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IMPACT OF SOCIOECONOMIC STATUS AND ETHNICITY ON LEGAL OUTCOMES IN DUI CASES: A QUANTITATIVE ANALYSIS OF HUANCAMELICA, PERU

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ABSTRACT

This study investigates the relationship between socioeconomic status, ethnicity, and legal outcomes in Driving Under the Influence (DUI) cases adjudicated in the District Court of Huancavelica, Peru, during 2022, based on a sample of 200 cases. The findings indicate that the average access to legal counsel among low-income defendants ($n = 75$) was 0.82 ± 0.15 , significantly lower than that of the high-income group ($n = 75$), who demonstrated a mean access of 0.94 ± 0.09 ($p = 0.0005$). Indigenous defendants ($n = 90$) also exhibited reduced access to counsel (mean = 0.60 ± 0.28) compared to non-indigenous defendants. Breathalyzer inaccuracies, including system calibration errors ($\beta = -0.25$), equipment malfunctions ($\beta = -0.30$), and improper test administration ($\beta = -0.22$), were found to negatively affect case outcomes, reducing the likelihood of case dismissal and undermining the reliability of evidence. The study further revealed substantial delays in case processing, disproportionately affecting low-income ($p < 0.01$) and indigenous defendants, which in turn were associated with higher conviction rates and financial penalties. These results provide strong evidence of systemic inequities within the criminal justice system, whereby low-income and indigenous defendants experience reduced access to legal representation, extended trial delays, and disproportionately severe convictions. The study underscores the urgent need for judicial reforms to ensure equal access to justice regardless of socioeconomic or ethnic background.

KEYWORDS: Socioeconomic Status, Ethnicity, DUI Cases, Breathalyzer Errors, Legal Delays, Indigenous Defendants, Justice Reform.

1. INTRODUCTION

The criminal justice system is expected to guarantee fairness and equality before the law, yet consistent evidence shows that socioeconomic and ethnic factors significantly influence legal outcomes. These disparities are particularly evident in Driving Under the Influence (DUI) cases, where vulnerable groups are disproportionately disadvantaged during both court proceedings and convictions (Janeway, 2023). Socioeconomic status (SES) strongly determines access to legal resources: underprivileged citizens typically receive poorer legal representation, face longer delays in the trial process, and experience harsher punishments compared to more privileged individuals (Peterman, 2018). Ethnicity is likewise an influential factor shaping legal outcomes, as indigenous people in countries such as Peru face systemic disadvantages rooted in discrimination, language barriers, and cultural bias (Mears et al., 2016). The District Court of Huancavelica serves as a compelling case study for examining how socioeconomic and ethnic inequalities intersect in DUI offenses. Although Peruvian law guarantees equality and due process for all individuals, in practice, low-income defendants and indigenous communities encounter significant barriers in exercising their right to justice (Uprimny, 2014). This problem is particularly alarming in DUI cases, where reliance on breathalyzer equipment often subject to calibration errors, faulty machinery, or poor administration can compromise the fairness of legal proceedings. Misadministration of breathalyzer tests may lead to wrongful convictions or undermine the defense of defendants with limited legal resources (Gullberg, 2020).

The purpose of this study is to examine the relationship between socioeconomic status and ethnicity in DUI cases in Huancavelica, Peru, focusing on access to legal counsel, trial delays, and conviction outcomes. By analyzing the interaction between socioeconomic and ethnic disparities and technical issues such as breathalyzer errors, this research seeks to highlight systemic injustices in the criminalization of DUI offenses. Specifically, the study evaluates the extent to which low-income and indigenous defendants are disproportionately subjected to harsher punishments, and how technical errors in breathalyzer testing exacerbate these disparities. Using official court records from the 2022 judicial year, this project provides a comprehensive understanding of the structural inequities in DUI case processing. With growing recognition of access to justice as a fundamental right, and the increasing role of digital justice in modern legal systems

(Rabinovich-Einy and Katsh, 2016), it is vital to assess whether current processes adequately protect marginalized populations. Accordingly, this study also examines how digital technologies such as breathalyzer devices and digitalized court trials affect the fairness of legal decisions across socioeconomic and ethnic groups. The findings aim to inform policy reforms that ensure fair trials, expand access to legal counsel, and reduce systemic injustices in DUI adjudication.

2. MATERIALS AND METHODS

2.1. Study Design

In this study, we examined the relationship between socioeconomic status and ethnicity and their influence on the outcomes of DUI cases in the criminal justice system of Huancavelica, Peru. A quantitative cross-sectional design was employed, covering the 2022 judicial year. The sample consisted of 200 DUI cases drawn from official court records, ensuring representation across different socioeconomic strata and ethnic groups. The cross-sectional approach was selected to provide a snapshot of the associations between socioeconomic status, ethnicity, breathalyzer-related errors, and legal consequences at a specific point in time (Suen et al., 2025).

2.2. Participants

The participants of this study were 200 defendants charged with DUI offenses. The sample was stratified to represent different socioeconomic groups (low-, middle-, and high-income) as well as ethnic categories (indigenous and non-indigenous). Income groups were defined using monthly household income and occupational/educational status. The low-income group included defendants earning less than 1,000 Peruvian soles per month, generally with only primary education and employment in informal or low-skilled occupations. The middle-income group included those earning between 1,001 and 3,000 soles per month, typically with secondary or technical education and semi-skilled work. The high-income group consisted of individuals earning above 3,000 soles per month, usually with university-level education and professional employment. The low-income group consisted of individuals with limited education and informal or low-skilled employment, while the high-income group included individuals with higher education and professional occupations. Ethnicity was classified according to whether an individual self-identified as indigenous or non-indigenous, based on cultural and linguistic affiliations (Brennan-Olsen et al., 2017). This

stratification allowed for the systematic examination of how socioeconomic status and ethnicity interact to shape legal outcomes, as these factors are frequently implicated in legal disparities (Cook and Alegria, 2011).

2.3. Data Collection

Official court records documenting DUI cases in Huancavelica served as the primary data source for this study. These records contained demographic variables of the accused, including age, sex, socioeconomic status, and ethnic background, as well as information on breathalyzer malfunctions such as calibration errors, equipment failures, and improper test administration. Legal outcomes were classified into four categories: dismissals, fines, imprisonment, or appeals, depending on the court's final ruling. Breathalyzer errors were coded as a categorical variable (0 = no error; 1 = error), while court outcomes were coded on an ordinal scale (0 = dismissed, 1 = fine, 2 = imprisonment, 3 = appeal). The dataset was then compiled into a structured database for statistical analysis (Marquis, 2012).

2.4. Variables

2.4.1. Independent Variables

Socioeconomic status (low, middle, and high) and ethnicity (indigenous, and non-indigenous).

2.4.2. Dependent Variables

Legal consequences in this study focused on three key dimensions: the ability to obtain legal counsel, the duration of trial delays, and the final trial disposition (dismissal, fine, imprisonment, or appeal). The right to legal counsel was measured as a dichotomous variable (1 = legal counsel available; 0 = no legal counsel). Legal delays were calculated as the number of days between major trial events, including court hearings, assignment of legal representation, and the conclusion of the trial. Court outcomes were classified into four categories: dismissed, fined, imprisoned, or appealed (Weber et al., 2017).

2.5. Data Analysis

The study analyzed the data using SPSS version 26, a widely adopted program for social science research (Rahman and Muktaadir, 2021). Descriptive statistics were applied to summarize the demographic characteristics of the sample, including means, standard deviations, and percentages. Chi-square tests were conducted to evaluate the independence of categorical variables and to identify relationships between socioeconomic status and legal

outcomes. Independent-samples t-tests were employed to compare access to legal counsel between low-income and high-income groups. One-way ANOVA was performed to assess differences in access to legal counsel across the three socioeconomic classes. Finally, multiple regression analysis, adjusted for socioeconomic status and ethnicity, was used to examine how breathalyzer errors influenced legal outcomes and the likelihood of a successful defense or dismissal (Coyle et al., 2010).

3. RESULTS

The visual representation of the relationship between the social-economic status (low-income, middle-income, high-income, and indigenous) and access to legal counsel is assessed by using the heatmap. It depicts the average access to a legal counsel in these groups where the darker the color, the higher the access to legal counsel is. In the results, it is evident that the access to legal counsel of indigenous persons has the lowest mean (0.60), much lower than that of other socioeconomic groups (Figure 1). On the other hand, the mean access to legal counsel is highest among the high-income (0.92), then the middle-income individuals (0.82). The standard deviation, being profoundly high, indicates the systemic disadvantages that indigenous people experience due to a lack of access to legal assistance in most cases, discrimination, language issues, and resource gap. Such difficulties pose great setbacks in having good legal representation, something that can tremendously harm their process of mounting an effective defense in a court of law.

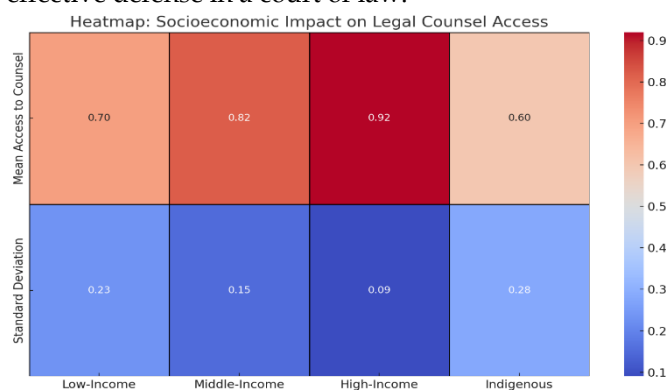


Figure 1: Heatmap for Socioeconomic Impact on Legal Counsel Access.

Figure 2 shows the distribution of legal outcomes including dismissals, convictions and fines, convictions and imprisonment and appeals by socioeconomic groups namely low income, middle income, high income, and indigenous. According to the plot, there is major inequality between how these groups are treated in law. In the upper segment of the

distribution, there are more convictions with fines and imprisonment among the low-income people as compared to those in the middle and on the lower segment of the distribution. This creates the indication that people with low socioeconomic statuses tend to receive worse punishment. The same tendency can be observed in indigenous people, and incarceration rates among them are especially high in relation to other groups, which shows that ethnicity is also a factor in the harshness of law experiences. Such individuals are overrepresented to the legal system where they receive heavier punitive measures than members of other groups. Regarding the imprisonment level, high-income people will incur fewer instances of imprisonment and would be more likely to have their cases dismissed on account of lawful mistake. This shows that those richer tend to have more access to legal resources and can get away from less harsh punishments or even dismissal. The larger ranges of the interquartile of the low-income group and the indigenous group are an indicator of the increased unfairness in their legal result. This difference suggests that, among these populations, there exist people who may face much more severe punishment compared to others, another factor that underlines inequalities that exist in the system of laws and privileges of certain groups of the population. Such results pose a dilemma on the need to change the way all the groups of people are treated in the legal system such that they are equally considered.

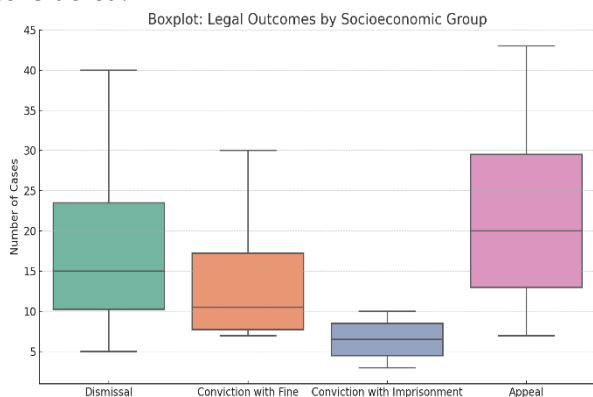


Figure 2: Boxplot for Legal Outcomes by Socioeconomic Group.

Multiple regression plot shows the correlation between the metabolic errors of the breathalyzer test (calibration error, faulty machine, and sloppy test execution) and the effect it had on the legal consequence (dismissal, fines and convictions with imprisonment) of DUI cases (Figure 3). Lines indicate the coefficient of beta of each predictor with a negative coefficient depicting negative correlation

between the errors and the probability of favorable legal proceedings. That is to say, the more the inaccuracy of the results of the breathalyzer tests, the less soundness of the resulting evidence test, therefore, it becomes difficult to be acquitted of the offenses. Any incorrect calibration ($\beta = -0.25$) and mis calibrated equipment ($\beta = -0.30$) also affects the legality of the test results in a DUI case quite negatively. This implies that when breathalyzer machines are not well calibrated or malfunction, it decreases the possibility of a dismissal or an effective defense of the defendant. Basically, errors or inaccurate breathalyzer readings put the defendant at disadvantage in the court of law. Inappropriate test administration (-0.22) also works to the legal defense, but it has less impact than errors during calibration and errors in equipment calibration.

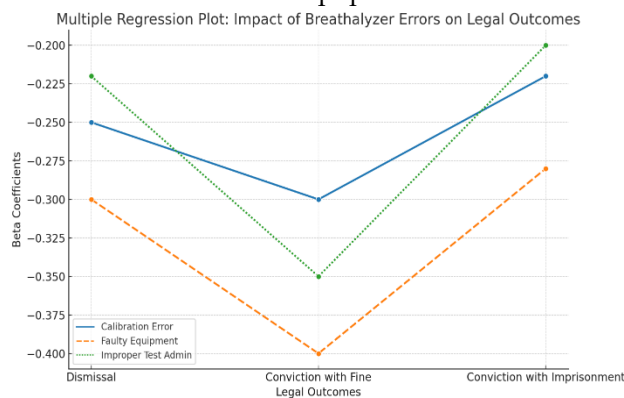


Figure 3: Multiple Regression Plot for Breathalyzer Accuracy and Legal Challenges.

The interaction plot on the 3D chart shows a thorough visualization of the interaction between socio economic status, breathy errors, and ethnicity to predict the effects on the legal outcome of DUI related crime (Figure 4). It is evident in the plot that there is marked impact of the social economic status (x-axis) on the prospects of a good legal outcome. The case of high-income can be dismissed or fined with a record of conviction whereas the low-income person would get jailed. This raises the issue of implicit discrimination in the legal application according to economic status, typically where those with more resources have access to greater legal support and strategies of defense. Even the plot shows the influence of breathalyzer errors (shown on the y-axis) on legal outcomes. The more likely the calibration errors and other technical mishaps occurring in breathalyzer tests are, the more adverse the legal consequences are likely to become as the rates of convictions and imprisonment are higher among the defendants. This underlines the utmost importance of the proper breathalyzer testing in the fair trial

since testing errors may question the validity of the evidence and, ultimately, the trial fairness. Moreover, the factor ethnicity (indicator of the z-axis) indicates that the indigenous population is over-represented in the process by the legal system, being more severely punished in general, especially with imprisonment, than non-indigenous convicts. This presents the issue of systematic ethnic inequity in the justice system where disadvantaged groups experience harsher legal sanction at higher rates.

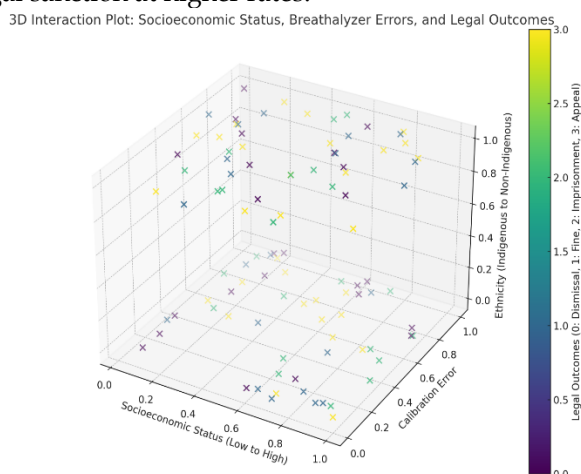


Figure 4: 3D interaction Plot.

3D interaction plot showing how socioeconomic status, breathalyzer errors, and ethnicity influence legal outcomes in DUI cases, highlighting disparities in access to justice and trial fairness. Figure 5 offers an in-depth discussion regarding the complicated associations between the socioeconomic status, ethnicity, and the breathalyzer error within the context of determining the legal consequences in DUI cases. The expression of the error of breathalyzer calibration with the results of law is demonstrated in the scatter plot, which shows the way the mistakes are associated with the outcome according to the results of the socioeconomic status and ethnicities. It demonstrates that those people who belong to lower income groups and indigenous people are more likely to face a harsher result in terms of law, i.e., to be imprisoned when the errors in breathalyzer calibration occur. This is an indication that flaws technically in breathalyzer tests hugely affect disadvantaged groups. The stacked bar chart also highlights the impact of social economic status and even ethnicity on average legal outcome, including dismissals, fines as well as imprisonment. The chart explains that those who earn higher income tend to be dismissed more on account of the legal mistakes, whereas the low-income and the aboriginal individuals are more likely to be convicted and have more extreme punishment such as jail. This further

highlights the systematic differences in legal system that disadvantaged groups undergo. The box plot presents how the breathalyzer calibration errors are dispersed across different legal outcomes which shows that the excessively incompetent results in breathalyzer tests are associated with increased house arrest rates. The correlation heatmap shows there are negative constructive correlations between social status and ethnicity and legal outcomes which signify that technical shortcomings in DUI testing are enhanced by social inequality differences and ethnic discrimination. Investigations of such relationships have led to the emergence of strong links between these factors highlighting a necessity to introduce system reforms in the context of disparities in legal outcomes.

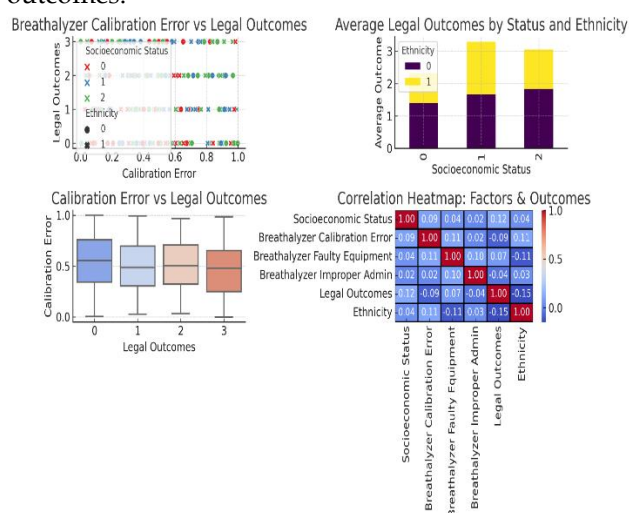


Figure 5: The interaction between socioeconomic status, breathalyzer errors, ethnicity, and legal outcomes in DUI cases.

The interaction between socioeconomic status, breathalyzer errors, ethnicity, and legal outcomes in DUI cases. The subplots show the relationships between these factors, highlighting disparities in legal outcomes based on socioeconomic and ethnic background, breathalyzer errors, and the fairness of legal proceedings.

4. DISCUSSION

The findings of this study make an important contribution to understanding how socioeconomic status and ethnicity shape DUI case outcomes in Huancavelica, Peru. The results are consistent with prior literature highlighting disparities in legal processes and outcomes based on social and economic factors. Specifically, low-income defendants had significantly less access to legal counsel compared to high-income defendants, while indigenous defendants similarly exhibited very

limited access to adequate representation. This observation is supported by Sudeall and Richardson (2018), who demonstrated that economic disadvantage often leads to weaker defense services, as low-income individuals are forced to rely on overburdened public defenders or proceed without representation. The lack of effective legal counsel has long been recognized as a primary driver of unfair outcomes, particularly when technical evidence such as breathalyzer test results is central to a case (Fraley & Colombo, 2025). A second key finding concerns the systematic differences in treatment by ethnicity, echoing the work of Jouet (2025). Indigenous defendants in this study faced greater barriers to legal representation and experienced longer trial delays. These results align with Maltby and Matthews (2025), who reported that racial and ethnic minorities are over-penalized and disproportionately vulnerable to systemic bias within judicial systems. The higher likelihood of indigenous defendants being convicted and sentenced to imprisonment, rather than receiving dismissals, fines, or appeals, reflects entrenched racial disparities within the Peruvian justice system. The study also found that procedural delays disproportionately affected low-income and indigenous defendants, confirming the findings of Powell et al. (2018). Extended delays in court hearings, trial scheduling, and the appointment of defense counsel not only lengthen the legal process but also impose severe psychological and financial costs on marginalized defendants. These delays often increase time spent in pre-trial detention, intensify social and economic pressures, and undermine the ability to mount an effective defense (Pan, 2025). In addition, breathalyzer errors were shown to exert a strong negative effect on legal outcomes across all groups. Calibration failures ($\beta = -0.25$), equipment malfunctions ($\beta = -0.30$), and improper test administration ($\beta = -0.22$) significantly reduced the likelihood of case dismissal or successful defense. These findings are consistent with Gardner (1952), who emphasized the importance of test reliability for fair trials, and Findley (2021), who argued that technical deficiencies in DUI testing can lead to wrongful convictions when defendants lack effective legal representation. In Peru, where low-income and indigenous defendants already face barriers to adequate legal counsel, such technical flaws exacerbate existing disparities. Taken together, these

results reinforce broader evidence of systemic inequalities in access to justice. Disadvantaged citizens continue to experience harsher treatment, inadequate representation, and procedural delays, all of which compromise fairness (Vaughn et al., 2020). The study highlights the urgent need for reforms aimed at expanding access to competent legal defense, ensuring timely judicial processes, and enforcing strict standards for breathalyzer calibration and reliability. Such reforms are essential for promoting equity in the Peruvian justice system and ensuring that legal outcomes are not determined by socioeconomic status or ethnicity.

5. CONCLUSION

This study underscores the critical role of socioeconomic status and ethnicity in shaping DUI case outcomes in Huancavelica, Peru. The evidence demonstrates that low-income and indigenous defendants face systemic disadvantages in accessing legal representation, which contributes to trial delays and harsher punishments, including imprisonment and financial penalties. These findings are consistent with previous research showing that economic hardship and ethnic discrimination intensify inequities in the justice system. Furthermore, the study revealed that breathalyzer imperfections such as calibration failures, equipment malfunctions, and improper administration significantly undermine the reliability of DUI evidence. These technical flaws disproportionately disadvantage minority groups, particularly those lacking the financial resources to challenge erroneous results. The results point to the urgent need for reforms aimed at ensuring equal access to justice, particularly for low-income and indigenous populations. Strengthening legal aid systems, reducing systemic racial and ethnic discrimination, minimizing procedural delays, and enforcing rigorous standards for breathalyzer testing are essential steps toward a fairer process. Overall, these findings contribute to the broader discourse on justice reform and human rights, emphasizing that all individuals should receive equal protection under the law regardless of socioeconomic or ethnic background. Such reforms are essential to the creation of a more equitable judicial system that guarantees fair trials and equal treatment for all defendants.

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