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HOMICIDE: PREDICTION AND PREVENTION.

1. INTRODUCTION

Forecasting is an indispensible activity in numerous forms of decision making regarding the future (Makridakis 1998) which is widely used within economics and other disciplines. However are these very same methods applicable to capricious human behaviour, is it possible to predict who is at risk of committing homicide and thus who poses a threat to the safety of society? The value of predicting homicide is obvious (Sherman 2007a) and the urgency with which something needs to be done is emphasised by the number of homicides which go unsolved.¹ Thus effective predictive and preventive methods need to be identified, so scarce resources can be directed towards those who pose a high risk to society in an attempt to substantially decrease current homicide rates.²

2. IS FORECASTING HOMICIDE POSSIBLE?

THE BEST METHODS TO DATE.

Though there are numerous methods for predicting recidivism (e.g. Gagliardi, Lovell, Peterson, & Jemelka, 2004), violence (e.g. McMillan, Hasting & Coldwell, 2004) and general crime with some success far less research has been done into the predictability of homicide. This is likely to be a consequence of the relative infrequency of homicide occurrences, leading to a lack of data to construct and test models. Furthermore the little research that has been conducted lacks rigorous testing and evaluation (Berk 2008a).

Due to crime statistics released by the Home Office that reveal over half the crime committed is committed by a very small population (10%) of offenders, detecting this small population and providing suitable interventions could result in a vast decrease in crime. It thus seems intelligible to identify this tiny fraction of people with extraordinary high risks and to direct scarce resources towards them (Farrington, 2000). However is it possible to reliably identify who fits in to such a category by using the best psychological and criminological advances of today?

¹ Though the detection rate of identifying murders in England and Wales is above 90% fewer than 50% of cases are solved in the US (Berk et al 2009).
² Only Statistical forecasting methods will be considered due to evidence that they are far more reliable than clinical forecasting methods (Gottfredson & Moriarity, 2006).
Homicide seems to be correlated with a number of factors (Sherman, 2007a), it is particularly high within males, with 80-90% of homicides being committed by males. It also seems to be highly concentrated among young men on parole with an estimated 70% of homicides relating to those on community supervision. There appears to be no single risk factor that can adequately predict homicide among young offenders, but such behaviour may result from exposure to an accumulation of different risk factors (Heide, 1999). These factors include situation factors, societal influences, resource availability, and personal characteristics to name a few.

One seemingly successful forecasting method within the limited published literature is a statistical learning random forecasting (Breiman, 2001) method proposed by Berk, Sherman, Barnes, Kurtz, and Ahlman (2009) to forecast homicide within a population of probationers and parolees. Their aim was not to convict those the model highlighted as potentially dangerous to the community but to concentrate rehabilitation, treatment and surveillance resources on this small subset of convicted offenders. This method aggregates results from hundreds of classification and regression trees, identifying the single predictor most related to the outcome variable and splitting the data according to the presence of absence of such a predictor, partitioning the data set continues until there are no more splits that improve the classification. The results show an eightfold increase in accuracy, compared to logistic methods and other methods which do little better than chance (Berk 2006, 2008b; Breiman 2001). However the False Positive count is still too high to impose any retributive harm, punishment or additional restraint (Berk et al 2009).

One major advantage of this forecasting technique is that the researchers integrated the costs of forecasting errors (False Positives (FP) and False Negatives (FN) into the model, however the value of these is somewhat subjective and needs to be investigated further (see section 5). Another advantage of the model created by Berk and colleagues (2009) is the inclusion of attempted homicide within their classification of homicide. This seems necessary due to the fine line between homicide and violent assault. The difference between an event being considered homicide or assault may simply be due to a bystander’s intervention or something out of the perpetrators control (e.g. speed of an ambulance (Gottfredson & Hirschi 1990) , accuracy of a gun shot (Doerner, 1988)), both acts have the same intent, different principally only in their outcome rather than the processes involved (Harries 1990). This inclusion should be made in future models for forecasting homicide.

Though the model created by Berk et al (2009) seems somewhat promising the lack of data from youth homicide may be detrimental to it’s accuracy due to the nature of a strong link between young males and homicide ((Federal Bureau of Investigation, 2002). Until 2005 no attempt to
predict homicide in a population of youths had been made (Loeber et al. 2005). More recently, Loeber et al. (2005) have attempted to predict violence and homicide within a normative population of young males using information from a longitudinal multiple cohort of development of delinquency. They investigated predictors in a stepwise fashion, firstly predicting violence and subsequently predicting homicide among those who were violent in earlier life. Logistic regression was used to identify risk facts that discriminated between the two groups. For each individual presence or lack of nine significant risk factors were summed to form a risk score. The data dichotomised to isolate those at high risk with four or more risk factors present, those without were seen as far lower risk. Results showed violence was a necessary precursor of homicide, homicide perpetrators were also more likely to carry a weapon, have conduct disorder, substance abuse etc. The models strength lies in its low FN rate, very few of the homicide offenders were characterised by less than four risk factors (Loeber et al. 2005).

The Metropolitan Police Homicide prevention unit are putting strategies similar to those mentioned above into practice. They have introduced the Prolific and other Priority Offender (PPO) strategy the National Intelligence Model to identify a small number of individuals who pose the greatest threat to the safety and of their local communities. Individuals identified by the model will then be targeted by prevention schemes in an attempt to encourage them to leave their offending lifestyles.

Though the methods above seem somewhat promising there are many limitations and ethical concerns to be considered.

3. THE PROBLEM WITH FORECASTING HOMICIDE:
THE CAPRICIOUSNESS OF HUMANITY.

The fundamental problem with forecasting homicide is human’s capriciousness, their ability to change their attitudes and behaviours at their own will. This in part along with human’s ability to influence the future with their own actions according to Makridakis (1988) is what makes human behaviour so unpredictable, if not rendering it near impossible to forecast. Furthermore “forecasts themselves can become self-fulfilling and/or self-defeating prophecies that change established patterns/relationships” (Makridakis 1998 pp.469). Though mans anticipation of the future cannot influence the course of nature, a forecast can have the power to divert the course of nature that it would have pursued in the absence of a forecast (Von Miser, 1962). This makes it difficult to assess the accuracy of forecasts.
An additional problem is that forecasting looks to patterns in the past and extrapolates them into the future to predict what will happen. However the world is subject to change, especially with regard to human’s free will to act as they desire. Thus a model that accurately fits the past may make poor predictions about the future, the correlation between the two is only 0.3 (Makridakis, 1988) and decreases as the forecasting horizon increases, falling until there is no relation between the past and the future. Furthermore, models are devised using data from convicted felons rather than those who are never caught (Wilson & Soothill, 1996) and as such the results may be seriously flawed due to an increase in FN errors (Berk et al 2009). However homicide offences are detected and reported with greater accuracy (Berk et al 2009) than other lesser crimes.

Predicting the future trends seems an attractive way to target resources and make decisions about financial investment, marketing and economics etc. However there is concern that such techniques are insufficiently accurate to make important decisions about anything beyond trivial, e.g. complex human behaviours (e.g. Hart, Michie, & Cooke, 2007). It appears we make a considerable amount of errors when catching those who have committed crime, let alone predicting who will commit crime before it happens.

4. FORECASTING ERRORS: CONVICTING THE INNOCENT AND ACQUITTING THE GUILTY.

When forecasting homicide there are four possible outcomes (see Figure 1. below), firstly that the forecast will correctly predict who will commit homicide (TP) and secondly the model will correctly predict who will remain innocent (TN). However there are also two possible errors when forecasting, firstly the model may incorrectly identify someone innocent as a likely homicide suspect (FP) or the model may fail to identify someone who will go on to murder (FN) (see Figure 1.).

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<tr>
<th>STATE OF THE WORLD</th>
<th>FORECAST</th>
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<td>Innocent</td>
<td>Innocent</td>
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<td>Guilty</td>
<td>False Negative (FN)</td>
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**Figure 1.** Demonstrates possible forecasting outcomes. Adapted from Arkes & Mellers (2000)
It is necessary to improve forecasting to maximise its utility, by minimising the number of falsely identified and falsely acquitted high risk cases (Arkes & Mellers 2000). However there is a direct trade off between these two errors (this can be seen in Figure 2. below), as the probability of one decreases the probability of the other increases. Unless the distributions can be made further apart (i.e. forecasting accuracy can be substantially improved) it is impossible to simultaneously decrease both errors and thus a decision must be made as to which is least costly; to the individual and to the greater good. To do this we need to work out psychological costs and benefits of the outcome (utilities) for FPs and FNs, to enable us to identify the optimum threshold for trade-off between the two errors (cf. Signal detection theory: Green & Swets, 1966).

Figure 2. The trade off between forecasting errors: FN and FP. Adapted from Arkes & Mellers (2000).

5. THE TRADE OFF BETWEEN FALSE POSITIVES AND FALSE NEGATIVES.

Assessing the trade off between forecasting errors is an area that remains somewhat subjective, costs and benefits will be considered for both the individual (suspect) and the utilitarian greater good (community). It is evident that predictive models can not offer accurate enough predictions to incarcerate individuals or employ any retributive justice (Berk et al 2009) due to the FP rate in particular being too high. Thus the analyses will be conducted in light of this with relation to redirecting scarce resources towards high risk individuals.
Forecasting Errors

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<th>False Positive</th>
<th>Individual</th>
<th>Utilitarian Greater Good</th>
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<td>•Wrongly suspected individuals may have to complete prevention strategies, these could be beneficial in eliminating risk factors that predispose the individual towards lesser crime. However being wrongly identified may also be detrimental to the individual leading to self-fulfilling prophecy, with the individual rebelling against being singled out as someone who poses a risk to society. However the likelihood of this is low.</td>
<td>•Scarcie resources are directed away from those who really do pose a threat to society, but are likely to help prevent lesser crimes. Only if misidentification leads to self-fulfilling prophecy may the individual then pose a risk to society.</td>
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<tr>
<th>False Negative</th>
<th>Individual</th>
<th>Utilitarian Greater Good</th>
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<tr>
<td>•No cost.</td>
<td>•An individual who may pose a risk to society receives no preventative intervention and thus are still a potential risk to the community.</td>
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**Figure 3.** Cost/benefit analyses between FNs and FPs when redirecting resources towards high risk offenders.

From the analyses in Figure 3, it is apparent the costs of a FN for the greater good outweigh those of a FP due to individuals who pose a risk to society being left unidentified, in the case of a FP even though individuals are wrongly indentified by the model they are still among a population who are likely to partake in other crime, whether violent or not and thus intervention and funding is not entirely redundant (Berk et al 2009), however this may result in self-fulfilling prophecy, with those treated like murderers turning into murderers. Thus it is better to employ these intervention strategies rather than letting homicide perpetrators continue to pose a risk to society, reducing the acceptable rate of FNs and increasing tolerance of FPs. This view is supported by the Philadelphia’s Adult Probation and Parole Department (Berk et al 2009) who view FNs as ten time more costly than FPs.

However after closer inspection this trade off may be misguided in relation to some cases, in a paper by Halvorsen (2004) who investigated the trade off between FPs and FNs of conviction after a crime has been committed he rightly points out that in both instances of error the ‘criminal’ walks free. This idea may be applicable to forecasting homicide. The two errors though at first are seemingly mutually exclusive, may in actual fact be inseparable to some degree. It appears that in fact a FN may be inherent within every FP, for if an innocent person has wrongly been identified as
a risk to the society, then individuals who actually do pose a risk to society may remain unidentified due to time and effort being directed toward the wrong individuals, thus a FN error may also occur. Therefore the errors are essentially in some cases inextricably linked, with the added negative of false identification in the case of a FP. Little reasoning was published by the APPD in Berk et al (2009) to counteract this assertion, it seems logically to hold true for some cases. See figure 4. below for a diagram representing the two different views of the relationship between FN and FP.

Figure 4. Venn Diagrams to represent the relationships between FN and FP errors in forecasting homicide: (a) as interpreted from Berk et al 2009 and other researchers who appear to view the two as mutually exclusive (b) application of ideas of Halvorsen (2004) to forecasting errors.

This view is inline with individuals such a Blackstone (1769) who believed “it is better that ten guilty persons escape than one innocent suffer” (pp. 420). It is evident that people would view it more acceptable to let the guilty walk free than to incarcerate an innocent person, due to a violation of human rights to freedom. This view was also shared by a group of students questioned on the matter by Sherman (2007a) who were willing to tolerate fewer false convictions than false acquittals. Although this view may appeal to civil liberties advocates, the public may not tolerate the corresponding false negatives. However to reiterate the point made above, the possible FNs inherent within FPs must not be forgotten.

Although FNs may be inherent within some FPs there is still a trade off between the two errors due to the fact though all FPs have the possibility of also being FNs, not all FNs are FPs. It appears that in light of the application of the ideas of Halvorsen (2004) and other evidence FPs are more ethically troubling than FNs and thus the optimum threshold for the trade off between the two errors is one in which the number of possible FPs is lower than that of FNs.
6. PRACTICAL IMPLICATIONS OF PREDICTING HOMICIDE.

There are numerous practical implications regarding predicting homicide which make the subject ethically troubling. Firstly if we are to attempt to predict who may pose a risk to society (potential murderer) copious amounts of information will need to be held about the majority of the population to identify those who are supposedly at risk so that interventions can be guided towards them. Such a database would be highly controversial due to its infringements on human rights of privacy and freedom much like the current Identity Card debate, and moving us further towards the undesirable Big Brother Surveillance state. The prospect of people being singled out for offences they have no intention of committing is also highly ethically troubling. It has been speculated that criminal profilers within the London Metropolitan Police are attempting to create such a database that lists the 100 people most likely to commit rape and murder in the future (Bannerman, 2006).

Furthermore in keeping such records it could be viewed as though every single person is being treated as a potential criminal: What has happened to the notion of innocent until proven guilty? Treating people in such a way could be detrimental to society by leading to adverse effects and self-fulfilling prophecy. In addition data could also get into the wrong hands leading to further ethical dilemmas.

7. PREVENTION: METHODS AND EVALUATION OF EFFECTIVENESS.

Home Office statistics (2007/2008) reveal only 12% of the 59.9 billion pounds spent on crime each year is spent on education and prevention of criminal behaviour. The lack of money ploughed into the prevention of homicide may be a result of the infrequent (but not infrequent enough) occurrence, diversity and apparently low predictability of the crime (Brookman & Maguire, 2003). It is difficult to implement strategies to prevent such crime due to problems with prediction where intervention is necessary, but even more difficult to assess the efficacy of such strategies. Thus the next section of this report in part remains rather speculative due to the lack of effective assessment of research in this area.

In 2004 the Home Office launched a Prolific and other Priority Offenders Programme (PPO) strategy aiming to identify the most prolific offenders and the young offenders at risk of becoming part of that group. Due to the fact that it is a very small percentage of the active criminal community that commits a large proportion of crime, it thus appears necessary to identify this group and
provide intervention. The PPO strategy has three complimentary strands, however of most interest here is: ‘Prevent and Deter’. The primary aim of ‘Prevent and Deter’ is to work intensively with those young offenders identified as being on the 'cusp' of becoming PPOs and to provide multi-agency support to positively influence their lives and divert them away from an offending lifestyle.

The Home Office have identified two main strategies to prevent homicide (Brookman & Maguire, 2003). Firstly, situational crime prevention strategies which focus on potential offenders and situations which may lead to violent crime and homicide e.g. preventing youths from carrying weapons, affiliating with delinquent peers, participating in gang fights and/or selling drugs (Sherman 2007a). These prevention strategies are particularly reliant on prediction of who is likely to offend so intervention can target particular hotspots or populations. Thus it is evident that funding is necessary to improve both prediction and prevention strategies as neither is effective without the other. Secondly social crime prevention which includes community regeneration, literacy, parenting skills and education, these address the longer term risk factors that need to be tackled in order to prevent homicide (Loeber and Farrington, 2001).

Evidence of a strong correlation between homicide rates and levels of poverty and social inequality (Messner & Rosenfeld, 1999; Avakame, 1997) suggests that significant and lasting reductions in homicide may be achieved by strategies which take this into account. Other factors have been highlighted e.g. location, weapons used, gender, motive etc. that need to be reduced in order to reduce the incidence of homicide.

One theory that has been used as a basis for prevention strategies is the Broken Windows approach view of crime; minor crimes and disorder within society beckon more serious offending by signalling that the police and community have lost control of the streets (William & Kelling, 1982). Therefore in order to reduce serious crime we should firstly address the minor crime. This logic has been employed by an initiative called New York Compstat which was put into place in 1994; it sought to restore order on the streets through the means of aggressive order maintenance policing (e.g. making arrests for minor offences). However analyses conducted by Rosenfeld, Fornango, & Baumer (2005) reported no significant decline, further than what would be expected by already declining homicide rates after the intervention had been put into place. Rosenfeld et al (2005) also evaluated other methods of crime reduction including the Virginia Project Exile implemented in 1997. This aimed to reduce crimes by incarcerating felons through an increase in federal prosecution. This appeared somewhat successful with a significant difference in homicide trends; however this difference was small and thus somewhat unreliable. Furthermore, the practical
implications of this prevention strategy would make it hard to uphold it. It would cost the state a considerable amount of money to keep so many felons imprisoned, due to the fact funding is somewhat in short supply, this would require removal of funds from other areas which may be additionally detrimental to the community’s safety.

An additional prevention strategy that appears somewhat successful is a new problem-oriented policing framework (Braga, 2008). The framework is made up of numerous interventions “based on the “pulling levers” deterrence strategy that focuses criminal justice and social service attention on a small number of chronically offending gang members responsible for the bulk of [particular crimes]” (Braga, 2008 pp.332). Principles of problem oriented policing (cf. Goldstein, 1990) are employed to select a particular crime problem e.g. gun homicide. A group of law enforcement practitioners then attempt to identify key offenders, groups and behaviour patterns. They then communicate to the offenders that varied sanctions (“pulling levers”) will be enforced to stop them from continuing their violent and disorderly behaviour. Social services and community resources are also focused on the targeted offenders (Braga 2008). However further evaluation of the effectiveness of these intervention is necessary.

Homicide may also be seen as the extreme end of the violence continuum, differing only marginally from violent assault in some cases as described earlier in section 2. If this is the case, then in using strategies to reduce violence homicide rates may also fall. One method found to be successful in reducing violence has been school based programmes. Hahn et al (2007a) used a school based programme to prevent violent behaviour. The results revealed strong evidence that the strategies reduced violence in all school years. The efficacy of the strategy is also confirmed by a systematic review (Hahn et al 2007b) and meta analysis (Wilson & Lipsay 2007) of the school based program. However application of normal crime prevention principles to the phenomenon of homicide comes up against some substantial difficulties due to the highly diverse characteristics, causes and dynamics of homicide (Brookman and Maguire, 2003).

It is unlikely that a single preventative strategy can impact all forms of homicide thus many may need to be employed in conjunction with each other. However the best methods or combinations of methods need to be further investigated. It is obvious that it is difficult to assess effectiveness of prevention strategies especially when homicide rates are already gradually declining (Rosenfeld et al 2005). It is near impossible in the short term to assess whether prediction or prevention strategies are effective. It is not possible to decipher whether an individual has refrained from homicide due to prevention strategies or if in fact they never had the potential to commit murder. However in the
long term one possible way to assess homicide prevention effectiveness is to evaluate homicide trends and draw inferences from them about the effectiveness of interventions ability to reduce homicide. Though this method is not entirely fool proof and other factors may have a part to play, is the best suggestion to date (Rosenfeld et al 2005).

8. CONCLUSION

To conclude, it is obvious that there is potential to reduce the amount of homicide committed each year. It appears current forecasting methods are able to identify who is likely to commit homicide more accurately than chance, thus with greater funding and research in this area it is likely we can increase the precision of such methods and consequently further decrease forecasting error, random forecasting (Breiman, 2001) seems particularly promising. A trade off between errors will still need to be made as predictions will never become certainties, in light of the application of Halvorsen (2004) to forecasting errors, it seems necessary that the possibility of inherent FNs within FPs need to be accounted for when decisions are made. Forecasting is necessary so that scarce resources can be directed towards high risk individuals in the hope that many homicides can be prevented and the current statistics changed. Our capacity to prevent murder is also dependent on the effective delivery of such resources (prevention strategies) (Sherman, 2007a). Thus further research and short term and long term evaluation is needed in this area. Guidance for direction in future research is summed in a three part strategy put forward by Sherman (2007a) in order to help criminologists prevent homicide by providing three resources to probation and parole workers:

1. Precise forecasting of those at risk of committing homicide.
2. Precise diagnosis of mental health problems and risk factors afflicting those few clients.
3. Systematic reviews of most effective treatments for each offender’s conditions.

Although there will always be problems with assessing forecasting accuracy and the effectiveness of prevention strategies, the need to keep improving these methods is indispensible. Consequently, a number of ethical considerations need to be made, we need to optimise the balance between public safety and the civil liberties of supposed potential offenders and the general population needs to be optimised, the costs of self-fulfilling need to be considered, and may be most importantly we need to not lose sight of the capriciousness of human behaviour.
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