Public Acceptance on the Benefits and Risks of DNA Profile Storage in Forensic DNA Databases: A Lesson from Malaysia

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ABSTRACT
In December 2015, the Forensic DNA Databank of Malaysia (FDDM) was formally established to help in crime prevention and justice. Government activities are boosting public awareness, yet some misconceptions and concerns remain about the collection, storage, and use of Forensic DNA databases. The study's aim is to raise awareness about the benefits and risks of profile storage in forensic DNA data banks. A small number of public informants were selected using the qualitative technique. These included ten public informants and the study employs thematic analysis, and the results are somewhat unexpected. The findings of Focus Group Discussions (FGDs) show that informants' understanding of the benefits and risk of storing DNA profiles in forensic DNA data banks remains low. If the public is unclear and has limited understanding of the benefits and risks involved, it can have an impact on public health in general, and informants continue to blame practitioners in the relevant authorities for a lack of information. It raises the question of how the Malaysian forensic DNA database can be considered sustainable by the public. In recommendations, the government can collaborate with all key government agencies, including the judicial system, the attorney general's office, and the department of chemistry, to raise public acceptance of the benefits and risks of preserving DNA profiles in forensics DNA databanks. Future research is expected to involve additional stakeholders and use a variety of methodological approaches to cover a broader scope.

1. Introduction

DNA databases collect, store, and use the DNA profiles of those who have been found guilty, volunteers, victims, and others who may be the subject of police investigations and are typically subject to local laws (Smith & Bluth, 2016; Divakar, 2017; Faran et al., 2018; Samehsalari & Reddy, 2018). In some countries, the government is attempting to ensure that more criminals are convicted and, if released, are unable to commit the same crimes again by extending their forensic DNA data banks (Zadok et al. 2010, Machado and Prainsack 2012). The more people have DNA profiles in the database, the better the chances of identifying criminals. Some experts have suggested that forensic DNA testing violates civil liberties by storing profiles in a computerized database that can be used to identify criminals. This database is deemed to violate human rights such as freedom, autonomy, privacy, consent transparency, and moral and bodily integrity (Machado & Silva 2019; Weinroth, 2017; Van Camp & Dierickx 2008). Additional risks associated with forensic DNA testing that have been documented in the findings of other studies include racial and social stigma because of disputes and arguments among social and ethnic groups in the forensic DNA data bank, which emphasize the importance of religion and belief (Chow-White, 2011; Skinner, 2013). A few issues include the transparency with which DNA data is used, the possibility of false positive results, the lack of international standardization for DNA analysis, the lack of ethical oversight of the information flow through the legal system, and the possibility of data protection laws being violated (Tomm, 2018; Machado, 2018; Amankwaa, 2019; McCartney, 2014). Previous research has linked a lack of knowledge and education with young people (Tomm, 2018; Machado, 2018). The benefits and risks of storing DNA profiles in the Malaysian Forensic DNA Data Bank have yet to be thoroughly investigated in Malaysia (Hakim et al., 2019; Munir & Yong, 2008). Furthermore, information on the presence and use of DNA profile storage in the Malaysian Forensic DNA database is currently lacking. This is because FDDM is a relatively new idea, and there have been no media platforms or actions to generate awareness about it (Rahman et al., 2021). Despite efforts by the government and affiliated groups to raise public awareness of the database, most Malaysians, even enforcement officials, are unfamiliar with FDDM (Rahman et al., 2021). There is a need for more public education and comprehension, especially given concerns about privacy and civil rights. By ensuring the system's long-term viability and the public's trust, the government and relevant agencies must

maintain contact and address the problems. There is a research gap about the benefits and risks of storing profiles in FDDM, as evidenced by the government's efforts to educate the public. The lack of understanding about the benefits and risks is related to low-income, underprivileged families that do not have adequate access to life (Guerrini, Robinson, Petersen, & McGuire, 2018; Murphy, 2018; Genomics, 2019). In future research, particularly public acceptance, and intergovernmental perspectives on forensic DNA data banks has a better model for describing a robust governance in Malaysian Forensic DNA data banks that is morally sound, open, and effective.

2. Literature Review

Schroeder (2007), Briody (2004), Dunsmuir et al. (2008), and Tully (1998) conducted comprehensive assessments of various field studies that explored the efficacy of DNA testing in criminal investigations. Although these studies offer empirical evidence of the usefulness and application of DNA technology for criminal investigations, researchers have highlighted limitations such as sample selection bias and generalization errors. Teodorovi, Mijovi, Radovanovi, and Savi (2017) identified ineffective monitoring and efficiency as the main factor contributing to concerns about forensic analysis related to DNA. Tozzo, Fassina, and Caenazzo (2017) suggested that every laboratory should undergo routine "Blind Tests" or unexpected expert inspections to validate the accuracy of their results. The public rarely has access to forensic DNA data banks, which means that professionals often lack the necessary knowledge and expertise to work with them. Additionally, individuals not involved in the project are usually unaware of the existence of DNA data banks (Machado & Santos, 2011; Teodorovi, Mijovi, Radovanovi & Savi, 2017; Machado & Silva, 2014; Machado & Silva 2016). Several studies have demonstrated the strong relationship between socioeconomic factors and the general public's lack of awareness about criminal DNA databases, particularly in terms of public opinion on the benefits and drawbacks of these databases (Tozzo, Fassina & Caenazzo, 2017; Guerrini, Robinson, Petersen & McGuire, 2018).

Previous research has extensively explored the debates surrounding the collection, storage, and consent for DNA samples (Weinroth, 2018; Williams & Johnson, 2004; Guerrini, Robinson, Petersen & McGuire, 2018; Anderson, Stackhouse, Shaw & Iredale, 2010). In addition, older people approach the pros and cons of utilizing DNA profiles, which contain genetic information for purposes other than criminal inquiries, with more caution and are more optimistic about the value of maintaining forensic DNA databases (Curtis, 2014). Nonetheless, certain findings by Machado & Silva, 2014; Curtis, 2014; Curtis, 2009) and Williams, Johnson & Martin, 2004) indicate that the public's opinion of DNA analysis in criminal cases is dependent of age. Gender, socioeconomic status, and community awareness of DNA databases have been associated in multiple studies. The relationships remain valid even after adjusting for age and level of education (Anderson, Stackhouse, Shaw, & Iredale, 2010; Zieger & Utz, 2015; Machado, Santos & Silva, 2011). Individuals with higher levels of education were found to be less inclined to believe that criminal DNA databases could enhance progress and promote fair and justice (Nwawuba et al., 2022 and Weinroth, 2018). Research also indicates that professionals in law enforcement, such as police officers, attorneys, and forensics experts, have greater knowledge with the topic and are aware of the existence of a national DNA database (Zieger & Utz, 2015). Furthermore, legal experts expressed more support for using a global DNA database to combat crime without infringing on individuals' privacy compared to endorsing the construction of the database without public authorization. The research conducted by Maciado & Silva (2014), Machado & Silva (2015), and Guerrini et al. (2018) indicates a strong relationship between employment and the public perception of DNA forensic analysis in the context of crime. Out of ten studies exploring the relationship between gender and public awareness of forensic DNA databanks (Machado & Silva, 2014; Teodorovi, Mijovi, Radovanovi & Savi, 2017; Dundes, 2001; Gamero et al., 2007; Gamero et al., 2008; Curtis, 2009; Curtis, 2014), seven found no correlation. However, three studies consistently show that women are more supportive of forensic DNA testing (Curtis, 2014).

3. Materials and Method

The study used a qualitative methodology, utilising Focus Group Discussions (FGDs) to conduct interviews with ten informants and thematic analysis for in-depth analysis. Interviews were conducted with selected informants in Selangor and Kuala Lumpur. Thematic analysis is used to examine qualitative data from surveys, focus groups, interviews, visual aids, field research, observation, action research, and secondary sources can help the researcher to get richness of data (Coffey, Atkinson, & Paul, 1996; Clarke & Braun, 2016).

4. Findings

The purpose of this study is to determine the level of awareness and comprehension of the benefits and risks of profile storage in Malaysian forensic DNA data banks. The study's findings show that there is still a lack of public knowledge and understanding, with some informants unaware of the existence and function of DNA forensic data banks in Malaysia. This study is the first FGD in the data collection process, with ten respondents drawn from the general population. The informants are separated into two groups: Group A consists of 5 informants aged 18 to 40 years, while Group B consists of 5 informants aged 41 and above. This First FGD has ten informants: five (50%) men and five (50%) women, as well as five (50%) singles and five (50%) unmarried. Fifteen percent are between the ages of 18 and 40, with an additional five falling between the ages of 41 and 65. Six persons (about 60%) are Malay, followed by two Chinese (20%) and two Indians (20%). Of the civil servants interviewed, 5 (50%), 4 (40%), and 1 (10%) are unemployed. Two percent of the informants earn less than RM1500, three percent between RM15001 and RM3000, three percent between RM3001 and RM5000, and two percent over RM5001. Eight (80%) of the informants are Muslims, followed by Chinese, one (10%) Buddhist, and one (10%) Hindu.

The results of this first FGD study were based on two small groups: Group A represented young people and Group B represented adults. The researcher separated the public into five groups, Group A and Group B, to determine how people of various ages felt about the benefits and risks of having their profiles saved in the Malaysian forensic DNA data bank database. The findings of the First FGD study are significant because they supplement the researcher's conclusions with data from informant interviews with law enforcement and other related disciplines. Interviews with enforcement practitioners revealed that there is still a shortage of information and a low level of awareness. Most respondents agreed, claiming that they were ignorant of Malaysia's forensic DNA data bank. There appears to be no public awareness of the existence or purpose of Malaysia's forensic DNA data bank. Most informants simply stated that the RMP controls the identification procedure, or any crimes committed on the premises; they were unaware of any involvement with other parties. The study's findings show that Group A, which consists of young individuals, is uninformed of the forensic DNA data bank's existence, and does not appear to care. Group A members also lack fundamental understanding regarding the benefits and risks of storing DNA profiles in a database. The responses of adults in Group B who are aware of the forensic DNA data bank's existence, the community it serves, and its role in the community. The answer from Group A can be seen clearly as below:

" The DNA of people involved in any crime must be taken as evidence near the body, right...I think so...I don't know if there is a DNA data bank in Malaysia, like CSI? Why don't I know? My mom and dad also watch CSI, and thought that there is nothing like that in Malaysia..."

(Informant A)

"I know what DNA is by watching movies or western TV dramas... there is no official announcement from our government, I have never even heard about the forensic DNA database, I always only look at the written of forensic clothes when near a crime scene, there is no written in the data bank DNA... How do I know the existence of the DNA databank? Is there any government information for us? I remember RMP managing everything, or am I wrong?"

(Informant B)

"DNA is taken close to our body, right...is there a DNA data bank in Malaysia like in other countries? If so, why don't I know? So far, I have never seen it on TV or anywhere, the government should tell us if it exists, then we will know what the benefits or risks are, we are only ok if there is new information to know, then we can answer if people ask, the existence of banks has been around for a long time… The data is yes, but why don't I know, even though I'm actively reading news or info on TV."

(Informant C)

"I also watched the drama, just watched CSI and I know how forensics goes into DNA data, there is no official information from the government as far as I know, but in Malaysia it doesn't even exist, like there is no information… I might be wrong, but seriously it's not know it exists, then how do you know the benefits or risks are there, right?"

(Informant D)

"I know about DNA through movies and dramas outside Malaysia... No, until now I have not received any information about it, I think only developed countries like USA or UK have this data. Forensic DNA bank, seriously, I was a bit surprised when it was said that it has been established in Malaysia for more than 10 years, the government needs to spread that information more to the people."

(Informant E)

Statements from Group A, however, are contrary to Group B, which consists of adults aged 41 years and above who express some basic knowledge about the benefits and risks of storing DNA data in forensic DNA data banks in Malaysia. It is clearly seen through the statements below:

"I know a little bit about DNA, because my son also works in the Chemistry Department, but I still don't know much... what I know, the RMP forensics department and the Chemistry Department are indeed involved when there is a criminal case... Forensic data only has a database , there is not much information I think, the government should publicize so that the public knows what DNA is, what are its benefits and risks, only when the level of awareness and knowledge is there... then can I give my opinion... as a public plus a parent, I think it's good for a forensic DNA data bank, it is easy for us to detect criminal cases... but it needs to be announced prudently by the government... even now the people are happy to have information just at their fingertips is there any publicity given?"

(Informant A)

"I think the government does not give information officially, if you watch a drama or movie on TV, there is a lot of DNA information, I read recently that I had to google to know how criminal cases in Malaysia can happen. I just found out that there is a DNA forensic data bank. It has been established for a long time and is advanced. The government must disclose this good thing. Let everyone know about the benefits and risks. Don't blame the young boys for negative comments. At least the information has arrived. To me, it was good to have a forensic DNA data bank in Malaysia, dealing with crime through forensic should be easy but why the government or RMP do not publicize its existence."

(Informant B)

"I know very little about DNA...but only a little about our body tissues that the RMP takes when criminal cases occur, but I did not know that there is a forensic DNA data bank in Malaysia, it has existed for a long time but there is no publicity things good for the community, I think everyone can accept it, there may be critics, but now it is advanced and modern, the mentality of the community can accept good things, but there is a lack of information for the people, it seems that the majority of people know through TV, but the knowledge is very minimal, therefore I feel like it's unfair to give my opinion. But you asked my opinion, for me this forensic data bank is good there are good and bad things are normal in one system therefore the government needs to announce that…"

(Informant C)

"To me, I say frankly, very minimal information from the government, but if there is a bank data for DNA forensics in Malaysia, it is good for us, it is good to solve crimes quickly, we are safer in our community, but it is very sad that the information not given, I have some information about DNA forensics, but all from TV and social media, not from government channels, so for those who don't know the platform, how can they know about the benefits and risks of DNA databases? Whether we know a little or a lot depends on how the government does it."

(Informant D)

"I know about DNA from my children, not much information from the government, but a good effort if the government has a data bank for forensic DNA... the government can help, there are many benefits for the people, but there are definitely risks if information and hype are good, there are also risks and the people can understand… Always watch Malay dramas, there are not many forensic stories in Malaysia maybe there are dramas like CSI that can interest young people and can benefit from this DNA data.... the government must work on the best platform so that RMP and related agencies go into the field I know only RMP, but it seemed don't have enough information, everyone thought that RMP is in charge, I think there are many more agencies so please give more info so that we can give our response accordingly".

(Informant E)

The goal of raising awareness about the benefits and risks of preserving DNA profiles in forensic DNA data banks in Malaysia has been clearly achieved, as indicated by the statements from the First FGDs. All findings show that the public may be underinformed on the uses of DNA and the availability of forensic DNA data banks, resulting in a limited knowledge. If the government wants good feedback on a policy, it needs to publicize it more regularly. This study's findings are consistent with Machado (2014) and Machado and Silva (2016), who discovered that the public knows little about DNA and the presence of forensic DNA data banks, even in develop countries such as the United States and the United Kingdom. This finding is also in line with System Theory, which states that the success of a country's system is determined by attempts to communicate information to the public (Cao, 2017). The lack of knowledge will cause the public to wonder, resulting in the weakness and failure of the policy under consideration. The people's well-being and harmony will suffer because of their lack of understanding about the existence of a forensic DNA data bank in Malaysia.

5. Discussions and Conclusion

The first conclusion that can be drawn is that the First FGD group of informants representing the public has a limited awareness of the benefits and risks of preserving DNA profiles in Malaysia's forensic DNA data bank. Group A, which represents young individuals, has the lowest level of knowledge when compared to Group B, which consists of adult informants. Most young people aged 18 to 40 responded negatively, but those aged 41 and above responded rationally despite having low or moderate retention. All informants in the public agreed that the government's attempts to educate and publish relevant information were insufficient and the second group of informants from RMP which includes of legal and enforcement professionals, likewise, concurred with the findings.

5.1 Implications for national security policy and the criminal justice system

When there is a lack of public support for the benefits and risks of storing DNA profiles in forensic DNA data banks, individuals will either accept or reject the system. Lack of knowledge and exposure will result in a negative rather than positive reaction, such as widespread rejection. The public will decline to volunteer to donate DNA to a forensic DNA bank. If not addressed, this situation will worsen. It will have an influence on the government's attempts to combat crime by utilizing DNA identification technology contained in the forensic DNA database. As a result, the government must step up its efforts to provide frequent exposure and information to the public. The government's failure to raise public knowledge of the benefits and risks of keeping DNA profiles in forensic DNA data banks has substantial consequences for the criminal justice system. The government must use digital technology to ease information access as an effective tool for educating and raising public awareness about the significance of forensic data banks in society and the country. One of the primary goals is by using 3D (3D) technology in crime scene to enhance scientific investigation and increase service skills and efficiency through courses and training both in the country and abroad. In addition, the Forensic Digital Unit should be authorized to act as the principal investigator in cybercrime cases due these cases slightly increased nowadays. Thus, RMP's mission is to develop a Cyber Sexual Forensic Laboratory in Bukit Aman, as well as 14 Satellite Digital Forensics seemed relevance by it means (RMP, 2021).

5.2 Implications for the Image of Law enforcement

RMP is a law enforcement agency entrusted with keeping the public safe and improving the justice system. As a result, RMP's efforts to reduce crime rates through D10 and D13 among the top in Malaysian forensics. However, if public awareness remains low, and there is insufficient information regarding the benefits and risks of maintaining DNA profiles in the forensic DNA data bank, the RMP's reputation and responsibilities will affect the image. The forensics department and FDMM do an excellent job at the crime scene, but if public understanding and knowledge remains low, the possibility of negative criticism and rejection outweighs positive acceptance. The lack of exposure and information will eventually lead to a skeptical attitude among the community. In this context, the RMP and Chemistry Department might collaborate to increase public awareness of the benefits and risks of storing DNA profiles in forensic DNA data banks. The agencies must go into the field to educate and provide individuals with the essential knowledge.

The RMP should do on a regular basis, especially when it comes to the importance of forensic DNA data banks in lowering criminal cases and enhancing the social justice system. Effective dissemination to the community is considered as needing the cooperation of all parties, with the RMP working from the ground up to ensure that

the information provided is consistent and clear to all parties. RMP can start engaging with the public sector at the federal and state levels by presenting a series of briefings to civil officials across Malaysia on the importance of forensic DNA data banks for community well-being. With these efforts, civil servants will be able to inform their families about the advantages and disadvantages of preserving DNA profiles in forensic DNA data banks. RMP, in collaboration with the Chemistry Department, can also plan a "road show" with Non-Governmental Organizations (NGOs) to raise community awareness. RMP's interaction with community leaders is also seen as a collaborative effort with the Ministries of Housing and Local Government Development, Rural Affairs, and Family, Women, and Community Development. NGOs are considered as crucial in alerting the community about the benefits and risks of storing DNA profiles in forensic DNA databases. It is because the community is concerned that contributing DNA will jeopardize people's rights and liberties.

There are some limitations to this study's results regarding the benefits and risks of storing DNA profiles in Malaysia's forensic DNA data bank. The first limitation of the study is that the researcher obtains data in the field primarily using a qualitative approach. This strategy is limited and incomplete, as it does not use quantitative tools such as surveys to gather more thorough input. As a result, qualitative data gained through interview methods cannot be generalize by quantitative evidence, and so may not correctly reflect the conclusions of extensive research. The second constraint is that the study was conducted in Shah Alam and Kuala Lumpur, with just ten public informants. The sample size in this study is limited, and the study's findings are primarily based on the opinions of the people in Kuala Lumpur and Shah Alam, Selangor. As a result, the study's findings cannot be generalized to the public's perceptions of the benefits and risks of preserving DNA profiles in other parts of Malaysia. Based on the study's limitations, the researchers would like to make some recommendations for future study, considering the methodology, total sample size, and diversity of variables. Future research on the benefits and risks of preserving DNA profiles in forensic DNA data banks is anticipated to be more comprehensive, utilizing mixed mode methodologies that combine quantitative and qualitative approaches to generate in-depth research results. It is hoped that in the future, the study's scope would be expanded to encompass a larger sample size and a wider study area. The types and categories of the public can also be extended to widen the scope of future studies, allowing the study's conclusions to be applied to a broader range of people. Similarly, practitioners' informants can be separated into two groups: informants who work in allied areas such as hospitals, and practitioners in law enforcement and health sciences.

In conclusion, this study achieved its goal of public acceptance of the benefits and risks of storing DNA profiles in Malaysia's forensic DNA data bank. According to the informants, the community's level of remains low. The study's interview data show that most informants in the First FGD, who were young individuals, expressed their opinions loudly. Adults, on the other hand, are thought to be more sensible and mature in their evaluation of the benefits and risks. The study's findings clearly show a lack of understanding, necessitating collaboration by all parties concerned. The researchers made a few recommendations for a comprehensive improvement effort in collaboration with the RMP, the Department of Chemistry, and the relevant ministries and agencies to ensure that information and publicity reach the grassroots, and social media channels are ideal for disseminating announcements to all levels of society. To ensure that Malaysian youth are literate in forensic science, forensic DNA education should be implemented from the start of school. The creation of a Syariah Forensic Laboratory is perceived as boosting public confidence in government efforts to assist the Muslim community in accepting the advantages and risks of storing DNA profiles in forensic DNA data banks with an open heart and confidence.

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