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STUDYING ETHICAL CONTROVERSIES AROUND GENETIC SURVEILLANCE TECHNOLOGIES: A COMPARATIVE APPROACH TO THE CASES OF PORTUGAL AND THE UK

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Resumo

A partir das tecnologias genéticas de vigilância utilizadas para combater o crime, queremos explorar as preocupações éticas que constituem desafios para uma governação responsável destas mesmas inovações tecnológicas. A governação responsável enfrenta o desafio do equilíbrio entre os potenciais riscos e benefícios da vigilância – que são concebidos em cada país de forma diferente relativamente aos seus efeitos de (des)capacitação.

O presente texto apoia-se nas controvérsias que têm acompanhado o surgimento e expansão de tecnologias forenses de vigilância genética em dois países: Portugal e o Reino Unido. Apesar de surgir caracterizado como um país de “sociedade de vigilância máxima”, o Reino Unido tem sido palco de uma ampla controvérsia pública e contestações relativamente a estas tecnologias. Em Portugal a retórica política enfatizou a melhoria da eficácia do sistema de justiça e o estabelecimento da base de dados de ADN nacional foi acompanhado por uma aceitação pública silenciosa, companheira sintomática do sistema de vigilância português.

Através do conceito de Jasanoff, ‘epistemologias cívicas’, analisamos de que forma é que as bases de dados genéticos forenses criadas e desenvolvidas em Portugal e no Reino Unido, com o objetivo de vigiar e controlar populações criminais, se relacionam com diferentes formas de conhecimento público. Por fim, o texto termina com um conjunto de sugestões sobre como repensar a governação democrática e responsável das tecnologias genéticas forenses.

Abstract

By focusing on genetic surveillance technologies used to fight crime, we want to explore ethical concerns that bring challenges to a responsible governance of these technological innovations. Responsible governance faces the challenge of balancing between potential risks and benefits of surveillance – which are conceived differently in each country with regards to their empowering and disempowering effects.

We draw on controversies which have accompanied the emergence and expansion of forensic genetic surveillance technologies in two different countries: Portugal and the UK. While UK has been characterized as the “maximum surveillance society” it also has generally experienced broad public controversy on contested technologies. In Portugal the political rhetoric emphasized the improvement of the efficacy of the justice system, and the establishment of the national forensic DNA database has been accompanied by silent public acceptance, a symptomatic companion in the Portuguese surveillance system.

Using Jasanoff’s analytical concept of ‘civic epistemologies’ we will analyze how the development and establishment of forensic DNA databases aiming at surveillance and tracking of “criminal populations” in Portugal and in the UK are rooted in different ways of public knowing. Finally, we conclude with suggestions how to rethink democratic and responsible governance of forensic genetics technologies.

Palavras-chave: tecnologias genéticas de vigilância, bases de dados genéticos forenses, geneticistas forenses, controvérsias éticas, epistemologias cívicas

Keywords: genetic surveillance technologies, forensic DNA-databases, forensic geneticists, ethical controversies, civic epistemologies

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1. Introduction

Growing concerns about security and crime control, in particular the threats of terrorism, organized crime and illegal immigration have motivated major investments in surveillance technologies to collect and identify biometric information. One particularly example is “forensic genetic surveillance”, what we understand as the act of carefully watching someone based on his or her genetic body specifics especially in order to detect and reconstruct a crime (Machado & Prainsack, 2012, p. 1; Williams, 2010, p. 134).

The aim of this communication is to explore the ethical and democratic challenges of forensic genetic surveillance technologies in the fight against criminality. We portray the specific situations of Portugal and UK in the area of forensic genetics, namely how they shape certainty or taken-for-granted assumptions about risks, benefits and their implications for understanding ethical and democratic challenges. Using a country and culture sensitive approach, we applied an adapted version of the analytical heuristic of civic epistemologies (Jasanoff, 2005), which was developed to understand different political cultures of public knowing.

Jasanoff explores the term of civic epistemologies to refer to ways and practices of public knowledge that are culturally specific, historically and politically grounded and which are used as a basis for making collective choices (Jasanoff, 2005). Thereby we aimed to specify the current status of forensic genetic surveillance societies and demonstrate the specific situated ethical and democratic perceptions of risk and benefits. Last but not least, we want to stimulate a discussion about implications for responsible governance of forensic genetic surveillance.

We suggest to expand the focus and to integrate the ethical debate in an STS inspired view on the democratic challenges of forensic genetic surveillance. Such an angle opens the perspective to reflect on the knowledge flows which foster forensic genetic surveillance technologies and shape their public acceptance, and expand on questions such as: what are legitimate forms of public knowledge production in forensic genetics, how epistemic authority of knowledge claims is achieved and influences the shape of forensic surveillance technologies in accountable manners, and how such DNA technologies and forensic DNA databases become regulated in democratically responsible ways.

2. Critical discourses in science and technology studies on forensic genetic surveillance

In the last two decades, science and technology studies (STS) have made a considerable contribution to critical thinking about the creation and expansion of forensic DNA databases used to support criminal prosecution and criminal justice. Amongst the various lines of inquiry (Heinemann, Lemke, & Prainsack, 2012), one significant area of controversy involves the legal, ethical and civic issues relating to excessive state control over citizens and potential threats to civil rights. Socio-legal and ethical studies have largely explored the impact on the rights to privacy, liberty, moral and physical integrity, human dignity and the presumption of innocence (Krimsky & Simoncelli, 2012; Lazer, 2004; C. McCartney, 2006; Toom, 2012; Van Camp & Dierickx, 2008), based mainly on a normative approach.

STS research adds to this literature by exploring the flow of knowledge from sites and organizations that contribute to the co-production and co-development of the various discursive practices that reflect the appropriate and legitimate uses of DNA technologies and forensic DNA databases. An STS inspired perspective not only opens the view to acknowledge the complexities, contingencies and ambiguities of forensic genetic surveillance with regards to ethical dimensions of civic rights as this paragraph will show. Furthermore, we argue that STS research can be also taken as an invitation to reconsider the democratic challenges of forensic genetic surveillance by reconsidering the science, technology and society relations.

Ethical controversies about forensic genetics most often relate to individual civic and human rights and link to issues such as privacy, liberty, dignity, the presumption of innocence and the principle of proportionality, e.g. respect for the individuals’ rights and the need, under certain circumstances, to restrict these rights in order to

protect the public interest of the society (Barbara Prainsack & Aronson, 2015; Robin Williams & Johnson, 2004a; Robin Williams & Wienroth, 2014). Thereby the democratic governance of DNA-databases itself becomes a challenge with regards to transparency and public accountability.

From an STS perspective, more recent approaches explore in greater depth the complexity, contingencies and ambiguities of the discussion on the potential threats to civil rights emerging from the uses of forensic DNA databases. Privacy and other civic rights are even more complex if one considers the different categories of individuals – offenders, victims, volunteers, relatives, persons of interest – who might be requested to provide a DNA sample for analysis or are identified through the profiling of someone else's sample during criminal investigation (Williams and Weinroth 2014, 82).

Regarding the transnational exchange of DNA profiles for forensic and police use within the EU, (Prainsack & Toom, 2010) propose the concept of situated dis/empowerment to argue that there is an under-conceptualization of agency (Jasanoff, 2012), leading to an over-emphasis on the oppressive aspects of DNA profiling and surveillance. Traditionally, the empowering effects of forensic DNA databases are focused on their potential to improve efforts to detect crime and identify suspects, which are, in turn, expected to reduce crime and increase public safety and security; while disempowering effects are included as threats to a range of civil rights, such as the right to privacy, liberty, moral and physical integrity, the dignity of persons and the presumption of innocence.

In order to contribute to this range of nuanced perspectives on forensic genetic surveillance we suggest to expand the focus and to integrate the ethical debate in an STS inspired view on the democratic challenges of forensic genetic surveillance. Such an angle opens the perspective to reflect on the knowledge flows which foster forensic genetic surveillance technologies and shape their public acceptance. An STS focus on democratic challenges expands on questions such as what are legitimate forms of public knowledge production in forensic genetics, how epistemic authority of knowledge claims is achieved and influences the shape of forensic surveillance technologies in accountable manners, and how such DNA technologies and forensic DNA databases become regulated in democratically responsible ways.

Instead, of providing universal political philosophical answers to the questions above democratic reconsiderations of science and society relations play out empirically. What is understood as democratic challenges of forensic genetic surveillance, in particular with regards to its legitimacy and accountability, varies depending on the situational country specific context. Therefore we suggest a country and political culture sensitive approach which is developed in the following section.

3. Research approach and analytical approach

In order to portray the two country cases we take analytical inspiration from the concept of civic epistemologies developed by Sheila Jasanoff. She argues that science and technology in liberal democracies are meant to serve the public and are enacted in ways to demonstrate their credibility and utility to their spectators, the citizens (with particular ways of public knowledge making, forms to gain public accountability and with demonstration practices). Yet, the science-technology-and-society-relations are ambiguous. In particular, biological sciences, which are foundational for biotechnology as well as for forensic genetics, are used as instruments of governance, helping to sort and classify people to standardized physical, mental or social characteristics. Thereby science has specific practices to construct objectivity, expertise and the visibility of expert bodies. The implicit notion is dominant that representative governments have the capacity to anticipate their citizen's needs and to enact science and technology in the benefit of their interests. Western democracies seem to share such basic imaginaries. Yet, Jasanoff identifies cross-national variations in the public acceptance and in public responses to science and technology. To make the concept of civic epistemologies analytically applicable to cross-national comparison she proposes constitutive criteria: styles of public knowledge making, public accountability as the basis for trust, demonstration practices, objectivity, expertise and visibility of expert bodies. Since the field of forensic genetic technologies differs from biotechnology, we will adapt those criteria.

Criteria of civic epistemologies	Translation to forensic genetics technologies
Styles of public knowledge making	Diversity of authors of knowledge claims about forensic genetic technologies
Public accountability (basis for trust)	Trust in persons and institutions of forensic genetics Forms of governing public accountability of DNA databases and forensic genetics
Demonstration practices	Trust in utility of specific technologies
Objectivity	Forms of “Truth machines”; guarantees for maintaining scientific standards; Standardization process of scientific and laboratory procedures
Expertise	Trust in expertise/type of court systems; Type of risk/technology assessments
Visibility of expert bodies	Constellation of expert groups; Type of activities of expert bodies; Engagement with the public

Table 1 – Civic epistemologies and forensic genetics technologies. Own composition inspired by Jasanoff (2005: 259).

4. Forensic genetics surveillance in United Kingdom and Portugal

Both countries are chosen because they differ with regards to their traditions with DNA databases and with regards to the different influences of their civic epistemologies. While UK has a long tradition with collecting and storing DNA data in a database for forensic purposes, Portugal only recently began to establish a forensic DNA database. Furthermore, different influences of civic epistemologies can be identified. While UK has been characterized as the “maximum surveillance society” (Norris & Armstrong, 1999) although with a tradition of public controversy on contested technologies, in Portugal the establishment of the national forensic DNA database has been politically justified by improving the efficacy of the justice system, and accompanied by silent public acceptance (Machado & Silva, 2010; Machado & Prainsack, 2012).

a. United Kingdom

Created in 1995, the UK National Criminal Intelligence DNA Database (NDNAD) is considered to be the oldest national forensic DNA database. Under former UK Prime Minister Tony Blair, the Criminal Justice and Police Act of 2001 was introduced regulating that DNA profiles could be kept on the database even when a person was acquitted of a crime. In April 2003, the law changed and allowed that DNA could be taken as soon as a person was arrested, instead of waiting for them to be charged with an offence. These regulations came into effect in England and Wales in 2004 (Wallace et al., 2014, p. 58). These initial legislations triggered the inclusion of more than 1 million innocent people’s DNA profiles, including minors. The *S. & Marper v. UK* decision of the ECHR impacted the Protection of Freedoms Act 2012 in England

and Wales which re-regulated the right to privacy. As a result, all DNA samples have to be destroyed within six months from the moment of being taken. Although speculative searches on the DNA profiles of non-convicted individuals are allowed, indefinite retention is eliminated by establishing retention periods differentiated according to the seriousness of the suspected offence (Santos et al., 2013).

Styles of public knowledge making

As one of the world’s largest DNA-database its societal effects triggered various public controversies addressing the massive social and ethical implications linked to its size and scope. Such controversies involved two major agencies dealing with ethical issues of genetics in the UK - the Nuffield Council on Bioethics (2002, 2007), and the Human Genetics Commission (2001, 2002, 2008) civil society organizations such as Genewatch UK and the parliament (Williams & Wienroth, 2014, p. 7).

Public accountability

The emergence and establishment of the UK’s DNA database has caused various public controversies about ethical and social ambiguities also due to its early immense expansion. This in turn has stimulated stricter regulations in favor of civic rights and has motivated governance forms responsive to some needs of public accountability. The use and management NDNAD had been accompanied by controversies about its potential for ethnic discrimination since it overrepresented in particular young black man. The NDNAD strategy and the ethics boards also began to directly engage with advocacy groups of minorities, and in particular the Black Community, in order to tackle problems of mistrust. As a result of the ongoing controversies including its legal contention the procedures changed in 2012 and “ethnic appearance” is no longer recorded.

Criteria of civic epistemologies	Translation to forensic genetics technologies	UK
Styles of public knowledge making	Diversity of authors of knowledge claims	Heterogeneous actor set
Public accountability (basis for trust)	Trust in persons and institutions of forensic genetics; Forms of governing public accountability	Regulatory governance responses to specific public controversies; Institutionalization of ethical oversight bodies to produce transparency and accountability
Demonstration practices	Trust in utility of specific technologies	Mass media as a major source of information (“CSI effect”); lack of information about the state’s governance of DNA database
Objectivity	Forms of “Truth machines”; Standardization process of scientific and laboratory procedures	Oversight institutions such as the “Forensic Regulator” to develop scientific standards and procedural guidelines for data quality across the field of forensic genetics;
Expertise	Trust in expertise/type of court systems; Type of risk/technology assessments	Adversarial legal system (judge plays a passive role; Accusation and defense play the dominant role) → Evidence shall support the presentation of opposing viewpoints; Equality Impact Assessments 2007, 2009 (EIA); (Ethical) Technology assessments

Table 2 – United Kingdom. Own composition.

Demonstration practices

In UK's societal stakeholder views, diverse representations of DNA which effect the ethical assertions about the legitimacy of a number of its forensic uses can be found (Williams & Johnson, 2004b). Williams and Johnson differentiate between three such representations which they identified along concerns about the types of information that are contained in DNA samples and profiles, the governance of research based on these retained materials, and the possible future uses to they may be put. "Genetic exceptionalism" stresses the unique character of genetic material; "genomic minimalism" emphasizes the mundane character of forensic uses of non-coding sequences of DNA; "biometric pragmatism" distinguishes between different sources of DNA material and what may legitimately be done with DNA obtained from these sources (Williams & Johnson, 2004b, p. 211). Stakeholders such as human rights groups, the Home Security or criminal prosecutors have relied on such representations differently and concluded on the DNA database to be clearly necessary, wonderful or engrossing. A snapshot on public perceptions in UK on the place, role and significance of forensic DNA technologies similarly to the stakeholders' views demonstrates a heterogeneous picture of individual opinions about DNA technologies – which shows that public opinions in comparison to academic literature less problematize but more often accepts DNA technologies (Wilson-Kovacs et al., 2012). Thereby they also illustrate diverse strategies of dis/engagement with forensic genetics. This links up with the availability of popular choreographies of forensic genetics in TV series, the so-called CSI-effect on the one hand, and the rather absent information about the NDNAD on the other hand. Developing a response to the public's demand for more information about the functioning and goals of the UK's database has been recommended by a Citizen's report from a citizens' jury carried out in the UK, as a national inquiry into the forensic use of DNA and the National DNA database, recently instigated by the Human Genetics Commission (HGC) in collaboration with the ESRC Genomics Policy and Research Forum in Edinburgh, and the Policy, Ethics and Life Sciences Research Centre (PEALS) in Durham and Newcastle (Human Genetics Commission, 2008).

Objectivity

The more recent governance landscape of the NDNAD and forensic genetics in the UK is shaped by a situation of precarious public financial conditions which has resulted in the privatization of forensic services in the UK. At the same time, UK recently "opted in" for the decision to begin participating in the transnational DNA-data exchange regulated under the regime of Prüm which will increase the demand for forensic services. The regulatory response to these developments builds on the historical cultural trajectories (McCartney et al., 2011; McCartney, 2015) and has resulted in a differentiated organizational oversight system which balances between keeping scientific norms, controlling data protection and responding to public demands for accountability. In order to improve and maintain scientific standards for forensic genetic technologies in general and laboratory practices in particular, an oversight institution, the Forensic Regulator, was installed to facilitate agreement across diverse stakeholders. The Biometric Commissioner, as independent from the government, is responsible to accompany the police's use and retention of DNA data. Furthermore, the ethics board of the NDNAD produces ethical impact assessments of forensic technology innovations. All of these oversight institutions build on monitoring and reporting practices as attempts of transparent and accountable governance forms.

Expertise

The NDNAD serves in UK's adversarial legal system, which allows the presentation of opposing viewpoints to a relatively passive judge. The parties themselves attempt to control the litigation and perceive the decision maker as neutral (Toom, 2010). With regards to DNA evidence, the role of an expert witness in criminal cases is to assist the court on matters within their forensic science expertise and to explain forensic genetic matters that may not be understood by the judge or the jury. Monitoring

activities to ensure transparency of the database system such as Equality Impact Assessments (EIA) of the NDNAD took place in 2007 and 2009 and triggered the inclusion of procedures to secure the reliability and suitability of available data.

b. Portugal

The Portuguese forensic DNA Database was established by law in 2008 (Law 5/2008), and started to be operational in 2009. Initially, the government planned to establish a universal database by collecting genetic data from the entire Portuguese population. But, rather than pioneering the field with a radical new approach to DNA databasing – since no single country worldwide had such a population-wide database at that timeⁱ, the option was to establish very restrictive criteria. In fact, regulation of the Portuguese forensic DNA database is more restrictive in terms of data inclusion and information preservation than any other EU country (Santos et al. 2013). These restrictions included profile entry criteria: DNA profiles are included only to those convicted of serious crimes with a sentence of three years or more and if there is a judicial order. Furthermore, there is no permanent retention of any criminal's DNA profile in the DNA database. Another important feature of the legislative framework of the Portuguese forensic DNA database is the concept of volunteers. The Law 5/2008 states the possibility of a gradual phased construction of the DNA database from collecting samples from volunteers, either the relatives of missing persons or unidentified victims or anyone who wishes to donate a sample. The DNA profiles collected from volunteers shall be preserved for unlimited time and are uploaded to the general database, and are only removed in the case of explicit revocation of the previously given consent or in the case of victim identification.

Styles of public knowledge making

The National Institute of Legal Medicine is the institution that processes the DNA samples and conveys the results to the competent judicial authorities. All the activities developed by the Institute related to the forensic DNA database are supervised and controlled by an administrative independent body (*Conselho de Fiscalização*), with powers of authority nominated by the Portuguese Parliament, constituted by a group of three individuals and until the present day all these persons have been legal experts. Thus the involved actors are scientific experts from a homogeneous group.

Public accountability

The emergence and establishment of the Portuguese DNA database has remained a rather peripheral societal phenomenon, probably also due to limited size and its restrictive regulation perceived as not provoking larger threats to civic rights. Generally, there is low confidence of citizens in public institution in general and in the justice system in particular. Similarly to the UK case, the Portuguese DNA database implies potential for controversies about racism. However, publically these controversies are not addressed since there is no institutionalization of treating ethics of forensic genetics publically accountable. The issue at stake relates to the identification and collection form, in all its versions (for volunteers, people involved in civil identification procedures, convicted individuals and official suspects and forensic professionals), requires the identification of the individuals' ethnic group, as well as the ethnic group of the mother and father. Being based on self-classifications or visual assessments made by the forensic personnel, ethnic categories might not correspond to ethnic classifications used in population genetics and are rarely applied to some groups, even by the individuals themselves, with any consistency (Machado & Silva, 2009). The inclusion of the ethnic group category in the information collected from individuals whose DNA profiles will be added to the database contradicts a trend that has prevailed until now in Portuguese legislation regarding the prevention of discrimination which has been evident, for example, in the fact that crime statistics only record nationality, not ethnicity or phenotype.

epistemologies	genetics technologies	
Styles of public knowledge making	Diversity of authors of knowledge claims	Homogeneous actor set from science
Public accountability (basis for trust)	Trust in persons and institutions of forensic genetics; Forms of governing public accountability	Low confidence of citizens in public institutions and in justice system – need to create mechanisms of public accountability; No institutionalization, occasional treatments of ethics (Portuguese National Council of Ethics for the Life Sciences (2007))
Demonstration practices	Trust in utility of specific technologies	Mass media as a major source of information (“CSI effect”); lack of information about the state’s governance of DNA database
Objectivity	Forms of “Truth machines”; Standardization process of scientific and laboratory procedures	No regulation and no guidelines to maintain the quality of the crime scene or quality assurance for how scientific evidence should be admitted in court; Single Supervisory Council for the DNA Database
Expertise	Trust in expertise/type of court systems; Type of risk/technology assessments	Inquisitorial legal system (dominant role played by judge) → Presentation of factual facts (which in this case takes form of genetic expert reports); No risk assessment of DNA technologies

Table 3 – Portugal. Own Composition inspired by Jasanoff (2005: 259)..

Demonstration practices

The mass media plays a fundamental role in creating public expectations regarding the Portuguese forensic DNA databases in particular in regards to the use of DNA technologies in high-profile criminal cases: the media narratives tend to bolster arguments in favor of expanding forensic DNA databases (Machado & Santos, 2011). In addition, according to a national consultation, most of the Portuguese citizens considered a nationwide public awareness campaign about the forensic DNA database to be important and referred that the most important source of information are the mass media (Machado et al., 2013). Portuguese citizens also report that they would need more information about the functioning and goals of the Portuguese forensic DNA database (Machado & Silva, 2014).

Objectivity

The role of the single supervisory council mentioned above is to monitor and assess the DNA database practices in terms of ethical standards, but this board has no functions in the domain for assuring mechanisms of accountability, security, and quality assurance of forensic services. These safeguards would be important especially in relation to the transparency and effective functioning of the administrative body that will control and supervise the activities of the National forensic DNA database. They would help to evaluate the concept of ‘volunteers’. Furthermore, they could give guidance for the monitoring of quality assurance of crime scene forensic examination; for the interpretation of bio information and probable level of scientific evidence in criminal courts; and for the circulation of genetic information within international cooperation treaties and agencies. In addition, the single supervisory body develops its activities by using the human and technical resources and the facilities of the entity it monitors: the National Institute for Legal Medicine. Our concern regarding the competences ascribed to this board is twofold: first, we think there should be clear guidelines as to the safeguarding of the board’s independence and impartiality, as well as to its scope of powers and the objectives of monitoring. Second, that the functioning of this board should foster

public confidence in the database, so that the public can be confident that data held in it are not misused (Nuffield Council on Bioethics, 2007, p. 92).

Expertise

One of the specific features of the Portuguese is its inquisitorial orientation and the coexistence of informal police databases containing various types of data (biometric data and descriptive data) (Machado & Prainsack, 2012, p. 40). In contrast to adversarial legal systems in inquisitorial judicial systems the judge plays a dominant role in the examination process and in imposing rules of demonstrating evidence and court procedures. Often, the judge will perceive forensic genetic expert reports as a type of evidence close to an absolute truth, or at least as constituting all that is worth knowing about the trial in question (Jasanoff, 2006). Therefore, in inquisitorial trials actively ask parties for factual truths and expert reports are perceived as one way of going about this.

5. Conclusions

There are selected implications which result from our case comparison and which we want to highlight here in order to stimulate rethinking a democratic and responsible governance of forensic genetics technologies.

The first implication conveys an understanding of country's specific use and governance of forensic genetic technologies as imaginaries of societal surveillance with impacts on general notions of civic rights and forms of public participation. These imaginaries are representations of the relationship between state, science and the public. In both countries the dominant narrative authored by state and science institutions accompanying the national DNA database comes with an ideology of the neutrality and truth of science and in justice's endowment for equality and defense of individual's rights. Although this narrative's intention is to garner the expected confidence of the citizens, differentiated mechanisms of civic accountability and participation in the modes of organization and maintenance of genetic data are missing (Portugal) or can be expanded (UK). The emergence and establishment of the UK's DNA database has caused various public controversies about ethical and social ambiguities also due to its early immense expansion. This in turn has stimulated stricter regulations in favor of civic rights and has motivated governance forms responsive to some needs of public accountability. The emergence and establishment of the Portuguese DNA database has remained a rather peripheral societal phenomenon, probably also due to limited size and its restrictive regulation perceived as not provoking larger threats to civic rights.

This leads to a second implication deriving from our comparison: we suggest a notion of public accountability which allows multiple views and even contestation about the truth of DNA technologies. Both countries lack the systematic integration of citizens' views in assessing risks and benefits of forensic DNA-databases.

The third implication comes as a proposal for incorporating forms of participatory democracy. Participation is not only meant as individuals participating as DNA-material provider, but as being involved in the processes of decision-making. Two models – corresponding to the two different civic epistemologies of the two countries – could give inspiration to rethink and broaden the understanding of participation in decision-making. The first model favors direct involvement in multiple forms of decision-making (e.g. for instance involving the heterogeneous views of stakeholders and citizens). The second model highlights a representative version of participation which means the public as the recipient and addressee of public accountability of the state and science. This mainly refers to the responsibilities of the institutions of state and science which have to create transparency and explain better and justify what and why they do to their societies.

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ⁱ However, Kuwait has passed a law in 2015 to begin installing a universal database as the first country.