Predictive Policing: Review of Benefits and Drawbacks

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ABSTRACT

This literature review illuminates the conceptualization of predictive policing, and also its potential and realized benefits and drawbacks. The review shows a discrepancy between the considerable attention for potential benefits and drawbacks of predictive policing in the literature, and the empirical evidence that is available. The empirical evidence provides little support for the claimed benefits of predictive policing. Whereas some empirical studies conclude that predictive policing strategies lead to a decrease in crime, others find no effect. At the same time, there is no empirical evidence at all for the claimed drawbacks. We conclude that the current thrust of predictive policing initiatives is based on convincing arguments and anecdotal evidence rather than on systematic empirical research. We urge the research community to do independent tests of both positive and negative expectations to generate an evidence base for predictive policing.

Introduction

In the past years, an increasing number of police forces around the world have adopted software that uses statistical data to guide their decision-making: predictive policing. This approach means that police departments analyze statistical historic data to predict in what geographic areas there is an increased chance of criminal activity. This type of information can be used by law enforcers to efficiently deploy their resources to prevent criminal behavior (Ratcliffe, 2004). Predictive policing does not replace conventional policing methods (e.g. problem-oriented policing, intelligence-led policing or hotspot policing) but enhances these traditional practices by applying advanced statistical models and algorithms (NIJ, 2014).

The use of statistical models can be of immense value for reducing crime and ensuring the safety in cities. Indeed, some cases in the United States indicate that when predictive policing software is used, the crime rate decreases. For instance, with the use of historic data, Richmond's police department tried to forecast where gun firing would occur on New Year's Eve, in 2003, and adapted their surveillance routes to these predictions. It was deemed a success: the random gunfire decreased on this night with 47%, 246% more weapons were seized, while the police force became more efficient as $15.000 was saved (Pearsall, 2010, p. 17).

There are, however, also indications that predictive policing may have important drawbacks. When predictive models are administered, crime-forecasting is not dependent on theory anymore, but takes the large amount available data as a starting point (Kitchin, 2014; Vlahos, 2012). These models might result in possibly skewed depictions of society and criminal behavior as they tend to remove context (Innes, Fielding, & Cope, 2005). The risk here is that predictive policing could result in less effective and maybe even discriminatory police interventions.

In view of this debate about the benefits and risks of predictive policing, there is a need for a state-of-the-art overview of existing literature on the benefits and drawbacks of predictive policing. By conducting a PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analysis) study (Liberati et al., 2009), we offer a systematic overview of the literature and illuminate how predictive policing is conceptualized, and to what extent the claimed benefits and drawbacks are empirically supported. Full information about this literature review can be obtained from the authors: we present the key findings of this extensive review in this article. In short, this paper gives police practitioners an overview of the claimed benefits and drawbacks of predictive policing and highlights that they need to realize that, for the moment, this innovative method lacks a clear evidence basis.

Research method

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is a rigorous method for

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conducting systematic literature reviews (Liberati et al., 2009). The strength of this method lies in the transparent choices regarding the selection of publications and their analysis. In doing so, scholars can assess the review-process and replicate it.

Following the PRISMA method, the exact settings for the information sources are described (Liberati et al., 2009, p. 8). The 'incognito-mode' of the browser (i.e. Google Chrome) was administered to prevent any interferences of cookies or other browser-settings. Second, in the settings of every search engine the keywords 'predictive policing' were always in this fixed order. The main criteria that the literature needed to fulfill for it to be screened by the author is that it contained 'predictive policing' in either the title, abstract, summary or included in the keywords of the article. For our review of the literature, no date-restrictions were incorporated. The last date on which there has been a search for literature is 20–04-2017. Only publications written in English in ranked the journals (with an impact factor) or conference proceedings were selected. In the first phase of our literature search Multiple well-known search engines – Scopus, Science Direct, and ISI Web of Knowledge – were used to retrieve articles and conference papers. Hereinafter, Google Scholar was used to check whether important articles or papers were left out and to complement our corpus of literature, by searching for books and (edited) book chapters that also cover predictive policing. To secure their quality, only books and chapters from academic the publishers were included.

The search on the Web of Knowledge led to 22 results, Science Direct gave us eight documents and Scopus offered 45 results. Google Scholar offered 2400 and we evaluated the first 32 pages to check for high-quality books and (edited) book chapters that cover predictive policing. After the identification of the articles and the removal of duplicates (n = 55), the records were screened and assessed on eligibility, but also whether they were freely accessible via our research institute. In this phase, the abstract and/or summary of the records were qualitatively analyzed to assess how they conceptualized predictive policing, what its benefits are and to identify the drawbacks. The assessment of the documents resulted in a corpus of 37 bodies of literature.

Table 1 presents an overview of the publications that we included in the review. As expected, the attention to this topic is very recent: the oldest document that discussed predictive policing dates from 2010. The vast majority of the bodies of literature are published articles (n = 24). The articles are published from 2010 onward, with the most recent published in 2017. The increased interest in this topic can also be deduced from several recent conference papers (2013 onward; n = 4). Also, five book chapters in edited academic books discussed predictive policing. The first book that discussed predictive policing was published in 2013.

The journals that incorporated articles about predictive policing are from a wide variety of journals: there is not a journal from which multiple articles originate. There are various criminological journals but also journals that are concerned with big data and information science. In addition, mostly (North-) American and British studies conducted evaluative studies towards predictive policing. Regarding the academic books, RAND corporation is a key player as two books from the corpus are written by them. Elsevier is the main contributor with the three individual book chapters regarding predictive policing. The conference papers that are included in this review are mainly from computer and information science conferences.

What is predictive policing?

In the literature, a unanimous definition of predictive policing is missing but there is some consensus on its key features. Many of the articles indicate that predictive policing entails the application of quantitative techniques to forecast where criminal activities might occur in the (near) future (Camacho-Collados & Liberatore, 2015). The predictions based on these analytic tools can guide the decision-making of law enforcement agencies, especially with the deployment of its personnel (Bennett Moses and Chan, 2016).

Norton (2013) refers to a conceptualization of Craig Uchida of the National Institute of Justice that captures the essence of predictive policing: "Predictive policing is a concept that is built on the premise that it is possible to predict when and where crimes will occur again in the future by using sophisticated computer

Table 1. Overview of the publications in the corpus.

Type of publication	Academic article	Conference paper	Book	Book chapter
Number of publications	24	4	4	5
Years of publication	2010–2017	2013–2016	2013–2016	2011–2015
Disciplines	Criminology: 7	Information Sc.: 3	Criminology: 1	Criminology: 1
	Information Sc.: 4	Security: 1	Information Sc.: 1	Information Sc.: 5
	Statistics: 3		Policing: 2	Policing: 3
	Policing: 2			
	Other: 8			

analysis of information about previously committed crimes" (Uchida, as cited in Norton, 2013, pp. 32–33). Conceptualizations of predictive policing by Uchida are also used in other bodies of literature (Bennett Moses and Chan, 2016; Tayebi & Glässer, 2016). Perry (2013) wield a slightly different conceptualization that not only focuses on place but also on the identification of individuals by these models: "Predictive policing is the application of analytical techniques- particularly quantitative techniques- to *identify* likely targets for police intervention and prevent crime or solve past crimes by making statistical predictions" (p. xiii, own emphasis).

On the basis of these different but complimentary notions about predictive policing in the literature, we developed the following definition: *Predictive policing is the collection and analysis of data about previous crimes for identification and statistical prediction of individuals or geospatial areas with an increased probability of criminal activity to help developing policing intervention and prevention strategies and tactics.*

A first key feature of predictive policing is the *usage of a broad variety of sorts of data*. There is general agreement that predictive policing is mainly occupied with descriptive analytics that have the aim to expose and understand crime trends by processing a wide variety of (un)unstructured data. Potentially this could help law enforcers in their strategic and tactical planning and how they can effectively deploy their resources (Schlehahn et al., 2015). Indeed, it is argued that this type of policing strategy uses data mining methods to collect data that can help in the decision-making of law enforcement agencies (McCue, 2014; Tayebi & Glässer, 2016; Van Brakel & De Hert, 2011). This indicates that all data is relevant, whereas the traditional policing methods only rely on criminal data.

A second key feature of predictive policing is the *connection with pre-emptive policing*, which is the notion that law enforcers act before criminal activities take place to prevent crime from happening (Van Brakel & De Hert, 2011). Bennett Moses and Chan (2016) argue that predictive policing can be regarded as a form of pre-emptive policing that is mainly depended on statistical data. Inayatullah (2013) describes that the police can prevent criminal behavior by engaging in "*upstream prevention*" (Inayatullah, 2013, p. 5, original emphasis). Herein, law enforcers should work with multiple actors in society to take away factors that cause criminal behavior: safety becomes co-production. This is a theoretical caveat, however, as little literature argue how predictive policing can use in a manner that prevents criminal activity by taking away factors that cause it, in the spirit of upstream prevention.

Benefits of predictive policing

Potential benefits

In the conceptualization of predictive policing, general potential benefits are embedded: law enforcement agencies apply these methods to deploy their resources more efficiently and effectively. Schlehahn et al. (2015) indicate in their paper that predictive policing can identify patterns in enormous data sets, which can be used for interferences by police forces. We analyzed the literature to identify the specific claims.

A first specific claim of the benefits of predictive policing is that *resources can be deployed more accurately in place and time*. In respect to identifying areas at increased risk, predictive policing techniques are used that rely both on historic crime data and a wider range of data. For instance, advanced hot spot identification models and risk terrain analysis are used to forecast where criminal activity is most likely to occur. With this geospatial analysis, both criminal data and data that is retrieved through data mining are of importance: data that have no immediate relevance but can potentially help to prevent and predict crime from happening (Andrejevic, 2017). In addition, these different types of data can also be used to determine *when* criminal activity is most likely to occur through spatiotemporal analysis. These models aim to forecast on what times the criminal activity is the highest in a specific geographic area. The assumption of near-repeat crimes, the theory that future crimes are more likely to take place near to the time and place of current crimes (Perry, 2013, p. 41), is studied but also more specific patterns are presented in the literature. For instance, Dario, Morrow, Wooditch, and Vickovic (2015) tested with the use of criminal historic data from the Ventura Police Department whether good surfing conditions in California (i.e. weather conditions that attract surfers, locals, and tourists to surf spots), can be linked with a rise of criminal activity. They conclude that weather conditions indeed lead to more criminal activity in these areas, but only for a specific time-interval: between 2:30 pm and 5:29 pm (Dario et al., 2015, p. 271). Haberman and Ratcliffe (2012) found comparable results, as a chance of near-repeat events of armed robberies is increased in the first seven days, but hereinafter diminishes.

The analysis of time and space forms the basis for deployments of resources. Camacho-Collados and Liberatore (2015) have developed in collaboration with the Spanish National Police Corps a Decision Support System (DSS) to efficiently distribute police officers in a geographic area. With their study, they

tried to offer a solution of the Police Districting Problem (PDP), which is the challenge how police officers can optimally determine patrol sectors in which the chance of criminal behavior is the highest. The DSS-model proposed by the authors can help to better allocate police officers and determine the most optimal patrol routes. As part of their study, the authors tested their system and conclude that this method has the potential to distribute police forces more efficiently throughout the city. Although this is very promising, it remains a solution that needs to be implemented in practice to determine its actual value.

A second specific claim is that predictive policing techniques help to *identify individuals that potentially will be involved in an act of crime – either as victim of offender*. Perry (2013) describe that predictive algorithms can be used to identify members of criminal groups that show an elevated risk of a violent outbreak between them (e.g. gang shootings). Also, individuals can be identified that might become offenders in the future: inductive profiling (Van Brakel & De Hert, 2011). With these techniques, individuals that have attributes that correlate with a higher chance of displaying criminal behavior can already be monitored or targeted on the forehand (De Hert & Lammerant, 2016; Perry, 2013). This profiling transcends only demographical characteristics of individuals, but can also consist of (social) behavioral patterns (Brannon, 2017; Van Brakel & De Hert, 2011). Downs (2016) illustrated with his research that sex crimes are most likely concentrated in activity spaces of the offender (i.e. locations that are frequently visited by individuals). On the basis of a more sophisticated analysis, Kump et al. (2016) demonstrated through social network analysis that the crime risks of individuals increase for a period of time (approximately 25 weeks; Kump et al., 2016, p. 159) if they are socially connected to a certain degree to an offender. Williams, Burnap, and Sloan (2016) draw similar conclusions in respect to social media and criminal activity, as they find an association "between aggregated open-source communications data and aggregated police recorded crime data in London" (p. 337).

Evidence for these benefits

Santos (2014) argued with his assessment of different policing techniques that there is little evidence regarding the effectiveness of predictive policing. Nevertheless, his article was written several years ago and this field of research is developing at high speed and several empirical studies have been conducted in the meantime. For this reason, we re-assessed the evidence-base for the

benefits of predictive policing. We found that still only a limited number of studies in our corpus focused on the effectiveness of predictive policing methods in practice, but some recent studies tested whether the application of predictive policing techniques results in improvements of crime reduction.

Levine, Tisch, Tasso, and Joy (2017) evaluated the utilization of predictive policing techniques by the New York Police Department (NYPD). They assessed the Domain Awareness system, which is a network of sensors, databases, devices, software and infrastructure that delivers tailored information and analytics to mobile devices and precinct desktops (Levine et al., 2017, p. 71). The NYPD combined video analysis of cameras, environmental sensors, license plate readers, the 911-feed and an acoustic correlation processing of gun firing (i.e. ShotSpotter) to keep track of criminal activity in the city. The authors compared traditional hot spot policing with NYPD's predictive policing software and the accuracy of predicting certain types of criminal behavior (i.e. burglary, felony assault, grand larceny, robbery & shootings). They did this by comparing traditional hot spot policing with this new predictive policing system in a 24-week cross-validation period and the results were striking: the accuracy of the predictions on the different types of criminal behavior have increased, especially for shootings. In addition, the efficiency of the officers was also improved as they could better respond on criminal activity and find suspects through the full network of sensors by which it is easier to find suspects or stolen vehicles through license plate recognition. Also, officers can respond faster on shootings through ShotSpotter (which registers the sounds of shootings). Overall, the overall crime index of New York decreased with 6% since the implementation of DAS. The authors recognize that this cannot be fully attributed to this system but still qualify the system as a success.

Mohler et al. (2015) randomized controlled trials of predictive policing techniques in divisions of police departments of Los Angeles and Kent. They tested whether an epidemic-type aftershock sequence model (ETAS) that calculates the risk of criminal behavior in long-term hotspots and short-term near-repeat risks (Mohler et al., 2015). In this experiment, every 24 h they randomly assigned police divisions to configure their patrol route with the use of either the ETAS-algorithm (treatment) or with the use of a traditional crime analyst (control). The main findings of this study are that the configuration of police patrols with ETAS forecasts resulted in a decrease in crime as a function of patrol time of 7,4%. In contrast, the forecasts made by analysts did not have any significant effect in terms of

crime reduction (Mohler et al., 2015, p. 1400). Thus, they conclude, predictive algorithms such as the ETAS algorithm can indeed help to reduce crime (Mohler et al., 2015).

However, not all studies that tested the effectiveness of predictive policing methods found positive results. For instance, Hunt, Saunders, and Hollywood (2014) evaluated an experiment conducted by the Shreveport police department, Louisiana, in 2012. In this study, a predictive policing programme is used to determine geographical areas with a higher risk of criminal activity: Predictive Intelligence Operational Targeting (PILOT). In addition, this programme also derives concrete plans for action. This experiment uses program theory – i.e., the determination of indicators that increases the likelihood that property crime occurs- to construct prevention models on how to react to these indicators. These models are distributed to the command staff (i.e. intermediate outcomes), and it assessed whether this resulted in a reduction of crime and an increase in the quality of arrests (i.e. final outcomes). The results are indecisive: there is no considerable evidence that the application of PILOT leads to a reduction in crime rates when compared to the control districts which used conventional crime mapping. Possible explanations for these no-results are the (1) statistical power which was too limited (because few districts were incorporated in the experiment), (2) the police departments did not implement the strategies from PILOT rightly, (3) or the possibility that the programme was inadequate.

One evaluation study focused specifically on profiling systems. Saunders, Hunt, and Hollywood (2016) tested whether a Strategic Subject List (SSL) which estimates the risk of individuals that might be involved in gun violence, either as offender or victim – can help to prevent criminal activity. In their research, they did not find any clues that individuals on this list have an increased chance of being a victim of gun violence. The authors found an increase in the chance of individuals on this list being arrested for shooting but this could result from the fact that officers used the Strategic Subject List as leads for cases that were unresolved or because of extra monitoring. Hence, it remains unclear how this specific predictive policing method should be used and whether it can contribute to existing policing practices (Saunders et al., 2016).

Thus, existing evaluations and assessments produce mixed results. Whereas several studies show a positive significant effect for geospatial predictions, other studies have no significant results. Only one studied focused on profiling and this study produced
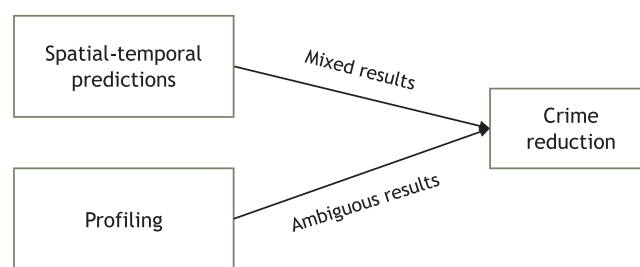

Figure 1. Relation between claimed and proven benefits of predictive policing.

ambiguous outcomes. The mixed findings can be attributed to the type of evaluation, to the type of predictive policing or to the type of method that was used for predictive policing. A preliminary conclusion is that this approach has potential but not all types of crimes can be effectively reduced through predictive policing models and therefore the officers executing these strategies need to adequately use these models. Every individual predictive model that is applied by police departments should be individually evaluated to determine their effectiveness and efficiency. Below, an overview is given to what extent the two different types of predictions are empirically proven (Figure 1).

Drawbacks of predictive policing

Claimed drawbacks

Although many police departments and academics are convinced of a bright future for predictive policing, several academics also raise some concerns regarding the usage of data mining and algorithms to forecast criminal behavior. These concerns will be discussed and determined to what extent these drawbacks are based on hypothetical assumptions or on empirical evidence. Many of these potential drawbacks concern both the spatial-temporal predictions and the profiling and therefore we only discuss this distinction if it is specifically highlighted.

A cautionary remark that is raised in the existing literature is that the algorithms cannot be fully comprehended by law enforcement agencies because of a lack of transparency of the predictive policing models (Datta, Sen, & Zick, 2016; Schlehahn et al., 2015). If the models are not fathomed by law enforcement agencies, it might become a challenge to determine how risky geospatial areas or individuals are: *riskier* is not the equivalent of *risky* (Saunders et al., 2016). If law enforcers do not understand the factors that lead to an increased chance of crime, the effectiveness of their actions might be reduced (Perry, 2013). In addition, it is important for law enforcement agencies to make

adequate inferences of the data and to make sure that it is properly understood to develop fitting strategies (Townsley, 2017).

Most of the predictive *models are mainly data driven instead of theory driven*, which can also have major implications on how these models are used. The usage of big data and data-based approaches might have the consequence that there is too much emphasis on correlations, instead of causality (Andrejevic, 2017). This could be problematic as predictions that are derived on algorithms are opaque and are hard to interpret (Chan & Bennett Moses, 2016). If existing models are not assessed and evaluated with the use of practical insights (e.g. tacit knowledge of police officers), the models will be outdated and present a skewed image of reality (Perry, 2013). The study by Saunders et al. (2016), as already described, also indicate that predictive algorithms are possibly not self-explanatory. One of the reasons why they did not find significant results could be the fact that although the contact with potential offenders increased, the models do not provide any enough recommendations how to interact with these offenders or how the models should be used. This reinforces the assumption that the predictive models can never be used on itself without further instructions to police officers how to act in the streets, and hamper their effectiveness.

With a lack of transparency and understanding of predictive models, *accountability problems* might occur. Bennett Moses and Chan (2016) raise the potential consequence that law enforcers cannot fully understand and interpreted the outcomes of the software an and deem the outcomes as sufficient input for decision-making. This could lead to an accountability gap in which police officers are unable to understand the models and therefore cannot deduce biases in the models. In other words, it becomes unclear who is responsible for decision-making when there is full reliance on predictive algorithms.

As a consequence of the lack of transparency, use of a model of predictive policing for profiling may result in *stigmatizing individuals and groups* and thus forms of discrimination based on algorithms. Law enforcers may overlook and underestimate the effect when the predictive models are used inadequately as they can potentially lead to stigmatization of individuals (Schlehahn et al., 2015). In their article, Schlehahn et al. (2015) provide a hypothetical example of how the resocialisation of ex-convicts might be affected by the actions of law enforcement agencies. They make a compelling argument how the stigmatization of groups of people with a criminal record can lead to aversion, and eventually, relapse in criminal behavior as their reintegration in society is

stagnated by these predictive algorithms and how they are treated by officers. Thus, the profiling of individuals can eventually be self-fulfilling as it drives individuals towards criminal behavior.

The administration of predictive policing techniques can also entail *unintended consequences*. Brannon (2017) compared two data-driven projects – one of which concerned with predictive policing – and came to a remarkable conclusion. He reviewed the Kansas City No Violence Alliance (KCNOVA), which uses network-analysis software to identify individuals that are most likely to be involved in criminal activity and a living lab in the downtown of Kansas that is aimed to improve the quality of live and stimulate capital investment in this part of the city. Brannon (2017) concludes that the application of predictive policing in a geographical area in the city also impacts this space and its inhabitants: when one area is monitoring criminal activity while the other area is flourishing as capital investments are encouraged, this leads to spatial inequality across racial and social classes (Brannon, 2017).

Next, to the practical issues that are accompanying the administration of predictive algorithms, more fundamental *concerns regarding privacy and ethics* are raised. Edwards and Urquhart (2016) review whether the usage of open source and social media data by law enforcement agencies should be permitted and to what extent the digital identity of citizens is protected. The authors raise the question to what extent the digital footprint of citizens (e.g. what citizens share on social media and the data that can be collected such as our movements with public transport) is private and whether it can be used unconditionally. De Hert and Lammerant (2016) discuss tensions between the profiling of individuals in society and legal safeguards, as these are often loosened to resolve these tensions. Even tough jurisprudence on privacy is very clear in the legal limits of predictive profiling, there remain little cases which makes it hard to set precise boundaries what is eligible. This conclusion is underlined by Costanzo, D'Onofrio, and Friedl (2015), as they argue that legislation is important to retain trust between citizens and governments as there should be a balance between the utilization of big data and the privacy of citizens. If there are no clear boundaries citizens might develop a profound sense of mistrust towards governments as they are unaware whether, and to what extent, they are monitored (Inayatullah, 2013; Schlehahn et al., 2015).

Evidence for these drawbacks

This literature review highlights the potential drawbacks of predictive policing have been discussed quite extensively,
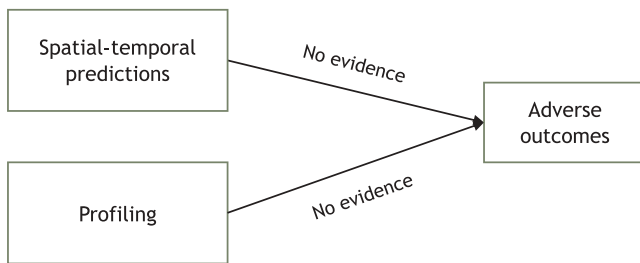
Figure 2. Relation between claimed and proven drawbacks of predictive policing.

but empirical evidence for these drawbacks is lacking. The risk of predictive policing lacking transparency, with affiliated problems such as accountability issues, is plausible. In addition, if law enforcement agencies have limited boundaries or legislation they need to comply to, a wedge might develop between the government and its citizens since the mutual trust is reduced. However, in academic literature, there is little empirical evidence how predictive policing methods lead to difficulties in practice. The focus in the (limited number of) empirical evaluation studies is on testing whether the desirable outcomes were realized and not whether this resulted in adverse effects. This is a gap that needs to be filled by empirical research, to show whether these claimed drawbacks actually occur in the implementation of predictive policing. In Figure 2, we summarize the evidence in the literature on the adverse effects of predictive policing.

Conclusions

This literature review attempted to give a state-of-the-art overview of the scholarly attention to predictive policing. The purpose of this study is threefold as it assessed (1) how predictive policing is conceptualized, (2) what the potential and proven benefits are, and (3) what evidence there is for these claimed and proven drawbacks. We will summarize the outcomes in these conclusions and highlight the relevance for police practitioners.

In the current literature, a unanimous definition of predictive policing is absent. Nevertheless, most of the literature operationalize predictive policing as a method that applies quantitative techniques to predict in what geographical areas there is an increase chance of criminal behavior, but also which individuals and groups – through predictive profiling – are more likely to be involved in criminal activities. These models help in to configure an optimal deployment of resources (e.g. patrol routes of officers) to reduce crime most efficiently and effectively. On the basis of our review of the literature, we developed the following definition that

combines the geospatial focus and profiling: *Predictive policing is the collection and analysis of data about previous crimes for identification and statistical prediction of individuals or geospatial areas with an increased probability of criminal activity to help developing policing intervention and prevention strategies and tactics.*

With respect to the benefits of predictive policing, there are mismatches identified in the literature. There are many prospects described of predictive models, as it aims to reduce crime through more efficient and effective policing strategies. Nonetheless, actual evaluations of the usage of these models in practice lead to mixed results. Of the three existing studies that empirically tested whether geographic areas are better targeted with predictive software, only two show a positive correlation. In addition, a study that evaluated whether the profiling of potential victims and offenders of criminal activities neither show a significant result. This implies that not all predictive policing models effectively reduce each form of crime and that that geospatial predicting and profiling are both very different variations of predictive policing. We conclude that the usage of every individual model should be thoroughly evaluated before any effectiveness-claims can be made.

The concerns surrounding predictive policing are mainly directed towards the lack of transparency of the predictive models. This has consequences for both the effectiveness and accountability of these models. If police officers do not comprehend why the predictive algorithms derive certain outcomes or how their patrol routes are configured, they might not be aware of how they should respond in certain situations or how to act. This might hamper the effectiveness of the geospatial predictions of predictive software. Besides, when the predictive models are not transparent, police departments potentially cannot legitimize their decision-making anymore. There are also glimpses identified that the administration of predictive policing software in certain areas can lead to inequality between social groups. Lastly, the ethical question regarding the protection of privacy is brought up. When the profiling of individuals is gained a more prominent role in the practices of law enforcers, it is important to revise the rights of the citizens in relation to their digital and online privacy, as legislation and jurisprudence are often vague and unclear. Arguably, this could impair the relationship between citizens and the government because of unclear civil rights. However, there is no empirical evidence to strengthen any of these assumptions. Hence, academics should further elaborate how the predictive models work out in practice and whether we actually see that the drawbacks of lack of transparency and stigmatizing of individuals and groups actually occurs.

In sum, this study has provided an overview of what predictive policing is and what the claimed benefits and drawbacks are. At the same time, the overview highlights that there is a need for a stronger empirical assessment of these approaches to understand the relation between features of the approaches and success in reducing certain forms of crime. When there is more evidence available to back-up the claimed benefits and drawbacks of predictive policing, it can be objectively determined how effective predictive policing methods are and how they can contribute to the traditional policing methods. Therefore, scholars are urged to evaluate different predictive policing models to increase our understanding of what type of predictive methods seem fruitful and under which conditions. To evaluate the claimed drawbacks of lack of transparency or accountability, it should be studied how predictive models are used in practice. If strategies that are derived from predictive algorithms are not executed properly or valued by officers, this undermines their effectiveness. Furthermore, it can be beneficial to evaluate to what extent there is too much focus on correlations instead of causalities by law enforcement agencies. Finally, in line with Inayatullah (2013), it will worthwhile to investigate how these predictive policing models can reduce crime through prevention instead of the controlling of geospatial areas and individuals. It should be evaluated how these predictive models can be used to resolve underlying factors that lead to an increased risk of criminal activity.

Disclosure statement

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