * RGB
Brown	DI = 3.167 − 0.035 * RGB + 0.122 * (RGB − 85)
Beige	DI = 3.167 − 0.035 * RGB + 0.122 * (RGB − 85) − 0.123 * (RGB −112)
Blond	DI = 3.167 − 0.035 * RGB + 0.122 * (RGB − 85) − 0.123 * (RGB −112) + 0.100 * (RGB − 171)

Note. DI = Disproportionality index; RGB = red-green-blue

Marginal Effects Format

The coefficients presented in Table 13 reflect the changes in slopes when transitioning from one skin tone segment to the next, illustrating the variations in the relationship between average RGB value and the DI across different segments.

Table 14

Marginal Effects of the Spline Regression

Model	*B*	*SE*	95% CI		*t*	*p*
			LL	*UL*		
Black	−0.04	0.01	−0.04	−0.03	−7.10	<.001
Brown	0.09	0.01	0.08	0.09	16.60	<.001
Beige	−0.04	0.01	−0.04	−0.03	−14.65	<.001
Blond	0.07	0.01	0.05	0.08	8.55	<.001
Constant	3.17	0.34	2.49	3.84	9.26	<.001

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

For the brown segment, the coefficient was 0.09 (*SE* = 0.01, $p < .001$). This indicates a change in slope compared to the black segment. The positive coefficient suggests that the slope increases by 0.09 when moving from the black segment to the brown segment. The coefficient for the beige segment was −0.04 (*SE* = 0.00, $p < .001$), representing a change in slope compared to the brown segment. The negative coefficient suggests that the slope decreases by 0.04 when moving from the brown segment to the beige segment. In the blond segment, the coefficient was 0.07 (*SE* = 0.01, $p < .001$), indicating a change in slope compared to the preceding segment (beige). The positive coefficient suggests that the slope increases by 0.07 when moving from the beige segment to the blond segment.

Research Questions and Hypotheses

RQ1: *Is there a significant difference in the slopes of the relationships between RGB and the DI across the skin tone groups (black, brown, beige, and blond) defined by the knots?*

- $H_0$1: There is no significant difference in the slopes of the relationships between RGB and the DI across the skin tone groups.
- H_a1: There is a significant difference in the slopes of the relationships between RGB and the DI across the skin tone groups.

To answer the research question, a segmented linear regression model was fitted to the data. The model divided the range of average RGB values into distinct segments based on predefined knot locations, providing a framework to examine potential variations in the slopes across the different skin tone groups.

To determine the significance of differences in the slopes, a Wald test for joint hypotheses was conducted, using a Bonferroni correction for multiple comparisons. The Wald test enables the simultaneous evaluation of multiple coefficients to test the hypothesis that the slopes differ significantly between the skin tone groups (Mendenhall et al., 2003). The results of the Wald test are presented in Table 14.

Table 15

Differences in Slopes Between Skin Tone Segments

Group comparison	*t*(148)	*p*
Black vs. brown	−16.94	<.001
Brown vs. beige	21.16	<.001
Beige vs. blond	−12.59	<.001
Black vs. beige	0.15	.884
Black vs. blond	−11.00	<.001
Brown vs. blond	2.46	.015

The results showed that the slopes for the black and brown segments were significantly different ($t(148) = -16.94$, $p < .001$), as were the slopes for the brown and beige segments ($t(148) = 21.16$, $p < .001$) and the beige and blond segments ($t(148) = -12.59$, $p < .001$). However, the slopes for the black and beige segments were not significantly different ($t(148) = 0.15$, $p = .884$). Additionally, the slopes for the black and blond segments ($t(148) = -11.00$, $p <$

.001) and the brown and blond segments ($t(148) = 2.46$, $p = .015$) were found to be significantly different. However, after adjusting for multiple comparisons using the Bonferroni correction, the difference between the slopes of brown and blond was no longer significant ($t(148) = 2.46$, $p = .015 > 0.01$).

These results suggest that each skin tone group exhibited a distinct slope in the relationship between average RGB values and the DI, with the exception of the black and beige, as well as brown and blond, skin tone groups. This indicates variations in the effect of lightening skin tone on the DI across different skin tone groups. Therefore, the null hypothesis was rejected, and there exists sufficient evidence to conclude that there are significant differences in the slopes of the relationships between RGB and the DI across the skin tone groups.

This study was framed around two key hypotheses. For Research Question 1, the null hypothesis ($H_0 1$) posited that there is no significant difference in the slopes of the relationships between RGB and the DI across the skin tone groups. Conversely, the alternative hypothesis ($H_a 1$) proposed that there is a significant difference in these slopes, indicating that Black people and Brown people face different disparities. The statistical analysis, specifically a *t*-test comparison between Black and Brown individuals, yielded a t value of -16.94 with a highly significant p value of $< .001$. This result decisively rejects the null hypothesis ($H_0 1$), providing strong evidence in favor of the alternative hypothesis ($H_a 1$). These findings indicate that there is a significant difference in the slopes of the relationships between RGB and the DI for the black and brown skin tone groups. The negative sign of the t value further elucidates the directionality of this disparity, which merits additional significance to fully comprehend its implications. In light of these outcomes, the study confirms differing levels of disparity between Black and Brown individuals in the context of police arrests. This not only substantiates the alternative

hypothesis but also is a revolutionary understanding of racial and ethnic disparities in policing practices.

RQ2: *If there are significant differences in the slopes, as determined in RQ1, is there a significant difference in the slopes of the relationships between RGB and DI between the black and brown skin tone groups, specifically?*

- $H_0$2: There is no significant difference in the slopes of the relationships between RGB and the DI between the black and brown skin tone groups.
- H_a2: There is a significant difference in the slopes of the relationships between RGB and the DI between the black and brown skin tone groups.

To address Research Question 2, a specific comparison was made between the black and brown skin tone groups to assess whether there exists a significant difference in the slopes of their relationships between RGB and the DI. The results from the Wald test showed that the slopes of the black and brown skin tone groups were indeed significantly different ($t(148) = -16.944$, $p < .001$). Therefore, the null hypothesis is rejected in favor of the alternative hypothesis, providing evidence of a significant difference in the slopes of the relationships between RGB and the DI among the black and brown skin tone groups.

Building upon Research Question 1, which established the presence of significant differences in the slopes of the relationships between RGB values and the DI across skin tone groups, Research Question 2 posed a deeper and more specific comparison between black and brown skin tone groups. Research Question 2 was framed around two hypotheses: the null hypothesis ($H_0$2) posited that there was no significant difference in the slopes of the relationships between RGB and the DI, specifically between Black and Brown individuals, and the alternative hypothesis (Ha2) posited that there was a significant difference. The focused *t*-test comparison between these two specific groups yielded a t value of −16.94 and a p value of < .001. This significant result unambiguously negated the null hypothesis ($H_0$2), lending robust empirical

support to the alternative hypothesis (H_a2). Consequently, it can be confidently stated that there is a significant difference in the slopes of the relationships between RGB and the DI when comparing black and brown skin tone groups. The negative *t* value of −16.94 not only signifies a statistically significant difference, but also underscores a distinct directionality in the slopes of the relationships between RGB and the DI for black and brown groups. This directionality in the slopes is not merely a statistical nuance; it calls for a more granular investigation into the underlying factors that led to this particular form of disparity. Focusing on this specific aspect, Research Question 2 serves as a critical extension of the broader inquiry inherent to Research Question 1 and demonstrates that disparities in police arrests are not universally applicable across skin tone groups but are distinctly differentiated. The variation in slopes between Black and Brown individuals is especially noteworthy, validating the alternative hypothesis (H_a2) and highlighting the complexity of racial and ethnic disparities in policing practices.

This study sought to determine which of the three theories surrounding disproportionate arrests is most predictive; that is, disproportionate rates increase as skin tone gets darker (stereotype threat theory), disproportionate rates are different for Black and Brown people (the self-categorization theory), or disproportionate rates apply equally across all darker skin colors (the social dominance theory). Based on this study, it would appear not only that virtually all prior studies and disparity in police arrests are invalid because of the denominator effect, but also that virtually all studies are invalid due to the reliance on demographic data over skin tone as a continual variable. Each of the three theories surrounding disproportionate police arrests either require that Black and Brown people have the same slope or the same directional slope. For the stereotype threat theory to be validated, the slopes of Black and Brown people would have to be the same. For the self-categorization theory to be validated, the slopes would at least have to be

in the same direction. For the social dominance theory to be validated, the slopes of Black and Brown people would also have to be the same. In Chapter Five, a precise graph of these three theories against the actual data is provided to show how significantly the data deviate from the three theories on disproportionate police arrests.

Association Between Skin Color and Police Arrests

This study examined the prevailing notion of skin color disparities in police arrests. Although previous research has suggested a clear association between skin color and police arrests, a deeper analysis of the available data led to a fresh understanding of this relationship. This study attempted to show the factors contributing to disparities in police arrests, specifically through the exploration of the role of skin color variation.

The issue of the disparities in police arrests has long been a topic of considerable debate and study, and a resulting body of research has suggested that skin color is pivotal in determining the likelihood of an individual being arrested. However, this study offers an alternative perspective rooted in the analysis of data patterns and the general demographic population of skin tone distribution.

Historical and contemporary studies have pointed toward a direct relationship between the darkness of an individual's skin and their likelihood of being arrested. However, examination of the demographics in Alachua County revealed that skin tone distribution is far from uniform across the population. The United States has not reached a level of intermarriage between Black and White populations that would render it a true melting pot in terms of skin color. The distribution of skin tones in the United States is bimodal, with distinct peaks representing the average skin color of dark-skinned and light-skinned individuals as two distinct groups. This

bimodal histogram of skin color in the population reveals how skin tone disparity follows the same pattern as the model in this study.

Analysis of the data identified clear patterns. The disparities in police arrests are not solely determined by the darkness of an individual's skin. Instead, police tend to focus on individuals who stand out within a given community because of their uncommon skin tone. If an individual's skin tone is atypical for the surrounding community, that person is more likely to draw police attention and, consequently, face a higher likelihood of arrest.

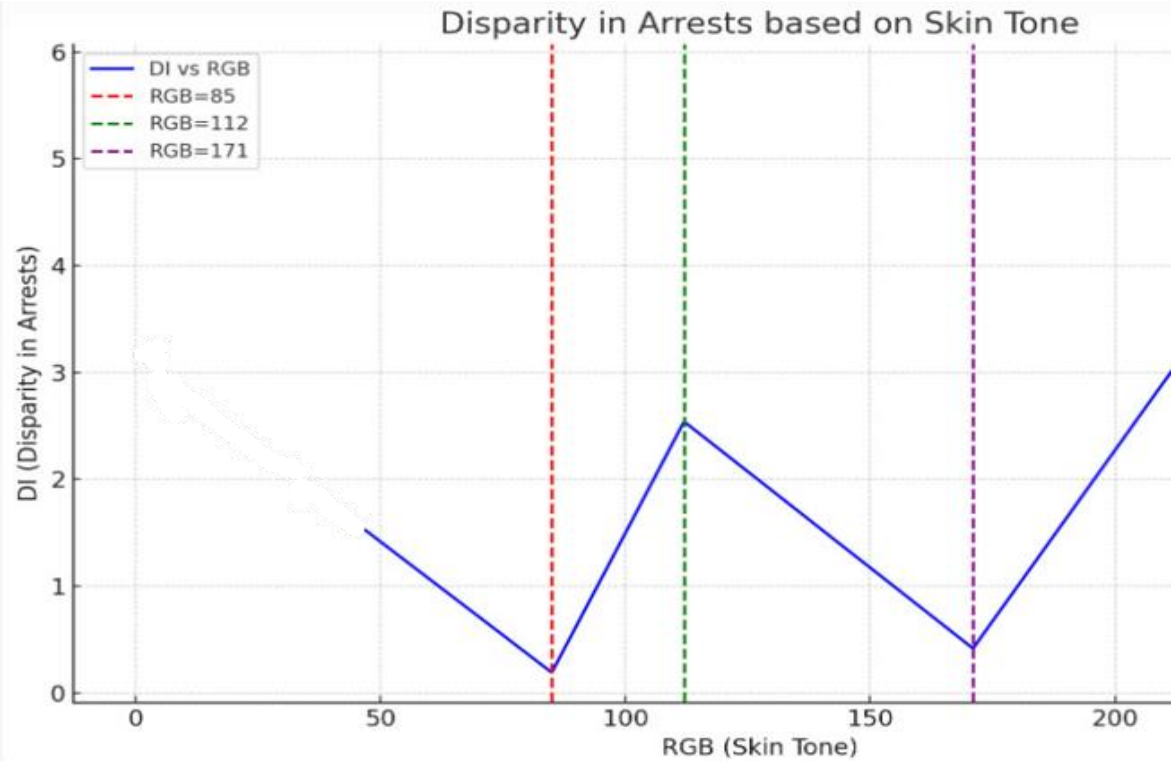
The relationship between skin color and police arrests is complex. There is no denying that disparities exist, but the reasons behind these disparities are only recently becoming clearer. This study underscores the importance of understanding the population demographics of skin tone distribution in a given community and how it impacts police behavior. The findings call for a shift in discourse and prompt scholars and policymakers to consider broader implications of skin tone rarity within communities, rather than simply focusing on the binary of dark versus light skin. Further research is needed to investigate community-specific patterns and how they influence police behavior. Policymakers and law enforcement agencies made aware of these findings could install more equitable policing practices that do not inadvertently target individuals based on the rarity of their skin tone in their communities.

The model provided in Figure 12 suggests that this disparity is based on uncommonness. The more an individual's skin tone deviates from the mean skin color of either the dark-skinned or light-skinned population groups, the greater the disparity they face regarding police arrests. As shown in Figure 12, the further a darker skin tone measures from an RGB of 85, the more disparity that individual is likely to experience. The same outcome is realized for a light-skinned

individual with an RGB of 171. There are indeed two groups that experience similar disparity: one dark-skinned and one light-skinned.

Figure 12

Disparity in Arrests Linear Spline Model



Note. RGB = red-green-blue.

The following points explain the graphical representation in Figure 12 of the relationship between RGB (skin tone) and the DI (disparity in arrests) based on the study's model:

- The blue curve represents the disparity in arrests as a function of skin tone (RGB value).
- The vertical dashed lines indicate the knots in the linear spline regression model at RGB values of 85, 112, and 171.

The graph generates the following observations:

- Initially, as RGB increases (moving from darker to slightly lighter skin tones), the disparity in arrests decreases.

- At the first knot (RGB = 85, red dashed line), there is a noticeable increase in disparity as RGB continues to increase.
- At the second knot (RGB = 112, green dashed line), the disparity decreases again as RGB increases.
- At the third knot (RGB = 171, purple dashed line), there is another increase in disparity with increasing RGB values.

Figure 12 provides a clearer picture of how the disparity in arrests varies across different skin tones based on the model. In examining the relationship between skin tone, quantified by the RGB value, and the disparity in arrests, the provided linear spline regression model offers significant insights into this association. The RGB value serves as a continuous spectrum in which lower values correspond to darker skin tones and higher values correspond to lighter ones. Initially, as the RGB value increases, indicating a transition from darker to slightly lighter skin tones, there is a decline in the disparity of arrests. This downward trend suggests that individuals with very dark skin tones face a slightly reduced risk of disproportionate arrest as their skin tone lightens within this initial range. However, this trend does not persist.

Upon reaching an RGB value of 85, which serves as the first knot in the model, a notable shift occurs. Beyond this point, the disparity in arrests begins to rise, implying that individuals whose skin tone falls within this subsequent range face an augmented risk of being arrested unfairly as their skin lightens. This increase in the DI continues until the RGB value reaches 112, marking the second knot. This identifies a gap in the research on disproportionate arrests in the Hispanic community. From RGB values of 112 to 171, the model indicates a reduction in the disparity of arrests. This decrease suggests that within this skin tone range, the likelihood of experiencing disproportionate arrest diminishes. Upon surpassing an RGB value of 171, the third

knot in the model, the disparity in arrests again begins to climb. This uptrend suggests that individuals with skin tones in the higher RGB range, which might correspond to much lighter skin tones, again face an increased risk of being unjustly arrested. This identifies a void in the research on disproportionate arrests of light-skinned people.

Although specific skin tone ranges appear to be associated with a reduced risk of disproportionate arrest, others indicate heightened vulnerability. These findings underscore the role skin tone plays in the context of arrests in certain areas. Although the model adequately captures some aspects of this relationship, it is crucial to approach such results holistically and consider societal, cultural, and systemic factors that might further elucidate these observed patterns.

In exploring the relationship between skin tone and the disparity in arrests, this linear spline regression model offers a granular perspective, primarily when skin tones are categorized into specific groups: black, brown, beige, and blond. Individuals categorized in the black group, represented by RGB values up to 85, demonstrate an intriguing trend. As the skin tone transitions within this darker range, there is a noticeable reduction in the disparity of arrests. This finding contradicts a prevailing theory that darker skin tones are universally associated with higher arrest disparities.

Transitioning to the brown category, which spans RGB values from 86 to 112, a significant rise in arrest disparities is observed. This suggests that individuals within this skin tone range face an elevated risk of being unfairly arrested as their skin tone becomes lighter, contradicting all three theories of arrest disparity that are prominently discussed in the literature. The brown category would be particularly worth studying, in particular male versus female, due to research on the treatment of different genders in that skin tone category. Current research

suggests that the brown category might present significantly different slopes, or possibly different ranges, for males and females, which clearly points to a gap in the literature.

The model's linear relationship is again disrupted in the beige group, represented by RGB values between 113 and 171. Within this category, there is a discernible decrease in arrest disparities, indicating that as the skin tone lightens within this range, the likelihood of disproportionate arrest diminishes. This also contradicts all three theories of arrest disparity currently in the literature. Surprisingly, the blond category, representing skin tones with RGB values above 171, exhibits increased arrest disparities. This unexpected trend suggests that individuals with the lightest skin tones in the dataset also face an augmented risk of being arrested unfairly. This also significantly contradicts all three theories of arrest disparity currently in the literature. This shocking finding makes it likely that all prior research on police disparity is invalid. The relationship between skin tone categories and arrest disparities is intricate and does not adhere to conventional theories. Although specific categories, such as black, in a vague sense align with the theory that darker skin tones are associated with higher arrest disparities, other categories directly challenge this notion. Such findings highlight the complexity of skin tone's influence on arrest disparities and underscore the necessity of a skin tone approach when examining such critical societal issues.

Stereotype Threat Theory

In the broader discourse on racial disparities and arrests, there is a prevailing theory that individuals classified in the brown category experience a consistently increasing rate of arrest disparities and those in the black category face consistently heightened levels. This linear spline regression analysis, based on RGB values representing skin tones, provides a clearer perspective on this hypothesis.

For individuals within the black group, represented by RGB values up to 85, the data reveal a decline in the disparity of arrests as skin tones transition within this darker spectrum. This observed reduction is especially intriguing, given that the prevailing theory anticipates a consistently elevated arrest disparity for this group. Instead, these findings suggest that the relationship within the black category reduces the disparity to one of the lowest levels within the groups. The fact that a large section of the black category experiences the lowest levels of disparity conflicts with all modern theories on arrest disparity.

Transitioning to the brown category, which encompasses RGB values from 86 to 112, there is a marked increase in arrest disparities. This rise suggests that individuals within this skin tone range face a heightened risk of unfair arrest. Still, as skin tone becomes lighter, it does not align with the standard theory disparity level for Brown individuals. Note that the increase does not plateau, indicating variability within this category.

Considering these findings, it is evident that while the brown category does exhibit inverse elevated arrest disparities inconsistent with prevailing theories, the black category's relationship with arrest disparities is more complex than conventionally believed. The trends observed through this study underscore the importance of adopting a skin tone approach when considering societal assumptions. The brown and black categories' results challenge and expand this study's understanding of the dynamics at play. The stereotype threat theory states that as skin tone darkens, disparity increases; thus, this study presents a direct contradiction to that hypothesis.

Self-Categorization Theory

This theory indicates that racism manifests in tiered levels of disparities among racial and ethnic groups. The prevailing narrative posits that individuals in the brown skin tone category

experience a significant level of arrest disparities owing to racial prejudices. For those in the black category, the disparities are hypothesized to be even more pronounced, reflecting deeper-seated biases. Individuals in the blond category are theorized to face minimal to no disparities, presumably shielded by societal privilege. The present study contradicts this theory of arrest disparity prominent in the existing literature.

The linear spline regression analysis, rooted in RGB values as proxies for skin tones, offers a rich tapestry of insights to evaluate the current theory. For the black group, represented by RGB values up to 85, the findings reveal an intriguing result. Contrary to current theory expectations of a consistently high arrest disparity, there is a discernible decline in disparities as skin tones lighten within this spectrum. This unexpected trend suggests that the relationship within the black category may be influenced by skin tone alone and not by racial categories. Transitioning to the brown category, spanning RGB values from 86 to 112, the data resonate even less with popular belief. A marked increase in arrest disparities is observed, suggesting that Brown individuals indeed grapple with pronounced disparities, but their disparity increases as their skin becomes lighter. This dramatically contradicts all three theories of arrest disparity prominent in the existing literature. This study does suggest that there are two groups, light skin and dark skin, but it is surprising that these two groups face similar disparities not dissimilar disparities. It is even more surprising that light-skinned people might experience the highest amount of disparity in the extreme end and the Hispanic population might experience the broadest range of disparity across the range of their skin tones.

The blond category, characterized by RGB values above 171, challenges conventional wisdom. Instead of the anticipated absence of disparities, there was an obvious and noticeable uptick in arrest disparities for individuals within this lighter skin tone range. This finding

counters the theory's assertion of few to no disparities for individuals in the blond skin tone group and underscores the complexity of skin tone's influence on arrest disparities. This also contradicts all three prominent theories of arrest disparity. The self-categorization theory states that as skin tone darkens, the disparity increases, but the rate or level at which this happens is statistically different for black and brown groups. This study is in direct conflict with that hypothesis.

Social Dominance Theory

Certain aspects of this study's findings, particularly within the brown category, are completely misaligned with the prevailing theory; other findings, notably within the black and blond categories, prompt a reconsideration and expansion of this study's outcomes, which underscore the multifaceted nature of racial disparities and the importance of interrogating broad societal assumptions with empirical rigor.

The blond group, characterized by RGB values above 171, exhibited the highest arrest disparity at the extreme end. This suggests that contrary to all prevailing theories, the blond category faces the most significant discrimination in terms of arrest disparities within the context of this dataset. This finding also underscores the importance of empirical analysis in challenging and refining conventional beliefs, urging a deeper exploration into the factors and nuances driving such unexpected patterns.

In the contemporary sociopolitical climate, a significant spotlight has been cast on the systemic biases and prejudices faced by Black individuals, particularly in their interactions with law enforcement. News media narratives often paint a grim picture of overt discrimination, perpetuating the belief that Black individuals consistently face heightened disparities, especially in the context of arrests. For this study, empirical exploration, grounded in the linear spline

regression model using RGB values as proxies for skin tones, offers a contrarian perspective of this widely accepted narrative. Although the treatment of people arrested is not the focus of this study, the disparity of Black people appears to be no different than any other group and possibly dramatically less than the Hispanic population.

Discrimination

For individuals categorized under the black skin tone group, spanning RGB values up to 85, the data reveal an unexpected trend. Contrary to the widely held belief of a consistently high arrest disparity for Black individuals, there is a discernible decline in disparities as skin tones transition within this darker spectrum. This finding challenges the monolithic portrayal of the Black individual's experience and suggests that within the black skin tone category, disparities in arrests may vary based on subtle differences in skin tone or other unaccounted factors of modern theory.

It is imperative to contextualize this finding within broader frameworks. The data indicate variability within the black skin tone category but do not negate the real experiences of discrimination and prejudice that many Black individuals face. The data merely underscore the complexity of the issue and the potential dangers of overgeneralization. Furthermore, the observed trend in the black skin tone category is contrasted by the data from the brown category, which showed a marked increase in arrest disparities as skin tone lightens. This trend aligns even less with prevalent beliefs about racial biases, underscoring that discrimination is multifaceted and can manifest differently across various racial and ethnic subgroups. Although the data offer a more intricate view of arrest disparities among Black individuals than often portrayed in popular narratives, they by no means diminish pressing concerns surrounding racial biases in law enforcement. Instead, the data encourage a more granular, data-driven approach to understanding

these disparities, fostering a richer dialogue that considers the full spectrum of experiences within racial and ethnic communities.

This study's model offers several interesting insights into the relationship between skin color and the disparity in police arrests. The following are notable observations and their implications:

- Nonlinearity of disparities: One of the most striking findings was a nonlinear relationship between skin color and arrest disparities. Conventional wisdom might expect a simple increasing gradient across the RGB spectrum, but the data reveal more intricate patterns. This suggests that the influence of skin color on arrest disparities might be shaped by skin tone frequency over all other factors.
- Blond group disparities: Contrary to the common belief that lighter-skinned individuals, represented by the blond category, face minimal to no disparities, the data indicate a significant increase in arrest disparities for this group. This finding is particularly surprising and underscores the importance of empirical analysis in challenging preconceived notions. It also raises questions about potential biases or systemic issues affecting this group, perhaps related to other sociocultural factors beyond skin darkness alone.
- Transition points: The chosen knots in the linear spline regression model (RGB values of 85, 112, and 171) signified transition points where the relationship between skin color and arrest disparities changes. These transitions might correspond to the population frequency of skin color, revealing how nuanced differences in skin tone can lead to shifts in disparities. Understanding the origins and implications of these knots to each particular

community could be crucial in addressing the root causes of arrest disparities. There is a significant gap in the literature on the exact points of the knots.

- Broader sociocultural context: Although the data provide a quantitative perspective on arrest disparities across skin tones, it is essential to interpret these findings in light of broader sociocultural contexts. For example, historical prejudices, media representations, and socioeconomic factors can all influence arrest patterns and disparities. The data serve as a starting point, but a holistic understanding requires a more expansive exploration.
- Potential for further research: The findings open avenues for further research. For example, qualitative studies could delve into the experiences of individuals within each RGB category to better understand the nuances. Additionally, intersectional analyses considering other demographic factors like gender, age, charge level, and socioeconomic status, in conjunction with skin color, could offer richer insights into arrest disparities. Most importantly, in a larger metropolitan area, a study of only male and only female arrests might offer a substantial finding.

The data underscore the complexity of the relationship between skin color and arrest disparities. The findings do not align with common theories; they challenge, redirect, and expand. This implies a need for a substantive change in research on arrest disparity.

Limitations

The statistical results presented in this dissertation for the spline regression model are notably robust, but there are intrinsic limitations to address. First, this research is the pioneering effort in employing spline regression in this specific context, which means that similar research does not exist. In the more than 3,000 studies reviewed for this study's literature review, not a single journal article presented results similar to what was achieved in this exploratory method.

As is the nature of trailblazing studies, the results should be interpreted with caution and within the confines of the specific conditions and variables considered. Furthermore, although spline regression offers a nuanced understanding of the relationship between variables by providing flexibility, it may also introduce complexities that may lead to overfitting. Hence, the strong statistical outcomes, though promising, should be used as an impetus for further exploration and validation rather than a conclusive end. Future studies can build upon this foundational work to validate, refine, or even challenge the insights presented here.

Generalizability refers to the extent to which research findings can be applied to settings, people, times, and measures other than the ones used in the study. Although groundbreaking and innovative, the outcomes of this dissertation study pose challenges to generalizability. Because this research is the first of its kind in this particular domain using spline regression, it lacks the comparative basis that converging studies can provide. Multiple studies on the same topic increase confidence in the generalizability of findings.

Given the limited context, it remains unclear whether the strong statistical results would hold true across different populations and settings or under varying conditions. The absence of prior studies also raises questions regarding potential external factors that might not have been considered but that could influence the results from different police departments.

Regarding applicability, the findings provide valuable insights within the defined scope of this research, but practitioners should exercise caution when extrapolating these results to other real-world scenarios. Without replication and validation across varied settings, there is a risk that the results, if directly applied, may not yield the expected outcomes.

Although the findings of this study provide a promising direction, they should be considered as an initial step. For broader generalizability and applicability, it is crucial to

validate the findings through replication studies, expanded sample populations, varied settings, and different methodologies to ensure robustness and reliability in diverse contexts.

In reflecting on the anticipated limitations delineated in Chapter One, the unique circumstances of the COVID-19 pandemic indeed manifested as significant constraints on the generalizability of this study. The unique characteristics of this global crisis rendered the study unrepeatable, as was expected, raising questions about the applicability of the findings to similar but fundamentally distinct future scenarios. Following the experience of the COVID-19 pandemic, the world's responses to such events would likely be less spontaneous, further diminishing the direct relevance of the findings. Additionally, there were anticipated challenges stemming from this study's quasi-experimental design. Despite utilizing a large volume of data points and incorporating 100% of all arrest records, which certainly fortified the analysis, the inherent inability to make conclusive causal associations from the mandate persisted. The stark reduction in arrest levels following the mandate provided strong evidence of association, yet the absence of a controlled experimental framework leaves open the possibility of influence from extraneous variables or unforeseen factors. Thus, the actual limitations closely mirrored those anticipated, but their impact, particularly in understanding the multifaceted societal reactions to government mandates during an unprecedented event, became more nuanced and profound as the research unfolded. Future interpretation and application of these findings must, therefore, be approached with this complexity and context in mind. Specifically, it would prove beneficial for a future study to include a large metropolitan area that would create the amount of data necessary to consider additional variables, such as sex.

Summary

This chapter presented details about the intricate relationship between skin tone and disproportionate arrest rates. Previous literature has shown that individuals with darker skin tones often face more negative outcomes and have a higher likelihood of being arrested during police interactions. However, the specific role of police behavior in these outcomes remains elusive, and results from studies that primarily consider race can be inconsistent. To address this knowledge gap, this study relied on a quasi-experimental design with a focus on skin tone as a central variable. The chapter featured distinct sections. The section on Descriptive Statistics offered a snapshot of the data, focusing on variables like skin tone and arrest rates, using means, standard deviations, and frequencies. The section on Assumption Tests validated the statistical techniques chosen for the study, ensuring their findings' reliability and validity. The section on Spline Regression Results highlighted the main insights from the spline regression analysis, presenting a nuanced view of the relationship between skin tone and arrest rates. The section on Research Questions and Hypotheses reflected the study's initial objectives and hypotheses, comparing them with findings for a complete overview of the relationship in question.

This study's hypotheses were validated with an exceptionally high degree of confidence. However, upon more intuitive scrutiny of the data, an unforeseen pattern emerged that has not been identified in this or any prior study. This could potentially offer a groundbreaking perspective on disproportionate police arrests. The findings of this exploratory study are illuminating, but they only crack open the door; future research is necessary to illuminate the topic fully. Chapter Five explored these nuances, and at a preliminary level, the content suggests that one root cause of disproportionate police arrests may not be the darkness of skin but rather the rarity of skin color in a given population. Although it remains beyond this study's purview, it

is worth noting an intriguing final observation: when the scatterplot of RBG and the DI graph is inverted, the result bears a striking resemblance to a bimodal histogram of Alachua County's population distribution.

CHAPTER FIVE: CONCLUSION

This study explored the intricate details of disproportionate arrest rates, shedding light on their significance, identifying significant gaps in the existing literature, and tracing the historical and theoretical development of the three theories (the stereotype threat theory, the self-categorization theory, and the social dominance theory) in disproportionate arrest research. By reviewing prior research, the preceding chapters laid the foundation for this study by presenting relevant research and emphasizing the pressing need for further investigation into disproportionate arrest rates. This study suggests for the first time that it is not skin tone that directly causes disproportionate arrest rates. Rather, it is unusual skin tones that increase suspicion, increasing the likelihood of being arrested. This study has shown why the field of disproportionate arrest rates is riddled with inconclusive results.

These next two examples illustrate the interplay that skin tone and suspicion have on disproportionate arrest rates. The following hypothetical scenarios show how complex skin tone can be in decision making: Assume a police officer entered a bar that they were called to because two men were fighting. One man had the skin tone of Jason Marshall Jr. (Figure 2), and the other man had the skin tone of Micah Leon. Nothing caught the officer's attention with the dark-skinned man, but something seemed off to the officer about the very light-skinned man. Both men were given warnings and asked to leave. At the same time, across town, a different officer walked into a bar that they were also called to for two men fighting. One man who came by himself had the skin tone of Kamari Wilson, and the other had the skin tone of Sebastian Vargas. The darker-skinned man immediately caused the officer to have heightened suspicion, and when talking to the friends of the lighter-skinned man, they all confirmed that the darker-skinned man

instigated the fight. The darker-skinned man was trespassed from the property, and the lighter-skinned man was asked to be taken home by his friends.

The existing body of research on disproportionate arrest rates is plagued by methodological concerns, notably the denominator effect asserted by Neil and Winship (2019). The denominator effect refers to the concerns arising from imprecise calculations or benchmarking in studies of disproportionate arrest rates. This effect highlights how even minor errors in estimating the denominator can lead to significant consequences in understanding disparities, particularly disparities in arrest rates based on skin tone. This issue casts doubt on the reliability and validity of prior conclusions, necessitating a rigorous reexamination. To overcome this challenge, this study used an exploratory quasi-experimental design to explore fixing the denominator effect and its impact on disproportionate arrest rates.

Discussion

This study aimed to determine the most predictive theory among stereotype threat theory, self-categorization theory, and social dominance theory about disproportionate arrest rates. It also presents a tool to address the denominator effect that has rendered virtually all prior research on disproportionate arrest rates invalid. Based on a gap in the literature on disproportionate arrest rates, the following two research questions and hypotheses were proposed:

RQ1: *Is there a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups (black, brown, beige, and blond) defined by the knots?*

$H_0$1: There is no significant difference in the slopes of the relationships between RGB and DI across the skin tone groups.

H_a1: There is a significant difference in the slopes of the relationships between RGB and DI across the skin tone groups.

RQ2: *If there are significant differences in the slopes, which will be determined in RQ1, is there a significant difference in the slopes of the relationships between RGB and DI between the Black and Brown skin tone groups, specifically?*

$H_0$2: There is no significant difference in the slopes of the relationships between RGB and DI between the Black and Brown skin tone groups.

H_a2: There is a significant difference in the slopes of the relationships between RGB and DI between the Black and Brown skin tone groups.

The literature on disproportionate arrest rates presents three competing theories. The stereotype threat theory states that as skin tone darkens, the DI should increase. The self-categorization theory states that Black and Brown people are two distinct categories that experience two different levels of disproportionality. The social dominance theory states that all dark skin people experience the same level of disproportionality and that light-skinned people do not experience disproportional arrests. Figure 13 shows the expected predicted line (in bold green) against the actual data from this study regarding stereotype threat theory. As can be seen by the three preceding figures, the data directly conflicts with all three theories of disproportionate arrest rates.

The predicted DI line (bold green line) is straightforward for stereotype threat theory. Although the actual point at which the line begins to slope upward can begin at any point, and the slope could be any negative value, implying that as skin tone gets darker, bias increases, the bulk of the data for darker-skinned people is expected to be over 1.3 and continue to increase as skin tone becomes darker from some point on the line. The actual line fails to remain flat across the lighter skin tones, and a significant amount of data for darker skin tones is below biased levels.

Figure 13

Disproportionality Index Versus Stereotype Threat Theory

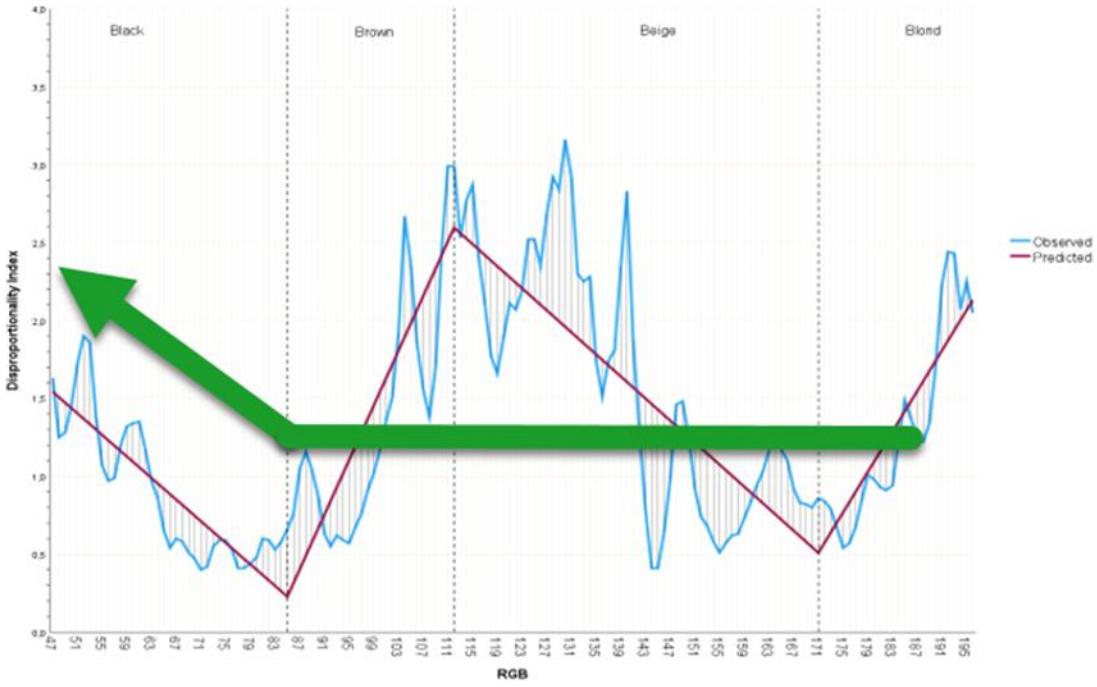


Figure 14 shows the expected predicted line (in bold green) against the actual data from this study regarding self-categorization theory. The self-categorization theory states that disproportionate arrest rates are biased against darker-skinned people but are also different for Black and Brown people. This theory could encompass many possible expected DI lines, but all segments of the darker skin tones should be above the horizontal line for lighter skin tones. There may be a slope for the DI line for Black and Brown people, but the expectation is that there would be a point of discontinuity in the knot between Black and Brown people. At a minimum, for self-categorization theory to be supported by evidence, all the points in the darker-skinned region should be above 1.3 on the DI.

Figure 14

Disproportionality Index Versus Self-Categorization Theory

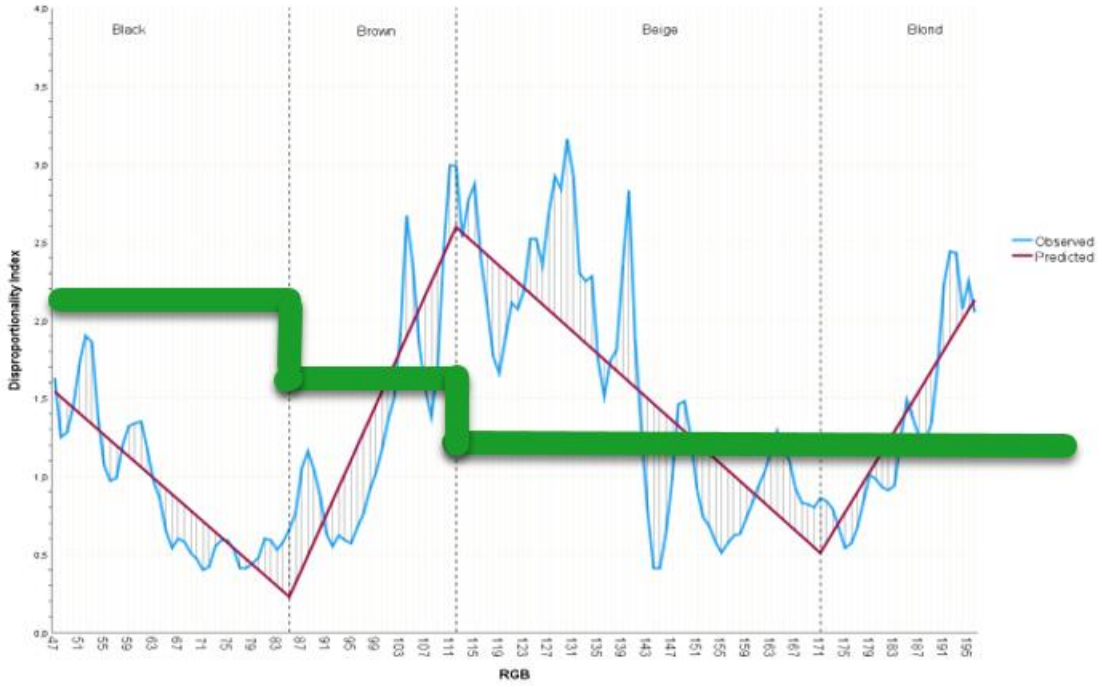
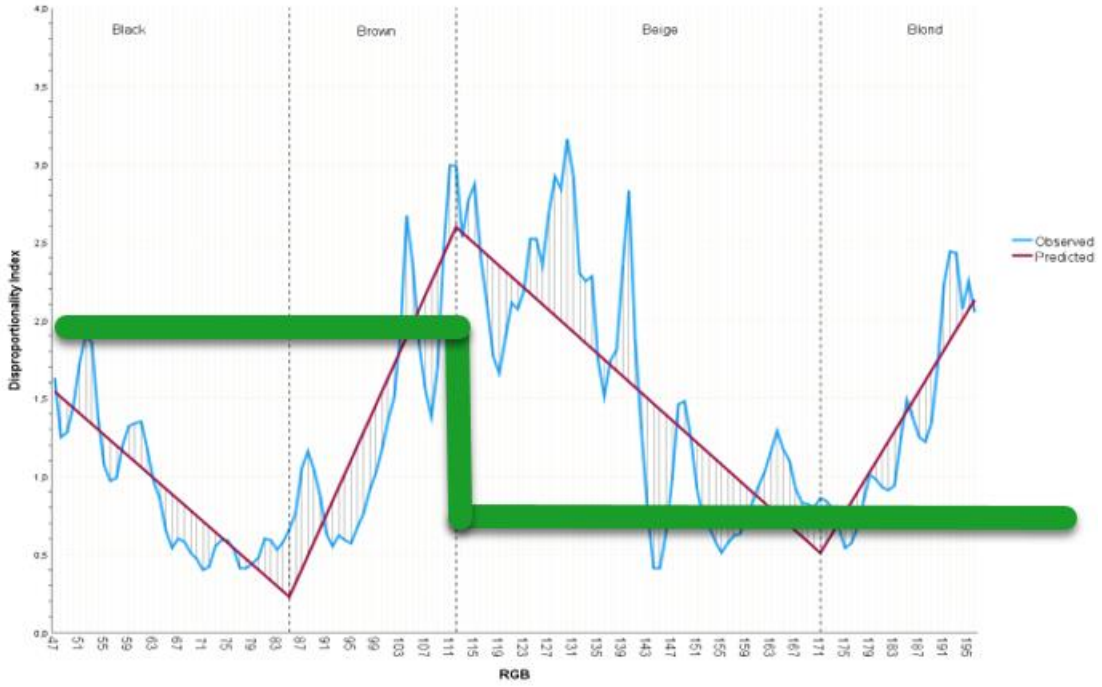


Figure 15 shows the expected predicted line (in bold green) against the actual data from this study regarding social dominance theory. The theory behind social dominance is much more straightforward. All darker-skinned people are being put down, and all lighter-skinned people do not experience bias in arrests (i.e., White privilege). For social dominance theory, the predicted DI line (bold green line) should have horizontal slopes, with all data points for black and brown being above 1.3 and all data points for beige and blond being below 1.3 on the bold green predicted line.

Figure 15

Disproportionality Index Versus Social Dominance Theory



Conclusions About Research Question 1

There is a significant difference among slopes of the relationships between RGB and DI across the skin tone groups. For those in the black group, as skin tone becomes darker, the disparity increases. This study provides little evidence supporting the hypothesis that disproportionately high arrest rates are experienced by individuals with the darkest skin tones. Stereotypes can significantly influence decision-making processes, particularly when interpreting ambiguous behaviors. These stereotypes can lead to harsher judgments and punishments for Black individuals throughout the criminal justice system, increasing their likelihood of re-offending (Jacobson, 2019; Kovera, 2019; Levinson & Young, 2010; Puddifoot, 2019).

Prior literature indicates a relationship between skin tone and arrest rates. Scholars have identified a significant and steep increase in the negative consequences faced by individuals with the darkest skin tones as compared to those with lighter skin tones (Ward, 2022; K. M. White,

2015). This suggests that individuals with the darkest skin tones experience higher exposure rates to the criminal justice system than individuals with lighter skin tones.

Researchers have found that Black faces are often perceived as more violent than White faces, and such stereotypes are strongly associated with disparities in police arrests (Walsh & Tartakovsky, 2021; Wertz et al., 2020). According to Zhang (2021), past research has shown that the media perpetuates the false narrative that Black people are disproportionately involved in criminal activities. The media's influence is particularly evident in how it shapes the public's perception of crime. Studies have shown that newspapers and news programs overrepresent minorities as criminals, often using mugshots and negative portrayals (Weitzer & Kubrin, 2004). Media coverage of mass shootings also exhibits racial biases, with White perpetrators more likely to be depicted as mentally ill than Black perpetrators. The media's selective portrayal of crime exacerbates biases against darker-skinned individuals and perpetuates the cycle of discrimination throughout the criminal justice system (West, 2018). This study showed that for those in the black category, the disparity increases as a person's skin tone becomes darker; however, the black category begins at the lowest level of disparity and rises barely above what would be considered biased. The data showed that a very small minority of people in the black category fall in this disparity range. Based on this study, it appears that the media's negative portrayal of Black people has not impacted police arrest behavior.

Stereotype threat theory vaguely aligns with the data from this study. For those in the Black skin tone group, this study showed that the disparity in police arrest increases as a person's skin tone becomes darker. This aligns with the theory that it is the stereotypes that have been placed on darker skin tones that are associated with the disparity, and as skin tone darkens, the

greater the role these stereotypes play. The theory falls apart, though, because half face disparity and half do not. This is inconsistent with the foundation of the theory.

Conclusions About Research Question 2

As Figure 14 shows, there is a significant difference in the slopes of the relationships between RGB and the DI between the Black and Brown skin tone groups. The Black and Brown sections of Figure 14 show the slopes associated with these disparities are the exact opposite. The findings from this study provide evidence that Black and Brown individuals experience significantly different disproportionate arrest rates. Within the framework of self-categorization theory, a notable gap exists in comprehending the formation of skin color-based groups and their subsequent perceptual consequences, underscoring the need for a more comprehensive exploration of these dynamics in the study of intergroup relations. (Zhirkov, 2021). According to Yadon and Ostfeld (2020), social identity plays a crucial role in predicting behaviors between ingroups and outgroups, including the social identity of police officers. It completely fails to address why Black and Brown people face opposite disparity.

Categorizing people in social environments, particularly within interactions between police and the public, helps individuals make sense of situations. The categorization process influences behavior and objectives, as observed in the analysis of police interrogations using membership categorization analysis.

Self-categorization theory presents an innovative approach to understanding the influence of skin tone categories on someone else's behaviors. The discretion granted to police officers in low-level crimes exposes them to greater levels of social influence, which can have unintentional and inconsistent outcomes. An understanding of group dynamics rooted in tribal instincts, as outlined by Darwin, Freud, and contemporary researchers, provides insights into the deep

emotional attachments, support, and biases that shape ingroup and outgroup dynamics. Tribal instincts may play a larger role in the prosocial behaviors of law enforcement personnel than thought based on the evidence presented in Chapter Two and can possibly be used to promote positive changes throughout disproportionate groups. Researchers have suggested that negative consequences arise from belonging to a group, with assertions attempting to rationalize disproportionate arrests of Black individuals (Goldner et al., 2015; Latzer, 2018; Monk et al., 2021; Mugg, 2020; Orelus et al., 2020). This may be true about groups, but this study shows that prior researchers have not correctly captured disproportionate arrest rates in people of similar skin tone.

Conclusions from the study highlight the distinctly separate disproportionate arrest rates for Black and Brown individuals. As can be seen in Figure 16, if the line for Black and Brown people were separate lines, they would almost be opposites of each other. This shows how they are distinctly different groups even though the data do not support self-categorization theory. The application of the self-categorization theory and the examination of group dynamics, tribal instincts, and social influences provide valuable insights into the underlying factors that contribute to these disparities. Still, this study fails to support much beyond the idea that Black and Brown people are two completely different groups in terms of disparities in police arrests.

This study has shown that a new lens is needed for Black and Brown arrests. Regarding disproportionate arrests, Brown people are in the same category as Blond people, not Black people. Any studies in which researchers claimed this could be possible could not be located. Fundamentally, this study points to the idea that less common skin tones create more suspicion. Based on a visual analysis of Figure 16, it seems reasonable to investigate the effect of the area

around the knot between brown and beige. There is a gap in the research in understanding the extremely high disparity around this knot.

This study supports self-categorization theory in that Black and Brown skin-tone groups face different disproportionate arrest rates. However, findings from this study significantly diverge from self-categorization theory in that it was found that Black people did not face higher disparity rates than Brown people. Although this research showed that Black and Brown people face completely different disparities, it was unclear whether Black people face more disparity than Brown people. Both face more disparity than Blond people, which is a fundamental part of the self-categorization theory.

Reflection of the Dissertation Process

I chose this study because I started out believing that disproportionate police arrests were due to the excessive and disproportionate presence of law enforcement in certain communities or among specific demographics. Before this study started, I believed that overpolicing often led to increased surveillance, stops, arrests, and other forms of enforcement actions, which subsequently led to a heightened level of scrutiny and intrusion in these communities. Overpolicing can have a detrimental impact by perpetuating systemic inequalities, eroding trust between law enforcement and the community, and disproportionately affecting marginalized populations. The current level of distrust of law enforcement shows the urgent need for reforms and more equitable approaches to policing. This study further emphasizes a need for a renewed focus on community engagement strategies, proactive crime prevention strategies, and the root causes of crime toward promoting fairness, justice, and effective law enforcement practices. Assumptions can be made about the overpolicing of darker-skinned people in prison, but research is needed to draw conclusions. This study provides a promising method to resolve the

issue of disproportionate police arrests. For the first time, disproportionate arrest rates can be discussed without the racially charged discourse of Black people versus White people.

The time it took to produce the actual data for this study was substantially less than originally planned 42 hours. The time it took to take multiple readings of a mugshot was less than 20 s. Writing down the additional data that went along with the mugshot took an additional 20 s but was more random in time. 100 mugshots can easily be done in an hour. The entire process from the start to a complete data set in SPSS took 1 day, which is substantially less time than initially expected. As a comparison, it took about the same amount of time to develop the model for this study:

$$(DI)\hat{} = \beta0 + \beta1 * RGB + \beta2 * (RGB - k1) * I(k1 \leq RGB < k2) + \beta3 * (RGB - k2) * I(k2 \leq RGB < k3) + \beta4 * (RGB - k3) * I(RGB \geq k3).$$

This model highlights an area for future research. This study was originally going to use IBM SPSS 29, PROCESS v4.2 MODEL 1 instead of linear spline regression. Two of the world's leading scholars on PROCESS and linear spline regression confirmed the concept of using PROCESS over using linear spline regression. The results from using PROCESS would have taken seconds compared to the many hours it took to complete linear spline regression in SPSS. There are a couple of ways to go about it, but ultimately, manually adding the necessary data to SPSS to be able to perform linear spline regression was the easiest approach. The output from using PROCESS is identical to that obtained using SPSS regression; however, there is no published research to serve and support its use. The lengthy time gap could be eliminated if a statistician developed a mathamatical proof for a journal article substantiating the acceptance of using PROCESS for linear spline regression. The model for this study under PROCESS would have been:

$(DI)\hat{} = \beta_0 + \beta_1 RGB + \beta_2 black + \beta_3 brown + \beta_4 beige + \beta_5 RGB*black + \beta_6 RGB*brown + \beta_7 RGB*beige$.

As my research progressed, my initial research question evolved. However, there remains a significant need for further knowledge. In Chapter One, I initially believed that the key to understanding disproportionate arrest rates lay in officer discretion and human brain functioning. In Chapter Two, I expanded my perspective and identified three potential theoretical solutions to address disproportionate arrest rates, expecting my research to substantiate the more predictive theory. As I reached Chapter Three, I realized that previous research on disproportionate arrest rates might be incorrect, which led me to increasingly consider that my research conclusions might significantly differ from what I had originally anticipated. Still, at this juncture, I fully believed that the three theories described in Chapter Two encompassed all prior research. Nonetheless, my belief was growing that disproportionate arrest rate research might turn on its head, morphing into a Disproportionate Arrest Rates 2.0.

Ensuring and demonstrating internal validity is crucial, as it substantiates findings and supports the conclusions derived from such findings, providing a foundation for future research. This involves a meticulous research design and thorough data collection and data analysis, with the aim to control or account for potential threats to internal validity. Internal validity refers to the degree to which the results of a study represent the relationships among the variables within the study. It is the accuracy of the conclusions drawn from the study and the degree to which a study captures true relationships among the variables and that those relationships are not the result of external factors or errors.

This study yielded validity evidence to support that skin color has an effect on disproportionate arrest rates; however, the causal relationship needs further examination. There

is insufficient research on suspicion in arrest decisions, and research on how continuous skin tone variables and suspicion relate to disproportionate arrest rates could not be located. The bulk of rationale this study was based on the idea that darker skin tones create negative mindsets that lead to disproportionate arrest rates. However, the findings from this study instead support the alternative explanation that skin tone affects suspicion and not negative thoughts.

There were no clear threats to internal validity in this study. This study used a 3-point scale that ranged from 1 (*low*) to 3 (*high*) to measure validity. The point system was applied to the various threats to validity, including history, maturation, testing, instrumentation, selection bias, experimental mortality, and experimenter bias. This study had a score of 10, with all items receiving a score of 1 except for instrumentation and history. History received a score of 2 because this period of time was extremely rare, and instrumentation received a score of 2 because although due diligence on the science and practical uses of the tools involved was done, it is a fast-changing and technical area of expertise. The high validity evidence for this study allowed for robust conclusions and added credibility to and enabled the generalizability of the findings.

The conclusions of my study diverged from the existing scholarly research. I did not anticipate variations in disproportionate index for arrests involving individuals with lighter skin. The presence of such variations was unexpected. Thus, there are limitations to the conclusions that can be drawn at this point. Still, this study suggests a need for further exploration to obtain comprehensive answers to the many questions raised. This study highlighted many new gaps in the discourse surrounding suspicion and overpolicing that require attention.

There is much research on stereotypes, categorization, and dominance, but the lack of research on suspicion is a shortcoming that can limit the depth and breadth of this study. The

scope of exploration regarding the relevant aspects of disproportionate arrest rates may also be limited. However, new research on disproportionate arrest rates can pave the way for future research, and subsequent studies must address these new gaps.

The conclusions from this study deviate from the existing literature regarding how police interact with people based on skin tone, which creates a significant opportunity for further inquiry. Such deviations can stem from various factors. In this case, past research using demographic data was too simplistic to answer questions regarding disproportionate police arrests. When confronted with conclusions that diverge from the established body of literature, researchers must use analysis to evaluate the reasons for the divergent conclusions. Researchers should also consider alternative explanations because of unique circumstances not previously explored. Deviations from the literature also offer a chance to challenge theories, expand boundaries, and foster a deeper understanding of disproportionate police arrests, all of which encourage researchers to engage in discussions, develop hypotheses, and design future studies to replicate or refute these unexpected conclusions. Embracing deviations from the literature promotes progress, encourages curiosity, and fosters a culture of critical thinking and innovation throughout the academy.

There were no data collection or analysis process issues during this study. The findings were surprising, and as the study progressed, it became increasingly clear that they might be very different than expected. The most recent research on disproportionate police arrests shows that all prior research might be invalid Neil and Winship (2019). This, as well as realizing how bad a method is when using demographic data, snowballed this feeling. It was fortuitous that the hypotheses and study design were robust enough to handle the data that were obtained in this study.

The conclusions of this study were surprising. Discussions on racial disparities in law enforcement have focused on the overpolicing and targeting of minority communities, particularly Black and Brown individuals. However, uncovering evidence of similar disparities affecting White individuals challenges conventional narratives and highlights the complexity of the issue. These conclusions indicate systemic flaws in prior research. These unexpected results underscore the importance of using analysis to understand law enforcement and suspicion, and they invite investigation into the dynamics that contribute to disproportionate arrest rates for diverse populations. By acknowledging these unexpected conclusions, for the first time, researchers can promote a nonpoliticized understanding of the challenges faced by all communities, foster a fairer criminal justice system, and strive for equitable outcomes for all individuals, regardless of their skin tone.

Future researchers should consider the various reasons why suspicion occurs in different contexts and situations. It is a complex psychological and sociological phenomenon that can arise due to a combination of individual, interpersonal, and societal factors. Understanding suspicion and its implications can provide valuable insights into human behavior, decision-making processes, and social dynamics. Suspicion often emerges when there is a lack of trust or when trust is broken between people or groups. Investigating the factors that contribute to suspicion can help researchers better understand how skin tone affects suspicion.

Studying suspicion can shed light on the cognitive mechanisms underlying police officers' judgment and decision making. Suspicion often arises when individuals perceive inconsistencies, discrepancies, or potential threats. Future researchers might show that disproportionate arrest rates have more to do with the elements of RGB and not just the average.

By investigating the cognitive processes involved in suspicion, researchers can gain insights into how people process information, evaluate risks, and become suspicious.

Suspicion is often accompanied by negative emotions such as fear, doubt, and uncertainty that over time can stigmatize those with increased suspicion (Gaston and Brunson 2020). Examining and understanding the emotional and psychological aspects of suspicion that contribute to the impact of suspicion on the chance of being arrested would be valuable. Research can also help explore strategies for coping with suspicion when suspicion is known to possibly cause bias in arrests. Suspicion can have significant implications for police interactions. It can affect cooperation, collaboration, and collective decision-making processes. Investigating suspicion in the context of social networks, organizations, or communities can provide insights into how suspicion influences individual police officers' decision making.

Different police agencies may have different levels of suspicion due to their unique norms, values, and experiences. Examining suspicion across different agencies can help researchers understand the gap in knowledge on how police cultural factors shape suspicion and its consequences. It can also provide insights into the role of suspicion. Suspicion is a multifaceted concept that can be explored from various angles. Future research on suspicion can contribute to a deeper understanding of police behavior, decision-making processes, and law enforcement dynamics. It can also have practical implications in areas such as conflict resolution, trust-building, and fostering positive social relationships.

The practical implementation of these conclusions might pose challenges, particularly when utilizing distinct data from academic research, especially if the researcher lacks recognition or an established platform in the field. Despite the potential significance of these conclusions, disseminating them effectively to relevant stakeholders and decision makers may prove difficult.

Limited visibility and credibility throughout the academic community can hinder the researcher's ability to gain attention and recognition for their work. Established practices, policies, and beliefs throughout the criminal justice field may mean that stakeholders resist these conclusions, as they challenge existing theories and require changes in current thought. A lack of resources, such as institutional support, can impede the researcher's capacity to initiate new applications and drive meaningful change. Overcoming these hurdles requires real effort, such as actively seeking collaborations, engaging with key influencers, and employing effective communication strategies to bridge the gap between academia and law enforcement. By leveraging partnerships, advocacy, and dissemination efforts, researchers can increase the likelihood that their unique and surprising conclusions gain traction, fostering broader recognition and influencing criminal justice policy.

Implications

Theoretical Implications

The central focus of this study was disproportionate arrests. Although previous research has suggested that individuals with darker skin tones are more likely to experience disproportionate arrest rates, essential questions remain. Specifically, it is unclear whether this disparity increases proportionally as skin tone darkens, whether it escalates incrementally between Brown and Black skin tones, or whether all individuals with dark skin encounter similar levels of disparity. As such, this study investigated which theory (stereotype threat theory, self-categorization theory, and social dominance theory) about disproportionate arrest rates offers the most predictive power about disparities based on skin tone.

By investigating causes of disproportionate arrest rates, this dissertation does more than merely contribute to the existing literature. It addresses crucial research gaps and methodological failures. Through an examination of the theoretical foundations and the use of a quasi-

experiment approach, this study enhanced the understanding of factors that contribute to disparities in arrest rates based on skin tone. These research findings hold the potential to inform policy development and intervention strategies and contribute to the broader pursuit of a fair and equitable criminal justice system.

Findings from this study also had implications for social dominance theory. As can be seen in Figure 15, if social dominance theory is the most accurate, Black and Brown people would be on the same regression line, and there would be no disparity in lighter skin tones. This study has generated more questions than answers, but one thing this research has shown is that the police in Alachua County are not engaged in social dominance. If they were, Figure 15 would look like the thick green line instead of the actual thin red line of the model. The conclusions drawn from this study show significant insights into the disproportionate arrests of Black individuals. This study suggests that the police officers' role in creating arrest disparities may be influenced by the dynamics of suspicion rather than by skin tone.

There is a gap in the understanding of how much prior research has been flawed. The majority of prior research exploring inequality in the criminal justice system has relied heavily on census-style category data, grouping individuals into broad racial categories and thereby offering an inaccurate understanding of disparities. This approach neglects the continuum of skin tone and the interracial disparities within these classifications. Research indicates that disparities exist across a spectrum of skin tones; however, studies incorporating this gradational variation in the context of criminal justice are rare (Monk, 2019). This oversight is a shortcoming of past research, which has documented the disparities faced by darker skin tones but failed to capture the disparities evident in various aspects of life. The implications of skin tone in policing, punishment, and interactions with the criminal justice system have only recently begun to be

explored, highlighting the need for a more comprehensive approach that considers skin tone variation in future research on disparities. In addition, research on disparity in arrest rates should not be grouped with research on social inequality and should focus more on suspicion and the sampling population than skin tone.

Examining the literature on the negative consequences of social dominance makes apparent that the impact of arrests extends beyond the individual level. Mass incarceration has resulted in an alarming social cost for people of color, particularly Black men, who have experienced significant rollbacks of their civil rights (Berger, 2013; Chiao, 2017; Hinton et al., 2018; Kennedy, 2009). Police contact, which often precedes arrests, is associated with emotional damage, loneliness, poor health, and unhappiness. Researchers have highlighted that police contact with Black children is correlated with increased adult arrests, indicating a concerning cycle perpetuated by labeling and differential treatment based on race (Bacak & Apel, 2020; Chiao, 2017; Kennedy, 2009; McGlynn-Wright et al., 2022). Based on this current study, it is not recommended that future researchers focus on implicit bias. This study linked implicit bias with the idea of type I and II thinking. Future researchers might find more interesting questions when looking at suspicion and type I thinking.

The existing literature also addresses the historical influence of colonialism, which has subjected people of color to oppression and led to feelings of vulnerability, resistance, and anger (Grosfoguel, 2007; Watts & Erevelles, 2004). This anger has, at times, manifested in violence that reinforces the structure of colonialism. The persistence of postcolonialism highlights the need for effective decolonization policies to address the lingering effects of colonialism in the modern world. This study does not support the idea that these social ills have affected police arrest rates.

Race is a construct that perpetuates the idea of inferiority for darker-skinned individuals and superiority for lighter-skinned individuals. As shown in Figure 12, the idea of light-skinned superiority in arrest rates is false. If the police were treating dark-skinned people unfairly, then the expectation was that the DI for dark-skinned people would be above 1.3 and the DI for light-skinned people would be below 1.3. The overall shape of the line is less important than the fact that darker skin should be above 1.3 and lighter skin should be below 1.3 on the graph. The other expectation was that the DI line for light-skinned people would be flat because that would indicate they would all be treated the same. This study showed that looking beyond race and focusing on skin color can offer new insights into understanding the dynamics between darker-skinned individuals and law enforcement. Conclusions from the study also show the nature of disproportionate arrests of darker-skinned individuals. This study showed how skin color plays a role in police suspicion. This study does not support the idea that police are perpetrating the idea of colonialism.

Practical Implications

Disproportionate arrest rates based on skin tone, particularly when the skin tone proves less common across the general population, carry significant implications. These disparities raise concerns about the criteria for suspicion. When certain racial or ethnic groups experience higher arrest rates compared to their distribution in the population, it suggests that individuals with specific skin tones are more likely to be subject to scrutiny and suspicion by law enforcement. Such disparities can undermine trust in the criminal justice system and lead to injustice among affected communities. Moreover, the overpolicing of certain groups based on their skin tone can divert resources from addressing underlying factors that contribute to and hinder efforts to enhance public safety. It is essential to address these implications by promoting fair and unbiased

law enforcement practices, implementing community-oriented policing strategies, providing training, and striving for equal treatment for all individuals, regardless of skin tone.

When individuals find themselves in a situation where a police officer is suspicious of them based on their skin tone, it can be incredibly challenging to navigate and escape the situation unscathed. The burden of disproving suspicion often falls on the individual, leading to powerlessness and heightened vulnerability. Being under suspicion can escalate encounters with law enforcement, which increases the likelihood of confrontations and even the use of force. The situation becomes even more complicated when an officer's preconceived notions influence their actions, making it more difficult for the individual to overcome the initial suspicion.

Escaping suspicion can be a complex and stressful process. Individuals may feel compelled to justify their actions, provide excessive explanations, or exhibit signs of noncompliance, even if they have done nothing wrong. A person's fear of being wrongly accused or mistreated can lead to heightened anxiety that inadvertently affects their behaviors and interactions with law enforcement and potentially exacerbates the situation.

It is essential to acknowledge that the impact of suspicion based on skin tone extends beyond the immediate encounter. The emotional toll of such experiences can have long-lasting effects that include feelings of humiliation and anger and a loss of trust in law enforcement. These experiences can contribute to a pervasive sense of injustice and erode the relationship between communities and the police, hindering efforts to foster cooperation and build safer neighborhoods.

Addressing these issues requires a comprehensive examination of law enforcement practices, and may include enhancing training, increasing cultural sensitivity, and recognizing and addressing how suspicion is formed. It is crucial to promote accountability, transparency,

and fairness in policing to ensure that suspicion is based on objective evidence rather than subjective factors such as skin tone. Additionally, fostering open dialogue between law enforcement agencies and communities can help bridge the divide and build trust, creating an environment where individuals are treated with respect regardless of their skin tone. For the first time, the issue of disproportionate police arrests can be addressed without the politicized discourse of racism.

Summary of Key Findings

Major Findings

The core objective of this dissertation was to explore the relationship between a policy change spurred on by COVID-19 and its impact on arrest rates, with a focus on disproportionate arrests across Alachua County, Florida. The policy change led to a significant drop in arrest rates in Alachua County. One of the major findings of this study was that disproportionate arrests increase as skin tone deviates from two central points on the RGB skin tone x-axis. As skin tone moves away from the knot where Black and Brown skin colors converge and Beige and Blond skin colors converge, the disparity increases. At the two knots where Black and Brown skin tone meet and Beige and Blond skin tone meet, the disparity is at its lowest points. This result is particularly noteworthy because it ran counter to the major theories on disproportionate arrest rates.

One of the central achievements of this dissertation was resolving the denominator effect issue in criminal justice research. This effect, often a complicating factor in studies on disproportionate arrests, refers to the distortion that occurs when base rates are not appropriately considered. By developing a novel methodological approach that accurately determines the base rate, the study contributes to a significant advancement in the field. This new approach validates

the findings of this specific research and also offers a robust tool for future investigations into arrest disparities, thereby increasing the credibility and utility of such studies. Virtually all prior research on disproportionate arrests is invalid; thus, the ability to determine accurate base rates is a major finding.

Minor Findings

Though the primary focus of this study was on policy impact and disproportionate arrests, minor but important findings also emerged. This study introduced new tools to use for research on disproportionate arrest rates. Although not the primary focus of the study, the new tools offered a road map and a list of considerations in studying skin tone that future researchers could explore in greater detail.

The research also revealed a solution for disproportionate arrests. With the ability to discuss disproportionate arrests in terms of suspicion instead of skin color, it is believed that more progress can be made to reduce disproportionate arrest rates. This finding, although secondary to the main research objectives, offers valuable insight into potential areas for reform.

Strengths of the Study

Quasi-experimental research is important but rare in criminology, mainly because traditional experimental designs are often impossible to implement. The strength of quasi-experimental studies lies in the ability to approximate the rigor of experimental methods without random assignment, which is typically challenging in criminological settings.

One of the primary advantages of quasi-experimental research is the capacity for researchers to provide causal inferences in real-world settings. Although experimental studies are the gold standard for determining causality, they require strict control over all variables, which may only be feasible in some criminological contexts. It would be unethical to randomly assign

individuals to conditions that might expose them to criminal activities. Quasi-experimental designs leverage naturally occurring events or, as in this study, a policy change to create comparison groups. This allows researchers to study the causal effects of phenomena in a way that mirrors real-world conditions.

Another strength of quasi-experimental research in criminology is its adaptability. Given the challenges associated with research in criminology, adapting research designs is essential because of logistical constraints. Quasi-experiments can be designed to account for potential confounding variables. This flexibility enables researchers to address multiple research questions while maintaining methodological rigor.

Quasi-experimental studies often capitalize on large-scale, naturally occurring events, such as, in this study, policy changes, to study their impact on criminal behavior. This means that the findings from such studies can have significant real-world implications. Such research can provide valuable insights for policymakers and practitioners about the efficacy of interventions.

Because criminologists might only sometimes be able to conduct fully randomized experiments, quasi-experimental designs offer a robust and flexible alternative. Quasi-experimental designs enable researchers to draw causal inferences in real-world settings, adapt to challenges, and produce findings that inform effective policies and interventions. This study's most significant strength is that COVID-19 made a possible once-in-a-lifetime quasi-experiment.

Limitations of the Study

Limitations of Quasi-Experimental Research in Criminology

Quasi-experimental designs, although good for studying causal relationships when controlled experiments are impractical, have inherent limitations. The first limitation is related to reproducibility. Researchers can control variables in traditional experimental designs, thereby

making it easier to replicate the study. Quasi-experimental research often relies on unique, unrepeatable events or policy changes. In the case of this study, which focused on a specific policy change affecting arrest rates in Alachua County, the circumstances are so particular that replication is problematic. This limited reproducibility due to unique circumstances restricts the potential for the study findings to be replicated, making the reliability of the findings less certain.

The second limitation is related to generalizability. That is, in the case of this study, although the research may offer robust insights into the relationship between policy changes and arrest rates in Alachua County, these findings are not automatically transferrable to other settings. Different geographic locations possess unique demographic attributes, economic conditions, and law enforcement practices that could substantially change the outcomes of a study like this one. Furthermore, the lack of random assignment introduces another layer of complexity, as it allows for the possibility of confounding variables. These variables, even when controlled for, can introduce biases that might skew any study's results, affecting the overall validity of the findings.

Gaps in the Research Literature

An exhaustive literature review was conducted with the aim of offering a comprehensive understanding of the research on which this study was based. The review revealed significant gaps in the existing research, notably in the areas of suspicion and the effect of neighborhood demographics on arrest rates. The absence of studies in these specific areas hindered the depth of the literature review and, subsequently, the study itself. This is not an inherent limitation of the study methodology but rather an issue with the existing body of research, which failed to offer sufficient guidance. It is worth noting that the lack of research itself has value, as it reveals the

gap these topics are in the literature. It also points to a larger issue within the academic community that these areas remain insufficiently explored.

Implications for Future Research

Although there were limitations due to the research design and gaps in existing literature, this study serves as a crucial starting point for future research. The lack of comprehensive studies on disproportionate police arrests and suspicion underscores the study's value. It aims to fill existing gaps and inspire future research endeavors in these less-explored areas. This dissertation should not be seen as an end product but rather as a catalyst for further studies in law and criminal justice, particularly focusing on disproportionate police arrests and suspicion.

Alachua County has many unique characteristics that may make the findings from this study different from findings in other jurisdictions. The county's distinct sociodemographic and institutional structures have the potential to exert an influential impact on the results of studies conducted elsewhere, emphasizing the importance of considering local factors when extrapolating findings. The understanding of policing concerning skin tone, cognitive cues, and arrest disparities plays a role in interpreting the results from Alachua County. In the broader exploration of skin tone and its relationship with arrest rates, findings from Alachua County may provide a local, small-scale perspective on a large-scale issue. A study of very large metropolitan areas, such as New York City, Chicago, and Miami, would be a good complement to this study.

Alachua County is a small community with a very large university, which may make it dissimilar to other jurisdictions. This can lead to a less common mix of populations—students, academics, and local residents—that can influence the dynamics of police interaction. This is important in understanding the lens of both the police officer and the arrestee in interactions. With a university, there could be additional layers of complexity, such as the presence of out-of-

state or international students, which may make the county's experience different from others. A similar metropolitan area would also be a good complement to this study. An argument could be made for a location such as Tallahassee, Florida, which is a small city with a large university. Another interesting choice would be Miramar, Florida, which is also a small city in Florida but without a large university.

Universities can have both a positive and negative impact on the crime rates in a city, creating an environment that is distinct from cities without a university. Universities often act as economic catalysts, generating employment and thereby indirectly contributing to lower crime rates by reducing unemployment. The presence of a university usually entails enhanced security measures, including campus police forces and sophisticated surveillance systems, which can deter crime on campus and in adjacent neighborhoods. Universities often engage in community outreach and educational programs aimed at preventing crimes, as well as producing research that can inform effective public policy for crime reduction. The concentration of a young and often transient population can lead to specific types of crime, notably alcohol-related offenses and petty crimes such as burglary and vandalism. The high population density associated with university campuses can strain public resources, potentially leading to lapses in public safety measures and thus contributing to elevated crime rates. The development and gentrification often associated with university expansion can lead to long-term residents being displaced, which can lead to social friction and foster an environment conducive to criminal activities. Given these complex interrelationships, cities with universities require a diligent approach to disparity research. Understanding the multifaceted impact of a university on a city's crime rate is necessary to understand how this study might be different from other studies.

Alachua County has several police departments, but they all share the same sally port and mugshot processing station. Having multiple locations where mugshots are taken can cause operational intricacies that add another layer of complexity to the findings. It may be necessary to take additional time to calibrate across locations to ensure the findings are as valid as possible. Future researchers should also track the serial number of the camera being used and its location. In addition, it might be necessary to track lighting conditions, calibration of cameras, individuals who have had mugshots taken at multiple locations, metadata from the photos, location analysis to identify localized errors, and camera operator training. By incorporating these additional elements, researchers can better navigate the operational intricacies introduced by having multiple mugshot locations, thereby ensuring the validity and reliability of research findings related to skin tone and arrest disparities.

All prior researchers have relied on the assumption that demographic data can be used to answer questions about disproportionate arrest rates. This exploratory study has shown that this assumption cannot be allowed in research on disproportionate arrest rates. Prior researchers have delved into the concepts of disproportionate police arrests, relying on demographic data and assuming race is a valid variable. Using race in criminology research can be problematic, scientifically flawed, and morally contentious. This exploratory study has illuminated the problem of this assumption, particularly when examining inequalities in disproportionate police arrests. The new focus on skin tone, as opposed to reported race, offers a valid approach to understanding arrest disparities and challenges traditional methodologies and assumptions. This study is limited because the study of disproportionate arrest rates no longer has a body of knowledge on which to rest. The pervasive reliance on inappropriate benchmarking and false assumptions about race mean that this study is the starting point instead of the finish line.

The greatest limitation of this study was that when it first began, it was felt that the disproportionately arrest rate world was flat, but now it is known to be round. The problem statement for this study was that the literature indicates that dark-skinned people are disproportionately arrested, but it is unknown if the disparity increases as skin tone darkens, if the disparity increases in steps as skin tone darkens, or if all dark-skinned people face the same rates of disparity. At the start of this study, these three theories were everything known about disproportionately arrest rates. Now that we have sailed across the ocean, we see that the world is round. This study sought to show how skin tone is associated with disproportionate arrest rates, but future studies should fill the gap in knowledge on how skin tone affects suspicion.

The Interdisciplinary Challenge

Although the primary focus of this study lies within the realm of law and criminal justice, attempts were made to consult interdisciplinary literature in the hope of gaining a more rounded perspective. However, it became clear that the bulk of relevant research on disproportionate police arrests resides within its discipline. The lack of literature from related fields, like sociology or psychology, restricted the use of a multidisciplinary approach in this study. This limitation, while not affecting the core research, does highlight the nature of academic disciplines, which could potentially benefit from more integrated research methods.

Recommendations for Future Research

Recommendations for Replicating this Study

Population Skin Tone

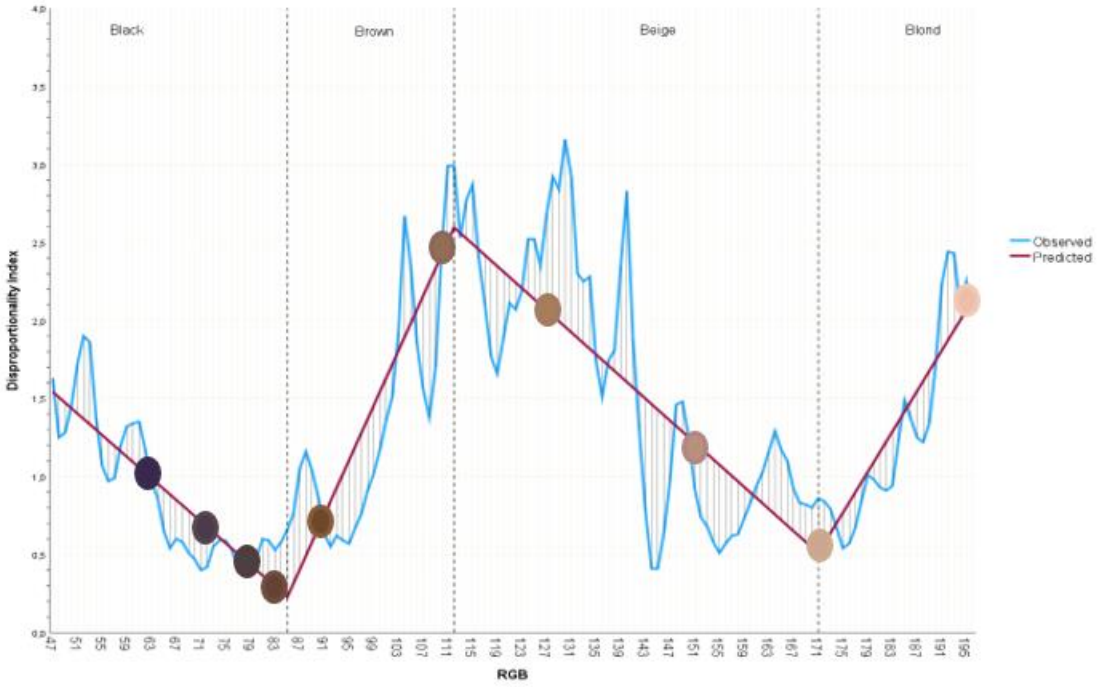
There is good reason to suspect that Figure 16 resembles an upside-down bimodal histogram of the population of Alachua County. Figure 16 shows the actual data for the study in the blue jagged line (observed). The straight line (predicted) shows the linear spline regression

line, with the shaded area reflecting the magnitude of the differences between the observed and the linear spline line. The circles represent where the Massey-Martin Color Guide falls on the linear spline regression. The values were determined by the same method to obtain RGB data that was used on the mugshots. The circles represent only where they would fall on the RGB scale, but they were placed on the linear spline regression line to show their proximity to the knots and provide insight into how past research could be unreliable.

Future researchers should investigate the correlation between the DI spline curve model and an estimate of the bimodal population from which the samples were taken. There are several ways to accomplish this, but because law enforcement has access to driver's license photos, they have an accessible solution. Understanding the relationship between predictive models and actual demographic distributions is the next step toward understanding disproportionate police arrests. Future researchers need to figure out how to model the population histogram against the DI line. Visually, these two lines seem to be very correlated. This promising avenue for future investigation lies in examining the correlation between the DI spline curve and the line created by plotting the histogram of the bimodal population. The objective of such a study would be to gauge how well the DI spline curve approximates the features of a bimodal population, thereby providing empirical evidence for DI spline curve to be used in associating uncommon skin tones with disproportionate police arrests. Statistical correlation tests would then be applied to determine the strength and significance of the relationship between the DI spline curves and the population frequencies. Using this research framework offers the potential for significant strides to be made in reducing disproportionate arrests and fostering a better understanding of disproportionate arrests.

Figure 16

Disproportionality Index Versus Massey-Martin Color Guide



Black, Brown, Beige, and Blond People

At the start of this research project, it was a constant struggle to develop appropriate terms to classify people. After many attempts, Black, Brown, Beige, and Blond worked better than all prior options. An unexpected benefit of the term selection was eliminating the word "White," which proved to have a positive impact on the study. The best change was that the groups became equal, with no group having a stereotypically positive or negative attribute; they were just groups.

Gaps in the Literature

One of the most pressing gaps identified in the existing literature concerned the areas of suspicion and the effect of neighborhood demographics on arrest rates. The absence of comprehensive studies in these specific fields limited the depth of the literature review and the conclusions drawn from this study. The nonexisting research is noteworthy as it underscores the

emerging nature of disproportionate arrest rate research within the academy. It highlights a need for targeted research to fill this gap, given its relevance and significance in the broader context of law enforcement and social justice.

When faced with such a void in existing literature, researchers have options. The scarcity itself should be explicitly acknowledged as a limitation and serve as an impetus for the study. The absence of prior research elevates the importance of the current study, positioning it as a pioneering effort in an underexplored area. Researchers in disproportionate arrest rates will have a hard time looking at closely related fields to fill this gap. Primary data collection becomes even more crucial. In-depth interviews, surveys, or observational studies can offer valuable insights when secondary data is scant. Lastly, given the lack of existing research, these studies should aim to be as comprehensive as possible, functioning as a potential guide for future research efforts. Researchers in this area should act quickly to reproduce this study as the ability to reproduce it is limited due to the irreproducibility of this unique event.

The presence of significant gaps in literature presents challenges but also offers opportunities for groundbreaking work. It serves as an invitation for scholars to delve into new directions, laying the foundation for subsequent investigations. By addressing these gaps, researchers contribute to their field by potentially influencing future research and policy.

Recommendations to Address Questions from Study Findings

Race-Out-Of-Place

This study dealt with the challenges of terminology in classifying individuals, and eliminating White had a positive effect. ROOP addresses the impact of skin tone on perceptions and the increased scrutiny faced by individuals with lighter or darker skin tones in racially homogeneous environments. Greater awareness and efforts to challenge preconceived notions

about skin tone inclusivity and disparity is recommended. Sergeant reviews of police officers' arrests is highlighted as a crucial practice for reducing disproportionate arrests and ensuring accountability, oversight, and fair policing throughout law enforcement agencies.

ROOP was not a focal point of the literature reviewed for this study. However, it is not uncommon for relevant findings and discussions to emerge postanalysis, which enriches the understanding of the primary study's findings. The information on ROOP is intrinsically linked to the Chamberlain et al. (2021) study but has not been previously discussed in this study. This additional insight provides a broader perspective on this study, shedding light on aspects that further underscore the study's significance and implications. This information is a supplementary layer of understanding, enhancing the depth and breadth of Chapter Four.

Chamberlain et al. (2021) showed that a Black person in a 90% White neighborhood might experience almost 10 times the chance of getting arrested than in a 50% or more Black neighborhood. The identical but less dramatic effect would be for a White person in a Black neighborhood. ROOP refers to a social phenomenon in which individuals are perceived as out of place within a specific context. Skin tone can significantly impact ROOP as it influences the immediate visual perception of an individual's racial or ethnic identity. Lighter or darker skin tones may trigger assumptions, stereotypes, and biases that result in a perceived mismatch between an individual's appearance and the racial or ethnic expectations of a particular setting. In racially homogeneous environments, individuals with lighter or darker skin tones may experience heightened scrutiny, suspicion, or even hostility due to their perceived deviation from the norm. This phenomenon underscores the complex interplay between racial perceptions, biases, and social expectations. It highlights the need for greater awareness, education, and efforts to challenge preconceived notions about skin tone to foster inclusivity and combat

discrimination. This study presents tools that could contribute to a much deeper understanding of ROOP.

How to Investigate Strangers

The results of this study suggest that researchers take a new direction in analyzing disproportionate arrest rates. Findings point to the idea that the police investigate things that are different, out of place, or not fitting with what is seen in normal observations. Things that are abnormal, uncommon, or strange can cause a police officer to investigate further. In Alachua County, the police call in a Signal 13 to report something suspicious, and a Signal 13P is a suspicious person; this study sheds new light on the importance of what creates suspicion in police officers, and recommendations include that future researchers consider how skin tone affects suspicion.

In the thousands of articles that were read to formulate the literature review for this study, only two pointed directly to the significance of suspicion in disproportionate arrest rates. These studies made clear that to understand disproportionate arrest rates, suspicion must also be understood. In the first article, Gaston and Brunson (2020) showed that it is essential to understand suspicion. Gaston and Brunson (2020) also showed that race plays a significant role in police–citizen contacts, but arousing suspicion in the police officers was observed in 66% of the encounters. In the second article, Dunham et al. (2005) asserted that there is a lack of research on the effect of suspicious behavior or how officers become suspicious. The literature review in Chapter Two started with these two articles. Still, this content did not support the guiding themes of the study. After completing this dissertation study, it is possible that these two initial articles hold the most substantial key to comprehending disproportionate police arrest rates—understanding suspicion.

Policy Recommendations

This study shows the significance of evaluating an individual's character and criminality based on facts rather than skin tone. Thus, it is recommended as a policy change to judge character without reference to skin tone. Disproportionate police arrests not based on skin tone emerge as key to advancing the principles of justice and equality. The imperative to rely on factual evidence in assessing character and criminality seeks to transcend the injustices propagated by racial or ethnic biases. By emphasizing evidence-based methods, such as patterns, actions, and empirical data, researchers can avoid perpetuating harmful stereotypes and discrimination. This approach upholds the principles of fairness, impartiality, and the protection of civil liberties, ensuring that individuals are treated based on their actions rather than the color of their skin. By challenging the association between skin tone and criminality, this study contributes to a more just society and promotes environments where objectivity, evidence-based practices, and equality prevail.

This study challenges the prevailing narrative that disproportionality in arrest rates is predominantly associated with darker skin tones. This study adds evidence from a quasi-experiment to the debate on disproportionality in arrest rates and adds to a body of research that is often susceptible to inaccuracies from the denominator effect. This approach to evaluating arrest rates across all skin tones provides a better understanding of the dynamics at play. This study opens new avenues for understanding the factors that contribute to arrest rate disparities. The implication here is profound and suggests that the issue is not as straightforward as a direct correlation between skin tone and arrest rates but rather is more complex interplay that may include but is not limited to suspicion.

The findings from this study highlight the danger of using skin tone as a predictive or evaluative factor for arrest rates, thereby emphasizing the significance of assessing an individual's character and criminality based on facts. The study revealed that disparities exist across all skin tones, suggesting that skin tone should not be the singular or primary factor in determining criminality or the likelihood of arrest. This is relevant in the context of law enforcement practices and policies. The findings could serve as a catalyst for reevaluating procedures that might contribute to a more equitable system. As an example, there is currently a huge push for using de-escalation techniques that are a direct result of the media attention placed on interactions with police and dark-skinned people. Law enforcement might be better served by providing more training on understanding suspicion and judging character.

For policymakers in the field of criminal justice, the study serves as an impetus to reevaluate existing theories and models that explain or predict arrest rates based on skin tone. It calls for more intricate models that incorporate a broader range of variables, thereby moving away from reductionist approaches that may perpetuate stereotypes and systemic biases.

In summary, the study underscores the importance of a fact-based approach in the assessment of character and criminality. It dispels the notion that skin tone can serve as a reliable proxy for determining arrest disparities and champions the need for nuanced, evidence-based models in criminal justice.

Recommendations for Future Training

Sergeant Review

Because most sergeants are not present at crime scenes but do review arrest reports before a police officer enters the sally port, the importance of sergeants reviewing police officers' arrest records to reduce disproportionate arrests cannot be overstated. This practice is

pivotal in ensuring accountability, oversight, and fair policing throughout law enforcement. By carefully scrutinizing officers' arrest records, sergeants can identify any biases or inconsistencies, thus preserving the integrity of the arrest process and minimizing the likelihood of disproportionate arrests based on race, ethnicity, or socioeconomic status. Sergeants can provide the necessary training and guidance to address observed patterns and equip officers with the knowledge and tools to make unbiased and informed decisions during arrests. This proactive approach also helps to uncover and rectify systemic issues, such as flawed policies or biased practices, that may contribute to disparities in arrests. By promoting transparency and accountability, sergeants' review of arrests builds trust and confidence between law enforcement agencies and their communities, which reinforces the notion that fair and just practices are the priority. This practice also ensures legal compliance and reduces the potential for legal challenges related to discrimination or civil rights violations. Sergeant reviews of police officers' arrests is a vital mechanism for promoting equitable policing, addressing issues, and fostering community trust.

Police Treatment of Black People

This study has presented a framework for agencies to investigate officers who have a propensity toward unfair treatment of people based on skin color. By comparing an officer's history of arrests to the overall arrest record based on skin tone, departments can now identify officers whose arrests should be reviewed. By plotting an officer's arrest history (mugshot skin tone) against Figure 16, it should be easier to spot problem areas. This would work well for high-crime areas, but small communities with few arrests would be more problematic. Reduced data can lead to less reliable conclusions and make it difficult to see patterns. Smaller datasets are more susceptible to distortions from outliers, potentially skewing metrics. Establishing consistent

outcomes becomes challenging due to less data. Generalizing findings from small studies to broader contexts has risks, and the data's sensitivity to errors is larger in smaller datasets. Although insights can still be seen, it is crucial to navigate such analyses with an awareness of these inherent limitations.

The conclusions made from this were surprising. In particular, discovering that light-skinned people also experience disproportionate arrest rates was unexpected. Future research should spend more time addressing how police can mitigate the harms society places on Black people than looking at the harms the police place on Black people. In this study, it was initially assumed that dark-skinned people experience disproportionate arrest rates. However, based on study findings, it appears that all skin tones can experience disproportionate arrest rates. This unexpected outcome warrants a discussion, particularly focusing on suspicion as a subject for future research.

The easy answer to this unexpected finding is that decisions by law enforcement officers to arrest are complex and may be influenced by many variables beyond skin color, such as socioeconomic status, behavior, location, and an individual officer's training and experience. The multifaceted nature of these interactions could have clouded the initial expected outcomes based on skin color alone. The initial thought, though, is that it is suspicion that leads to disproportionate arrest rates and not directly skin tone.

Suspicion can serve as a pivotal axis for future research in disproportionate arrest rates. Suspicion is subjective, shaped by individual cognitive processes, which are influenced by cultural, social, and personal experiences. In the context of law enforcement, suspicion is often the preliminary trigger for further actions, such as stops, searches, and, ultimately, arrests. Given its subjective nature, examining how suspicion is formed and acted on can yield insights into

disproportionate arrest rates. Researchers could investigate how officers perceive suspicion across different demographic categories, possibly using simulated scenarios or eye-tracking technology.

An exploration of how reasonable suspicion and probable cause are interpreted across an officer's cases involving different skin tones could offer a needed perspective on the issue. Also, understanding how people from different skin tone groups perceive police suspicion could help gauge the social and psychological impacts of arrest disparities. Surveys or interviews could be employed to gather perspectives from police and people who fall into different skin tone categories. The concept of suspicion, coupled with these unexpected findings, could serve as a robust foundation for future research, offering a multifaceted approach to understanding the complexities surrounding disproportionate police arrests.

Additional Recommendations

Recommendations for Specific Changes

Although the need to reevaluate previous studies on disproportionate arrest rates using the Massey-Martin Color Guide is required, research utilizing the Massey-Martin Color Guide still holds the potential for shedding new light on the relationship between skin tone and suspicion. The guide can capture the spline knots, and previous research using this tool may still contain valuable information. This study highlights the importance of suspicion in police–citizen encounters and suggests that future researchers should explore the correlation between skin tone and suspicion. Any color guide used in such research must encompass the spline knots to ensure accuracy.

The color red needs future research. This study showed that red is often skewed when researchers try to create guides for skin tone research. Future research could enhance the

understanding of the role that red in skin tone plays in disproportionate arrest rates. The objective is to construct a comprehensive framework that accounts for the multifaceted nature of colors. It might be worthwhile to explore how red in skin tone interacts with other factors, such as gender, age, and socioeconomic status, to influence arrest rates. Researchers could compare the effects of the red component in skin tone with other ethnic or racial groups that might also exhibit uncommon levels of red in their skin tone. This will help to determine whether the observed disparities are specific to certain communities or are more universally applicable.

Trying to understand red would also open this research to other fields, such as psychology and neuroscience. Research indicates that color can have an impact on human emotion and cognition. In the context of arrests, red may evoke or intensify feelings of fear, aggression, or alertness. In the psychological literature, red is associated with danger. When law enforcement officers encounter an individual with a reddish skin tone, it might subconsciously trigger a sense of caution or threat and influence their decision to arrest. Neuroscientific studies could explore how the perception of red impacts neural pathways responsible for decision making and emotion regulation. Such an investigation could reveal whether color plays a role in type I judgments during arrests. The use of color-filtered polarized glasses by law enforcement officers could be an interesting variable to study. Researchers could examine whether filtering out or reducing the intensity of red affects officers' decision-making processes during arrests. Incorporating this element into research could add a novel layer to understanding how perceptions of color influence arrest rates and law enforcement.

The parallel between the model used in this study and a histogram of the distribution of skin tones in the population of Alachua County presents an intriguing research avenue that warrants further exploration. There appears to be much to learn about suspicion and

disproportionate arrest rates, the first step of which could be exploring the frequency of different skin tones in the population. In addition, this study could be broken down for many communities of different distribution percentages of skin tone. Skin tone frequency refers to the statistical prevalence or distribution of various skin tones within a specific population. This metric is crucial for understanding the base rate of different skin tones, which, in turn, aids with analyzing whether a particular skin tone is over or underrepresented in arrest statistics. An understanding of skin tone frequency is essential for interpreting skin tone disparities in arrest rates. It would not be surprising to find that skin tone frequency and skin tone disparity in arrests are intricately linked.

Quantitative methods could be complemented with qualitative data, such as interviews and surveys with law enforcement officers and arrested individuals. Qualitative methods would address the sociocultural perceptions and attitudes that may be shaping the observed model. A comparative analysis that includes data from various geographical locations could provide evidence of whether the resemblance between the model and the histogram is a localized or universal phenomenon. By adopting this comprehensive, mixed-methods approach, the research can provide a holistic understanding of the factors that influence the striking resemblance between the study's model and the skin tone distribution, potentially leading to actionable recommendations for enhancing equity in law enforcement practices. One initial aim of this study was to interview people in jail or prison during the research period. This became impractical and pushed the scope of this study well beyond what would be part of a study. It quickly became apparent that filling this gap deserved its own study.

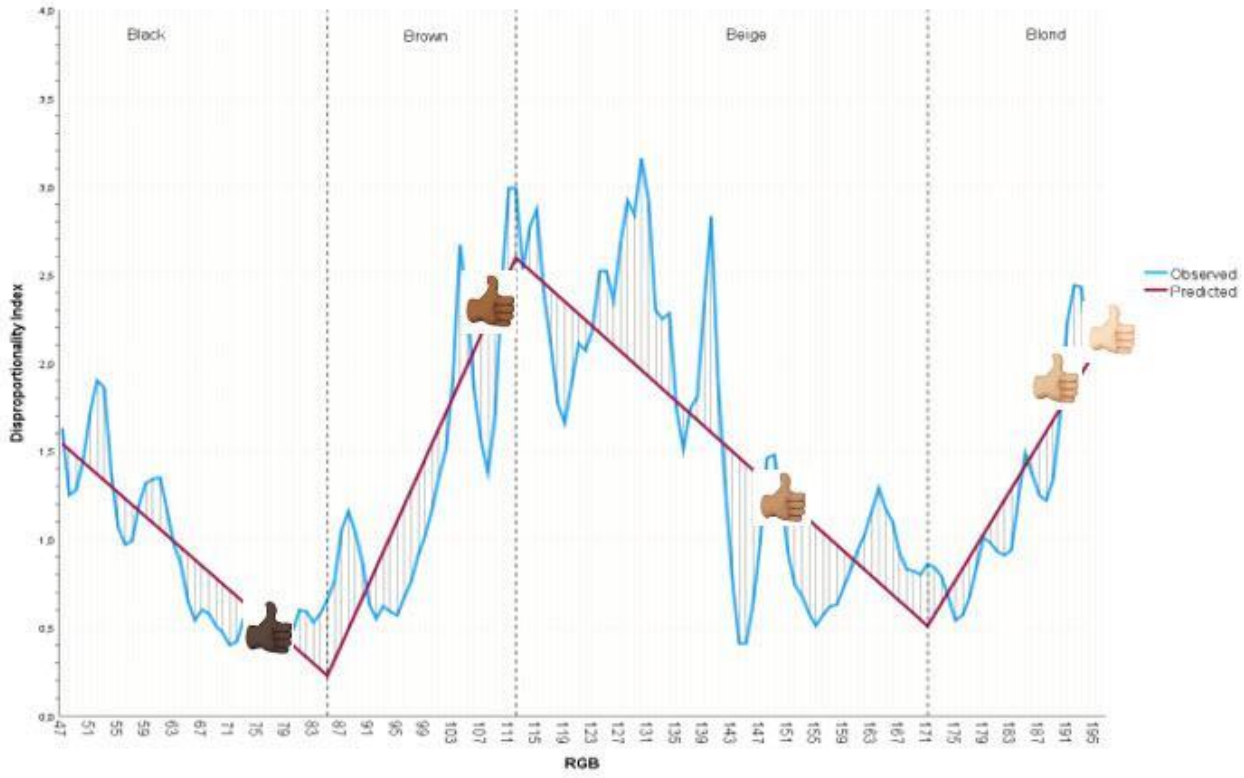
Recommended New Tools or Resources

Massey-Martin Color Guide

Researchers have suggested that virtually all prior research on disproportionate arrest rates must be scrapped (Hinton et al., 2018; Monk, 2019). Although virtually all prior research on disproportionate arrest rates is now suspect, considering a better understanding of how to create proper benchmarks, the Massey-Martin Color Guide has saved much research from becoming obsolete because of accurately capturing the knot locations. All prior research on disproportionate arrest rates should be reanalyzed before relying on it in current or future research. Still, studies that used the Massey-Martin Color Guide maintain the best potential for accurately reconsidering what is now known about skin tone. It was either through incredible luck or a fantastic insight into skin tones and the general population that the Massey-Martin Color Guide captured the same knots in this study's linear spline regression model. With this new knowledge, it seems reasonable that all prior research that utilized the historical gold standard in skin tone research on disproportionate arrest rates also contains hidden gaps of information waiting to be exposed. Guides are not people; future researchers should be extremely careful using guides as they can be riddled with problems. One problem that was seen repeatedly in this study was the use of unnaturally large values of red in the guide color. A pertinent example of when too much red makes a guide deceptive is the iPhone's hand colors as shown on Figure 17. It is important to remember that the effective range of skin tones is from 50–200, although Figure 17 extends these lines further. It is rare that a person in the black category would experience disproportionate arrest rates. This is especially true with respect to people in the very blonde category and a large portion of the area where the brown and beige categories meet.

Figure 17

Disproportionality Index Versus iPhone 15 Pro's Hand Colors



Benchmarking

As shown in Figure 16, disproportionate arrests are much more complicated than demographics. It is now apparent why current research indicates that virtually all prior research should be ignored or reevaluated. It is fortunate that all prior research using the Massey-Martin Color Guide could be easily redone because it captures the spline knots. However, this does not correct the denominator effect. The only way to address this problem is through more quasi-experiments.

Predicting Arrest Disparity

This study used known knots derived from a scant amount of data. It seems reasonable to question if R^2 in this study would be greater if the model knots were slightly different. Future research may also want to include an additional knot to understand the midpoint of the model. Visually, it appears that there is still a lot to understand about the knot at which brown and beige

connect. This study highlights specific RGB values (85, 112, and 171) as knots in the linear spline regression model. Future researchers could investigate why disparities change at these specific values and assess if there is a sociological or historical context behind these values. Because the disparities seem to change around these RGB values, a sensitivity analysis could be beneficial. Researchers can understand the robustness of the knots by varying these values.

Future researchers have the added benefit of being able to compare their study to this study, allowing for a more robust study. RGB skin tone is just one variable. Future research should include other potential confounding variables, such as socioeconomic status, sex, location, age, etc., to determine if they play a role in the observed disparities. Also, researchers could investigate if the observed disparity varies across different regions or countries. This could highlight specific areas where interventions are most needed or where best practices are already in place. It would be beneficial to compare these findings with new studies that explore the relationship between skin tone and arrest disparities to identify if other researchers find similar knots in the relationship. Given that certain RGB values are highlighted as points of change in disparity, researchers might consider new skin tone groups based on these RGB values and analyze arrest disparities within these groups.

This study provides evidence that unusual skin tones create suspicion, which leads to disparity in arrest rates. As this study was exploratory, it was not meant to provide definitive answers regarding disproportionate arrest rates. That being said, findings from this study suggest that past research on disproportionate arrest rates, at the very least, is fraught with misinformation and, at worst, has led to the spread of inaccurate information to hundreds of millions of people. Given that arrest disparities have been one of the biggest news topics in the past few years, it might be interesting to conduct a study on public perception, addressing

questions such as how people perceive individuals based on their skin tones, especially around the RGB values highlighted. Such a study could shed light on societal biases and, more to the point, how this study is perceived in light of the sheer magnitude of previous studies.

It would be interesting to see how this study's model for the jurisdiction of Alachua County compares to other jurisdictions. As a predictive model, it provides a groundbreaking approach to predicting disparity in arrests using a quasi-experimental linear spline regression with respect to RGB values as a proxy for skin tone. By identifying specific knots at the RGB values of 85, 112, and 171, the model unveils shifts in arrest disparities across a spectrum of skin tones. The predictive line in Figure 16, which represents the relationship between RGB and arrest disparity, demonstrates a trend in which the disparity initially decreased with increasing RGB, followed by a spike, a decrease, and then another increase. These intricacies revealed by the model offer a more granular understanding of arrest disparities than prior research models. Such insights are invaluable for policymakers, law enforcement agencies, and researchers aiming to address and rectify systemic biases in the criminal justice system.

Future Professional Aspirations

Throughout my journey, I have often approached problems from a different angle. In my early computer programming courses, instructors noted that my solutions, though effective, were unconventional. I tend to move on before fully realizing an idea's potential. I invented the miniature espresso machine inspired by the challenges faced by the military. My concept was featured on the Food Network's *Invention Hunters* show, and many companies now offer miniature espresso machines for traveling. I soon shifted my focus to other projects, including one later acquired by GE and a learning management system years before Canvas. My enthusiasm often wanes when faced with routine tasks. My research has notably contributed to

the field of disproportionate police arrests, but it is likely that others will operationalize these findings more than I will.

Academic research aligns closely with my interests and capabilities. I've always been drawn to original perspectives and tend to question established norms. When embarking on my dissertation, I was advised to temper my expectations for groundbreaking discoveries. However, the findings of this current study challenge the conventional wisdom on arrest disparity. It calls into question the accuracy of virtually all academic articles, media reports, and public perceptions concerning the behavior of law enforcement toward individuals with darker skin tones. Consequently, the study invites a reevaluation of prevailing attitudes toward police brutality, arrest bias, and suspicion.

Within the current academic landscape, engaging in research can be characterized by a sense of apprehension and uncertainty. The landscape of academic research and PhD programs is increasingly dominated by two issues: the imperative to publish and the disproportionate allocation of resources to administrative functions over faculty support. The pressure to publish manifests most notably through the competitive demand to produce research articles for prestigious journals. This "publish or perish'" culture has adverse effects. It can lead to hurried, less thorough research, as scholars are driven more by deadlines than by the quest for knowledge. The rush to publish can also result in a focus on safe topics that are more likely to get accepted by journals; this can stifle innovative research by unknown researchers. The constant pressure can increase stress and mental health issues and reduce work-life balance.

The trend of allocating more funds to administration at the expense of faculty and research is a concern. Reducing stipends for PhD candidates, limiting grants for research projects, and offering fewer tenured positions for professors is also concerning. It creates a

decrease in both the quality and quantity of mentorship and academic guidance available to students. The lack of financial support also places a burden on scholars, who might need to seek employment outside of academia, further detracting from their research focus and educational commitments.

The pressures of the need to publish and administrative financial misallocation present significant challenges in the academic research environment. These issues compromise the quality and scope of research and create a series of financial and psychological burdens on faculty that make the job seem less desirable. These challenges call for a reevaluation of current academic priorities and funding structures to ensure a more balanced and supportive environment for scholarly work.

I have started a nonprofit called the Küyr Institute, where we will work with police departments to help them understand and be aware of how skin color affects suspicion. We will also be developing software that is part of body cameras that use facial recognition to provide early notification to sergeants when biased arrests are more likely to occur. In addition, the software will be able to recognize people without the more intrusive questioning that can escalate emotions. Furthermore, I have a list of top professors in the United States who study disproportionate arrests. I plan to mail them a copy of this dissertation in the hopes that other students will use this study as a springboard to do more with the data than I ever could.

The transformation I have undergone during this process is unexpected. For many years, I instructed MBA-level courses, operating under the assumption that my responsibility was to deliver comprehensive and high-quality content to my students. I held the belief that once the educational material was presented, assimilating and applying it rested solely on the students. To me, their progress was a function of their own efforts and to make use of what I taught.

My experiences from this dissertation have started a fundamental shift in my belief system. I have come to understand that the true measure of my efficacy as an educator is not the quality of my lectures or the depth of knowledge I impart. Rather, it is the tangible improvement observed in my students that serves as the most authentic yardstick of my teaching success. This reorientation has led me to conclude that the role of a teacher extends beyond the act of instruction; it involves a commitment to fostering an environment conducive to student growth and continually refining one's methods in pursuit of this objective. The evaluation of a teacher should, therefore, hinge not on the clarity or eloquence of their delivery but on the demonstrable progress made by their students. This would also be evident if this dissertation was compared to the dissertation I would have created by myself.

Conclusion

The tools deployed in this study were more informative than color guides, such as the Massey-Martin Color Guide used in previous research. All uses of such guides should be abandoned, and all attempts to improve on these color guides should be abandoned as a result. Police suspicion increases when encountering someone whose skin tone is less common in the community; in turn, the likelihood increases that police will make an arrest. This study casts an intense light on the idea that suspicion is directly tied to disproportionate arrests.

The police mandate had a profound impact on arrests in Alachua County. In the premandate period, there were, on average, 8.6 arrests per day; in the postmandate period, that number dropped to 5.6 arrests per day. This drop in arrests was almost exclusively due to a drop in Level 1 crimes, the lowest level in the Florida crime rating system. The only other type of crime that showed a change was a dramatic rise in Level 6 crimes, which was expected because domestic fights (Level 6) normally go up when people are forced to spend more time indoors.

The original hypothesis was that this would benefit those with darker skin tones, but this was disproven. The median skin tone for Level 1 crimes fell from an avgRGB of 121 to an avgRGB of 95, indicating those in the middle (but less common) brown to beige knot; thus, the most relief from disproportionate arrest rates was actually where brown and beige skin tones meet.

Future researchers should seek to understand why the skin tone where Brown and Beige skin tones meet suffer the highest levels of disproportionate arrest rates. Future research should use larger data sets to study the effects on males and females separately. Future researchers should also study the correlation between skin tone histograms and the disparity line created in this study. Researchers now have the tools to investigate if unarmed Black men are unnecessarily killed by police. Most importantly, future research should explore how to mitigate suspicion unjustly signified by skin tone and ways to circumvent these arrests that lead to disproportionate arrest rates. Lastly, future research should investigate the most effective path forward in a criminal justice system that remains unjust.

Now, for the first time, a concrete solution to the denominator effect has been shown. For the first time, the underlying factor behind disproportionate arrest rates has been uncovered. This study has shown why the field of disproportionate arrest rates is riddled with inconclusive results and why unarmed dark-skinned men are disproportionately shot by police. In the diligent pursuit of progress, this study provided evidence that the arrest rates disproportionately bear upon skin tones. It is not simply color but an unwarranted cloud of suspicion that determines these outcomes. This study, however, offers a beacon of hope—a tool—that addresses these disparities, moving beyond the debates and toward the betterment of our shared community within the realm of law enforcement.

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APPENDIX A

IRB Exemption

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

May 24, 2023

Soren Brockdorf
Jade Pumphrey

Re IRB Application - IRB-FY22-23-1199 DISPROPORTIONATE ARREST RATES AN EXPLORATORY QUASI-EXPERIMENT FOLLOWING A COVID-19 POLICE MANDATE

Dear Soren Brockdorf and Jade Pumphrey,

The liberty University Institutional Review Board (IRB) has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds that your study does not meet the definition of human subjects research. This means you may begin your project with the data safeguarding methods mentioned in your IRB application.

Decision: No Human Subjects Research

Explanation: Your study/project is not considered human subjects research because it will not involve the collection of identifiable, private information from or about living individuals (45 CFR 46.102).

Please note that this decision only applies to your current application. Any modifications to your protocol must be reported to the Liberty University IRB for verification of continued non-human subjects research status. You may report these changes by completing a modification submission through your Cayuse IRB account.

If you have any questions about this determination or need assistance in determining whether possible modifications to your protocol would change your application's status, please email us at IRB@liberty.edu.

Sincerely,

G. Michele Baker, PhD, CIP
Administrative Chair
Research Ethics Office

VITA

Soren Geoffrey Brockdorf is a doctoral candidate with the Helms School of Government, pursing a PhD in Criminal Justice. He received a bachelor's degree from the University of Florida and his MBA from the Florida State University. His professional experience includes roles as a Strategic Business Analyst at Harbor Freight Tools, a Controller at Minnesota Power and Light, and his current position as President of Brockdorf, Melchar, & Bowie PA. Additionally, he has a history of entrepreneurship, including inventing the first travel espresso machine, owning multiple start-ups, and successfully selling his logistics company to GE.