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Ethics in Transnational Forensic DNA Data Exchange in the EU: Constructing Boundaries and Managing Controversies

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ABSTRACT

Under EU Law, Member States are compelled to engage in reciprocal automated forensic DNA profile exchange for stepping up on cross-border cooperation, particularly in combating terrorism and cross-border crime. The ethical implications of this transnational DNA data exchange are paramount. Exploring what the concept of ethics means to forensic practitioners actively involved in transnational DNA data exchange allows discussing how ethics can be addressed as embedded in the sociality of science and in the way scientific work is legitimated. The narratives of forensic practitioners juxtapose the construction of fluid ethical boundary work between science and non-science with the dynamic management of controversies, both of which are seen as ways to lend legitimacy and objectivity to scientific work.

Ethical boundary work involves diverse fluid forms: as a boundary between science/ethics, science/criminal justice system, and good and bad science. The management of controversies occurs in three interrelated ways. First, through a continuous process of reconstructing delegations of responsibility in dealing with uncertainty surrounding the reliability of DNA evidence. Second, threats to the protection of data are portrayed as being resolved by black-boxing privacy. Finally, controversies related to social accountability and transparency are negotiated through the lens of opening science to the public.

KEYWORDS

Prüm; ethics; sociality of science; boundary work; controversies

Introduction

On 21 May 2015, an elderly couple (75 and 74 years old) was found dead and raped in their home in Vienna. Although the Austrian police found the alleged killer's DNA, no DNA matches were identified in the national DNA database. However, under a transnational agreement on DNA data exchange – the Prüm Treaty – the Dutch DNA database provided a DNA match¹ for a 29-year-old man from Poland – Dariusz Pawel Kotwica – and Austrian authorities began looking for him. The suspect was arrested at a railway station in

Düsseldorf, Germany, on June 8. The suspect's DNA profile also matched unidentified crime scene stains in other EU countries.

The match in the Kotwica case was produced in the context of the so-called Prüm regime: a pan-European system created for reciprocal automated searching and comparison of DNA profile information (as well as fingerprints and vehicle registration data) for stepping up on cross-border cooperation, particularly in combating terrorism and cross-border crime (Council of the European Union, 2008a, 2008b). Presently, 24 countries operational EU Member States exchange DNA data within Prüm (Council of the European Union, 2017).

The Council Decisions established the legal and technical standards for information exchange among the Member States on a hit/no-hit basis (step 1), which allows a Member State to request additional information through mutual assistance procedures (step 2). No personal data are transferred between the Member States through such channels until a match has been declared (McCartney, 2014a, 2014b). The Prüm regime brings together a full array of heterogeneous actors, a shifting set of relationships with data, technological infrastructures, operational procedures, and criminal justice systems that support the circulation of information (M'charek *et al.*, 2013).

The media account of the Kotwica case did not acknowledge the diverse network of individuals, organizations, and knowledge practices that operated in both the domestic and international contexts. Instead, it used a narrative of simplification that implicitly conveyed that a match was automatically produced and that the suspect was subsequently put in criminal custody. The performative capacity of such stories (Law, 2002; Prainsack and Toom, 2010; Kruse, 2012) presents DNA evidence as superseding other means that support criminal investigation (Lynch *et al.*, 2008; Williams and Johnson, 2008; Williams, 2010), and transnational DNA data exchange is presented as an objective and neutral method for solving serious crimes (Prainsack and Toom, 2010, 2013).

The EU regulation of the Prüm system stipulates that for the purposes of supplying data, each Member State shall designate a national contact point (NCP), and the powers of the national contact points shall be governed by the applicable national law (Decision 2008/615/JHA). The forensic practitioners acting as NCPs are central actors in the Prüm regime: they conduct the daily activities that enable transnational exchange and hold a crucial position in decision-making processes. In particular, the persons acting as NCPs must organize and implement the necessary procedures and connections to perform automated exchanges with other databases (both receiving and sending information), perform tests with partners in other countries, and manage and report DNA matches.

The roles and responsibilities of the Prüm NCPs may vary among countries according to different organizational structures and national legislation. In addition, different countries have attributed the custody of their national DNA databases to different entities, ranging from judiciary authorities to police forces (Santos, 2017). Therefore, individuals operating as NCPs might

have differentiated professional and educational backgrounds, and they may work in either forensic laboratories or police forces.

The ethical implications of the transnational exchange of forensic DNA data under the Prüm regime are paramount. The current academic debate highlights the ethical challenges related to data protection, excessive surveillance of citizens, and potential threats to civil rights such as privacy, liberty, and the presumption of innocence (Nuffield Council on Bioethics, 2007; McCartney, 2010; McCartney *et al.*, 2011). Nevertheless, to date, empirical studies on the ethical impacts of forensic DNA data exchange at a supranational level remain lacking. Aiming to expand the debate on ethics, this article draws on interviews with forensic practitioners who play an active role in transnational DNA exchange in the Prüm system. In particular, we aim to explore what the concept of ethics means to these professionals.

By adopting an STS approach, we address the following unexplored questions: What does the concept of ‘ethics’ mean to the forensic practitioners directly involved in the Prüm regime? What do these practitioners consider ethically important in the context of transnational DNA data exchange in the EU? How are ethical controversies addressed and managed? We argue that the narratives of the forensic practitioners actively involved in transnational DNA exchange highlight the juxtaposition of, first, the construction of a fluid ethical boundary work – between science/ethics, science/criminal justice system, and good and bad science – with, second, a dynamic management of controversies. Both the ethical boundary work and the management of controversies are seen as ways to lend legitimacy and objectivity to scientific work.

Ethical challenges of transnational DNA data exchange

In the last two decades, scholars in the field of Science and Technology Studies (STS) have made a considerable contribution to critical thinking about the creation and expansion of the forensic DNA databases used to support the activities of criminal prosecution and the criminal justice system. Amongst the various lines of inquiry (Heinemann *et al.*, 2012), there are two main contributions which are particularly useful for the purposes of this article. Firstly, studies of the controversies and contingencies surrounding the credibility of DNA evidence in the criminal justice system (Jasanoff, 1998, 2006; Lynch, 2003; Lawless and Williams, 2010; Lawless, 2012). Secondly, critical perspectives on the development and expansion of DNA databases as elements in the history of criminal identification technologies (Cole, 2001; Williams and Johnson, 2005; Hindmarsh and Prainsack, 2010).

The STS approaches the introduction of the DNA evidence into criminal justice systems worldwide highlight the complexities related to the production, circulation, and appropriation of scientific knowledge in the courts (Lazer, 2004; McCartney, 2006; Aronson, 2007; Williams and Johnson, 2008; Lynch, 2013).

STS studies focusing on forensic genetics have largely documented boundary work between the forensic laboratory and the court. Particularly, such contributions have explored how initial controversies in the field of forensic genetics evolved and were ultimately closed through a complex series of practices and procedures that aimed to guarantee the credibility and reliability of forensic DNA evidence (Jordan and Lynch, 1992; Halfon, 1998; Derksen, 2000, 2003; Edmond, 2002; Kruse, 2016).

However, so far, STS contributions have scarcely addressed the ethical challenges posed by the transnational exchange of DNA data (for an exception, see M'charek *et al.*, 2014). Until now, the Prüm regime has mainly been examined by socio-legal literature and by political scientists. Such contributions tend to emphasize the problematic issues related to enormous disparities in national legislation and data protection; regimes of responsibility and database custody; transparency, accountability, and trust; and lack of ethical oversight of the transnational flow of law enforcement information (McCartney, 2010, 2013, 2014a, 2014b; Prainsack and Toom, 2010, 2013; McCartney *et al.*, 2011; Hufnagel and McCartney, 2015).

According to these studies, other relevant unintended consequences that might raise potential ethical problems include the high probability of false positive matches,² which may lead to false incrimination (McCartney, 2014a), and the potential pressure to confirm 'near matches' as reliable leads (McCartney, 2014b, p. 7). Aiming to further contribute to the debate about the Prüm regime, we explore what the concept of ethics means to forensic practitioners who are actively involved in the operations of the transnational exchange of DNA data. We adopt a STS approach by making use of the concepts of boundary work and management of controversies.

By considering how ethics relate to actors' discourses and practices, the STS approach to ethics ranges from an understanding of what is an ethical protocol in practice (Singleton, 1996; Mol, 2008) to a more complex analysis of the specifics of a set of practices, circumstances, and relationships among actors (Haimes, 2002). Some proponents of 'doing ethics' in the empirical field (Heeney, 2016) propose exploring the practices and circumstances in which ethical problems arise; these scholars highlight the difficulties of distinguishing facts from values – or, distinguishing an 'ought' from an 'is' (Wainwright *et al.*, 2006; Haimes and Williams, 2007; Dunn *et al.*, 2012).

In this article, we explore ethics as embedded in the sociality of science (Knorr-Cetina and Mulkay, 1983; Latour, 1987) and in the ways in which scientific work is legitimated (Stermerding and Jelsma, 1996; Hedgecoe and Martin, 2003; Wainwright *et al.*, 2006; Salter, 2007). This approach allows us to highlight how ethics play a role in the ways in which scientists relate to each other and negotiate responsibilities both within and outside their fields of expertise – i.e. with members of the criminal justice system. Furthermore, such an understanding of ethics also enables us to explore how the 'epistemic toolkit of science'

(Bliss, 2012), which ensures the legitimacy of scientific knowledge and practice, is increasingly anchored on notions of accountability and transparency. Thus, we argue that what the concept of ethics means to forensic practitioners directly involved in Prüm juxtaposes two dimensions. The first refers to the construction of fluid boundaries between science and non-science. The second relates to a dynamic resolution of controversies according to the norms and ideals of what good science is and how it should be conducted (Pickersgill, 2012; Thompson, 2012; Heeney, 2016).

In this article, we aim to contribute to expanding the debate on ethics in the use of transnational forensic DNA data by making use of the notions of, first, boundary work between science and the criminal justice system and, second, managing controversies related to DNA evidence. The idea of managing controversies refers to the opening and closing of uncertainties and black boxes in science (Latour, 1987).

To make use of the concept of controversy to analyse accounts of ethics allows further exploration of the dynamics of ‘boundary work,’ which was described by Thomas Gieryn (1983, p. 782) as ‘[scientists’] attribution of selected characteristics to the institution of science for purposes of constructing a social boundary that distinguishes some intellectual activities as “non-science”.’ Boundary work is often ambiguous; it is oriented mostly towards expanding expertise and authority, monopolizing professional authority and resources and protecting the autonomy of science (Gieryn, 1983, pp. 791–793). By analogy the notion of ‘ethical boundary work’ allows an understanding of how forensic practitioners set boundaries in their activities, ‘maintaining the distinction between “real science” and “associated ethics,” whilst at the same time incorporating ethical acceptability into the heart of the scientific work’ (Wainwright *et al.*, 2006, p. 745).

In the case of Prüm, the nature of the boundaries of knowledge flow and data circulation between different jurisdictions might be more complex than indicated by previous studies (Prainsack and Toom, 2010, 2013; M’charek *et al.*, 2013; Kruse, 2016). By elucidating the creative and transformative processes of (re)constructing relations and delegations of responsibility, the notion of ‘ethical boundary work’ underscores the strategies of social demarcation that are constructed and assembled in relation to ethics (Wainwright *et al.*, 2006; Heeney, 2016). The ‘ethical boundary work’ refers to a boundary between science and non-science displaying how the forensic practitioners define their responsibilities in such a boundary. This boundary work might take diverse fluid forms – as a boundary between science/ethics, science/criminal justice system, and good and bad science.

Methods

This article is based on a project that aims to explore the societal, cultural, ethical, regulatory, and political impacts of the use of DNA technologies in

the European Union. This research utilizes a multi-methodological approach, including collection and analysis of legislation and documentation related to the Prüm regime, as well as interviews with 14 forensic practitioners directly involved in step 1 of Prüm Regime – that is, the stage where DNA profiles are exchanged in order to identify possible matches between different countries.

Interviews were conducted in 10 different EU countries. As mentioned above, each country has the autonomy to determine how to attribute roles and responsibilities to its forensic practitioners who serve as Prüm national contact points. Thus, in some countries, only one person is responsible for the operations associated with the transnational exchange of DNA data, while in other countries, two or more persons might be involved in these tasks. In the latter situation, whenever different individuals made themselves available to participate in the study, they were interviewed. Thirteen participants were trained in Biology and one in Information Technology. Twelve participants worked daily within laboratories, and two performed work outside of the laboratory.

The interview protocol and procedures were conducted under the ethical regulations of the European Research Council. Identification of potential participants was made by accessing the public contact list provided in the documents of the ‘Working Party on Information Exchange and Data Protection’ (Council of the European Union, 2015) and by contacting privileged informants. Participants were recruited by email, letters, and telephone calls.

The script for the interviews covered the following themes: views and experiences with the implementation of Prüm at the national and European levels, opinions about the Prüm’ regime’s purposes and contributions, ethical issues raised by the transnational exchange of DNA data, expectations of development and innovation in DNA technology, and perceptions related to communication with the general public.

Prior to the interviews, the participants signed a written informed consent and agreed to be audio-recorded. The interviews took place at the interviewees’ workplaces or at a location chosen by the participant. The interviewers took notes to help guide their questions during the interviews and to use in post-interview reflection. When each interview was completed, the authors of this article reviewed the notes and made annotations regarding issues and items that could be addressed in subsequent interviews and/or analysis. All the interviews except one were digitally recorded, transcribed *verbatim*, and anonymized. On average, the interviews were 90 minutes long. In order to protect the anonymity of the interviews, each country was identified using a letter. This form of anonymization will be used in the interview quotes analysed in the following sections.

Quotes pertaining to ethics were coded and subjected to multiple readings to develop an in-depth understanding of the meanings of ethics to the forensic practitioners involved in step 1 of the Prüm regime. In order to avoid narrowed framings of ethics, the notion of ethics was made researchable by taking into

consideration what forensic practitioners directly identified as ethically challenging as well as by exploring their views on the concrete and imagined ethical implications of their work both within and beyond the criminal justice system. These quotes were then systematically compared, contrasted, synthesized, and coded by theme and by thematic category following the principles of grounded theory (Clarke, 2005; Charmaz, 2006), and they were interpreted using a qualitative content analysis approach (Mayring, 2004). In this article, we analyse the replies that were agreed upon by both authors as illustrative of each thematic category that emerged from the content analysis.

Ethical boundary work

Science and ethics

The topic of ethics was addressed in the interviews by asking the participants their opinions on the ethical challenges posed by Prüm. All the interviewees except two worked as forensic practitioners in state forensic laboratories and contextualized this question within their laboratory activities. The interviewees framed their work as NCPs in Prüm in terms of the types of scientific work performed and the means by which it could be legitimated (Wainwright *et al.*, 2006; Pickersgill, 2012).

A salient finding was that the majority of interviewees constructed fluid boundaries between science and ethics, and they painted somewhat different pictures of the consequences of drawing this boundary: to some participants, forensic analysis – conducted in the laboratory – and ethics were regarded as totally separate things; to others, science had ethical implications but not an ethical dimension *per se* (Pickersgill, 2012, p. 581).

One participant, who was somewhat surprised by the question about the ethical challenges posed by Prüm, highlighted a clear separation of science and ethics – a position of distance: *What do you mean by ‘ethical’? I’m confused... We do our job.* [Country B]. In this view, distance lends legitimacy and objectivity to scientific work inasmuch as disengagement from ethics signifies correct moral practice. Entangling symbolic distance with a position of proximity, the participant reframed his reply by referring to a democratic discussion among several actors in the laboratory to ensure data protection and ethical behaviour:

Every rule we have for data protection and ethical behaviour, we do it by ourselves (...)
[For example,] In our experts’ team, we talk about any difficult case or any difficult decision, and it is kind of a democratic decision. [Country B]

In this narrative, the forensic practitioner postulates the creation of a democratic platform among the several professionals of the laboratory as ethics in practice. In particular, the participant refers to how informal regimes of

normativity shape laboratory work processes; for example, colleagues share experiences and doubts, and they collectively reach consensus on how to conduct their work. Such a view of ethics in practice is thus entangled with what Corinna Kruse describes as ‘calibration talks,’ in which laboratory members discuss and compare their work (2016, pp. 86–87). In sum, the ethically grounded production of scientific knowledge is, to some degree, understood as an outcome of the democratic relationships scientists have with other members of the laboratory (Pickersgill, 2012, p. 598).

The science/ethics boundary work is therefore unstable and is continuously (de)stabilized in the forensic practitioners’ accounts through an entanglement of proximity and distance. By separating the spaces of science – such as laboratories – from external spaces – such as crime scenes and courts – most participants considered ethics to come either after or before scientific facts. Forensic practitioners’ accounts describe the space of the laboratory as objective and standardized (Lynch, 2002). This conception contrasts with the variability of materials that laboratories handle, inasmuch as these spaces are also receptors of crime scene samples that come from the hands of the police authorities. As the following extract exemplifies, forensic practitioners perceive the collection of DNA samples from the body of suspect persons – prior to arrival at the laboratory for DNA analysis – to be an ethically complex process. Based on this perspective, participants thus convey a general feeling that there is a need for the ethical governance of DNA data before biological material arrives in the hands of forensic experts at the laboratory:

The ethical oversight mostly occurs before the samples come to our lab. Most of our samples come from the police or from prisons (...) They should have done and acquired the necessary sort of permissions or paperwork in order to send the samples to our lab (...) Our job is to do the analysis and to give them results, as opposed to worrying about the ethical things. [Country E]

In addition to outlining how ethical behaviour must precede the work of the forensic practitioners, this narrative also shows how the participants in this study conceive the laboratory as a space for producing facts and not for engaging in ethical debates. For this reason, according to this participant, the potential controversies about the practices of collecting DNA samples should be regarded as outside the responsibility and functions of the forensic practitioners. In this sense, ethics moves from the space of knowledge production towards places where decisions about the meaning of the samples are made (Stemerding and Jelsma, 1996), e.g. the criminal justice system. Ethics are therefore not viewed as constitutive of scientific practice or of scientific knowledge production.

This type of distant positioning from ethics is strongly influenced by the type of information that forensic practitioners have (or, in this specific case, do not have) about the outcomes of their work. As one of the interviewees noted,

forensic practitioners do not follow the forensic data they generate as it travels to a different country; after producing a report, they no longer ‘own’ the data and are not able to act as responsible data chaperones:

As soon as we report a match, it is out of our hands. We do not have control over the police or the public prosecution office. [Country A]

In the forensic practitioners’ view the practices associated with handling the DNA samples before they arrive at the laboratory – during the collection of crime stains – and after – during court proceedings – are perceived as being ‘out of their hands.’ By distinguishing science and ethics from science and the external actors and spaces, forensic practitioners symbolically detach themselves from the outcomes of the DNA matches they produce. This construction of science/ethics boundary work allows forensic practitioners to separate themselves from the process of (de)criminalization of certain citizens, thus protecting the autonomy of science (Gieryn, 1983).

Science and the criminal justice system

The automated comparison of DNA profiles within the Prüm system has increased the possibility of false positives and false negatives (matches that are invalid) given the volume of profiles that are available for comparison (McCartney, 2014a). The occurrence of a large number of false positives in transnational DNA data exchange has transformed the topography of what forensic practitioners view as ethically problematic due to the lack of procedures establishing criteria for both reaching agreements and resolving disputes about what constitutes a reliable match (McCartney, 2014a). Consensus about what constitutes a valid match would provide crucial junctures for establishing objective knowledge in a legal setting (Derksen, 2000, p. 827; Jasanoff, 2006). However, in the absence of such consensus, the participants in this study take an ambiguous position on the decision to evaluate the reliability of a DNA match.

The determination of what is considered ‘reasonable’ agreement requires personal judgement and evaluation at the local level. This situation is further complicated when other actors in the criminal justice system – such as police and courts – intervene. As the following participant explains, forensic practitioners’ contribution implies ‘making uncertainty tractable’ (Kruse, 2016, pp. 89–90), that is, making the value of a DNA match knowable, manageable and communicable between different actors:

We have two threshold Prüm matches: One threshold is ‘Ok, this likelihood ratio is so low this must be a false positive match, we don’t report it’; and ‘This likelihood ratio is so high it must be a good match, so we will report it’. But everything in between is also reported, with a warning saying, ‘We do not know for sure whether this is a good match, so if you are going to use it, please validate it first’. [Country A]

When the forensic practitioners have to report a DNA match to the law authorities they do not close the ‘black box’ of forensic evidence; rather, they deliberately leave the uncertainty visible, which creates a ‘semi-transparent box’ (Kruse, 2016, p. 115). Evaluative statements such as ‘this is a good match,’ ‘this is not a good enough match’ and ‘we are not sure’ are not subjective emotions or reflections. Instead, these are normative assertions related to the quality of a DNA match that imply corresponding decisions about whether the forensic practitioners will or will not report the matches to a requesting country. In this sense, such statements constitute objectivity (Derksen, 2000, p. 838).

Some of the interviewed forensic practitioners mentioned the pressure they feel from actors in the criminal justice system (from particular countries) to proceed to step 2 (i.e. providing personal information related to a match). Facing such situations, some interviewees reported refusing to comply because the matches ‘were not good enough.’ A DNA match takes its form and acquires its attributes – as a reliable or unreliable match – as a result of its relations with other entities and of an assemblage of networks of relations (Law, 1999, p. 3; Kruse, 2016, pp. 7–10) connecting different professional, sociocultural and national contexts.

For a DNA match to assume the status of forensic evidence, knowledge of the case must be considered valid and legitimate. In this regard, one forensic practitioner emphasized how it is not always possible to reach a consensus on what constitutes a reliable DNA match. This participant considered the lack of consensus to be a result of the eagerness to obtain personal information from countries with regimes of custody governed by the police rather than countries in which Prüm is governed by a judicial entity:

Sometimes, we have discussions because we are not always in agreement, because, in countries where the DNA database is a police DNA database, they would like to have all the information like this [immediately] (...) we will not report a match if we don't have many markers (...) we are very strict on that. If we have a match on six markers, we know [there is a chance of] more than 60% that it is a false positive. (...) For me, it's a problem to do [this] kind of reporting: the magistrate will not understand when it's a good match and when it's not a good match. So we prefer not to report these cases. [Country I]

A DNA match can be described as social (Kruse, 2016, p. 9) because it has the material and the symbolic agency to potentially attain the status of reliable evidence, thus contributing to accusing or exonerating people. A DNA match will achieve this status if it has the capacity to convince (Latour, 1987, p. 12). Hence, a DNA match opens up a range of possibilities regarding how to make sense of its meaning and potential value (Lynch *et al.*, 2008, p. 345). However, a DNA match's potential to convince creates an ethical problem because it is not possible for forensic practitioners to control whether a scientific result will be ‘appropriately’ interpreted, especially when the DNA match is passed into

the hands of the criminal justice system of another country. This process creates friction because producing good science involves resolving controversies and managing uncertainties (Latour, 1987). In this context, a DNA match contains normativities that are neither fixed nor stable but rather articulate a sense of a collective identity within the community of forensic practitioners (M'charek, 2008).

The activities of reporting and evaluating a DNA match provide the context for creating a sense of collective community among the forensic practitioners by whom the idea of forensics as a global practice is constructed. At the same time, it also implies disentangling the collective by drawing a distinction between countries that have 'good' practices and countries that lack them (Thompson, 2012; Heeney, 2016). As the following quote highlights, some forensic practitioners are quite sceptical and doubtful about whether other colleagues ensure that no false matches are communicated to criminal investigators and/or to judicial entities:

We have good procedures in place to make sure that we first find out if it is a good match before it is reported to the authorities. So, I think, in [my country] there is no risk of a false positive match being used for legal actions. But I am not sure whether this is also the case in other countries. [Country A]

As this narrative shows, participants construct a good *versus* bad science ethical boundary work by presenting concerns that a false positive could be used as evidence in court because of less stringent ethical governance of DNA data by the police in a certain country. In this sense, while forensic practitioners can assure that ethically sound science is conducted in certain countries – that is, science that complies with the most demanding scientific standards (Sperling, 2008) – they remain doubtful about other countries' procedures.

According to the participant quoted below, the lack of ethical and legal control of the uses of DNA data – or police misinformation about the meaning of a DNA match – might allow a false positive match to be considered 'reliable' evidence and therefore lead to the wrongful conviction of an innocent person:

I hope that the police are well instructed [in other countries] (...) and that they know what to do if they want to use a DNA match. As the police receive the match [from another country], they can determine whether the match is relevant, they can find out the case and personal information. Let's say there is a murder case. And there's a 7-locus match [a potential false positive] and they say 'It's 95% reliable ... Ok, let's arrest the guy' ... I don't know if that happens, but if I know the mentality of the police, they are much less careful than scientists and public prosecutors. [Country A]

The idea of potential differences among countries in handling DNA matches exchanged within Prüm suggests the construction of a shared normative agenda that is constitutive of the practices of the collective of forensic practitioners and framed by scientific and ethical demands. However, the differences in the use of

DNA data create personal ambivalences and unease that affect the forensic practitioners' views of the implications of their work. As one of the participants emphasized, the 'problem' is not about the production of DNA matches in the Prüm regime but rather about the use of those DNA matches by the criminal justice system:

Generally, DNA is not, is never and should never be used as the only source of information when handling a case. (...) All the DNA analysis says is that there is biological material from a certain person, somewhere. What that means is actually not for [us], the [DNA] experts, to take into account. (...) What that [DNA analysis] does is that it provides the information and, afterwards, the investigative officers – the people who actually deal with the investigation – are to decide how to use that information. [Country K]

The issue of false positives thus relates to a specific form of ethical boundary work (Wainwright *et al.*, 2006; Heeney, 2016): drawing boundaries between the laboratory space and the criminal justice system. In the context of the narratives of forensic practitioners, this science/criminal justice system boundary is sustained by delegating the responsibility of assessing the reliability of a DNA match to operators in the criminal justice system.

The boundary science/criminal justice system implies that the uncertainty of what a DNA match means for a defendant's culpability is emphatically described as an issue to be handled outside the laboratory sphere, that is, not by forensic practitioners actively involved in step 1 of Prüm. For these actors, uncertainty is not resolved but is made manageable by a division of labour in which the forensic practitioners' contribution to the status of DNA forensic evidence depends on actions performed by members of the criminal justice system – pre-trial investigation, police work and the court's final decision (Kruse, 2016, p. 90).

Throughout the interviews, the forensic practitioners acting as Prüm NCPs undertook several forms of 'ethical boundary work' (Wainwright *et al.*, 2006; Heeney, 2016), distinguishing not only between science and ethics but also between good and bad science (Thompson, 2012) and between science and external actors and spaces. These distinctions reveal the creative and transformative processes of (re)constructing relations and delegations of responsibilities. In such processes ethics are framed as an assemblage of very diverse knowledge practices, with elements that remain clouded by uncertainty and disputes (Jordan and Lynch, 1992, p. 107) and that are to be resolved by the court – turning into a boundary between science and the criminal justice system (Jasanoff, 1995, 2006).

Managing controversies

Black-boxing privacy and opening up science

The interactions among science, ethics, and the criminal justice system – through which controversies and contingencies flexibly emerge and are resolved

– create a semi-transparent box of ethical boundary work that can take the form of a boundary between science/ethics, science/criminal justice system, and good *versus* bad science. In contrast, forensic practitioners directly involved in the transnational exchange of DNA data construct a black box for privacy and engage in a continuous and ambiguous process of opening and resolving controversies by responding to perceived requirements of social accountability.

According to forensic practitioners' accounts, the potential uncertainties, and controversies related to privacy and protection of personal data are resolved (Latour, 1987, p. 4) by referring to public regulatory bodies' assessment of the activities conducted under Prüm. As one interviewee stated, *everything is done to protect people's privacy, at least in the field of DNA* [Country B].

Another form of assuring data protection and privacy is through the standardization of procedures guaranteed by protected information and communication technology (ICT) systems and by the anonymization processes applied in transnational DNA data exchange. The following quotes from interviews express the prevailing feeling of resolving uncertainties through the seeming neutrality of codes and standards. The circulation of DNA profiles is translated as fluxes of impersonal numbers (Porter, 1995) – numerical references to profiles – and black-boxed ICT systems:

In our country, it is all encrypted, so ... If you have a profile, there is nothing to tell you that the person is there; it is just a string of numbers. [Country J]

I think that the two-step approach – first, compare DNA profiles and then, if you find a match, go and exchange the case and personal information – is a good measure to protect the privacy of the people involved. So, no risks there. (...) You only exchange DNA profiles; they are encrypted and sent over a secure TESTA network. [Country A]

Interviewees' narratives indicate that the standardization of procedures and operations conducted in a technologically mediated environment, coupled with the supervisory activities of regulatory authorities and the use of numerical references to represent DNA profiles, are expected to overcome privacy issues in the Prüm regime. In addition to allowing the circulation of data across different jurisdictions and establishing a common ground for interpretation, these numerical references function as a 'technology of distance' that creates a sense of objectivity by rendering invisible the subjective judgements, local circumstances and embodied practices involved in the production of forensic evidence (Derksen, 2000, p. 224).

The apparent neutrality of the process of transmitting DNA profiles through ICT communication networks is coupled to another form of black-boxing privacy that allows the Prüm regime to work – a form that lies in ignoring the considerable differences in the constituencies of databases in different jurisdictions.

In the EU, there is considerable variation among national forensic DNA databases regarding the criteria for including profiles and the periods of time and

conditions for their retention and/or deletion (Cho and Sankar, 2004; Van Camp and Dierickx, 2007; Machado and Silva, 2016). In countries with more restrictive legislation, the condition generally imposed for the inclusion of profiles in databases is that an individual must be suspected or convicted of a crime that involves a potential or effective prison sentence, or the fact that the individual subjected to the collection of a biological sample has committed crimes that are considered serious. In jurisdictions with legislation considered to be expansive, the inclusion criteria allow that individuals suspected of any crime can be submitted to sample collection and, consequently, to the inclusion of their respective DNA profiles in the forensic database (Santos, *et al.*, 2013).

The black boxing of privacy postulated by forensic practitioners is, however, challenged outside of their circle of experts, as these professionals address the public's imagined and actual anxieties associated with the protection of genetic data. The notion of the public as imagined by forensic practitioners tends to draw a major distinction between those directly involved with the criminal justice system – conceived as having some degree of experiential knowledge of Prüm – and those who are more distant from it: the general public.

In the view of the forensic practitioners the category of the general public encompasses both the common, unaware citizen who lacks information about what forensic practitioners do and/or citizens willing to learn more about the activities of those who work with forensic DNA databases. As the following quote illustrates, forensic practitioners perceive that this latter category of the general public is highly concerned – due to the informative potential of DNA – with the uses and purposes of genetic information in the forensic domain:

I think the biggest issue people have is about their privacy, in the sense that, right now, the idea of DNA is tied very closely to very personal information, like your eye colour or your medical information, but at the same time, the kind of DNA work that we do is very impersonal; it's often being compared to the idea of fingerprinting, where we take the portion that has no sort of coding information, and we use that as a tool of identification (...) I think people have trouble understanding that (...) All they see is the DNA aspect: they say, 'They're collecting DNA and my biological sample, and they get to know everything about me'. [Country E]

In the domain of the interactions with the general public, privacy emerges as an open box – that is, controversies are made visible and open – and requires further clarification. As the following quote shows, forensic practitioners tend to stress the power that medical uses of genetic data hold over the public imagination. The blurred boundaries between biobanks and forensic DNA databases are seen as capable of producing misconceptions that exacerbate concerns about the concrete uses of genetic data in criminal justice systems, and particularly within Prüm:

We are not [a medical database] ... If people are in the data, [it] is because they did something [wrong] (...) You do something [commit a crime], so we take your DNA

and we put [it] in the database. (...) If somebody can explain [to] me what is the danger [of Prüm]. The danger for me [is] that people don't know what we do and what is analysed, you know? If people know and understand what we analyse, [they would say] you can continue. [Country H]

As this excerpt clearly shows, forensic practitioners tend to view public apprehension about the uses of genetic material in the forensic field as unfounded. Describing their own activities as good and beneficial for society – that is, outlining how forensic science might help solve crimes – these forensic practitioners consider that mitigating public concerns and gaining public support for the use of genetic data in the forensic domain are primarily matters of proper communication (Bliss, 2012, p. 170), i.e. spreading a message to the public that elucidates the restricted uses of genetic information under the Prüm regime.

The ways in which forensic practitioners construct concepts of the public and infer the public's concerns lead to specific institutional responses (Stephens, *et al.*, 2013). In the case of forensic practitioners directly involved in Prüm, this generally implies the adoption of a 'proactive *ethos* of public responsibility,' that is, a position that perceives (forensic genetic) science as committed and engaged with its wider social implications (Bliss, 2012).

Within Prüm, the *ethos* of public responsibility is framed through the lenses of the public's scarce scientific literacy regarding the type of personal information that is extracted from DNA profiles in the forensic field and the limited knowledge of the public about the transnational exchange of DNA. In this context, some interviewees have expressed their availability to respond to perceived public needs for social accountability by assuming the roles of educators who correct misconceptions that the public may have about DNA and its transnational exchange. This type of position is illustrated in the words of this participant:

I think they [the public] don't know Prüm. Maybe they heard once of the international exchange of DNA (...) It's for that reason that, to me, it's important that we give information to the public, to the citizens (...) I would like to be very transparent (...) DNA is very sensitive. People think that we will analyse if they will be sick in the future, and so on. But it's not that. And I would like to show that. [Country I]

Communication via websites, publicly accessible activity reports, and interviews with the media and with academic researchers were described as common and acceptable ways to respond to perceived needs for social accountability. The public is understood by forensic practitioners as being in a position to challenge the authority of expertise and thus contribute to the renegotiation, revalidation, and re-legitimization of knowledge controversies (Young and Matthews, 2007). Forensic practitioners invoke also the citizens as the ultimate beneficiaries of scientific and technological activities (Nowotny, 2014) undertaken within transnational DNA data exchange, and refer to the social responsibility to disseminate information about a field that overwhelmingly depends on public support. Hence, although virtual or potential publics are not totally abstract, fully deployed or

actual, the general public can exert a real influence (Heeney, 2016, p. 3) by creating what forensic practitioners perceive as a ‘civic duty’ (Bliss, 2012) that, as the following quote illustrates, is conducive to social accountability:

We are working for society. Databases are an instrument to increase the safety of civilians in society. We are paid by taxpayers’ money, so I think society has a right to know what we are doing. [Country A]

Thus, forensic practitioners hold an actual or assumed position in the effort to reinforce the responsible governance of information, trust, and transparency that (re)build public trust and the credibility of institutions (Hedgecoe and Martin, 2003; Wainwright *et al.*, 2006; Salter, 2007). The activation of other channels of the sociality of science – such as communication with the general public – (re)delineates the hierarchies of knowledge production between experts and lay audiences. By inscribing communication with the public in a unilateral channel – that is, by solely making information available to the public instead of engaging in two-way directed science communication – forensic practitioners are able to create renewed forms of scientific legitimation. In particular, the forensic practitioners engage in boundary work in ways that allow the monopolization of expertise, the protection of the autonomy of science and the expansion of forensic practitioners’ role as public educators in society (Gieryn, 1983; Bliss, 2012). Therefore, by opening the black box of science and responding to perceived needs for social accountability, forensic practitioners are (re)positioning ethical boundary work in ways that lend credence to the field’s humanistic benefits for society.

Conclusion

This article contributes to expanding the debate surrounding the ethical implications of criminal DNA databases, and particularly to the debate over the transnational exchange of DNA data, by addressing what the concept of ethics means to forensic practitioners. The issues that the participants considered ethically important in the context of transnational DNA data exchange in the EU were wide-ranging. Participants highlighted that ethics are related to good science and laboratory practices, mentioned problems with receiving contaminated samples in the laboratory or reporting false positives to other countries, referred to data protection procedures, and outlined efforts to address social accountability by producing reports for assessment by external authorities and/or use by the general public.

Our theoretical approach was based on two main concepts: boundary work and management of controversies. The idea of managing controversies refers to the opening and closing of uncertainties and black boxes in science. Using the concept of controversy to analyse accounts of ethics allows further exploration of the dynamics of ‘boundary work’ which is oriented mostly towards expanding expertise and authority, monopolizing professional authority and resources and protecting the autonomy of science (Gieryn, 1983, pp. 791–793).

By analogy, the notion of ‘ethical boundary work’ allows an understanding of how forensic practitioners set boundaries in their activities.

Exploring what the concept of ethics means to forensic practitioners actively involved in transnational DNA data exchange allows discussing how ethics can be addressed as embedded in the sociality of science and in the way scientific work is legitimated. The narratives of forensic practitioners juxtapose the construction of fluid ethical boundary work between science and non-science with the dynamic management of controversies, both of which are seen as ways to lend legitimacy and objectivity to scientific work.

The creation of boundaries between science and non-science by forensic practitioners is governed by a continuous process of reconstructing the delegation of responsibility that enables the protection of the autonomy and legitimacy of science through the ambiguous, complex and transformative process of boundary work. Diverse forms of boundary work with ethics were revealed: first, the (re)construction of fluid boundaries between science/ethics. This form of ethical boundary work created distance by lending legitimacy to laboratory work, as disengagement from ethics signified correct moral practice. Conversely, the production of scientific knowledge was also understood as an outcome of ethical and democratic relationships among forensic practitioners.

A second form of ethical boundary work involves the establishment of distinctions between good and bad science that, in the case of Prüm, translates into the countries’ potentially different practices for assessing the reliability of a DNA match.

Finally, another form of ethical boundary work was enacted by processes of differentiating the scientific practices occurring within and outside the laboratory through the lens of a boundary between science/criminal justice system. While the presumed objectivity of scientific practices is assumed to ensure ethically grounded work within the laboratory, participants framed the activities that occur before and after the delivery of DNA evidence to the court as ethically challenging.

In discussing the above-mentioned contingencies of forensic practitioners’ practices in handling DNA data exchange, participants emphasized several strategies to address and manage ethical controversies. Three approaches were accentuated: first, uncertainty surrounding the reliability of DNA evidence was not resolved but was made manageable by a division of labour between the laboratory and the criminal justice system. In this context, ethics were framed as an assemblage of very diverse knowledge practices containing several controversial elements to be resolved by the courts. That is, forensic practitioners clearly outline that the responsibility for making decisions on the basis of DNA evidence is outside the realm of their responsibility.

Second, debates on threats to privacy resulting from transnational DNA exchange were portrayed as resolved by black-boxing privacy. The protection of privacy was framed by contextualizing the circulation of data within the technological environments of protected ICT systems, by outlining the

anonymization of personal data through impersonal numbers, and by referring to the control of data protection by supervisory boards. Within this framing of the protection of personal data, forensic practitioners presented privacy as a closed controversy within their circle of expertise.

Finally, there are open controversies related to perceived public needs for social accountability and transparency. These issues related to the general public have been negotiated through the lens of opening science to the public by providing information on the type of work that is possible to conduct with DNA databases and within the transnational exchange of DNA data, as part of the scientific *ethos* of forensic practitioners. That is, the creation and implementation of forms of interaction related to ethics, such as openness to the public and responses to social accountability, are part of the process of legitimizing the scientific practice.

Notes

1. A ‘match’ or a ‘hit’ might be used equally to describe correspondence between DNA profiles discovered by a database search at a single instant in time, independent of being a stain or stain-to-person match (ENFSI, 2016). In this article, we use the word ‘match’ because it was adopted by our interviewees.
2. As defined by Council Decision 2008/616/JHA, a full match implies that all the allele values of the compared loci are the same in the requested and requesting DNA profiles. Near matches are accepted in Prüm when the value of only one of all the compared alleles is different (one mismatch). However, Kees van der Beek showed that near matches consisting of six loci plus a mismatch are almost certainly false positives – i.e. a declared match that is invalid – or false negative – a match not found due to a mistake in a DNA profile. Therefore, the Netherlands does not provide demographic data for near matches without the guarantee of confirmatory testing (Van der Beek, 2011). Nevertheless, it remains unclear how other countries proceed with near matches (McCartney, 2014a, 2014b).

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