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# Disparities in Forensic Science Adoption for Crime Investigation in Kenya: The Role of Police Demographics

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**Abstract**

Widespread disparities in the adoption of forensic science (FS) in criminal investigations remain a global issue. Although multiple factors have been identified to cause disparities in the adoption of forensic science, little consideration has been given to the socio-demographic characteristics of police officers in explaining these disparities. This study analyzes police demographic characteristics using a cross-sectional descriptive survey of 146 Directorate of Criminal Investigation (DCI) officers in Kenya in relation to the adoption of FS in crime investigation. A binary logistic regression was performed to assess the predictive value of each demographic characteristic, including gender, level of education, police experience, police rank, favorite subject (science or non-science) in high school, and service formation, on the adoption of FS. We found that the composite police demographic variable was not statistically significant ($p = .877$) in predicting the adoption of FS in crime investigations. Officers with higher levels of education (bachelor's degree) and mid-level service experience showed significantly ($p < .05$) higher odds of adoption of FS. All other demographic variables (gender, service ranks, and service formation) were not statistically significant in predicting the adoption of FS. In conclusion, the disparities in the adoption of FS can be traced back to police demographic characteristics, particularly different levels of education, and experience among officers. We recommend police departments rethink the combined effect of police demographic characteristics in a bid to reduce disparities in the adoption of FS in crime investigations.

**Plain Language Summary**

This study sought to analyze police demographic characteristics using a cross-sectional descriptive survey of 146 Directorate of Criminal Investigation (DCI) officers in Kenya in relation to the adoption of FS in crime investigation. A binary logistic regression was performed to assess the predictive value of each demographic characteristic, including gender, level of education, police experience, police rank, favorite subject (science or non-science) in high school, and service formation, on the adoption of FS. We found that the composite police demographic variable was not statistically significant (p = .877) in predicting the adoption of FS in crime investigations. Officers with higher levels of education (bachelor degree) and mid-level service experience showed significantly (p <.05) higher odds of adoption of FS. All other demographic variables (gender, service ranks, and service formation) were not significant in predicting the adoption of FS but showed a correlation. In conclusion, the disparities in the adoption of FS can be traced back to police demographic characteristics, particularly different levels of education and experience among officers. The study result imply that police departments need to rethink the combined effect of police demographic characteristics in a bid to reduce disparities in the adoption of FS in crime investigations. The study dependent variable is limited in the sense that, there is need to enhance

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clarity on the construct of FS, and use of a specific crime or scenario based approach in determining intention to adopt forensic science

**Keywords**
forensic science, adoption, sociodemographic, police, crime investigation

## Introduction

Disparities in the adoption of new technologies continue to evoke a wide range of scholarly debates, including in criminal justice, regardless of awareness programs preceding its uptake. From the outset, new technology is perceived to be potentially disruptive and a deviation from the normative pathways of social action and group interactions, thereby causing disparities in the acceptance and adoption of technology. For instance, the transition from using traditional investigation techniques such as anthropometry to the application of modern scientific techniques such as DNA and fingerprinting techniques have been termed progressive but disruptive and could cause disparities in the adoption of science in criminal investigations. The resultant disparities, that manifest as poor, slow, inconsistent, and/or outright resistant, are funneled by individualized perceptions toward new technology and portend delays in the desired transformative impact in the criminal justice system (Mbaya, 2016).

Existing organizational research reveals the need for concerted efforts to increase the standardized adoption of new technology in an organization; however, there is growing evidence of disparities in the adoption of new technology at both the organizational and individual levels in most organizations (Adeboye, 2002; Agrawal et al., 2008; Gakuru, 2002; Laurin et al., 2013). Studies on the individual factors affecting the homogenous adoption of new technology remain largely noncomprehensive. Few studies conducted in Africa maintain that demographic factors precipitate individual perceptions regarding new technology, thus affecting its adoption (Chen & Chan, 2014; Gakuru, 2002). Unfortunately, studies that focus on police demographic characteristics as predictors of forensic science and technology are not exhaustive (Guclu & Can, 2015; Nalla et al., 2011; Z. M. Sarki & Saat, 2021).

Forensic science (FS) is the application of scientific knowledge and skills to solve crimes (R. Julian et al., 2012). Its value is embedded in its ability to offer evidence with a high probative value, a reasonable degree of utility, and a high measure of assurance and reliability (R. D. Julian et al., 2011; McEwen, 2010; Murphy, 2007). However, despite the perceived value and assured impact of FS in criminal investigations, the inconsistencies in the application of modern forensic science and technology in crime investigations continue to affect the prompt and fair administration of justice. There is growing concern about the huge case backlog occasioned by insufficient evidence in court, erroneous prosecution of cases, and unnecessary exhumations in most criminal justice systems, with the root cause traceable to disparities in the adoption of FS in crime investigations (Mbaya, 2016; National Council on the Administration of Justice, 2017; West & Meterko, 2015). Over time, several studies have shows that the sequential domino effect has led to a steady decline in case clearance and crime solvability, raising concerns about the credibility of criminal investigation institutions and the effect of FS in general (Anderson et al., 2018; Burch et al., 2012; R. D. Julian et al., 2011; Mbaya, 2016; National Academy of Sciences, 2009; Z. M. Sarki & Saat, 2021; Shako & Kalsi, 2019).

According to the diffusion of innovation (DoI) theory, an individual's adoption of new technology occurs in several phases—knowledge, persuasion, decision, implementation, and confirmation—before it is universally adopted in society (Rogers, 2003). Indeed, the phases of persuasion and decision-making are the most important but can be influenced by myriad factors such as culture, communication, time, and social systems (Rogers, 2003). These factors, among others, work together to influence an individual's perception of any new technology, consequently creating disparities in adoption across groups, cohorts, and societies.

Although it is not yet clear which variable has the greatest influence on individualized discernment in the adoption of technology, demographic characteristics such as age, gender, income, ethnicity, race, and marital status have been identified as leading factors affecting the propensity to adopt new technology (Chen & Chan, 2014; Gakuru, 2002; Laurin et al., 2013; Rogers, 2003).

Several police studies have shown that police demographic characteristics influence other facets of police work, but not the adoption of FS in crime investigation (Büchi et al., 2016; Chakraborty & Bosman, 2005; Feng et al., 2019; Scheerder et al., 2017). However, a study in Nigeria found a positive correlation between police demographics and perception of FS (Z. M. Sarki & Saat, 2021), which means that police demographics are important in police decision-making. Currently, few studies have examined the role of police demographic characteristics on the adoption of FS in crime investigation. In the case of Kenya, there have been numerous developments

regarding the acquisition of modern FS equipment, but the criminal justice system is still marred by numerous case backlogs and cold cases due to inconclusive investigations (Siele, 2022). Against this backdrop, this study explores the fundamental role of police demographic characteristics in the Directorate of Criminal Investigation (DCI), presumed to cause disparities in the adoption of FS in crime investigations.

## Literature Review

Several studies have shown that demographic characteristics can be used to explain the behavior of individuals. For instance, gender, age, education, income level, and place of residence have been found to affect social media use, the adoption of innovation, and mobile telephony (Alam et al., 2019; Damanpour & Schneider, 2009; Feng et al., 2019). Demographic characteristics play a significant role in the adoption of technology, but their positive effects are not necessarily universal. A study in Indonesia found that age, education level, gender, and length of adoption of technology did not have a significant relationship with the adoption of technology, which is in contrast to the findings of other studies (Athirah et al., 2020; Azizi et al., 2017).

The impact of demographic characteristics on disparities in police work and crime investigations remains ambiguous and inconsistent. On the one hand, some studies show that police demographics influence police officers' attitudes toward community policing and work-life balance of the police (Chaudhary & Rangnekar, 2017; Kang et al., 2014; Yawalkar & Sonawane, 2017). On the other hand, some demographic characteristics (e.g., gender) have been shown to not influence police job satisfaction (Nalla et al., 2011). The inconsistencies present the need to cross-examine the role of police demographics, such as gender, police officers' level of education, service rank, service formation, and experience (years of service) in relation to disambiguating disparities in the adoption of FS (Guclu & Can, 2015). The next section reviews extant literature examining the role of each demographic characteristic of the police in causing disparities in the adoption of FS in crime investigations.

## Gender

Gender refers to a set of socially constructed and acquired expectations, roles, and behaviors; it is one of the most commonly used demographic characteristics explaining the inclination toward the adoption of new technology (Krieger, 2003; Philips, 2005; Venkatesh & Morris, 2000; Venkatesh et al., 2003). However, there seems to be an irregular pattern in which gender influences behavior among professionals, modulating their performance at work (Damanpour & Schneider, 2009; Rainer et al., 2003). Some studies indicate that there is a diminished gendered impact in decision-making or attitude formation toward the adoption of technology (Ray et al., 1999; Z. M. Sarki & Saat, 2021; Sonfield et al., 2001), while other studies do not attribute gender in the adoption of technology (Damanpour & Schneider, 2006; Kakar, 2002).

Different police studies find gender to be a significant variable in determining the outcomes of the adoption of new technology (Guclu & Can, 2015; Li et al., 2008). This explains the probable critical role of gender variability (male or female officers) in the execution of police work, including crime investigations. As females are viewed as the weaker gender in the African patriarchal society including Kenya, the role of gender, especially in a profession such as policing, which is mainly regarded as a physically demanding profession, is a valid concern. Moreover, recent changes in police work have led to the introduction of more intellectual science-based policing nuances, such as forensic investigation, which departs from the traditional policing style. This implies that current police responsibilities may not necessarily favor any gender, thus creating a balance in the application of new intellectual skills such as FS.

## Level of Education

Education measures the different levels of formal instruction attained by an individual with reference to a particular skill set. Education has been reported as the most consistent predictor of technology adoption in different disciplines, wherein it is found to have a significant effect on most outcome variables (Mohr et al., 2007; Salkind, 2010). Nonetheless, several studies, especially police studies, have shown that education has a mixed effect on outcome variables, (Gau & Gaines, 2012; Rydberg & Terrill, 2010; Z. M. Sarki & Saat, 2021). Education in Nigeria was found to be a strong and positive predictor of the perception and actual adoption of FS by criminal investigators (Machado-Rios et al., 2019; Z. M. Sarki & Saat, 2021). In contrast, education has been shown to be not a significant predictor of different police work outcomes (Al-Daihani & ur Rehman, 2007; Wimshurst & Ransley, 2007). Moverover, a multiple regression analysis revealed that education was significant in predicting police officers' desire to update their sources of information at work (Guclu & Can, 2015); however, Wimshurst and Ransley (2007) asserted that the predictive value of education is still unclear among police officers and needs to be examined in different contexts.

The inconsistent findings on the role of education in police studies necessitate further investigation. Until recently, the recruitment process in Kenya police targeted individuals who scored lower grades in secondary education. However, the demand for more professionally skilled and technically adept individuals in the forensic divisions has led to a revision in the recruitment process.

There is a demand for highly qualified and formally trained investigative officers, portraying a shift in the importance of education in police services. However, it is not clear whether these changes have impacted the adoption of FS in criminal investigations.

## Police Service Rank

Police organizations have a well-structured vertically organized framework; that is, they are organized in different hierarchical ranks (Randol, 2014). Based on these structures, police ranks directly influence police conduct and execution of their work. Previous research confirms that service ranks have a positive impact on police conduct and provide significant value to police work performance (Gau & Gaines, 2012; Luceño Moreno et al., 2016; Masilamani et al., 2013). Police rank significantly predicts police officers' responses to FS in criminal investigations (Z. M. Sarki & Saat, 2021). In summary, officers with different ranks are differently likely to adopt FS in crime investigations.

## Police Service Experience

Service experience refers to the duration of years of service, and is believed to be a key demographic variable in police work. Numerous studies have reported that years of service significantly influence different outcome variables, such as the adoption of technology and police performance (Paoline & Terrill, 2007). However, several studies have found that experience is negatively correlated with several other outcome variables. For instance, years of experience had a negative correlation with the perception of the usefulness of technology but not that of FS in police investigations (R. O. Obasi & Ekatah, 2016; Z. M. Sarki & Saat, 2021).

Police experience draws different parallels in relation to the adoption of technology. On the one hand, several scholars, including those in Kenya, believe that older officers are more rigid toward change as opposed to younger officers who are drawn toward modern technology and are more liberal in their approach. Another set of scholars argue that older police officers may create a receptive culture of adopting FS that is imperative for adoption of modern FS (Alenezi et al., 2019; Elyas et al., 2014). Yeboah-Boateng and Essandoh (2014) asserted that age is a critical determinant of police officers' perceptions of the management support toward their duties.

## Service Formation

Service formation is the initial recruitment police service unit through which a police officer joins the disciplined services in Kenya. DCI brings together criminal investigators from different disciplined service formations with most officers from Kenya National Police service (NPS), while other forensic specialists are recruited from other disciplined service formations, such as Kenya Wildlife Service (KWS), Kenya Defense Forces (KDF), National Intelligence Service (NIS), Kenya prison warder, and civilian employees. This creates a multi-agency approach to police work that may affect the adoption of FS. Different service formations equip each trainee with unique attitudes, physical preparedness, and skills that may create individualized readiness to adopt modern FS. The role of service formation as an independent variable in the adoption of new technologies has not been studied before. Therefore, in this study, we assess the role of different service formations (identified as the initial unit of recruitment, training, and deployment before posting to DCI headquarters) in the adoption of FS.

In summary, in this study, we investigate the role of police demographics (gender, level of education, service ranks, service experience, and service formation) in causing disparities in the adoption of FS among police officers in Kenya.

## Methods

This was a cross sectional quantitive survey with questionnaire as the primary data collection tool. The study location was Directorate of Criminal Investigation (DCI)—Kenya headquarters. The DCI is an independent investigative body of the Kenya National Police that accommodates the forensic investigation arm of the Kenya criminal justice system where forensic analysis of evidence is carried out. The DCI is organized into three investigation sub-specialty units that deal with forensic based investigations, that is, department of investigation bureau, department of forensics science and the specialized units with an accessible population of 750 forensic investigation officers. The department of Investigation Bureau (IB) accommodates the following units: land investigation, economic crime investigation, banking fraud investigation, capital market fraud, serious crime, Kenya revenue protection services, anti-trafficking, and child protection, investigation fraud investigation, financial investigation, international crime, homicide while the department of Forensic Science (FS) accommodates: forensic document examination, bomb, and hazardous material disposal, digital forensic laboratory, ballistics, forensic crime scene investigation, finger prints identification, crimescene photography, and acoustic unit and the other specialized units include: anti-narcotics, criminal intelligence bureau, crime research, and intelligence bureau and the national central bureau—Interpol (DCI, 2020).

Following a pilot test done with the DCI officers working in Kenya regional police posts, the researcher evaluated and stratified the units based on their application of forensic science during an investigation. The research identified 14 out of the possible 22 units that are fully trained and provide with adequate forensic science equipment, that is: crime scene investigation, finger prints identification, digital forensic laboratory, economic crime investigation, serious crime, ballistics, document examination, crimescence photography and acoustics, bomb and hazardous material disposal, criminal intelligence bureau, anti-trafficking and child protection, homicide, financial investigation and land investigation with an accessible total population of 321 investigation officers based at the Head Quarter (DCI, 2020).

## Data Collection

The first step in sampling was application of non-probability (purposive) sampling to identify, classify and arrange investigators into 14 logical and valuable strata. Each strata contained investigator from the same specialized forensic unit. Then simple random sampling was conducted from each stratum of the IB, FS and SU departments. The researcher considered 50% of the accessible population ($n = 321$) in line with past studies criterion (Kabiru & Njenga, 2009) and a sample size of 161 officers working in their respective forensic investigation units was drawn.

A drop and pick was used to conduct the survey. The questionaries were issued relative to the specific calculated sample size of each participating investigative unit. Out of the total 161 questionnaires issued a total of 152 (94.4%) were filled and returned but only 146 (96.1%) of the returned questionnaires were eligible for analyzes. We used bivariate analysis to assess the correlation and determine the significance of the association between the variables and logistic regression to predict the adoption of FS in crime investigations. The choice of logistic regression was used due to a binary response in the dependent variable. Further, a composite independent variable was created by aggregating the police demographic variables into one construct (police demographics), which was then regressed with the adoption of FS.

## Dependent Variable

The dependent variable of the study was the adoption of FS in a crime investigation. The variable was measured by assessing police officers' use of FS at their disposal in the form of either equipment or standard operating procedure in crime investigation. The measurement scale was a binary response that was measured on a nominal scale. Coded as either "No" [0] indicating that the investigators did not use FS procedures or equipment at all times when conducting investigation, or "Yes" [1] indicating that the investigators used FS procedures and equipment at all times when conducting an investigation. The variable allows the researcher to assess whether an investigator who has been trained on forensic science and availed with forensic science equipment actually uses them at all times while conducting crime investigation. This variable conceptualization assumes that an investigator in the participating forensic investigation unit ought to use forensic science at all times to complete the task.

## Independent Variable

The independent variables were police demographic characteristics, namely, gender, level of education (the DCI officer's current level of education, level of education before joining service, favorite subjects in school), service ranks, service experience (the DCI officer's years of service at the DCI and the current forensic department), and service formation. Gender was measured as male or female, the current level of education was measured at the nominal level (certificate [KCSE], diploma, degree, masters, and doctorate), level of education before joining the service was measured at the nominal level (certificate [KCSE], diploma, degree, masters, and doctorate), favorite subject in high school was measured as multiple categorical variables but later dichotomized as science or non-science subjects, police rank was measured as ordinal but later dichotomized as gazetted or non-gazetted. For service formation variable, categories such as Kenya police officers (NPS), Kenya defense forces (KDF), and others (to accommodate civilian employes working at the DCI) were considered, and finally, total years of service at the DCI and total years of service at the current department were measured at the ordinal level.

## Test of Collinearity

The dependent variable data were normally distributed, as evidenced by presenting ranges not exceeding $-3$ and $+3$, a mean of 1.53, and a standard deviation of 0.943. Tests of collinearity were performed, and the results revealed tolerance levels $>1$ and the variance inflation factor (VIF) $<10$, indicating that the data did not violate the collinearity rule. Moreover, the correlation coefficient indicated no multicollinearity ($<.70$). Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test (Hosmer & Lemeshow, 1980).

## Results

A total of 146 DCI officers responded to the questionnaires. Of the respondents, 78.8% (115) were men and 21.2% (31) were women. Of the respondents, 54.1% (79) had only a high school certificate (KSCE) at the time of joining the DCI, whereas 28.1% (41) had a bachelor's degree. These findings are consistent with the recruitment process of the Kenya National police service requirement criteria whereby most officers are recruited immediately after completion of the Kenya Secondary Certificate Education and later undertake a degree course. Furthermore, the favorite subject in high school of 62.9% (111) officers was science, compared to 30.8% who preferred non-science subjects. The majority of the officers (47.3%) had worked at the DCI for 6 to 10 years, 50% had worked in their respective forensic departments for less than five years, and 36.3% had worked for less than 10 years. These findings reflect an increased effort to build the capacity of forensic departments with officers with more experience and higher education levels, which is consistent with the current DCI policy documentation and strategic goals. Notably, 34.2% of the DCI officers were lower-ranked police officers; considering the dichotomized police rank variable of gazetted versus non-gazetted officers, the majority (61%) of DCI officers were below the rank of gazetted police officers (with ranks below a police inspector) and 35.6% were gazetted officers (with a rank of police inspectors and above). Lastly, a majority of the respondents (86.3%) were from the national police services, which is consistent with the DCI recruitment and National Police Act, wherein most DCI investigators are to be seconded from the Kenya National Police Pool. A summary of police demographic characteristics and the results of the bivariate analysis is provided in Table 1.

## Disparities in the Adoption of FS at the DCI

A majority (57.5%) of the officers did not use FS in all the cases they investigated, while 42.5% used FS in all the cases they investigated which is consistent with previous literature (Anderson et al., 2018; Burch et al., 2012; R. D. Julian et al., 2011; Mbaya, 2016; National Academy of Sciences, 2009; Shako & Kalsi, 2019). The bivariate analysis revealed that 64.5% (20) of the total (31) female officers did not use FS at all times, while 57.7% (64) of the total (115) male officers adopted FS at all times in the cases they investigated. Therefore, a lower percentage of female than male officers were more likely to adopt FS, however, this difference was not statistically significant ($p = .376$). In contrast, there was a significant ($p < .05$) covariance between the level of education of the officers and the adoption of FS; 80.8% (21) of the officers with only a KCSE certificate did not use FS regularly, while 53.5% (38) of the officers with a bachelor's degree used FS at all times. Furthermore, 63.4% of the officers who joined the NPS with a degree always used FS, and this association was statistically significant ($p < .05$). In addition, 68.9% (31) of the officers who preferred non-science subjects and 52.5% (53) of those who preferred science subjects indicated that they did not always use FS, but this finding was not statistically significant ($p = .064$).

Furthermore, 75.9% (22) of the officers who had worked for less than 5 years did not use FS at all times, while 52.2% (36) of officers with 6 to 10 years experience always used FS. In addition, the majority (50.9%) of officers who had worked for 6 to 10 years in a specific forensic department used FS at all times. Although not significant ($p = .064$), the number of years of service positively correlated with the adoption of FS in investigations. Finally, 44.2 % (23) of the gazetted officers (police inspectors and above) and 41.6% (37) of non-gazetted officers did not use FS regularly; however, this difference was not significant. More than half (57.1%) of Kenya Defense Forces officers working at the DCI used FS at all times, while the only (46.2%) of DCI officers from other service formations use FS at all times in crime investigation; however, this difference was significant.

## Influence of Demographic Characteristics on the Adoption of FS

The summary logistic regression model containing composite police demographic variables revealed a significant ($X^2(116) = 43.290$, $p < .05$) relationship between police demographic factors and the adoption of FS in crime investigation. The summary model correctly classified 76.71% of the cases, with Nagelkerke $R^2 = .345$ and McFadden $R^2 = .218$. A pseudo $R^2$ in the range of .2 to .4 indicates a good model fit. The regression model suggest that the null hypothesis was rejected with a $p$ value of .877. This means that the composite police demographic characteristics did not predict the outcome variable (adoption of FS) as shown in Table 2.

However, Table 3 shows different variations in results of the logistic regression analysis of the decomposed police demographic variables in the adoption of FS. The results show a significant association between gender and FS adoption. Female officers (OR: 0.3531; 95% CI [0.1, 1.3]) were less likely to adopt FS compared to male officers, but the association was borderline significant ($p = .058$). There exists a relationship between education and the prediction of FS adoption. Police officers with lower levels of education (KCSE certificate only) were less likely to adopt FS than officers with a bachelor's degree (OR: 2.3479; 95% CI [0.5, 10.7]), however, this finding was not statistically significant ($p = .27$).

**Table 1.** Bivariate Analysis of Police Demographic Characteristics and the Adoption of FS.

| Variable Demographic | Category | Descriptive Frequency (%) | Adoption of FS | | Chi Sq ($X^2$) Value | Two-tailed Sig ($p$) |
|---|---|---|---|---|---|---|
| | | | No (%) | Yes (%) | | |
| Gender | Male | 115 (78.8) | 64 (57.7) | 51 (44.3) | 0.785 | .376 |
| | Female | 31 (21.2) | 20 (64.5) | 11 (35.5) | | |
| Level of education | Certificate (KCSE) | 26 (17.8) | 21 (80.8) | 5 (19.2) | 11.355 | .023 |
| | Diploma | 39 (26.7) | 25 (64.1) | 14 (35.9) | | |
| | Bachelor | 71 (48.6) | 33 (46.5) | 38 (53.5) | | |
| | Masters | 9 (6.2) | 5 (55.6) | 4 (44.4) | | |
| | Doctorate | 1 (0.7) | | 1 (100) | | |
| Level of education before service | Certificate (KCSE) | 79 (54.1) | 56 (70.9) | 23 (29.1) | 13.733 | .001 |
| | Diploma | 26 (17.8) | 13 (50) | 13 (50) | | |
| | Bachelor | 41 (28.1) | 15 (36.6) | 26 (63.4) | | |
| YoSDCI | Less than 5 years | 29 (19.9) | 22 (75.9) | 7 (24.1) | 10.41 | .064 |
| | 6–10 years | 69 (47.3) | 33 (47.8) | 36 (52.2) | | |
| | 11–15 years | 20 (13.7) | 10 (50) | 10 (50) | | |
| | 16–20 years | 15 (10.3) | 9 (60) | 6 (40) | | |
| | 21–25 years | 4 (2.7) | 4 (100) | | | |
| | 26 years and above | 9 (6.2) | 6 (66.7) | 3 (33.3) | | |
| YoSCS | Less than 5 years | 73 (50) | 47 (64.4) | 26 (35.6) | 3.832 | .429 |
| | 6–10 years | 53 (36.3) | 26 (49.1) | 27 (50.9) | | |
| | 11–15 years | 12 (8.2) | 6 (50) | 6 (50) | | |
| | 16–20 years | 4 (2.7) | 2 (50) | 2 (50) | | |
| | 21–25 years | 4 (2.7) | 3 (75) | 1 (25) | | |
| Police ranks | Senior assistant inspector general | 1 (0.7) | | 1 (100) | 7.486 | .679 |
| | Senior superintendent of police | 2 (1.4) | 2 (100) | | | |
| | Superintendent of police | 2 (1.4) | | 2 (100) | | |
| | Assistant superintendent of police | 1 (0.7) | | 1 (100) | | |
| | Chief inspector | 19 (13) | 12 (63.2) | 7 (36.8) | | |
| | Police inspector | 27 (18.5) | 15 (55.6) | 12 (44.6) | | |
| | Senior sergeant | 2 (1.4) | 1 (50) | 1 (50) | | |
| | Police sergeant | 15 (10.3) | 9 (60) | 6 (40) | | |
| | Police corporal | 22 (15.1) | 12 (54.5) | 10 (45.5) | | |
| | Police constable | 50 (34.2) | 30 (60) | 20 (40) | | |
| | Not applicable | 5 (3.4) | 3 (60) | 2 (40) | | |
| Service formation | Kenya National Police Service | 126 (86.3) | 74 (58.7) | 52 (41.3) | 7.486 | .679 |
| | Kenya Defense Forces | 7 (4.8) | 3 (42.9) | 4 (57.1) | | |
| | Any other | 13 (8.9) | 7 (53.8) | 6 (46.2) | | |
| Dichotomized variables | | | | | | |
| Favorite subject in school | Non-science | 45 (30.8) | 31 (68.9) | 14 (31.1) | 3.433 | .064 |
| | Science | 101 (62.9) | 53 (52.5) | 48 (47.5) | | |
| Police ranks | Gazetted officer | 52 (35.6) | 29 (55.8) | 23 (44.2) | 0.108 | .948 |
| | Non-Gazetted officer | 89 (61) | 52 (58.4) | 37 (41.6) | | |
| | Others | 5 (3.4) | 3 (60) | 2 (40) | | |

*Source.* Dennis Miano (2022).
*Note.* ($n$ = 146). YoSDCI = years of service at the DCI; YoSCS = years of service at the current service.

**Table 2.** Regression for Demographic Characteristic and the Adoption of FS.

| Description | *B* | Wald | Sig. | Exp (B) | 95% C.I. for EXP (*B*) | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Demographic composite | −0.345 | 0.024 | 0.877 | 0.708 | 0.009 | 56.596 |
| Constant | −0.257 | 0.557 | 0.456 | 0.773 | | |

**Table 3.** Logistic Regression of Police Demographics Characteristics in Predicting the Adoption of *FS* ($n = 146$).

| Description | Odds ratio | *p* | 95% CI | |
|---|---|---|---|---|
| | | | Lower bound | Upper bound |
| (Intercept) | 1.53E + 06 | .9971 | 0 | ∞ |
| Gender (female) | 0.3531 | .0581 | 0.1203 | 1.0366 |
| Level of education (diploma) | 1.1003 | .9082 | 0.217 | 5.5784 |
| Level of education (bachelor) | 2.3479 | .271 | 0.5137 | 10.7322 |
| Level of education (masters) | 2.1172 | .5082 | 0.2295 | 19.5341 |
| Level of education (doctorate) | 2.65E + 07 | .9966 | 0 | ∞ |
| Level of education before service (diploma) | 3.4807 | .0646 | 0.9274 | 13.0637 |
| Level of education before service (bachelor) | 6.5594 | .0079 | 1.6375 | 26.2751 |
| Subject (science subjects) | 1.124 | .8168 | 0.418 | 3.0228 |
| YoSDCI (6–10 years) | 4.2376 | .0273 | 1.1752 | 15.2797 |
| YoSDCI (11–15 years) | 3.4847 | .1634 | 0.6022 | 20.1641 |
| YoSDCI (16–20 years) | 6.9671 | .0454 | 1.0402 | 46.664 |
| YoSDCI (21–25 years) | 2.1461e−7 | .9925 | 0 | ∞ |
| YoSDCI (26 years and above) | 3.3961 | .3219 | 0.3023 | 38.1578 |
| YoSCS (6–10 years) | 1.0732 | .8924 | 0.3854 | 2.9888 |
| YoSCS (11–15 years) | 1.5895 | .6478 | 0.2177 | 11.6066 |
| YoSCS (16–20 years) | 0.5758 | .6859 | 0.0397 | 8.355 |
| YoSCS (21–25 years) | 5.5458 | .369 | 0.1321 | 232.8121 |
| Ranks (Senior superintendent of police) | 2.8821e−16 | .9937 | 0 | ∞ |
| Ranks (Superintendent of police) | 0.4701 | .9999 | 0 | ∞ |
| Ranks (Assistant superintendent of police) | 0.2899 | .9998 | 0 | ∞ |
| Ranks (Chief inspector) | 1.6861e−8 | .9964 | 0 | ∞ |
| Ranks (Police inspector) | 2.4607e−8 | .9965 | 0 | ∞ |
| Ranks (Senior sergeant) | 5.9450e−8 | .9966 | 0 | ∞ |
| Ranks (Police sergeant) | 3.4690e−8 | .9965 | 0 | ∞ |
| Ranks (Police corporal) | 1.0443e−7 | .9968 | 0 | ∞ |
| Ranks (Police constable) | 5.8912e−8 | .9966 | 0 | ∞ |
| Ranks (Not applicable) | 9.9432e−8 | .9967 | 0 | ∞ |
| Service formation (Kenya defense forces) | 2.5549 | .3716 | 0.3264 | 20.0005 |
| Service formation (Any other) | 0.4743 | .3484 | 0.0997 | 2.2552 |

*Source.* Dennis Miano (2022).

Note. Adoption FS level "Yes" coded as class 1. YoSDCI = years of services at the DCI; YoSCS = years of service at the current station.

However, there was a significant relationship between the level of education before joining the service and the adoption of FS. DCI officers with a degree certificate (OR: 6.5594; 95% CI [1.6, 26.3]; $p < .05$) at the time of joining the service were more likely to adopt FS during crime investigation compared to those who had a KCSE certificate only.

In addition, DCI officers who favored science subjects (OR: 1.124; 95% CI [0.4, 3.0]; $p = .8$) were more likely to adopt FS than those who did not favor science subjects in school, however, this association was not statistically significant. Service experience was found to be significantly associated with the likelihood of FS adoption. Investigation officers who had worked at the DCI (YoSDCI) for 6 to 10 years (OR: 4.2376; 95% CI [1.2, 15.3]; $p < .05$) and 16 to 20 years (OR: 6.9671; 95% CI [1.0, 46.7]; $p < .005$) were more likely to adopt FS than those withless than 5 years of service. These two levels of service experience were statistically significant in predicting FS adoption. Police rank and service formation were not significantly associated with FS adoption.

## Discussion

This study aimed to assess the role of police demographic characteristics in explaining disparities in the adoption of FS in crime investigations, and the findings imply that some police demographic factors affect the usage of forensic science in crime investigation. The diffusion of innovation (DoI) framework, argues that individual social system variables, such as demographic factors, that can cause untolled individualized apprehension about new technology (Rogers, 2003). The framework poses that demographics create a dissonance in the perception and interpretation of new technology from one individual to another based on variances in demographics. On this front, the disparities in the adoption of FS can be traced to the different demographic characteristics among the investigation officers at the DCI.

Foremost, the study established that there is a wide disparity in the adoption of FS at the DCI despite the availability and training on FS. Over half of the DCI officers (57.5%) stated that they do not use FS at all

times during crime investigations consistent with most studies that have reported inconsistent adoption of FS in different criminal justice systems (R. D. Julian et al., 2011; Kipngetich, 2021; Mbaya, 2016; Shako & Kalsi, 2019; Z. Sarki & Mat Saad, 2018). It is important to note this study found that police demographic characteristics differentially influenced the adoption of FS. For example, the level of education and years of experience were found to be statistically significant predictors of FS adoption, in line with those of previous studies (Büchi et al., 2016; Chaudhary & Rangnekar, 2017; Feng et al., 2019; Scheerder et al., 2017; Yawalkar & Sonawane, 2017).

A critical analysis of the decomposed independent variables revealed that the level of education is an important variable in the adoption of FS. Indeed, investigators with a higher level of education (presently or at the time of recruitment) and those that preferred science subjects in secondary school showed a higher chance greater likelihood of adopting FS. These results are consistent with several other studies that found education to be an important predictor variable (Gau & Gaines, 2012; Machando et al., 2019; Rydberg & Terrill, 2010; Z. M. Sarki & Saat, 2021). In addition, the study found that the police officers who favored doing science subjects in high school had higher chance of adoptiong forensic science than those who did not. The findings bring to the fore the need for continuous education, upskilling, and reskilling to reduce disparities and increase uniformity in the adoption of FS consistent with past scholars who argue that investigation officers with higher education were more likely to attend a forensic training (Z. M. Sarki & Saat, 2021). Similarly, Rydberg and Terrill (2010) study found that formal education has significant role among police officers while Lindh (2017) confirmed that education and practical skills are significant variables in all disciplines. These study results reaffirm the importance of education in the adoption of new FS and bring to the fore justification for policy changes in the traditional recruitment process of police at the DCI.

Another fundamental police demographic, service experience, was found to have a strong and positive influence on the decision to adopt FS. The results show that police officers with mid-level experience are more likely to adopt FS than older or inexperienced officers. Although some studies do not find experience important (J. E. Obasi, 2019; Paoline & Terrill, 2007) the findings in this study suggests that police experience is important in the adoption of forensic science in line with Z. M. Sarki and Saat (2021) who found that attending forensic training was influenced by the number of years a police officer had served in the organization. Similarly, Yeboah-Boateng and Essandoh (2014) in a cross sectional study of 145 Gold Coast police officers established that service tenure, the number of years with the police service was important. These findings highlight the importance of experience at in police work and the adoption of forensic science.

The other demographic variables (gender, service rank, and service formation) did not show statistically significant predictive results. We found that female officers are less likely than male officers to adopt FS, which is inconsistent with most previous studies that did not find evidence of gender-based differences in police work outcomes (Damanpour & Schneider, 2006; Guclu & Can, 2015; Kakar, 2002). There is a need for further analysis to determine the actual impact of gender in the adoption of science and technology, especially considering the societal inequalities that exist among African societies and police work.

We also found that non-gazetted officers (police officers in ranks below police inspector) are less likely (lower odds ratio) to adopt FS than gazetted officers (in the ranks of inspector and above) and other civilian officers working at the DCI. This is in line with past studies that indicate that police ranks create a difference in approach to work, attitude, and perception, which affects performance (Gau & Gaines, 2012; Luceño Moreno et al., 2016; Z. M. Sarki & Saat, 2021). This can be attributed to traditional police work that follows a command-and-control model of governance wherein the higher ranks (gazetted officers) show superiority and experience, while junior officers may be recently recruited and oblivious of the rules and expectations of the system. Finally, KDF officers showed a higher likelihood of adopting FS than NPS officers, indicating that although not significant, service formation has an impact on the variable adoption of FS at DCI. In summary, the study findings only highlight the influence gender, rank, experience and service formation offer in the understanding of the biases underlying the adoption of FS but needs to be validated in future research with probably larger research populations.

## Conclusion

In conclusion, police demographic characteristics predict the likelihood of the adoption of FS in crime investigations. We conclude that the current level of education, level of education before joining the service, and mid-level experience (YoSDCI 6-10 &16-20 years) are significant in predicting FS adoption. This study findings reaffirms the importance of experience and education in reducing disparities and enhancing the adoption of FS. The results offer empirical guide to the design and implementation of effective policies for the recruitment of police officers at the forensic units thereby contributing toward improving criminal justice.

## Limitations of the Study

The study conceptualized forensic science as both a techniques and/or physical equipment of science applied in criminal investigation which may create a vague understanding of the construct. In future research we propose for a need to separate the two constructs to enhance clarity in measuring the dependent variable. Secondly, the study did not use specific type of crime while considering the investigators' intention to apply forensic science, in the future research, there is need to use scenario based cases or one typology of crime while considering intention to adopt forensic science. Further, we view our findings may require a larger study population in police divisions that practice forensics and include additional demographic variables such as age, income, and marital status to provide an improved statistical assessment.

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### Ethical Approval

This study was approved by the National Commission for Science, Technology and Innovation (NACOSTI), Kenya. The research license is 528615. A formal consent form was filled by all the respondents during data collection stage and was attached to the questionnaire for the PhD work.

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### Data Availability

I would like to share my SPSS dataset as show in the two links below.
DOI: 10.6084/m9.figshare.23790474
https://figshare.com/articles/dataset/Untitled_Item/23790474

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