

Public Perspectives on Risks and Benefits of Forensic DNA Databases: An Approach to the Influence of Professional Group, Education, and Age

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Abstract

There is scarce knowledge about the influence of the professional group, education, and age on public perspectives on the risks and benefits of forensic DNA databases. Based on data collected through an online questionnaire applied to 628 individuals in Portugal, this research fills that gap. More than three quarters of the respondents believed that the Portuguese forensic DNA database can help fight crime more efficiently and develop a swifter and more accurate justice, whereas only approximately half thought that it could deter and prevent crime. Lack of security and control over access to data and the future unforeseen misuses of genetic information were the most relevant risks selected by the participants. Health care and life sciences professionals were more likely to agree with all the benefits, as opposed to those working in the field of law enforcement. More educated and older participants disagreed with benefits more often. Concerns with the risks increased with age.

Keywords

forensic DNA databases, public perspectives, risk benefit assessment, science literacy, Portugal

Introduction

Forensic DNA databases have become significant resources for criminal investigation and prosecution activities in criminal justice systems throughout the world. These databases involve the collection, storage, and use of DNA profiles from nominated suspects, convicted offenders, victims, volunteers, and other persons of interest to criminal investigation work for the purpose of comparison with those obtained from crime scene samples used in crime investigations and law enforcement. According to the nongovernmental organization *Forensic Genetics Policy Initiative*, 60 countries currently operate national forensic DNA databases and others are being expanded or established in at least 34 additional countries, although some countries lack reliable figures (Machado & Silva, 2014).

Different views on the benefits and risks of forensic DNA databases circulate within present-day societies. Academic literature in the domain of forensic genetics reports the following benefits of forensic DNA databases: their capacity to serve as a valuable law enforcement tool by helping fight crime more efficiently, their contribution to the prevention of miscarriages of justice, and their ability to deter offenders from further criminal activity, which is, in turn, expected to reduce crime and increase public safety and security (Bieber,

2006; Dror & Hampikian, 2011; Kaye, 2006; Ludwig & Fraser, 2013; Schneider & Martin, 2001).

Literature in the field of sociolegal and social sciences highlights the ethical and social risks of forensic DNA databases (Cho & Sankar, 2004; Chow-White & Duster, 2011; Guillén, Lareu, Pestoni, & Salas, 2000; Levitt, 2007; McCartney, 2012; Nuffield Council on Bioethics, 2007; Van Camp & Dierickx, 2008; Williams & Johnson, 2004, 2005; Williams & Wienroth, 2014a, 2014b) related to potential threats to individual rights and freedoms, such as privacy issues and the presumption of innocence. Other risks reported in the bioethical and sociolegal literature are the greater risk of social stigmatization and racial stereotyping attributed to the overrepresentation of specific social and ethnic groups in the forensic DNA databases (Chow-White & Duster, 2011), concerns that data processing may be associated with individual or group characteristics or criminal behavior and

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therefore lead to discrimination (Kaye, 2006; Nuffield Council on Bioethics, 2007), and mistaken identification and wrongful conviction resulting from erroneous interpretations of the information provided by DNA profiles (Williams & Johnson, 2004).

The existing scarce academic research into public views about forensic DNA databases is mostly based on qualitative studies, including mass media analysis of “CSI-effect,” studies of mock juries, and enquiries into prisoners’ perspectives (Johnson & Williams, 2004; Machado, Santos, & Silva, 2011). A qualitative study conducted in the United Kingdom, involving public consultation activities, suggests that citizens’ views toward forensic DNA databases are complex and heterogeneous, conveying views that can be seen as conflicting, emphasizing, for instance, the value of forensic DNA databases in protecting society from crime while also expressing concerns about improper access to forensic genetic data (Anderson, Stackhouse, Shaw, & Iredale, 2010; Stackhouse, Anderson, Shaw, & Iredale, 2010; Wilson-Kovacs, Wyatt, & Hauskeller, 2012). The existing quantitative studies about public perspectives on forensic DNA databases focus on a variety of topics but do not address opinions on risks and benefits. The following description summarizes the aims and the main results of the existing studies: A survey conducted in Spain with a national representative sample of 1,659 respondents, which revealed the impact of education and professional group in the levels of information regarding the uses of forensic DNA databases and in the opinions about custody and type of DNA profiles to be included (Gamero et al., 2008; Gamero, Romero, Peralta, Carvalho, & Corte-Real, 2007); two surveys administered in New Zealand, one to a random sample of 100 participants (Curtis, 2009) and the other one to a random sample of 394 residents (Curtis, 2014), which showed significant differences in sources of knowledge, understandings of processes, and attitudes toward DNA use across ethnic groups and according to political preferences; and a survey conducted with residents in Maryland (the United States), involving a convenience sample of 418 respondents, which does not provide an analysis according to sociodemographic variables and indicates a wide support for the inclusion of convicted violent offenders in DNA databases and lower support for the inclusion of DNA profiles of those suspected of any crime and all newborns (Dundes, 2001). At present, to the best of our knowledge, there is not any systematic empirical study about the influence of professional group, education, and age on public perspectives on the risks and benefits of forensic DNA databases.

This article aims to contribute to fill that gap, while highlighting the potential relevance of professional categories in the sense of what Williams and Wienroth (2014b) have interpreted as a different type of “informed” public, that is, those who do not necessarily have technical familiarity with DNA technologies, but have several motives of interest toward these technologies. Our sample emphasizes divergent attitudes and

beliefs that may be shaped by different “inside” modes of knowledge and experience, namely where professionals were grouped into the fields of law enforcement and health care and life sciences. Departing from the Portuguese context, similar studies can be replicated in different national settings in order to obtain a more comprehensive and in-depth knowledge in this field.

The National Forensic DNA Database in Portugal

The Portuguese forensic DNA database was formally created under legislation passed in 2008. Some years before the establishment of the national forensic DNA database, in 2005, the Portuguese government announced that it wanted to include the entire population in a forensic DNA database for the purposes of criminal investigation and civil identification (in the latter case, to identify missing persons or disaster victims). However, this plan was abandoned due to concerns about financial costs and human rights raised by the working party of experts who prepared the draft bill submitted to the Portuguese parliament for approval. It is important to note that if this plan had been implemented, Portugal would have been the first country in the world to have a centralized DNA database of its entire population for civil and criminal identification purposes. This initial idea of creating a universal database was then transformed into one of the most restrictive laws in the European Union (EU). Considering the criteria for the inclusion and removal of DNA profiles from forensic databases stated by legislation in 22 EU countries, the restrictive characteristics of the Portuguese legislation are similar to other national jurisdictions, such as Belgium, France, Germany, Hungary, Ireland, Italy, Luxemburg, the Netherlands, Poland, Romania, Spain, and Sweden (Santos, Machado, & Silva, 2013).

Materials and Method

This study is based on an online questionnaire uploaded by the authors onto the research project website, concerning the ethical, social, and political aspects of operating a national forensic DNA database in Portugal. The questionnaire was made available between October 2012 and December 2012. Respondents were invited to participate via the mailing lists of five public universities or research centers situated in different geographical areas of Portugal. The authors also distributed the questionnaire among their own professional and personal networks. This judgment sample relied upon researchers’ knowledge and networks to select useful samples for learning about the influence of the professional group on public perspectives on the risks and benefits of forensic DNA databases. It was not only the most convenient and economical approach, as it was technically and conceptually the most appropriate approach.

A total of 711 questionnaires were completed. The questionnaire comprised six main sets of questions covering the

following areas: (a) information about the national forensic DNA database: sources of knowledge, assessment of information on the DNA database provided by the government and the media, and opinion on how the media should be involved in disseminating information to the public; (b) perception of the benefits and risks of the national forensic DNA database; (c) assessment of the efficiency of DNA technology and the value of DNA evidence in court; (d) opinion on regulation of the forensic DNA database: custody, access, criteria for insertion and deletion of profiles; (e) the individual's willingness to accept the inclusion of his or her own profile in the national forensic DNA database and the reasons for their answer; (f) sociodemographic characteristics.

This article focuses on the results obtained for the topic relating to public perspectives on the benefits and risks of the national forensic DNA database, according to the professional group, education, and age of the participants. The benefits and risks were categorized based on the systematization of literature on these themes presented in the introductory section of this article.

Concerning perceptions of the benefits of the national forensic DNA database, participants were asked to report their level of agreement (categorized as *disagree*, *neither agree nor disagree*, or *agree*) with the following statements: "The forensic DNA database can deter and prevent criminality," "The forensic DNA database can help fight crime more efficiently," and "The forensic DNA database can help develop swifter and more accurate justice."

With regard to their perception of the risks of the national forensic DNA database, participants were asked to select the two most important from the following list of different risks: "lack of security and control over access to the data contained in the national forensic DNA database (i.e., access by nonauthorized parties such as police forces)"; "possibility of extracting data from genetic material for uses other than criminal identification (e.g., retrieving data related to health)"; "conducting potentially discriminatory genetic studies (e.g., studying genetic predisposition to criminality); and "stigmatization of certain social groups (e.g., ethnic minorities) due to their overrepresentation in the forensic DNA database."

A statistical analysis was performed using the Statistical Package for Social Sciences, version 20.0 for *Windows*. All the analyses included the following variables: professional group, level of education and age. The two authors independently classified and grouped occupations in four categories established a posteriori (law enforcement, health and life sciences, research and development, and other professions), and disagreements in classification were resolved by consensus. The "law enforcement" category comprised criminal investigators, public prosecutors, lawyers, judges, and police officers. The "health and life sciences" category comprised biologists, geneticists, nurses, doctors, and pharmacists. The "research and development" category comprised university and higher education teachers, researchers, and students. The

major group "other professions" included mainly professionals and technicians (business, administration, social and cultural operators), nonuniversity and nonhigher education teaching professionals, and service and sales workers. The responses are presented as proportions, compared using the chi-square test or the Fisher's exact test when appropriate. This analysis is based on 628 participants, after excluding those for whom information on age and educational level was missing ($n = 83$). The study protocol relating to the methods for collecting and processing the data and for ensuring anonymity, confidentiality, and privacy was approved by the Foundation for Science and Technology (Portuguese Ministry of Education and Science) and complied with the regulations of the Portuguese Data Protection Authority and the ethical guidelines of the International Sociological Association.

Results

Overall, the mean age of the participants was 32 years (range: 17-82 years). This sample of the Portuguese population is skewed by the level of education (more than 80% of the participants had a university degree, whereas in 2011 only 14.8% of the Portuguese population had completed more than secondary school education). Among those who declared their profession ($n = 458$), 34.9% worked in the field of research and development, 13.8% in law enforcement, 7% in health and life sciences, and 44.3% in other professions.

The participants' perceptions of the benefits of the Portuguese forensic DNA database in terms of its contribution toward deterring and preventing criminality, fighting crime more efficiently, and developing swifter and more accurate justice are summarized in Table 1, Table 2, and Table 3, respectively. More than three quarters believed that the DNA database could help fight crime more efficiently (88.5%) and develop swifter and more accurate justice (78.2%), whereas only around half thought that it could deter and prevent crime (47.9%). It is noteworthy that the proportion of those who neither agreed nor disagreed with the proposed statements on the benefits of forensic DNA database was higher than the percentage of those who disagreed (8.8% vs. 2.7% for efficiency, 15.3% vs. 6.5% for swiftness and accuracy, and 32.5% vs. 19.6% for deterrence and prevention), perhaps expressing some degree of expectation in the potential value of these technologies.

Health and life sciences professionals were more likely to agree with all these benefits, highlighting the potential to fight crime more efficiently, in contrast with those working in the field of law enforcement (who reported lower levels of agreement). Disagreement with the benefits of the national forensic DNA database increased in line with the level of education and tended to be more common among the oldest participants. There was only one significant difference in the perception of the benefits of the national forensic DNA

Table 1. Opinion on the Influence of the Portuguese Forensic DNA Database in Deterring and Preventing Criminality, by Professional Group, Education, and Age (%).

| | The DNA database can deter and prevent criminality | | | Number of respondents | χ^2 | df | p |
|---------------------------------|--|----------------------------|-------|-----------------------|----------|----|------|
| | Disagree | Neither agree nor disagree | Agree | | | | |
| Overall | 19.6 | 32.5 | 47.9 | 628 | | | |
| Age (years) | | | | | 7.2 | 6 | .300 |
| 17-23 | 14.7 | 32.2 | 53.1 | 143 | | | |
| 24-30 | 20.4 | 31.9 | 47.6 | 191 | | | |
| 31-37 | 17.6 | 30.3 | 52.1 | 119 | | | |
| ≥38 | 24.0 | 34.9 | 41.1 | 175 | | | |
| Level of education | | | | | 4.1 | 4 | .398 |
| Below tertiary education | 15.6 | 34.9 | 49.5 | 109 | | | |
| Bachelor's | 18.9 | 35.0 | 46.1 | 280 | | | |
| Master's or PhD | 22.2 | 28.5 | 49.4 | 239 | | | |
| Professional group ^a | | | | | 6.2 | 6 | .396 |
| Law enforcement | 20.6 | 33.3 | 46.0 | 63 | | | |
| Health and life sciences | 9.4 | 37.5 | 53.1 | 32 | | | |
| Research and development | 26.2 | 25.6 | 48.1 | 160 | | | |
| Other | 21.2 | 32.5 | 46.3 | 203 | | | |

Note. df = degrees of freedom.

^aThe total does not add up to 628 due to missing data.

Table 2. Opinion on the Influence of the Portuguese Forensic DNA Database in Fighting Crime Efficiently, by Professional Group, Education, and Age (%).

| | The DNA database can help fight crime more efficiently | | | Number of respondents | Fishers' exact test or χ^2 | df | p |
|---------------------------------|--|----------------------------|-------|-----------------------|---------------------------------|----|------|
| | Disagree | Neither agree nor disagree | Agree | | | | |
| Overall | 2.7 | 8.8 | 88.5 | 628 | | | |
| Age (years) | | | | | 11.3 | — | .800 |
| 17-23 | 0.7 | 12.6 | 86.7 | 143 | | | |
| 24-30 | 2.6 | 7.3 | 90.1 | 191 | | | |
| 31-37 | 0.8 | 8.4 | 90.8 | 119 | | | |
| ≥38 | 5.7 | 7.4 | 86.9 | 175 | | | |
| Level of education | | | | | 5.1 | 4 | .273 |
| Below tertiary education | 0.9 | 11.9 | 87.2 | 109 | | | |
| Bachelor's | 2.1 | 8.2 | 89.6 | 280 | | | |
| Master's or PhD | 4.2 | 7.9 | 87.9 | 239 | | | |
| Professional group ^a | | | | | 10.1 | — | .089 |
| Law enforcement | 7.9 | 9.5 | 82.5 | 63 | | | |
| Health and life sciences | 0.0 | 0.0 | 100 | 32 | | | |
| Research and development | 1.9 | 10.6 | 87.5 | 160 | | | |
| Other | 2.5 | 7.4 | 90.1 | 203 | | | |

Note. df = degrees of freedom.

^aThe total does not add up to 628 due to missing data.

database between groups: More educated respondents were more likely to disagree with the sentence "The DNA database can develop swifter and more accurate justice": $\chi^2(4, N = 628) = 10.7, p = .030$.

For this sample of the Portuguese population, lack of security and control over access to data (72.8%) and the probability of future unforeseen misuses of genetic

information (67.0%) proved to be the most significant risks associated with the functioning of the national forensic DNA database (Table 4). About one third (34.9%) chose the risk of stigmatization of certain social groups due to overrepresentation in the national forensic DNA database and one quarter (25.3%) indicated the risk of conducting potentially discriminatory genetic studies.

Table 3. Opinion on the Influence of the Portuguese Forensic DNA Database in Developing Swifter and More Accurate Justice, by Professional Group, Education, and Age (%).

| | The DNA database can develop swifter and more accurate justice | | | Number of respondents | Fishers' exact test or χ^2 | df | p |
|---------------------------------|--|----------------------------|-------|-----------------------|---------------------------------|----|------|
| | Disagree | Neither agree nor disagree | Agree | | | | |
| Overall | 6.5 | 15.3 | 78.2 | 628 | | | |
| Age (years) | | | | | 7.2 | 6 | .303 |
| 17-23 | 2.1 | 14.7 | 83.2 | 143 | | | |
| 24-30 | 8.4 | 16.2 | 75.4 | 191 | | | |
| 31-37 | 6.7 | 16.8 | 76.5 | 119 | | | |
| ≥ 38 | 8.0 | 13.7 | 78.3 | 175 | | | |
| Level of education | | | | | 10.7 | 4 | .030 |
| Below tertiary education | 2.8 | 15.6 | 81.7 | 109 | | | |
| Bachelor's | 4.6 | 14.6 | 80.7 | 280 | | | |
| Master's or PhD | 10.5 | 15.9 | 73.6 | 239 | | | |
| Professional group ^a | | | | | 5.6 | — | .476 |
| Law enforcement | 11.1 | 14.3 | 74.6 | 63 | | | |
| Health and life sciences | 0.0 | 15.6 | 84.4 | 32 | | | |
| Research and development | 8.1 | 18.1 | 73.8 | 160 | | | |
| Other | 7.4 | 13.3 | 79.3 | 203 | | | |

Note. df = degrees of freedom.

^aThe total does not add to 628 due to missing data.

Table 4. Identification of the Two Most Important Risks Associated With the Operation of the Portuguese Forensic DNA Database, by Professional Group, Education, and Age (%).^a

| | Lack of security and control over access to data | Unforeseen misuses of genetic information | Potentially discriminatory research | Stigmatization of certain social groups | Number of respondents |
|---------------------------------|--|---|-------------------------------------|---|-----------------------|
| Overall | 72.8 | 67.0 | 25.3 | 34.9 | 628 |
| Age (years) | | | | | |
| 17-23 | 62.2 | 58.7 | 31.5 | 47.6 | 143 |
| 24-30 | 79.1 | 61.8 | 27.7 | 31.4 | 191 |
| 31-37 | 76.5 | 74.8 | 16.8 | 31.9 | 119 |
| ≥ 38 | 72.0 | 74.3 | 23.4 | 30.3 | 175 |
| χ^2 | 12.7 | 14.2 | 8.3 | 13.2 | |
| df | 3 | 3 | 3 | 3 | |
| p | .005 | .003 | .039 | .004 | |
| Level of education | | | | | |
| Below tertiary education | 72.5 | 66.1 | 27.5 | 33.9 | 109 |
| Bachelor's | 70.7 | 65.0 | 26.4 | 37.9 | 280 |
| Master's or PhD | 75.3 | 69.9 | 23.0 | 31.8 | 239 |
| χ^2 | 1.4 | 1.4 | 1.1 | 2.1 | |
| df | 2 | 2 | 2 | 2 | |
| p | .501 | .486 | .567 | .344 | |
| Professional group ^b | | | | | |
| Law enforcement | 73.0 | 69.8 | 23.8 | 33.3 | 63 |
| Health and life sciences | 87.5 | 65.6 | 6.2 | 40.6 | 32 |
| Research and development | 76.9 | 73.1 | 20.0 | 30.0 | 160 |
| Other | 71.9 | 67.0 | 25.6 | 35.5 | 203 |
| χ^2 | 4.1 | 1.8 | 6.7 | 1.9 | |
| df | 3 | 3 | 3 | 3 | |
| p | .245 | .611 | .084 | .582 | |

^aPercentage of participants selecting each option. ^bThe total does not add to 628 due to missing data.

Concerns over the risk of possible uses of the genetic material for purposes other than criminal investigation increased with age (from 58.7% for the under-24 age group to 74.3% for the over-38 age group), $\chi^2(3, N = 628) = 14.2, p = .003$, and tended to be more common among professionals working in the field of research and development. Compared with older respondents, the youngest participants were more likely to select the stigmatization of certain social groups and discrimination in genetic studies as risks, while devaluing lack of security and control over access to data contained in the forensic DNA database. The proportion of health and life sciences professionals who cited the possibility of potentially discriminatory studies was quite low (6.2%), in contrast to the relevance attributed to the possible lack of security and control over access to data.

Discussion

The results obtained in this study reveal that the public tends to emphasize the potential benefits of the national forensic DNA database in terms of its contribution toward fighting crime more efficiently and developing swifter and more accurate justice. These results are similar to findings obtained from other surveys of public attitudes to forensic DNA databases conducted in Spain ([Gamero et al., 2007](#); [Gamero et al., 2008](#)), in New Zealand ([Curtis, 2009, 2014](#)), and in the United States ([Dundes, 2001](#)), which showed a strong public belief that forensic DNA databases provide reliable evidence for the criminal justice system and are beneficial to society. Nevertheless, it is likely that populations less exposed to the actual functioning of the criminal justice system can be more vulnerable to the prevalence of media reports about the successes of DNA technology in crime fighting, which are rarely contrasted with the difficulties and contingencies of the practical applications of forensic DNA technology ([Machado & Santos, 2011](#)).

The results also indicate that the participants expressed skepticism with regard to the ability of the national forensic DNA database to contribute toward deterring and preventing criminality. The perception of the limitations of the deterrent effect of a forensic DNA database or its utility as a tool for preventing crime concur with the opinion expressed by prisoners and other different stakeholders (working in forensic genetics, the criminal justice system, and academia) in Portugal ([Machado et al., 2011](#); [Machado, Silva, & Cunha, 2012](#)). The uncertainties of the value of a forensic DNA database for deterring and preventing criminality have also been explored in the literature ([Leary & Pease, 2003](#); [Ludwig & Fraser, 2013](#)) and some authors have noted that the potential deterrent effect and utility of forensic DNA databases must take certain characteristics of criminal behavior into account ([Kazemian, Pease, & Farrington, 2010](#)), together with the “forensic awareness of criminals” (i.e., precautions for avoiding police detection; [Beauregard & Bouchard, 2010](#); [Beauregard & Martineau, 2014](#)).

In this study, participants working in the field of health care and life sciences agreed more frequently that forensic DNA databases contribute to higher efficiency in crime fighting and accuracy in the criminal justice system, in contrast with the tendency toward lower levels of agreement among law enforcement professionals, although such differences are not statistically significant. This may reflect an enhanced sensitivity among law enforcement professionals regarding the contingencies of forensic work, in contrast with the health and life sciences professionals that draw their opinions from a more positive and optimistic view of science and technology in general. Research in public perspectives on science and technology in general has been revealing that high levels of education and concrete knowledge about a specific area are related to both highly positive and highly negative attitudes, suggesting that greater information about science and technology is more of a predictor of the strength of attitudes ([Allum, Sturgis, Tabourazi, & Brunton-Smith, 2008](#); [Gaskell et al., 2010](#)). Although that research does not address the specific case of attitudes in relation to forensic science and technology, the influence of levels of specific knowledge about the applications of forensic genetics in criminal identification might be useful for the interpretation of our data. The element of knowledge as a predictor of the strength of attitudes might explain why the two professional groups of this sample that could have more direct knowledge about the forensic DNA database—participants working in the field of health care and life sciences and law enforcement professionals—are the ones with more opposing views.

The optimistic view (i.e., emphasizing the benefits) of the participants working in health care and life sciences accords with the results obtained from a European survey of citizens' views of biotechnology, which showed that a university degree in science and greater familiarity and engagement with science are associated with greater optimism about the benefits of science and technology ([Gaskell et al., 2010](#)). This result also concurs with the results of a survey carried out in Spain, designed to study public views of forensic DNA databases, in which participants from professions related to health were more aware of the existence and usefulness of genetic fingerprinting in identifying individuals than other professional groups ([Gamero et al., 2008](#)). Qualitative studies conducted with professionals from the field of forensic genetics in the United Kingdom and the United States ([Lynch, Cole, McNally, & Jordan, 2008](#); [Williams & Wienroth, 2014b](#)) also showed that stakeholders working in the criminal justice system and in forensic genetics tend to highlight the forensic uses of DNA as highly beneficial resources for fighting crime and improving justice, whereas the ethical risks are relatively devalued. The skepticism (i.e., the lower level of agreement with regard to benefits) among law enforcement professionals is similar to the results obtained by [Williams and Johnson \(2004\)](#) on the basis of in-depth interviews conducted with human rights groups in the United Kingdom. In this study, human rights groups

expressed concern with several risks associated with excessive or unauthorized use of the DNA contained in large computerized DNA databases, including the emergence of eugenics, giving the police the power to increase levels of surveillance, and using DNA to derive sensitive information about individuals.

In this nonrepresentative sample of the Portuguese population, skepticism about the benefits of the national forensic DNA database increased with the level of education, but there was only one significant difference between groups: More educated individuals were more likely to disagree with the sentence “The DNA database can develop swifter and more accurate justice.” Public engagement activities with young offenders in the United Kingdom also revealed that more information about the national forensic DNA database led to greater awareness of the potential risks of its uses (Anderson et al., 2010; Stackhouse et al., 2010). The lower level of agreement with the benefits of the national forensic DNA database among participants with a higher level of education suggests that the impact of education on perceptions of the benefits and risks of the national forensic DNA database is not straightforward.

Only the age of the participants significantly influenced the perception of risks in this study, with the youngest more often selecting potential stigmatization and discrimination than the older respondents. This finding is similar to the results obtained by Stackhouse et al. (2010), in which it was observed that younger people are more concerned about discrimination and the ethnic bias produced by national forensic DNA databases and less worried about access and use of the genetic information they contain for purposes other than criminal investigation. This study also suggested that older generations are the most concerned with possible illegal uses of forensic genetic data by insurance companies.

The influence of professional groups was observed in the assessment of risks of forensic DNA databases, although not statistically significant. Health and life sciences professionals emphasized the possible lack of security and control over access to data and expressed little concern for the potential discrimination resulting from research into genetics. This emphasis on the risks connected to legal regulation and control, as opposed to the undervaluing of potential risks associated with scientific research, suggests the production of a hierarchy of risks based in the development of symbolic boundaries between the work and the responsibilities of scientists and of law authorities (Gieryn, 1983).

Despite the innovative and hypothesis-generating nature of the present study, certain limitations need to be addressed. The questionnaire was applied to a nonrepresentative sample of the Portuguese population, thus it lacks the generalizability of a random sample. In addition, the low mean age and heavily skewed level of education may affect the results. In addition, the generalization of these results to other national jurisdictions is limited and needs to be tested empirically. However, the study may

indicate the general tendencies of public perspectives in Portugal related to social groups with higher levels of education.

Conclusion

This study contributes toward understanding the influence of professional group, education, and age in public perspectives on forensic DNA databases, specifically in terms of the perception of risks and benefits, in an area in which there is still very little empirical knowledge.

The influence of professional group, level of education, and age on the evaluation of the benefits and risks of forensic DNA databases is complex, drawing attention to the need to include other variables in the analysis of this topic, such as the views on the criminal justice system and concerns about victimization or excessive police activity (Jang, Joo, & Zhao, 2010; Machado et al., 2011), and the impact of ethnic group and political preferences (Gamero et al., 2008). In particular, this study shows that the impact of level of education needs to be addressed in future research. Previous studies about public perspectives on science and technology in general have shown a small but consistent positive correlation between various science literacy measures and support for science and technology; and that professional socialization and academic background influence perceptions of the risks related with science and technology (Allum et al., 2008; Gaskell et al., 2010). However, further research is needed to gain knowledge about the influence of scientific literacy, professional socialization, and academic background in the specific case of public perspectives on forensic science and DNA technologies. This study produced evidence that belonging to a professional group whose activity is close to the area of genetics has an effect on the perceptions of the benefits and risks of forensic DNA databases. Overall, the participants in this study belonging to the health and life sciences professional group tend to be more optimistic about the benefits of the national forensic DNA database than other professional groups. The fact that professionals with a health care and/or science background tend to agree more often that national forensic DNA database contributes toward efficiency in crime fighting and accuracy in the criminal justice system, as opposed to the lower levels of agreement among law enforcement professionals, is worthy of further exploration in future research orientated to understand cross-national similarities and differences.

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