

**WHAT DO WE REALLY KNOW ABOUT POLICE PATROL?:
A SYSTEMATIC REVIEW OF ROUTINE POLICE PATROL RESEARCH**

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**WHAT DO WE REALLY KNOW ABOUT POLICE PATROL?:
A SYSTEMATIC REVIEW OF ROUTINE POLICE PATROL RESEARCH**

ABSTRACT

Purpose: Research on routine police patrol has experienced little attention in criminology for the past four decades. Despite the fact that little is known about this mode of policing, a consensus seems to prevail regarding its ineffectiveness for crime deterrence and crime prevention. To emphasize this gap of research, this study systematically reviews existing literature on routine police patrol.

Methods: A systematic review in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines of scientific studies (n=4) was conducted. Evidence was synthesized quantitatively (e.g., tabular) and qualitatively (e.g., narrative argumentation).

Results: The synthesized results provide no ground for the diagnosed ineffectiveness of routine police patrol, that seems to be believed throughout criminological studies. Despite the outdated character of the majority of reviewed studies, results show inconsistencies and fail to clearly establish positive or negative quantitative crime deterrent effects.

Conclusion: Contemporary research does not adequately understand the effects of routine police patrol and builds leading police research on a limited number of methodically flawed studies from the mid 1970's. Future research should establish the effectiveness of this mode of policing and optimal spatial allocation of police officers following a sound methodological framework.

Keywords:

police, crime, routine police patrol, deterrence, systematic review

INTRODUCTION

Police patrol is as old as institutions of police and public safety themselves. Whether one acknowledges the first recorded uniformed patrol in 13th century Hangzhou, China (Kelling, Pate, Dieckman, & Brown, 1974) or the establishment of the first formal police force by Sir Robert Peel through the UK Metropolitan Police Act in 1829 (Carrabine, 2009) as the emerge of police, routine patrol has always been the central element of policing repertoires. Along with that arose questions in regard to preventative effects of daily police work. Discussions have not yet converged around an explicit answer but they agree that a complete absence of police force arguably leads to soaring crime rates (see Sherman & Weisburd, 1992).

Despite the historically long-term implementation of routine police patrol, very little is known about this central strategy of policing. Especially, during the past four decades scholars have neglected routine patrol, as part of the standard model of policing, and largely agreed upon its ineffectiveness in fighting and preventing crime (see National Academies of Sciences, Engineering, and Medicine, 2018; Ratcliffe, 2008; Scott, Eck, Knutsson, & Goldstein, 2008; Telep & Weisburd, 2012; Townsley, 2017; Weisburd & Eck, 2004). From there, myriad novel and innovative policing practices have been developed and

elaborately evaluated. Most prominent are strategies such as *hot spots policing* (Ariel, Sherman, & Newton, 2019; Braga, Turchan, Papachristos, & Hureau, 2019), *community policing* (Weisburd & Eck, 2004), *problem-orientated policing* (Scott et al., 2008; Townsley, 2017), or *intelligence-led policing* (Ratcliffe, 2008). Although these policing strategies generally appear to have positive effects on police work throughout jurisdictions and have been extensively evaluated, they all operate under the assumption that routine patrol is an ineffective way of fighting crime and therefore should be dismissed.

Even within the paradigms of the presented policing strategies prevails a consensus that available knowledge on routine police patrol is scarce and more research on its effects is needed. Further, studies with a focus on routine police patrol have been subject to extensive academic criticism (Larson, 1975; Weisburd & Eck, 2004). However, most authors remain unclear on how much we actually know about routine policing and what its global outcome is. A single study that is widely cited remains to be the evaluation of *The Kansas City Preventive Patrol Experiment* from the mid 1970's (Kelling et al., 1974). Hence, scholars and practitioners alike have repeatedly called for more research on proactive crime prevention measures (Lum, Koper, Wu, Johnson, & Stoltz, 2020).

Definition of Routine Police Patrol

The strategy of routine police patrol is best understood in light of the standard model of policing and adjacent proactive policing strategies. Menace of arrest through police officers and judiciary punishment shape the standard model of policing and its presumed deterrent effects on crime in a wider prevention apparatus. Patrolling is one of the three central aspects of the standard model of policing, which also incorporates rapid response to emergency calls and post crime follow-up investigations. More than just these activities, e.g., traffic management, public order maintenance, responding to homeland security threats (Scott et al., 2008; Weisburd, Telep, Braga, & Groff, 2010), are recognized as core responsibilities of modern police forces. Nevertheless, police patrol stands out for its particular preventive nature. Here we understand the concept of routine police patrol as “[officer]¹ *self-initiated patrol for actual preventive patrol purposes*” (Schnelle, Kirchner, Casey, Uselton, & McNees, 1977). The idea of preventive strategies is, therefore, to act upon the aim to prevent and reduce crime or public disorder proactively. This means, that police forces do not solely react to ongoing crime or investigate past events but intentionally seek to stop and prevent crime before it takes place (National Academies of Sciences, Engineering, and Medicine, 2018).

One specific attribute manifests the distinctiveness of routine police patrol in contrast to other policing strategies. Routine police patrol is executed randomly. This randomness is based on two unique characteristics of routine police patrol. First, patrol officers are randomly dispatched across the entirety of their respective patrol beat (Weisburd & Eck, 2004). In contrast to place-based policing strategies, most prominently hot spots policing, random patrol is not intended to be geographically concentrated.

¹ Author's note.

Especially due to the duty to respond to citizen initiated calls for service or to perform other community related tasks, police patrol randomly starts and ends depending on prior assignments. The whole organization of police forces is highly affected by these responsive duties (Lum et al., 2020). Therefore, patrol officers uniformly spread out across all police beats to ensure a fast response to incoming calls for service (National Academies of Sciences, Engineering, and Medicine, 2018). Second, patrol officers choose where and how to engage in proactive patrolling based on their subjective assessment and local knowledge. Patrol officers are not send out with specific instructions to patrol certain areas within their district in everyday patrol activity. However, even when specific orders might be given to the patrol units, patrol can only take place when the officer is not bound to fulfill others tasks, such as emergency call response (Wise & Cheng, 2016). Estimates vary greatly on how much time is actually available to perform patrol tasks, at least between 60% to 75% of the officers' time seem to remain unassigned (Famega, 2005; Kelling et al., 1974). However, very little research focuses on officers' time allocation (Davies & Bowers, 2015).

Despite the fact that routine police patrol has been around for some time now, typological boundaries between different policing strategies often overlap and appear to some extent rather vague (Weisburd & Eck, 2004). Although advocates of more focused strategies dismiss routine police patrol as ineffective, these very strategies consist of main aspects that find use in the standard model of policing. Particularly, when patrol officers are free to self-initiate patrols in terms of a temporal and spatial degree, it does not appear devious to think they would target high crime areas, such as streets close to bars, nightclubs, or closed businesses at nighttime (Brantingham & Brantingham, 2008; Felson, 2002; Kinney, Brantingham, Wuschke, Kirk, & Brantingham, 2008; Kurland, Johnson, & Tilley, 2014), based on their experience within the district. Hence, in this aspect routine patrol shows a similar framework to hot spots policing. Yet, there still remains uncertainty on the implementation of such *standard* features in contemporary everyday policing (Lum et al., 2020).

Further, a practical ambiguity remains in terms of conducting routine police patrol (Chaiken, 1976). Notwithstanding the consensus that patrol requires uniformed officers to clearly be identified as such, the modes of patrol are manifold and demand appropriate research perspectives. Routine police patrol can be organized either as foot patrol, bike patrol, or motor patrol² (Chaiken, 1976). All of these modes have different structural characteristics and are diversely deployed throughout police departments. Routine police patrol as a general strategy can be applied with all three modes for different purposes as a function of their unique limitations. Evidently, motor patrols for instance can cover more ground in a shorter time but lack the higher terrain accessibility of foot or bike patrols (Piza & O'Hara, 2014; Police Foundation, 1981; Ratcliffe, Taniguchi, Groff, & Wood, 2011).

² Depending on the definition patrol can also be organized as horse patrol or K-9 units (working with police dogs), but indeed these forms are quite rare.

Importance of Routine Police Patrol Research

Why study routine patrol and its effect of crime when we have already transcended to more innovative policing strategies? Routine police patrol still remains central to contemporary policing. Here we present five rationales. First, everyday policing is still being widely organized along the standard model of policing. Against widely held presumptions, police departments are slow to adapt new strategies (Lum et al., 2020). On the one hand that is due to required structural changes within the entire police organization. New technology has to be acquired, officer trainings adapted, personnel units established³, and novel operations implemented. On the other hand, the structural changes bring along evident fiscal costs to train specialized staff. However, scholarly interest remains cold on research affiliated with practical implementation of innovative policing strategies within police departments. Second, police officers are a scarce resource. They need to be deployed over ever growing urban landscapes in terms of size and population. Scott et al. pointed out that the police officer-citizen-ratio sits at roughly 1:300 in the U.S. (Scott et al., 2008). This lack of personnel is further strained to a growth in non-crime related tasks that police officers have to address (Carrabine, 2009; Wuschke, Andresen, Brantingham, Rattenbury, & Richards, 2018). Therefore, police provision cannot be guaranteed for the entirety of each police beat at every moment of the day. Third, police operations account for a considerable part of public funds. Investments in policing and annual expenditures have been established to be around 20% of municipality budgets (Wuschke et al., 2018). Resulting from that, optimal spatial and temporal allocation of police resources must be aimed for and strategies to do so have to be developed. Fourth, as mentioned above, routine patrol presents the origins of contemporary police forces and policing strategies (Carrabine, 2009). Recently developed innovative strategies go back to central aspects of routine patrol practices. If we do not understand the very basic effects of all parts of the standard model, how can we go beyond and understand other strategies, which to a certain extent rely on the very same practices? Fifth, very little is known about such a central policing strategy that is arguably the most used patrol strategy throughout the globe. Most prominently, advocates of other policing strategies base their understanding of routine police and its effects on crime on a single more than forty year old study (see Ratcliffe, 2008; Telep & Weisburd, 2012; Townsley, 2017; Weisburd & Eck, 2004). Hence, this gap appears rather vast and must be addressed (Weisburd & Eck, 2004).

Current study

The aim of this paper is to synthesize and summarize research on routine police patrol and associated crime deterrent effects. The systematic review is to yield answers to the questions: (1) *what is known about routine police patrol, crime prevention, and its spatial allocation?* and (2) *where does research on routine police patrol need to go?* The remainder of this paper is dedicated to present an overview off

³ Especially data orientated policing strategies require specialist units for crime analytics to identify e.g., crime hot spots or particular risky local times per day.

all existing studies ever conducted on routine police patrol and systematically assess these studies' findings.

METHODS

A systematic review was conducted as it presents the favored review type to systematically search for relevant research, assess its quality, and consolidate findings of all identified research (Grant & Booth, 2009). This review was designed to follow the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher, Liberati, Tetzlaff, Altman, & Prisma Group, 2010). The criteria based literature search yielded four studies in total (see Figure 1). These studies were conducted in the United States (n = 2), United Kingdom (n = 1), and Australia (n = 1) from October 1972 to October 2015. The retrieved studies concentrated either on routine police patrol in terms of police presence in space or measured effects on crime rates.

[Insert Figure 1]

Search Strategies and Databases

We included peer-reviewed journal articles as well as grey literature in this systematic review. Grey literature in form of public agency reports, most evidently police departments, presents a valuable source of information regarding policing strategies. The complete process of literature search, screening, and selection was carried out by the authors. In total twelve academic databases were screened (see Table 1). These databases were chosen on the grounds of an in-depth relevancy test. Similar reviews in criminology were consulted to identify suitable databases. Next, journal suggestions from the American Society of Criminology (ASC) were scanned and an impact factor analysis resulted in 36 potential journals with relevancy in the field of criminology. For each journal the associated publisher and databases were identified and included. Four unique search terms were determined in order to retrieve relevant studies, namely: *routine police patrol*, *preventive police patrol*, *preventative police patrol*⁴, and *random patrol*. Depending on the algebra used in the respective database search engines, the search terms were linked through Boolean operators or quotation marks, e.g., random AND patrol or “random patrol”. We were able to use Boolean operators in two of the twelve databases. After the screening process a cross reference search was conducted manually to check for overlooked studies. Finally, literature recommendations from experts in the field were obtained, which added one study to the search result (see acknowledgements). The data retrieval was conducted during December 2019. In total, we retrieved 1,482 unique citations (see Figure 1).

[Insert Figure 2]

⁴ The rather similar terms *preventive police patrol* and *preventative police patrol* were used because criminological terminology concerning crime prevention varied during the past four decades.

Selection Criteria

Study selection was based on four criteria: (1) does the study focus on police patrol?; (2) does the study focus on routine police patrol; (3) is the study aimed at evaluating routine police patrol in terms of crime deterrence or spatial allocation?; (4) does the study generate novel data?⁵ The criteria were hierarchically tested from title and abstract to full-text (see Figure 2). Study information and abstracts were extracted through mass export from the databases. An original R-code was used to systematically merge the extracted information and preprocess the data for quality assessment. Studies that passed all four criteria checks were then digitally retrieved in full-text. We only included studies in the final assessment that were published in English, Dutch, and German, due to the authors' language proficiencies.

Assessment

The quality of retrieved studies was determined using both quantitative and qualitative assessment methods. The quantitative assessment featured (1) the publication type; (2) study design; (3) unit of analysis; and (4) variables used. Qualitative assessment was used on the (5) presented findings. Overall, the quality differed significantly across all studies. However, all four studies were included in the synthesis due to the small sample size ($n = 4$). The general quality of the retrieved studies and variance between the presented variables as well as statistical measures lead to the dismissal of conducting a meta-analysis.

[Insert Table 1]

RESULTS

Four studies met inclusion criteria (see Table 2). To present our assessment of deterrent effects and spatial allocation of routine police patrol, we first describe study characteristics, location, research design, and statistical methods used. Next, we present each study in detail and synthesize the empirical evidence for crime deterrent effects. Concluding, we point out main findings of all assessed studies.

Study Characteristics

The retrieved studies significantly differ in their characteristics although the shared focus is an examined relationship between routine police patrol and crime in urban agglomerations. However, all studies were conducted in Anglo-Saxon countries, two in the United States, one in the United Kingdom, and one in Australia. Three different research designs were identified in the studies: quasi-experimental trials ($n = 2$), observational data analysis ($n = 1$), and project evaluation ($n = 1$). This systematic review includes studies conducted between 1972 and 2015. The length in the observation periods or trial times varied greatly, with the shortest period being 12 days⁶ and the longest 365 days. On average, observation

⁵ The selection criteria were nested to guarantee detailed screening. If uncertainties prevailed, records were carried to the next level of filtering. E.g., record was screened in the abstract search if the title search did not identify answers to the criteria.

⁶ In the study of Schnelle et al. the complete observation period of 52 days represents the cumulative function of four independent time periods with a length of 12, 12, 12, and 16 days respectively (see Schnelle et al. (1977, p. 33).

periods lasted for 234 days (MED: 259, SD: 157). Both quantitative and qualitative methods were implemented in studies. Note that one of the assessed studies presents an government lead evaluation summary report, which does not employ a sophisticated statistical methodology. Next, each study is briefly presented in terms of academic quality, characteristics, and findings.

[Insert Table 2]

The Kansas City Preventive Patrol Experiment

The study was conducted in Kansas City, Missouri, in the U.S. in collaboration with the Local Police Department from October 1st 1972 to September 30th 1973. The overall costs of this experiment amounted to more than \$1,000,000 (Chaiken, 1976). Main aim of the study was to identify preventive effects of routine patrol on both crime and the public's fear of crime (Kelling et al., 1974). An experimental design in form of a randomized controlled trial was used on the police beat level. Based on social-economic characteristics, 15 out of 24 police beats within the South Patrol Division were selected for the experiment (Kelling et al., 1974). These 15 police beats were randomly allocated to three distinct experimental groups; *control*, *reactive*, and *proactive*. Each containing five assorted police beats. The reactive group favored response to emergency calls. Measures of routine police patrol were halted for the duration of the experiment. In the reactive group the level⁷ of routine police patrol was increased to up to 300% from the control baseline. To increase the level of police in the proactive beats, additional police cars were assigned to patrol and police teams from reactive beats regularly drove through the beat to respond to calls for service (Kelling et al., 1974).

Measured effects of crime were further categorized into five crime types: “*burglary, auto theft, larceny-theft of auto accessories, robbery, and vandalism*” (Kelling et al., 1974). To understand baseline crime and identify possible deterrent effects on these different crime types, the experiment relied on wide array of datasets⁸. First, businessmen were surveyed (n = 110) to collect data on victimization rates within the experimental areas. Second, reported crime data was obtained from the Kansas City Police Department for both the pre-experimental as well as experimental period. Third, arrest data per month and beat were also analyzed. The experimental data was tested for significance with comparisons between the three different groups. However, no explicit type of statistical testing is mentioned (Kelling et al., 1974).

The study lead to three significant findings of The Kansas City Preventive Patrol Experiment. First, a reduction of reported crime in “*other sex crimes*” was identified for the reactive beats in comparison to control beats ($.01 < p < .025$). The categorization of other sex crimes contains felonies such as nuisance and exhibitionism (Kelling et al., 1974). Second, reported crime through survey data showed in increase in residential burglaries for the responsive and proactive beats in contrast to control beats ($.025 < p <$

⁷ The study does not state how level of police is measured, e.g., number of officers, number of cars, time of cumulative patrol per time unit, between the three groups.

⁸ Not all datasets of the experiment are considered here as some solely focus upon subjective perception of fear of crime or response time indices. The excluded datasets did not correspond to the scope of the review.

.05). Third, vandalism on private properties decreased both within the responsive as well as the proactive beats ($.001 < p < .005$) (Kelling et al., 1974). All remaining cross group comparisons did not show any significant difference. Unfortunately, the results were not presented for each comparison across groups but on an aggregated level, namely: *control*, *reactive*, and *proactive*.

Patrol Evaluation Research

This quasi-experimental study was published under the title “Patrol Evaluation Research: A Multiple-Baseline Analysis of Saturation Police Patrolling During Day and Night Hours” (Schnelle et al., 1977). In light of the impact of the Kansas City Preventive Patrol Experiment, this study was conducted in Nashville, Tennessee, U.S. between April 14th and July 30th 1975⁹ (Schnelle et al., 1977). The aim was to identify the effects of increased police patrol on reported crime. A non-randomized experimental design was implemented to test for crime deterrent effects on crime. Four out of 33 police beats within the Nashville Metropolitan Area were selected due to observed high crime rates over long periods of time. The four zones were split into two groups: day patrol and night patrol. The day patrol beats received increased police patrol from 9:00 a.m. to 5:00 p.m. for 12 days each, one period in April and one during April and May. The night patrol beats were intensively patrolled for 12 and 16 days respectively from 7:00 p.m. to 3:00 a.m., one period in June and one in July. In the four examined police beats police patrol was increased up to 400% compared to the baseline level in the remaining 29 Nashville police beats. Therefore, the number of police cars, manned by one police officer, assigned to the police beats was increased from one to five (Schnelle et al., 1977).

The study especially highlights “Part 1 Crime”, consisting of burglaries, robberies, larcenies, aggravated assaults, forcible rapes, motor thefts, and homicides. The reported crime data was retrieved from the Nashville Metropolitan Police Department (NMPD). This dataset represents all citizen reported crime that the NMPD received through direct telephone calls (Schnelle et al., 1977). Routine police patrol was understood to detect more crime and enhance visibility when limited to a lower speed level, here 20 mph. Therefore, so called *tachographs* were used to measure the vehicle speed constantly throughout the study. Selected data was analyzed with time-series analysis to test for significant differences in the level of Part 1 reported crime. (Schnelle et al., 1977)

No significant changes in recorded crime counts were detected for the two day patrol beats at time of intervention ($t = .66, df = 50, p > .05$; $t = .79, df = 60, p > .05$). Significant changes were presented for the night patrol beats in the level of Part 1 crime compared to the preintervention period ($t = -2.48, df = 126, p < .05$; $t = 2.08, df = 98, p < .05$) (Schnelle et al., 1977). In the postintervention period significant increases in Part 1 crime were identified in the night patrol beats ($t = + 3.53, df = 44, p < .05$; $t = + 2.10, df = 21, p < .05$). The day patrol beats showed no significant differences in the same period ($t = -1.5, df = 44, p > .05$; $t = -.08, df = 44, p > .05$). Displacement of crime was accounted for

⁹ The study does not clearly state the year of the experiment.

using time-series testing on all adjacent police beats . No significant differences were identified in these beats. (Schnelle et al., 1977). The authors mention a more granular analysis of incidents for crimes against persons (rape, assault, armed robbery) and crimes against property (theft, burglary). However, they fail to present both data and results for this analysis (Schnelle et al., 1977).

Police Patrol in Victoria

The Prahran Police Department (PPD), Australia, evaluated the implementation of a novel routine policing strategy between April 1978 and March 1979 (Brown, Ball, & Macneil, 1980)¹⁰. Labelled as “*Integrative Community Policing*”, the shift in strategy was mainly aimed at reducing crime in Prahran, a suburb of Melbourne in the State of Victoria, improve the effectiveness of police patrol, both in quality and quantity, and consolidate police organizational practices. Hence, citizen and officer satisfaction was monitored to qualitatively assess police patrol practice. The study was designed to identify central important aspects for subsequent police reforms on the state level (Brown et al., 1980). This grey-literature study report presents not the usual scientific contribution sought for in the discussion on routine police patrol. The report evaluates changes in reported crime for two periods: project period and postproject period. Both period’s duration was set at 12 months (Brown et al., 1980). The increase of police patrol was measured in the number of sergeants posted and patrol cars available at Prahran Police Department. In total, 25 police officers and four patrol cars were added to the Department’s resources. This represents an increase in the number of police officers of approximately 60%. However, the increase in staff was not due to any experimental conditioning but to internal organizational restructuring (Brown et al., 1980). Although, the quality of the study can in no way be considered scientifically reliable, the 400 page report offers a detailed descriptive overview of then contemporary police evaluation measures.

Various datasets were used for the evaluation. Local crime data for the Prahran neighborhood, state level crime trends, dispatch records of PPD officers, as well as surveying and interview data were included into their analysis. However, results from surveying and summaries of KPI’s present the major body of this study (Brown et al., 1980). Detailed data was not provided. For example, district based changes in reported crime were given for the years 1977 and 1978 but the baseline data is not provided as a whole (Brown et al., 1980). Further, error prone data collection methods were implemented. All patrol officers were ordered to document daily patrol activities in a logbook. The report mentions that all of the motor patrol officers followed but most of the foot patrol officer’s activity remained unlogged (Brown et al., 1980).

Crime deterrent effects were established by focusing on numerical decreases in reported “*patrol preventable crime*” for a 12 month period after the implementation of the integrated community policing

¹⁰ The study fails to directly state the length of the observation period. The author’s logically deduced observation time by examining historical correspondence of the Prahran Police Department (Brown et al. 1980, p. 2).

measures (Brown et al., 1980). Data was provided for the implementation district Prahran and for the other three police districts (Hawthorn, Richmond, and Fitzroy) within the departments area of responsibility and the state of Victoria. On the one hand, three types of “*patrol preventable crime*” showed a large decrease associated with the change of policing strategy. “*Tamper with motor car*” decreased by -46.7%, “*Burglary (Other)*” decreased by -24.7% and “*Wilful [sic] Exposure*” by -21.4%. Only the first category showed an evident convergence with three other district trends. On the other hand, three types increased largely compared to the preceeding period. Reported crime on “*Burglary (House)*” increased by +47.4%, “*Armed Robbery*” by +16.7%, and “*Assault and Robbery*” by +8.7% in the Prahran District. Throughout all districts and the state level, crimes categorized as “*Burglary (House)*” increased similarly strong in the observation period (*Hawthorn*: +35.9%, *Richmond*: +36.0%, *Fitzroy*: +31.8%, *Victoria*: +25.5%). The remaining trends in reported crime for the other three districts showed no consistency with the increases or decreases in the Prahran district. The authors want to note that the analysis was neither backed by any statistical testing nor was the exact period of observation in terms of months or level of data aggregation stated (Brown et al., 1980).

Although the study evidently lacks any statistical or analytical rigor, it can be acknowledged for one important finding following from this patrol evaluation. A first attempt to define a classification of crime types into two groups: *patrol preventable* and *non-patrol preventable*. The study states its definition as follows:

“The concept of ‘patrol preventable’ crime, similarly to Integrated Community Policing, was found on the belief that a visible police presence deterred crime by making it more difficult, increasing the time and effort required for its commission and heightening offender’s sense of vulnerability. Offences which were committed in the public or involved an observable escape route, would be regarded as ‘patrol preventable’ in this sense, although it would be unrealistic to imagine that all such crime could be prevented by police action” (Brown et al., 1980)

Patrol preventable crime, in accordance with the given definition, was sorted into 14 distinct classifications: (1) *Armed Robbery*, (2) *Assault and Robbery*, (3) *Burglary (House)*, (4) *Burglary (Other)*, (5) *Theft from Person*, (6) *Theft from Clothesline*, (7) *Shopstealing*, (8) *Theft of bicycle*, (9) *Theft of motor vehicles*, (10) *Theft from vehicle*, (11) *Tamper with motor car*, (12) *ABH on civilian*, (13) *Other assault on civilian*, and (14) *Willful exposure* (Brown et al., 1980).

Supply and Demand of Police Patrol

The most recent study, published as “*Patterns in the supply and demand of urban policing at the street segment level*”, included in the systematic review presents a case study on observational data from London, United Kingdom, for the observation period from June 1st to October 31st 2015. Using spatial-statistical methods, datasets from the London Metropolitan Police Service (MPS) were analyzed (Davies & Bowers, 2019). The aim of the study was to identify the spatial distribution of police patrol through

London's 32 boroughs. By doing so, provision of routine police patrol and calls for service were framed as a supply and demand problem, which represents the potential matching or mismatching of police resources across urban street networks. Even though, the scope of this study does not clearly fall into establishing crime deterrent effects, as it highlights associations between police patrol and emergency call data which also includes non-crime related actions, it yields important insights to the spatial allocation of routine police patrol and everyday organizational practices of police departments. Especially what Davies and Bowers call the “*everyday provision of policing at the micro-scale*” (Davies & Bowers, 2015), presents a vital aspect in understanding both routine police patrol and crime deterrence at large.

The analyzed datasets consisted of GPS tracked location data from all MPS patrol vehicles, emergency call data retrieved from the MPS' Computer Aided Dispatch (CAD) system, and network data including street segments for all 32 boroughs of London. For the observed period, 1,194,255 emergency calls were sent to the London Metropolitan Police (Davies & Bowers, 2019). Deriving from these datasets, the supply and demand of police is measured for each individual street segment. Davies and Bowers define the supply and demand per unit as S_e and d_e respectively. Whereas e represents single street segments. Accordingly the supply and demand are defined as:

$$S_e = \frac{\text{seconds of police vehicle presence on } e}{\text{total seconds of police vehicle activity across borough}}.$$

$$d_e = \frac{\text{number of emergency call released on } e}{\text{total emergency calls across borough}}.$$

Hence, the quantified provision of police patrol cars responding to emergency calls per street segment, denoted by Davies and Bowers as p_e , can be defined as Δ of S_e and d_e :

$$p_e = S_e - d_e.$$

Thus, provision indicates supply of police vehicles on individual street segments in dependence with released emergency calls. Therefore, positive provision states elevated police presence and negative provision a lack of police presence (Davies & Bowers, 2019).

Statistically, supply and demand differ marginally. The provision of police p_e is highly symmetrical in its statistic distribution (Davies & Bowers, 2019). Overall, the distribution of p_e is positively skewed. This indicates that across the entire jurisdiction the provision of police patrol, in association with the demand measured by number of emergency calls, is generally at a sufficient level. However, various cases, or street segments, showed elevated aberrations and indicate a mismatch of police patrol (s_e) and number of emergency calls (d_e) (Davies & Bowers, 2019). The authors traced back these variations to network characteristics of betweenness. Here, betweenness describes the centrality of a street segment

e within the examined street network. Basically, more central street segments are connectors within the network as they present the shortest path between certain street segments. Thus, the higher the centrality of e the higher the number of street segment pairs it connects, represented as the shortest path between these two. Evidently, patrol officers choose streets with a higher value of betweenness to move within the network and respond to emergency calls throughout the patrol beats they operate in. The results of a regression analysis supported that hypothesis and all but one borough (Westminster) showed significant positive association between police patrol provision and betweenness.

Further, more network characteristics have been identified to be associated with patrol provision. Proximity to police stations, road types, speed limits, and road capacity also play part in the provision of police patrol in each respective borough (Davies & Bowers, 2019). First, streets closer to police stations will be supplied with more patrol provision as they inevitably function as paths to locations of emergency calls. Moreover, when officers start or end their shift and return from patrol duty back to the station they need to pass through distinct streets in order to reach the patrol car repository. Second, the typology of roads within London's street network is also associated with the level of police patrol provision. Higher classified roads show higher values of police patrol than lower classified roads. This classification incorporates street's characteristics such as speed limits or road capacity, e.g., number of lanes. Again, this stands to reason as police officers are called upon minimizing response time and therefore choose roads that provide higher travel speed and less risk of traffic accumulation. These associations appear as logical expectations in regard to ad-hoc route decision making and contribute to the understanding of routine police patrol routing strategies on the micro-level. However, Davies and Bowers indicated a counterintuitive effect regarding street classification between "*Local Street*" and "*Alley*". All analyzed cases exhibit higher provisions for alleys compared to local streets. The authors account possible geo-coding imprecision for that, which would lead to a biased "under-demand" for alleys and in return falsely manifest an over provision of police patrol. Besides this computational explanation, the high provision of patrol on alleys could arguably be due to subjective decision making of patrol officers (Davies & Bowers, 2019).

Although this study explores the relationship between calls for service, partially acknowledging for committed crimes, and routine police patrol, it still remains one of the very few studies that highlight routine patrol practices as such after all.

DISCUSSION

Routine police patrol has been widely neglected in its prime field of research; Criminology, for the past four decades. To identify the extent on available scientific knowledge on routine police patrol, its effects on crime, and particular spatiotemporal geographies, we systematically reviewed and synthesized studies on this particular mode of policing. We find that, despite the importance of routine police patrol for everyday operations of police departments around the globe, an evident lack of academic studies

shapes today's understanding of routine police patrol. In all reviewed study, the relationship between police presence and crime remains unclear and is framed rather simplistic. The major body of academic research endeavoring to establish crime deterrent effects of routine police patrol dates back to the early and late 1970's. Most notably, no convergent methodological framework was implemented to study potentially myriad effects that routine police can have on reported crime rates. Below we consolidate the findings of the four reviewed studies in terms of crime deterrence and spatiotemporal complexity and present criticism regarding shortcomings. Concluding, we present research trajectories that can build on existing research and overcome identified conceptual as well as methodological stumbling blocks.

Before discussing the findings, we mention two limitations of this systematic review. First, all studies were written in English and describe experiments conducted in an Anglo-Saxon context. Due to the origin of the studies being the United States, United Kingdom, and Australia, drawn conclusions and findings overrepresent police practices and deterrent effects from these particular regions. Second, the sample size of this systematic review ($n = 4$) is considerably low. Thus, we were not able to conduct a meta-analysis in order to quantitatively summarize results from these studies. Moreover, the retrieved data showed such severe inconsistencies that a reliable statistical approach could not have been guaranteed, even if more studies on routine police patrol would be available and a higher sample size could have been generated. Accordingly, publication bias cannot be accounted for.

Considering these limitations we synthesize key findings that emerged during the systematic review. First we present three findings that respond to the first research question: what is known about routine patrol and crime prevention? Then we consolidate shortcomings of the reviewed studies that yield answers to the second research question: where does research on routine police patrol need to go?

i. The (in)effectiveness of routine police patrol

Routine police patrol has been widely understood to have little effect on crime deterrence and crime prevention (National Academies of Sciences, Engineering, and Medicine, 2018; Scott et al., 2008; Weisburd & Eck, 2004). However, the systematic review of relevant studies shows that the association between routine patrol practices and crime deterrence remains unclear and that the effectiveness of routine police patrol should not be neglected without further research. Police operations that deploy police officers for routine patrol have shown a varying effect on crime rates for specific types of crime. In general, more publicly detectable crimes such as sexual assaults, vandalism on private properties, or auto related crimes appear to be preventable through routine policing (Brown et al., 1980; Kelling et al., 1974). This finding seems rather intuitive. During a shift, patrol officers move around their assigned police beat and look out for contraventions. When they are not assigned to respond to emergency calls, this patrolling task constitutes the main deed of a police officer. As police beats usually encompass quite extensive urban areas, the police officers attempt to cover as much ground as possible. Within this setting, detecting crime is likely to be difficult for police officers. Crimes, crimes that are more visible in public environments, e.g., vandalism or graffiti, tend to be more detectable. On the opposite side,

offenders are naturally more exposed while committing crime in the public. Therefore, apparent reductions in these crimes with a more “public” nature can be explained with higher level of detectability.

Moreover, crime deterrent effects most likely vary over time on a daily or even hourly basis. Schnelle et al. found that both significant increases and decreases in crime rates were identified during patrol shifts during night (Schnelle et al., 1977). The associated decrease in reported crime rates for the experiment period and the subsequent rise in reported crime for the post intervention period during nights shifts, as identified by Schnelle et al., is likely due to routine activities (Felson, 2008). Most of daily life happens during daytime and most public environments experience peak levels of social interactions or “activeness”. Police departments are likewise subject to these daily routines. Calls for service arguably reach their daily maximum during daytime and demand the allocation of police forces towards responding to these incidents. It can be assumed that police departments are less tied down during night shifts, as demand to respond to calls for service is likely to be significantly lower compared to day shifts. An exception present nights during the weekend which could show a local variance in released call for service due to a more active night economy, such as night clubs, bars, or casinos. Therefore, police officers can presumably dedicate more time to patrolling their beats and look out for contraventions. Besides the demand for police service being lower during night shifts, streets are evidently less frequented by pedestrians, bikers, and cars. Thus, crime might be more detectable as offenders have lower chances of being overlooked by patrol officers. Although some types of crimes are by nature more overt, this characteristic might be intensified by missing crowds of people on the streets during night shifts.

Overall, the reviewed studies showed no changes in reported crime rates for most tested crime types. For some they presented evidence for an increase, for some they reported decreases. However, it appears to be a great fallacy to overlook the evidence for crime preventative effects that were found in these studies for certain types of crime. Rather potential deterrent effects should be separately analyzed within groups of distinct crime type classifications.

ii. Of policeable crimes and other classifications

Research on routine police patrol seems to operate using diverging crime classifications and variant understandings of what constitutes *patrol preventable crime*¹¹. The reviewed studies examined deterrent effects on different types of crimes. The classifications ranged from “Part I” crime to overlapping categories of public disorder. Despite deviant terminologies, three mutual categories were used in the reviewed studies. First, burglaries constitute a type of crime that has been considered in the analysis of crime prevention through police patrol (Brown et al., 1980; Kelling et al., 1974; Schnelle et al., 1977). Though, burglaries can appear in various forms and should not be generally classified as *patrol*

¹¹ The term “patrol preventable” crime is adopted from the report by Brown et al. (see Brown et al. (1980, p. 3)

preventable crimes. Especially, the distinction between burglaries on residential and commercial properties appears highly important. Brown et al. highlighted differences in both subtypes of reported crime in regard to patrol operations. While reported crime for residential burglaries increased (+47.4%) during the observation period, other burglaries, including commercial property, decreased (-24.7%) in the same period (Brown et al., 1980). Second, crimes linked to theft of motor vehicles presented a central category of all studies that focused on the crime-police nexus. Although this consensus pleads for a starting point of crime classification, imprecisions with regard to a proper definition hinder an accurate partition of crime types. Kelling et al. utilized “Auto theft” as a categorization and Brown et al. respectively measured crime connected to “*Theft of motor vehicles*” (Brown et al., 1980; Kelling et al., 1974). Clearly, the latter comprises more types of vehicles than cars. Here lies the highlighted imprecision of definition. This categorization might include other motorized vehicles such as scooters, motor bikes, trucks, and in a contemporary context, e-bikes, or quads. Third, robberies were mutually understood to offer value for the analysis of routine police patrol. Crimes related to robberies present a classic type of crime which is inherently overt, when not occurring alongside burglaries. However, the proposed categorizations blended robberies with other crimes such as assaults. Brown et al. winnowed robberies into “*Armed Robberies*”, emphasizing force and violence, and “*Assault and Robbery*” (Brown et al., 1980). This second category is particularly prone to bias as two independently occurring crimes are accumulated within one generalized classification.

Keeping in mind that the study of Brown et al. was designed as an official government report to summarize the implementation of an elevated policing strategy and conducted by the Prahran Police Department, the utilized categorizations offer important insights into the *modus operandi* of reporting and classifying crime at local police departments. Therefore, two aspects have to be acknowledged, apart from the widely established biases of police data in general, when researching the relationship between crime and routine police patrol or any kind of policing strategy. First, crime data are mostly preprocessed and categorized by the responsible police department. The categorizations follow particular guidelines that were set up to support the actions of the respective police department. Crime data are not necessarily clustered for an in-depth analysis and must be, if possible, accessed in the rawest of forms. Second, researchers have to distinguish between crimes committed within private and public environments. Certain types of crime cannot be detected by police officers passing through streets within their patrol beat. For example, cases of domestic violence inherently take place within covert private settings and lay without the reach of even the most aware patrol officer. In order to completely understand preventive effects of routine police patrol, such crimes cannot be classified as *patrol preventable*. Future research on routine police patrol requires a thorough definition and classification of *patrol preventable* crimes that enables the analysis and establishment of crime deterrent effects.

iii. Spatiotemporal constraints of routine police patrol

Patrol officers' routine patrol throughout their police beats is bound to the characteristics of the street network in which they operate. However, so far no criminological research has dealt with the optimal spatial allocation of police officers (Dewinter, Vandeviver, Vander Beken, & Witlox, 2020). Though, Davies and Bowers showed that the provision of police presence is dependent on the local properties of streets. More central streets that connect less frequent streets tend to show more police presence in terms of the estimate deriving from received calls for service (Davies & Bowers, 2019). Thus, police officers conduct patrolling activities along various physical limitations. These limitations can arguably lead to officers not patrolling certain streets or parts of their patrol beat, because doing so would be seen as a high temporal constraint. However, police forces should supply preventive patrol throughout jurisdictions in equal measures as their funds are generated through equal tax payment by every citizen of the respective jurisdiction. Therefore, it is vital to understand the decision making and patrol selection process of police officers in order to unravel biases of "under patrolled" areas within jurisdictions. Further, capabilities of pursuing purely preventive police patrol are highly dependent on the spatiotemporal characteristics of calls for service. The obligation of responding to emergency calls is likely to prevent patrol units to execute patrol operations. Certain places within police beats might experience less police provision due to their distance from clusters of high levels of emergency calls. As police officers are frequently called to respond to calls at particular locations, they can be tempted to patrol in close proximity to these location to ensure quick response for subsequent calls for service. The law of crime concentration backs this explanation (Weisburd et al., 2010), in terms of explaining potential preferences to idle in areas that present a higher subjectively assessed probability of generating future calls for services.

From a temporal perspective, calls for service limit patrol resources to different extents over the course of the day. In this case, it is not only crucial to understand the demand of police response as a dichotomous framework of day and night patrol, but to analyze trajectories of police demand on a finer level. Identifying trends for specific time periods at different days is likely to yield myriad valuable insights for police departments to optimally deploy patrol officers throughout their jurisdiction.

iv. How to measure crime deterrence and magnify local aspects of crime and police?

The measurement of deterrent effects of routine police has not yet converged around an acceptable methodological framework. Clearly, measuring something that is not there, prevented crime, poses many causal problems. This systematic review leads to three key methodological dimensions that shape research on routine police patrol. First, variables that measure police presence or, especially in experimental settings, the increase of police patrols. Police presence on an aggregated level was measured through the number of police cars and number of police officers (Brown et al., 1980; Kelling et al., 1974; Schnelle et al., 1977). In contrast, Davies and Bowers measured police presence on a local level using a time-based approach (Davies & Bowers, 2019). Hereby, this more precise measurement

reduces uncertainties about the actual patrolling activities. The number of police officers or cars within a police department or police beat are not directly associated with relative levels of police patrol. Police beats with more police officers assigned to it as an experimental condition could at the same time experience more calls for service and therefore show a lower level of police provision in terms of supply and demand.

Second, a clear analytical and statistical framework is required to draw conclusion on the effectiveness of routine police patrol. Currently available studies employed various statistical methods and models. However, the lack of proper documentation of statistical analysis is consistent in older studies that were reviewed (Brown et al., 1980; Kelling et al., 1974; Schnelle et al., 1977). As we identify research on routine police patrol as an (re)emerging theme in criminology and beyond, a spectrum of statistical models should be pursued to establish a scalable framework that can test routine patrols' effectiveness in different local contexts. Indeed, this framework must be constructed with detailed documentation of assumptions and methods used and must not follow the shortcomings of existing studies.

Third, the most evident inconsistencies detected are represented by diverging types of data used. Besides data on reported crime provided by local police departments, in some cases more qualitative data were used. Business and citizen interviews were conducted to collect data on the quality of emergency call response or the subjective fear of crime (Kelling et al., 1974). As suitable types of data to establish the effectiveness of routine police patrol still need to be consented on, the most pressing question rather remains on the where then the what. Routine police patrol was studied in three different units of analysis. Brown et al. conducted their analysis on the police department and neighborhood level (Brown et al., 1980). Both Kelling et al. and Schnelle et al. focused their experiments on the level of police beats (Kelling et al., 1974; Schnelle et al., 1977). Davies and Bowers employed a fine-granular analysis and tracked patrol units on the street segment level. In accordance with accompanying research on policing practices, analysis on the micro geographic unit is called for (Telep & Weisburd, 2012). Clustering of crime on the local level requires a similarly detailed approach for measuring provision of police patrol on the smallest available geographic unit, the street segment. Although technological innovation just recently allowed researchers to measure movement of police officers with that level of detail (Vandeviver & Bernasco, 2017), Schnelle et al. have already attempted to use movement data collected through so called tachographs. These devices measured the speed, distance, engine operation, and flashlight use of each patrol unit and were employed to guarantee a certain travel speed of patrol vehicles ($< 20\text{mph}$), as this was assumed to be of significant importance for routine police patrol. Therefore, we call for the implementation of state of the art technologies to measure the spatiotemporal complexities of police patrol.

v. Deployment and organization of routine patrol

None of the reviewed study provided full length descriptions of the organization of routine police patrol. Indeed, spatial characteristics of police beats were described in great detail and helped to understand the

local context in which officers patrol. Despite its importance, the composition of patrol teams was not mentioned. However, this structural aspect seems likewise important such as the generic categorization of police patrol into its different modes; foot patrol, bike patrol, or car patrol. We believe that the size of a patrol unit¹², e.g., in terms of number of patrol officers inside the patrol car, arguably has major implications for their effectiveness. On the one hand, patrol units might benefit from a two-officer team through mutual compliance with patrol and route orders. As mentioned above, a subjective bias could be prevalent in patrol practices due to distinct spatial characteristics, a second officer can fulfill a control function for the driving officer to follow predefined routes and ensure patrol mandates. On the other hand, four eyes are better than two. On a practically note, police officers need to drive the patrol cars themselves. Their attention is fixed to follow traffic and equally respect traffic rules, when they are not responding to emergency calls and make use of sirens or flashlights. If patrol cars are manned by a single police officer, span of attention and the capability to detect ongoing crime are considerably lower compared to two-officer teams. Therefore, experiments as well as case studies on routine police patrol are bound to report the *modus operandi* of the police department which is subject to their analysis. Thus, potential deterrent effects of police patrol can be better understood in terms of patrol size and in the actual implementation of centrally designed policing strategies.

CONCLUSION

Little is known about routine police patrol and reliable research on the standard model of policing remains scarce. In recent years, almost no findings have been added to the thin body of research. Despite missing scientific groundwork, assumptions on the ineffectiveness of routine police patrol in terms of crime prevention or crime deterrence have guided research on policing strategies and crime preventive measures. This paper systematically reviewed all exiting studies to provide a comprehensive synthesis of findings. Although the statistical evidence seems small, we find evidence against the widely agreed upon ineffectiveness of routine police patrol as a measure of crime prevention and deterrence. We also find inconsistencies across studies in regard to a proper classification of *patrol preventable* crimes. Ultimately, conclusions as to the (in)effectiveness and optimal allocation of routine police patrol would be inadequate, as most of the available studies presented shortcomings in research design, data collection, statistical analysis, or reported results. These findings manifest the need to recondition research on routine police patrol in order to examine both negative and positive effects of policing strategies. Contemporary research in Criminology is urgently needed to understand the criminological realities of the most popular mode of policing.

¹² It appears likely that the size of a patrol units varies between one or two officers per unit.

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TABLES

Total	
in patrol"	
106	125
21	28
15	27
174	823
136	178
12	13
43	54
106	128
30	42
7	28
133	204
41	52
824	1702

Table 2. Overview of Reviewed Studies

Study authors	Observation period		Period of observation in days	Study location	Study design	Unit of analysis	Focus of analysis
	Year						
Brown et al. (1980)	1980		365	Australia	Government report	Neighborhood	Crime deterrence
Davies and Bowers (2019)	2015		153	United Kingdom	Case study	Street segment	Spatial allocation
Kelling et al. (1974)	1972		365	United States	Randomized-experiment	Police beat	Crime deterrence
Schnelle et al. (1977)	1977		52	United States	Quasi-experiment	Police beat	Crime deterrence

FIGURES

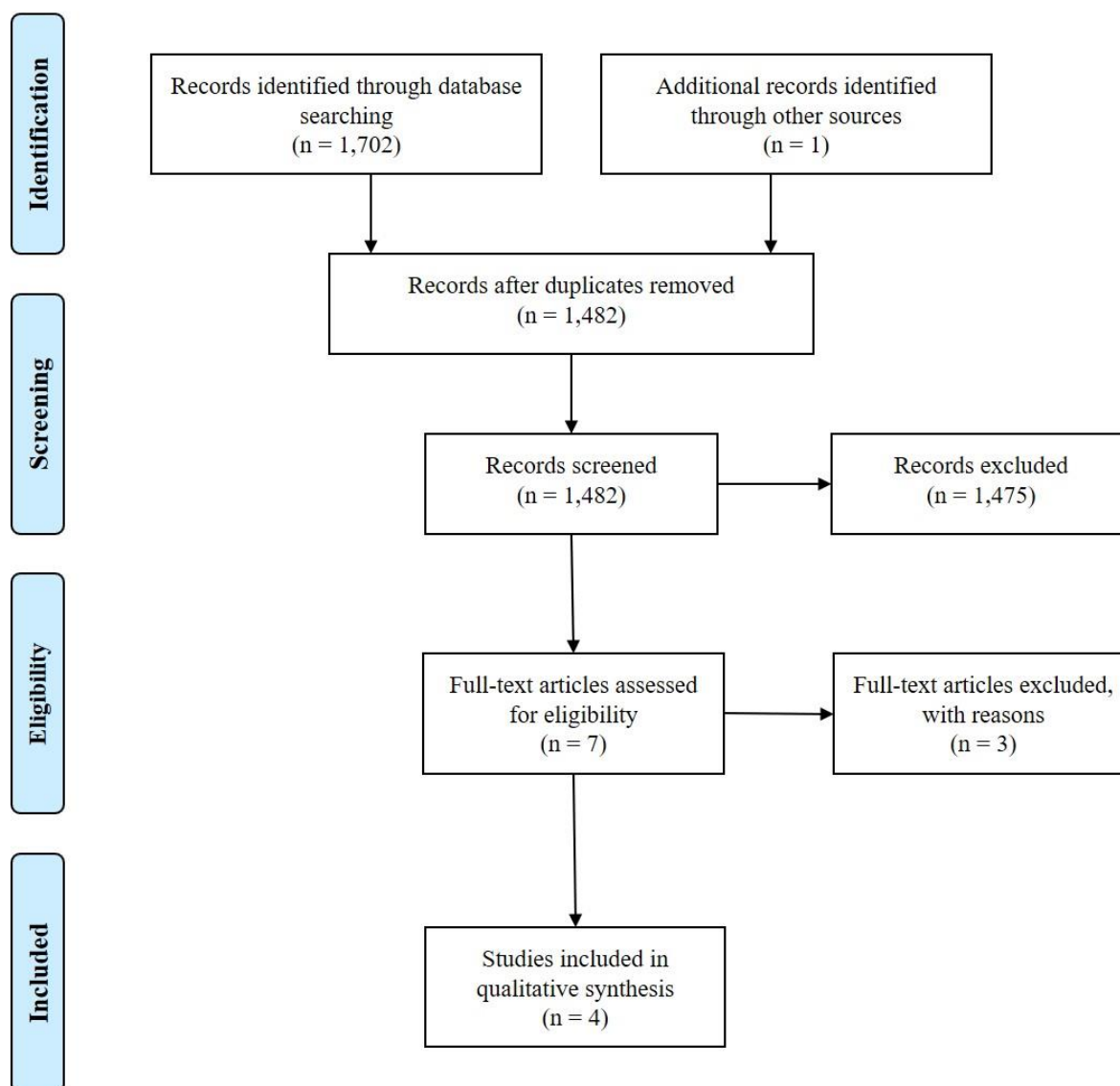


Figure 1. PRISMA Flow Diagram for Systematic Review on Routine Police Patrol (adapted from Moher, Liberati, Tetzlaff, Altman, & Prisma Group, 2010)

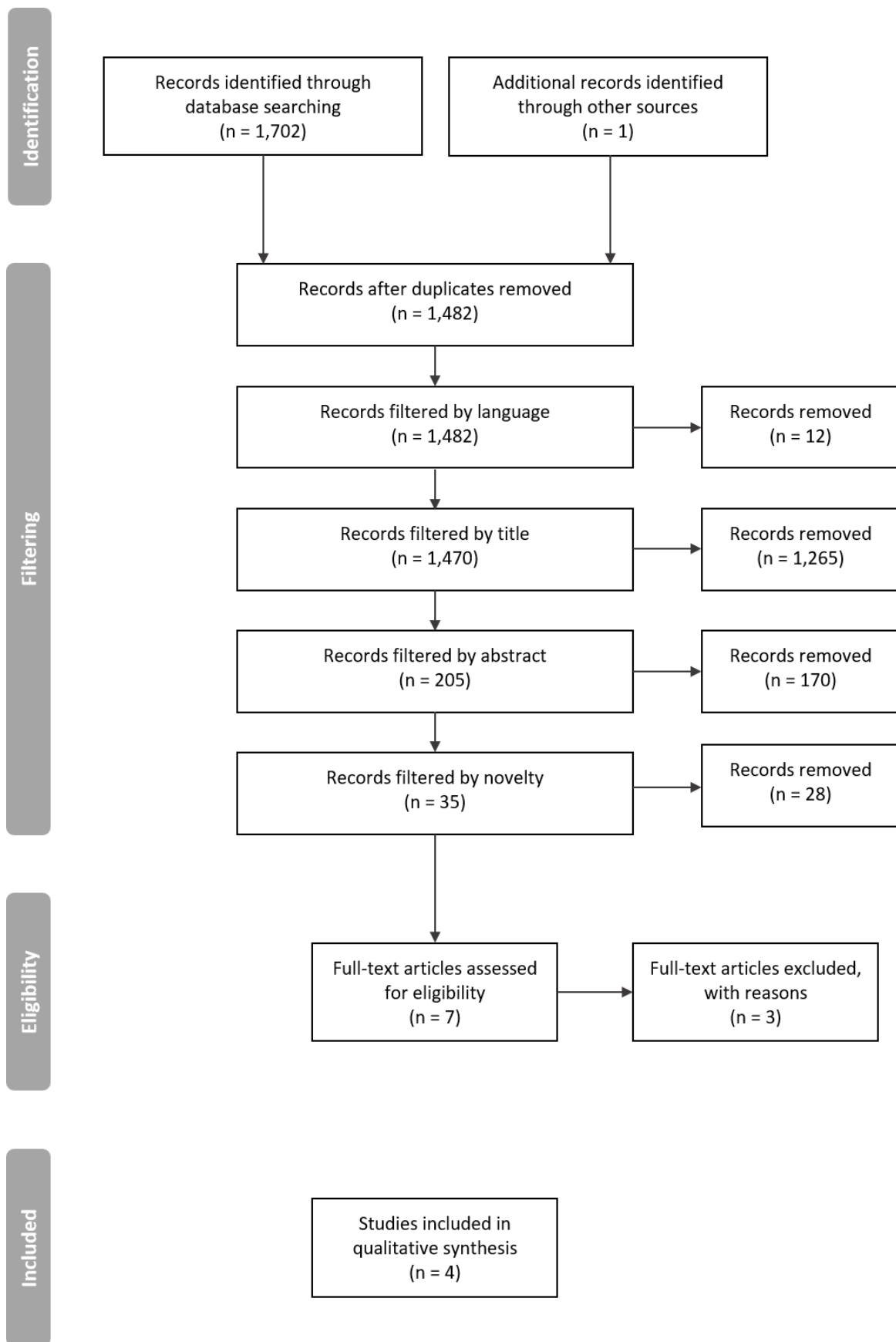


Figure 2. Flow Diagram with Exclusion Criteria (adapted from Moher, Liberati, Tetzlaff, Altman, & Prisma Group, 2010)