

Exploring Engagement of Victims of Violent Crime

Data Analytics Lab

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1 Introduction

A dip sample of violent crime (undertaken by FCID) suggested that 67% of violent crime victims did not support a prosecution from the outset. This is concerning and has led to the desire by Force CID to have a better understanding of what may be driving this lack of support for investigations. Knowing the drivers would be key to knowing how the force could adjust the service provided to meet the needs of victims, improve outcome rates and improve trust.

A search of the literature available, and discussions with a number of subject matter experts (SMEs) suggested the type of information to look for in the data.

Following these discussions, two different outcomes were considered- the victim following the case through to a successful outcome and the outcome where the victim withdraws their support from the case (referred to as evidential difficulties- victim henceforth).

1.1.1 Definition

For these purposes it was agreed with the project sponsor that violent crime would be defined as offences falling under sections 18, 20, 21, 42, and 47 of the Offences Against the Person Act (“Offences Against the Person Act 1861”), excluding any crimes identified as relating to domestic violence or child abuse. These cover a range from common assault to grievous bodily harm.

A successful outcome (success) includes any type of charge, a summons, a caution, turning point (a type of intervention), TIC (taken into consideration), a penalty notice, a warning, or a community resolution. This is expanded on in Section 7.6

2 Executive summary

This report considers the factors that are important to the successful outcome of investigations of **violent crimes** and what tends to lead victims to withdraw their support for the investigations. Using information from subject matter experts, explanatory models were developed with relevant variables. Outcome definitions are given in Section 7.6

The work highlights the impact of the most important factors, allows potential improvement pathways for the success rates to be proposed and the mitigation of factors that reduce the chance of a positive outcome.

Successful outcomes are associated with

- getting to the incident *quickly* or being reported by a *patrol*
- Keeping the victim *informed* and *advised* on the state of the case
- Ensuring that *support* is independent of the seriousness of the incident
- Keeping the *number of officers* involved in the investigation to a minimum
- *Victims* who are *female* and/or *older* may need extra attention as they are associated with unsuccessful outcomes

Victims withdrawing their support is linked to

- Officers *visiting* the victim, rather than telephoning
- Incidents associated with a large number of all female or all male offenders - potentially *gangs*
- *Inconsistent contact by personnel* with the victim

Some of the factors are associated with different directional impacts depending upon what is considered. This is due to the withdrawal of support occurring after the initial incident and after a time of reflection by the victim; but it is also determined by the interaction of the victim, officers and the **broader situation** in which they find themselves. Visits may not always be beneficial for victims of violence, whereas an email or phone call can keep the contact going without highlighting the victim's co-operation.

If the victim is identified as **vulnerable**, not only are they inherently in need of some extra support, but when not receiving victim support they are directly associated with higher levels of cases not achieving a successful outcome, and a non-vulnerable victim is strongly associated with success. It should be noted that the Victim's Code¹ has a particular definition of vulnerable that is broader than that used in the study. Where **Enhanced Rights** under the Victims' Code are deemed to be necessary, support can be

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/974376/victims-code-2020.pdf

offered in a more tailored fashion. These enhanced rights are generally based on the time scale of the more general right being implemented (1 rather than 5 days) but can include specialized liaison services.

The **interaction** with such victims is one where a balance between face-to-face support, for example visits, and less direct support on the phone or by email needs to be considered weighing the positive impact of the extra support with the potential negative impact of the visit unless an alternative can be found. In addition the **more officers** involved in the investigation, in particular if there are more than 21 officers², the greater the likelihood of the victim not supporting or withdrawing support.

The **number of offenders** has an effect, the more offenders the more successful the case, and in general the more offenders the less likely it is that there will be evidential difficulties due to the victim; however if all or most of those offenders are of the same sex then this is associated with the victim not supporting the investigation, possibly reflecting gang behaviour.

The following table (Table 1: Important Variables) summarises the most important variables, with + denoting a positive relationship and – a negative relationship. The number of + or – signs represents the strength of the relationship. Desirable outcomes are highlighted in green with the less desirable being highlighted in dark blue.

No case or incident is ever the same. This work suggests that some victims need different levels of assistance and support, officers will need to take these requirements into account in addition to all the other aspects of the investigations. Working within the context of the Victim's Code will aid in improving successful outcome rates.

² The probability of having 21 or more officers is low at circa 0.004. The number of officers with the highest probability of occurrence (at 0.16) is 4. Therefore the number of officers may reflect the complexity of a case.

Table 1: Important Variables

| Variable / level | Success | Evidential difficulties (victim) |
|---|---------|----------------------------------|
| Victim not vulnerable | +++++ | |
| Victim support not provided and vulnerable | --- | |
| Victim not vulnerable and receiving support | ++ | --- |
| Response P1 ³ | +++++ | + |
| Response P2 | +++ | |
| Reported by patrol | ++ | |
| 101 call | --- | |
| Number of offenders | ++++ | ---- |
| Number of female offenders / number of male offenders (possible gang indicator) | | +++++ |
| More serious violence | +++ | |
| Victim informed | +++++ | --- |
| Advised by visit ⁴ | ++++ | ++++ |
| Advised by telephone | | ---- |
| Advised by email | ++++ | |
| Female victim | --- | + if aged 26 to 40 |
| Victim under 26 | ++ | |
| Victim over 40 | --- | -- if male |
| Number of officers in investigation | ----- | +++++ |
| Key: | | |
| Better outcome designated | + | - |

³ This may reflect a P1 response increasing the probability of evidential difficulties given that it is not a successful outcome (hence contributing more strongly to the probability of success, but also contributing slightly to evidential difficulties (in a conditional probability sense).

⁴ This likely reflects the circumstances of the case and victim (see further in this report).

3 Literature review

Given that the main concern here is with victims not supporting an investigation, a brief literature review was carried out focusing on studies which examined the topic of the co-operation of victims with police in order to help inform variable selection and focus.

3.1 Procedural justice and police performance

The concepts of procedural justice and police performance are described below (Koster et al. 2016); they were originally put forward to explore the relationship between the police and (all) citizens. Recent studies have researched the relevance of these ideas to the relationship between police and victims of crime. Using this framework researchers have been able to quantify these relationships for use in modelling. The concepts of procedural justice and police performance could also be used to throw light on some of the results from this project and offer explanations as to what might be happening.

Key aspects of the compact between police and the population as described in Koster et al. (2016) are:

Procedural justice comprises voice, neutrality, respect, and trustworthiness as distinct elements. Voice indicates the extent to which the victim believes they had the opportunity to give their side of the story and express their thoughts (so they have a voice). Neutrality reflects the victim's perception of unbiased decision making by police (so they appear to be neutral). Respect means the perception that police officers are polite and treat the victim with dignity (so the police show respect). Finally trustworthiness is the perception that police did their best to achieve the best result for all concerned (so can be trusted).

This concept of procedural justice can feed into the concept of **legitimacy** - the intrinsic drive to obey and accept the decisions of the police. This can be split into the two concepts of obeying the law and trusting the police.

Police performance is the perceived quality of actions during the investigation process; did the police properly investigate the crime scene and try to arrest the offender (so did the police appear to do a thorough job)?

In a survey based study in Australia by Murphy and Barkworth (2014), victims of assault often felt further victimised by the criminal justice system. Many of these victims felt that police were unable to protect them in a public space. They were more likely than victims of other crimes (domestic violence and property crimes) to express negative sentiment towards police. Police performance was considered a more important factor than procedural justice in determining whether a victim of assault would report the crime. It should be noted that the actual term used was police effectiveness rather than police performance, but the measures used reflected the perception that police perform their role effectively and acted as a proxy for police performance. In terms of victims of assault fearing retaliation by offenders, perhaps a higher perception of police performance might go some way towards reducing those fears.

Another study by Elliott, Thomas, and Ogloff (2011) based on 110 in-depth interviews with victims of crime (70% victims of violent crime) linked procedural justice to legitimacy, finding it to be at least as important as police performance. Participants explicitly stated that procedural justice encourages them to obey the law and makes them believe that the police are competent and willing to do their best to solve the crime; over a third of respondents expressed the view that this was therapeutic in terms of alleviating the trauma associated with a crime. The quantitative analysis comprised three scales each based on a collection of Likert⁵ type scores, another scale based on a collection of true/false responses, and a further 4 scores of individual factors. The main factors determining perceived procedural justice were socio-economic factors, and the presence or absence of criminal histories; however perceptions of antecedents of procedural justice were a much better predictor of legitimacy than whether or not the victim was involved in crime or not. Results of the quantitative analysis supported a link between the antecedents of procedural justice and each of legitimacy, fairness, and satisfaction with contact, and between legitimacy and compliance with the law, leading the authors to suggest that there may be potential for procedural justice to be a powerful tool to motivate everyone, including those with a criminal history, to obey the law. The link with cooperation was not supported, but this could be due to how it was measured, participants merely being asked how likely they would be to help police in general.

Koster et al. (2016) carried out a literature review on studies of victims of various types of crime that focused on at least one of procedural justice or police performance, including Murphy and Barkworth (2014) and Elliott, Thomas, and Ogloff (2011). Although they report mixed support for links between each of the above criteria and cooperation, they do note that when focusing specifically on victims of violent crime the links do appear to be there.

As a result they state:

“A review of the literature showed that positive perceptions of procedural justice seem to hold a positive association with crime victims’ perceptions of police legitimacy. Perceived legitimacy, in turn, seems to be associated with victims’ cooperation, although findings were slightly mixed on this relationship. Further, crime victims’ perceptions of police performance seem to hold a direct, positive relationship to victims’ cooperation. This information is of great importance for police practice. For police officers, these findings suggest that they may be able to shape victims’ perceptions of police legitimacy and possibly victims’ intended and actual cooperative behavior by (1) encouraging victims to express their side of the story and their views on the investigation process, (2) showing victims that decisions are based on facts in a neutral and unbiased manner, (3) treating victims politely and with respect and dignity, (4) showing victims the sincere intention to do everything possible to solve the problem, and (5) showing victims the efforts made to investigate the crime and arrest the offender” (Koster et al. 2016, p39)

⁵ Likert scales relate to survey questions requiring you to select one of a scale of options, for example strongly agree, agree, neither agree nor disagree, disagree, strongly disagree.

This demonstrates the links between procedural justice and cooperation, and between police performance and cooperation, and sets out a possible strategy for addressing any issues victims may have with trusting the police, and helps identify potential variables for the analysis. It should be noted that WMP is already committed to procedural justice principles, although the current focus is on specific areas such as Use of Force, and Stop and Search; an extension of these principles into the investigations space may prove beneficial.

3.2 Victim characteristics

Whilst the actions of the police are important to the success of an investigation, the victim too is integral to this success. Studies have considered the role and characteristics of the victim in police investigations.

One study based on the International Crime Victims Survey by Dijk (2001) focused on repeat victims, finding that when they did report crimes, this was usually done in order to see an offender arrested or to stop an incident that was in progress. These repeat victims were however less inclined to report crimes at all because they felt that police could not or would not do anything to help them. Repeat victims were often less satisfied with police across all regions following negative personal experiences.

Another study by Berg, Slocum, and Loeber (2013) investigated whether robberies and assaults are less likely to be reported when the victim is involved in crime. They cite that around 42% of violent crimes are not reported, and that offenders are disproportionately victimised. The conclusion was that offenders are unlikely to report a crime when they are victimised, particularly in deprived and high crime neighbourhoods. In comparison the year ending March 2018, the Crime Survey for England and Wales (CSEW) suggested an estimated 38% of violent incidents were reported to the police (National Statistics 2019), although it was stated that this was not statistically significantly different from the 42% they had noted for 2017 and thus suggesting a comparable level of underreporting.

However, contrary to the above, Murphy and Barkworth (2014) found that for victims of assault no demographic or repeat victim status affected a victim's willingness to report a crime, once procedural justice and police performance were taken into account. The only demographic factors found to be relevant by Elliott, Thomas, and Ogloff (2011) were level of education and whether the person lived in public housing (information relating to these characteristics were not available in WMP data).

The final study by Avdija (2010) considered here investigated the extent to which police behaviour affects citizens' attitudes towards police via a survey of undergraduates (in the USA). It was noted that historically citizens of certain races or ethnicities, and those with low socio-economic status tended to have a poor view of police whereas females generally had a more favourable view. The results of the survey analysis supported the first two characteristics finding that African Americans were more likely to have a negative view of police, and that the higher the economic status the more positive the view of police, but contrary to expectations males were found to be more likely to have a positive view of police than females. Additional findings were that more police misconduct leads to a more negative view of police (accounting for 42% of variation), and that citizen-initiated contacts were more likely to lead to a positive view of police. Data were available for ethnicity and sex and may act as proxies for a lack of trust. It is

possible that females were less likely to trust police (than males) due to having a higher level of fear, hence setting a higher threshold for trust.

3.3 Discussions with subject matter experts (SMEs)

Meetings were held with the project requestors and with representatives who deal with the initial stages of a violent crime: force contact, response, initial investigation, and secondary investigation.

The points that emerged have been split into two groups to highlight similarities in the information for the relevant areas and to allow an understanding of the journeys associated with each grouping or process. These are victims and police actions.

3.3.1 Victims

Often when police arrive at a crime scene there is a lot going on, and it is not always obvious who is the victim and who the aggressor. In such cases, in the absence of other evidence, the person with the worst injuries may be identified as the victim. In one example provided, a review of CCTV revealed that the supposed victim was actually the aggressor. In other cases all participants may be both offender and victim. Also, as noted below and mirroring the literature, the victim may be involved in criminal activities and not want to be identified.

Many suspects are not identified; in some cases these will be known to the victim who is unwilling to identify them, either because they are complicit or are afraid of reprisal. A similar comment was made by another SME that when victims disengage it may be fear, or they may be known to the police.

According to an SME from Force Contact, most victims who call want to help, but sometimes won't say who the offender was and may hang up; if the victim wasn't the person reporting the incident they are less likely to engage. Another SME commented that even where victims were initially engaged, they often disengage at the secondary investigation stage, with some just disappearing.

It was felt that the Force might consider alternative routes, for example restorative justice, as court cases can be off-putting to the victim. COVID has made things worse as court cases are taking a lot longer (maybe 6 months) to conclude, although some improvement may be under way due to the re-launch of the Victims' Code recently (see below). However, whilst alternative avenues may thus be beneficial it was noted that for an out of court resolution the offender has to admit to the offence, and further many cases of violent crime are not suitable for out of court disposals, meaning only the more onerous formal criminal justice pathway is available – many victims may be put off by this. This leaves victims with few options and could be an area where victim support services would be of most help.

In line with the literature, SMEs also suggested that a lack of trust in the police was one factor leading to victims withdrawing their support for a case or to the case failing to get to a successful resolution. In cases where there is a named offender then officers may consider a victimless prosecution if the victim is not engaged.

From the dip sample conducted by Force CID, 55% of witnesses and victims who go through with the court case would not be willing to repeat the experience - this also

marries with the findings of the literature review. As has been noted above, the court process is particularly stressful for victims; whilst the police can do little to affect that part of the justice process, they can do their best to ensure that the victim is receiving appropriate support.

The default for victim support appears to be to direct victims to online access - no statistics were available as to how many of the victims do access the online support. This service is external to WMP but it would be beneficial to consider having information from the support providers in the future to ensure that support is taken up by victims where they want it. In addition to victim support there are specialist agencies offering support for different sectors of the community, but offering of support depends on the knowledge of individual officers and it is not clear from the data whether such types of support have been included. There is also no information available in the WMP data as to the quality or extent of any support provided. It was felt that pressures on resources have led to services to victims ebbing away.

The new Victims Code came into force on 1 April 2021⁶, the intention being that victims are given the support they need, and it applies to interactions with the police, courts, and other criminal justice agencies. This was not in force during the period covered by this study.

The interactions between the victims and offenders and the perceptions of the police by the victims are complex and potentially lead to a multitude of points of failure for cases. Further, the interaction between the Criminal Justice System and the victims (especially conditional on their past interactions both as a victim and suspect) all play their part in advancement of the investigations to a successful outcome.

3.3.2 Police actions and procedures

The interactions between officers and victims was further expanded upon by SMEs. Though the personal interaction is clearly important, other more direct factors were discussed. A number of comments suggested timeliness, physical presence and the number of officers attending were important. One SME commented that outcomes were generally inversely proportional to the length of time taken to engage with the victim. In a similar vein another commented that a major factor in keeping the victim engaged is reaching the victim quickly - this could be as simple as a telephone call to arrange an appointment on another day, as long as the victim feels supported. However another commented that satisfaction is high when there is physical attendance; suggesting that timeliness and physical presence may be most useful in combination and hence that incidents graded as P1s (immediate response – attendance should be within 15 minutes) and P2s (priority response – attendance should be within 60 minutes) would get the most support from victims.

The number of officers involved in the case was also highlighted as a factor that affected the victim's perception of support; maybe there is less trust if personnel keep changing. Similarly it was felt that staff rotation is a problem, without the continuity of support by a small cadre of officers, a victim is less likely to continue their engagement. This is

⁶ <https://www.gov.uk/government/news/new-victims-code-comes-into-force>

consistent with findings from other analyses undertaken by the Data Analytics Lab relating to the investigation of serious sexual offences and domestic abuse.

In prioritising responses, call handlers in Force Contact would log violent crime as P1 or P2⁷, sometimes P4 (scheduled investigation – where an appointment is made for an investigator to attend), but when there are no P1 or P2 resources available these will be allocated to P3 (priority investigation – attendance or phone call during the next few hours). The contact officer may remain on the telephone for up to half an hour until police officers arrive at the scene. If it is a hospital contacting the police this will normally be allocated a P1 or P2, or may be diverted to the local policing unit (NPU).

In other comments it was felt that serious violence is prioritised, meaning that lower-level violence may have longer response times - leading to dissatisfaction. Random attacks in the street get full focus, some of these will come under Section 47, actual bodily harm (less serious assault cases, though still involving some form of injury and more serious than a common assault) although most are Section 18, grievous bodily harm (the most serious violence). (“Offences Against the Person Act 1861”.)

The principle of proportionate investigation is key. Initial investigations by Force CID (FCID) have a process that determines what the proportionate level of investigation is on a case-by-case situation. Cases with limitations on evidence are likely to be filed. Detective Inspectors (DI) in each area will do an overnight crime review focusing on anything with any risk and in this way they sometimes see cases that would not be on their radar otherwise. Thus the metrics by which success is measured are influencing the allocation of investigative resources. This will lead to difficult decisions and to disenchantment of the victims leading to their withdrawal of support in the current and subsequent cases.

There is a thread here about building relationships between victims and police officers suggesting the importance of human interaction.

3.4 Summary

There are a number of points of agreement between the academic literature and the SMEs which are noteworthy. The majority of these highlight the reduced chances of victims being willing to interact with the police and the Criminal Justice System after an initial case or investigation. This is clearly an issue that needs to be addressed more widely than just in the West Midlands.

Procedural justice (voice, neutrality, respect, trustworthiness) can have a significant effect on willingness to cooperate according to the literature, and lack of trust of the police in general (rather than investigating officers) was also hypothesised by SMEs as an area of concern; this is an area where police may be able to make improvements. Some aspects of this are difficult to measure however factors such as timeliness, physical presence and the number of officers involved, important factors identified by the SMEs, could feed into this. Successfully linking the victim up with victim support may also help the victim feel that everything is being done to support them.

⁷ These are the most urgent classifications demanding rapid response.

Police performance (as defined in 3.1) is also influential. Getting the right messages across on a regular basis may help with improving this perception.

As might have been expected people already involved in crime are reluctant to get involved as this would draw unwanted attention to them. Police may not be aware of their involvement. SME comments show recognition that lack of cooperation could be due to the victim being involved in crime. It is not generally possible to tell from the data whether it is fear of reprisal by the offender or some level of criminal involvement which prevents some victims cooperating (or both). None of the victims studied here had been offenders in violent crimes in the previous 2 years – this could perhaps have been extended to cover all crime types, but a lack of results would not guarantee a lack of criminal activity.

The literature and the SME comments agree that previous victims are less willing to repeat the process and would be less likely to report an incident in future. It is not made clear which aspects of the process are causing this, although anything that could be done to improve the experience should help. Appropriate use of the Victims Code should be of benefit here. This is further influenced by the reduced willingness of some demographic groupings to co-operate with police, though SMEs did not speculate on this aspect.

Police misconduct, perceived and actual, leads to a more negative view of the police, which in turn makes victims less likely to cooperate. This aspect is not considered here as appropriate data are not available.

The factors identified by the discussions and literature suggest that the interaction between the police and the general population needs to be improved. The social contract, based on the Peelian Principles of consent and co-operation appear to be less robust than would be hoped for. It needs constant care and attention to ensure that the police are able to maximise the support of victims of crime to be able to proceed investigations towards successful outcomes.

4 Data

Starting with all crimes from 2010 with an identified victim fitting the definition noted in Section 1.1.1, the dataset was restricted to include only those cases with a clear-up code where a link could be found to a record in the incident systems. It is not always possible to connect crimes to the original incidents meaning that not all data could be used.

The outcomes (based on clear up codes) were placed into one of four groups and plotted by year to see if there were any trends. As can be seen from Figure 1 below, three of the outcome types were not in use prior to 2014.

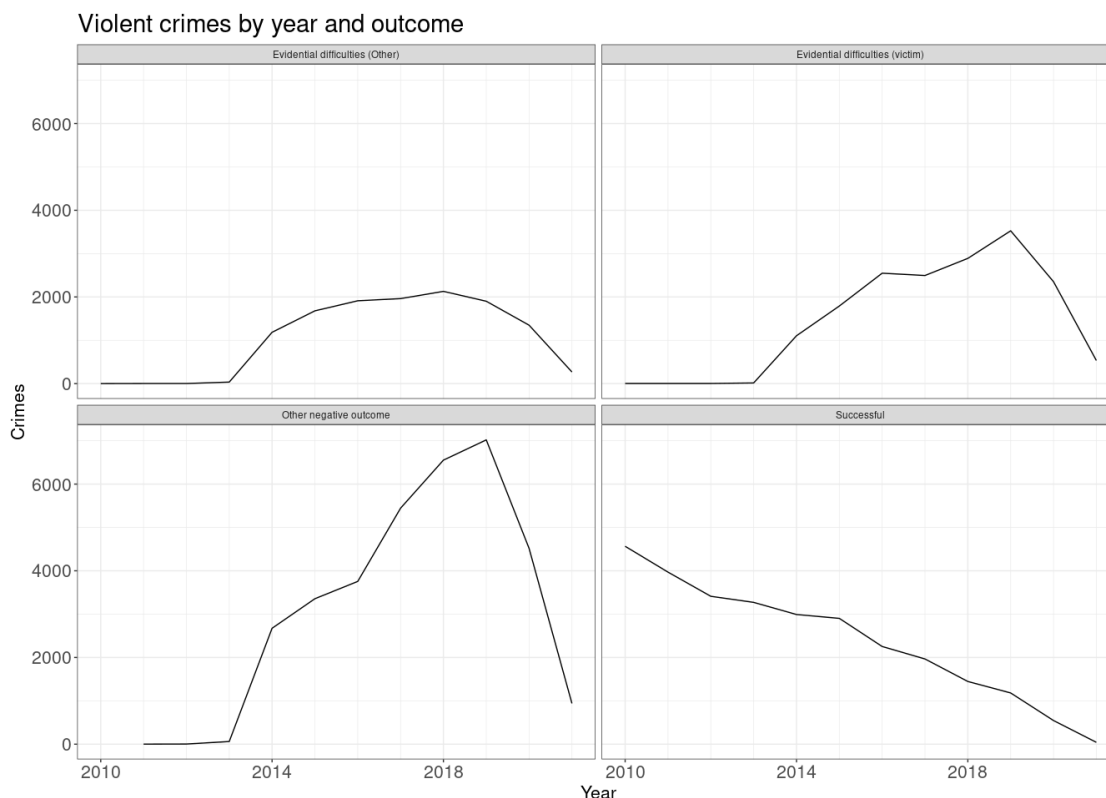


Figure 1: Changes in crime counts over time, by outcome type

The dataset was hence further restricted to only include crimes from 2014 onwards. Data from 2021 was retained but note that this only covered the first part of the year so should not be included in any consideration of trends. As this study is based on individual cases, rather than the trends the use of the 2021 data is possible.

There does appear to be an overall drop in 2020; closer inspection reveals a big drop between January and February 2020 followed by some recovery towards the summer although not to the levels of previous years. This timing suggests it could be partly due to COVID, although it also coincided with the introduction of a new system for recording incidents⁸ which may have led to fewer crimes being matched due to teething problems.

⁸ Controlworks (the command and control system).

However it may also be that for 2020 a lot of cases were still open and hence there were fewer cleared up cases to use in the analysis. The exact reason is not known but is likely to be a combination of these factors. The discussion of trends in the data will be limited to the period from 2014 - 2019 in light of this.

The outcomes of interest for this project are successful - whether or not a successful result was achieved (e.g. summons, caution), and evidential difficulties (victim) - whether lack of support from the victim created evidential difficulties causing the case to be unsuccessful. These will be the dependent variables for the models.

There is a clear steady reduction in the number of successful cases. For evidential difficulties (victim) there has been a fairly steady increase up to 2019. For the other outcomes, other negative outcome had a steeper increase up to 2019, whereas evidential difficulties (other) appeared to plateau at around 2000 cases with a slight downturn to 2019. There should be sufficient data within each category for modelling purposes, although the categories are not balanced, as can be seen in Figure 2 below.

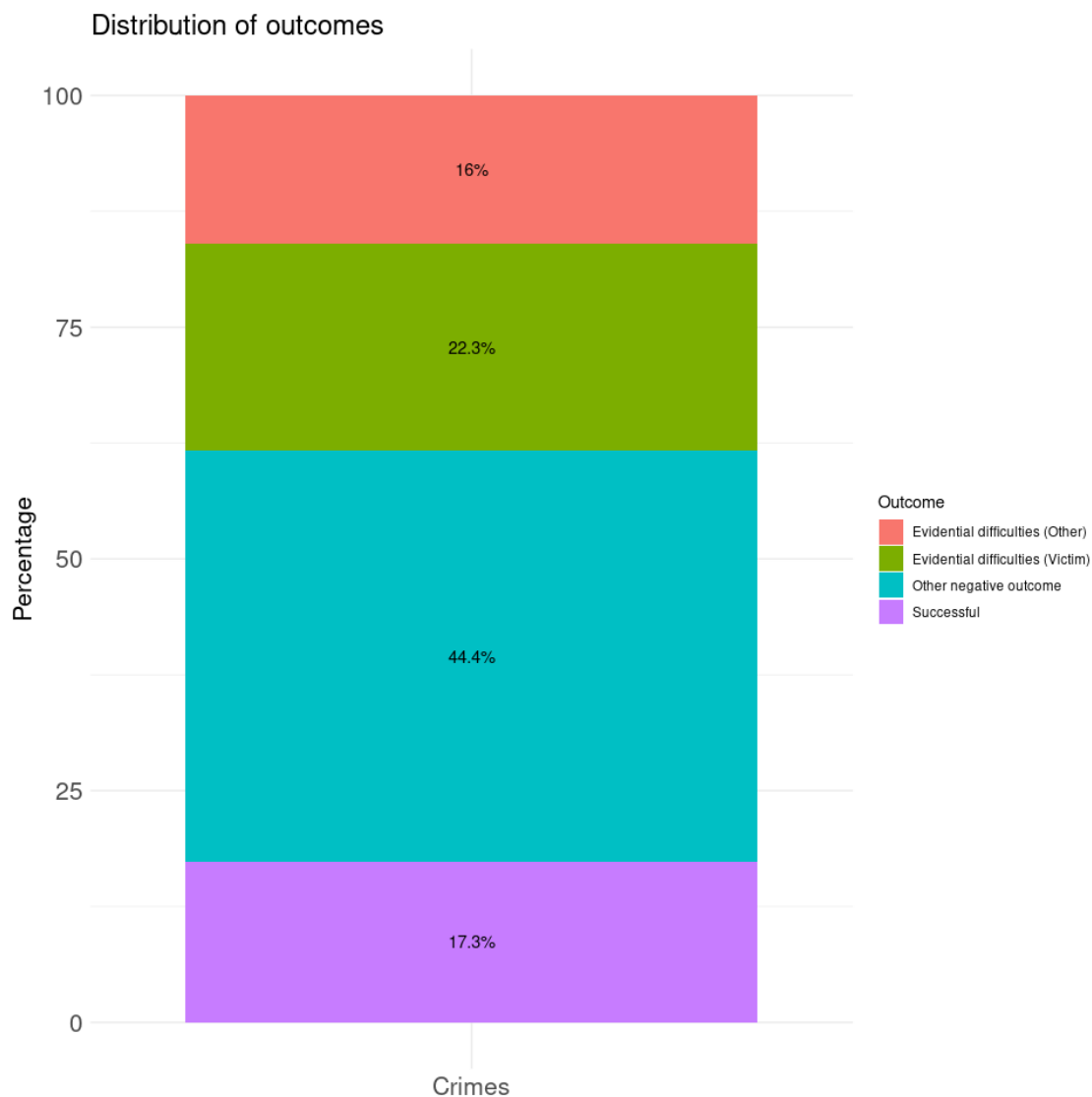


Figure 2: Distribution of outcomes in full dataset 2014-2021

Details of age (calculated from date of birth and date of crime), sex, and ethnicity of victims were available for most victims, the distributions are shown below in Figure 3.

Ages were grouped so that they contained approximately one third of the data, being up to 25, 26 to 40 and over 40, with a separate category of unknown.

In terms of offenders, in many cases there were no offender details available and in some cases there were multiple offenders. Hence counts of male and female offenders were used, and ages were placed in categories of up to (and including) 25, over 25 or unknown (including where no offender identified) with age reflecting average age where more than one offender. The ethnic groupings were too diverse to be helpful in this part of the data.

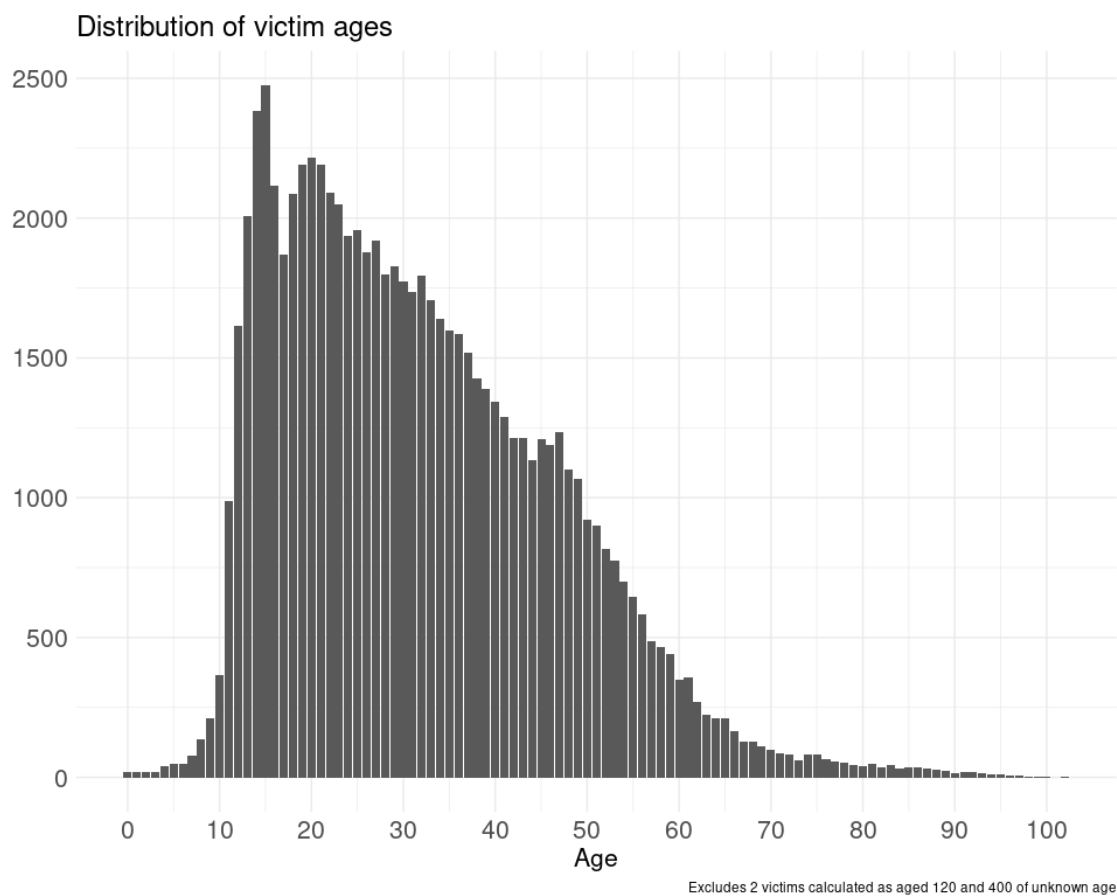


Figure 3: Distribution of victim ages in full dataset 2014 - 2021

There is a peak for the 15 to 25 age range, with numbers then reducing steadily up to around age 65 at which point numbers are below 500.

As shown in *Figure 4: Distribution of the victim's sex across possible outcomes*, in all cases the number of male victims exceeds females, with the greatest discrepancies being in the "Other negative outcome" category where the ratio is approximately 3:1.

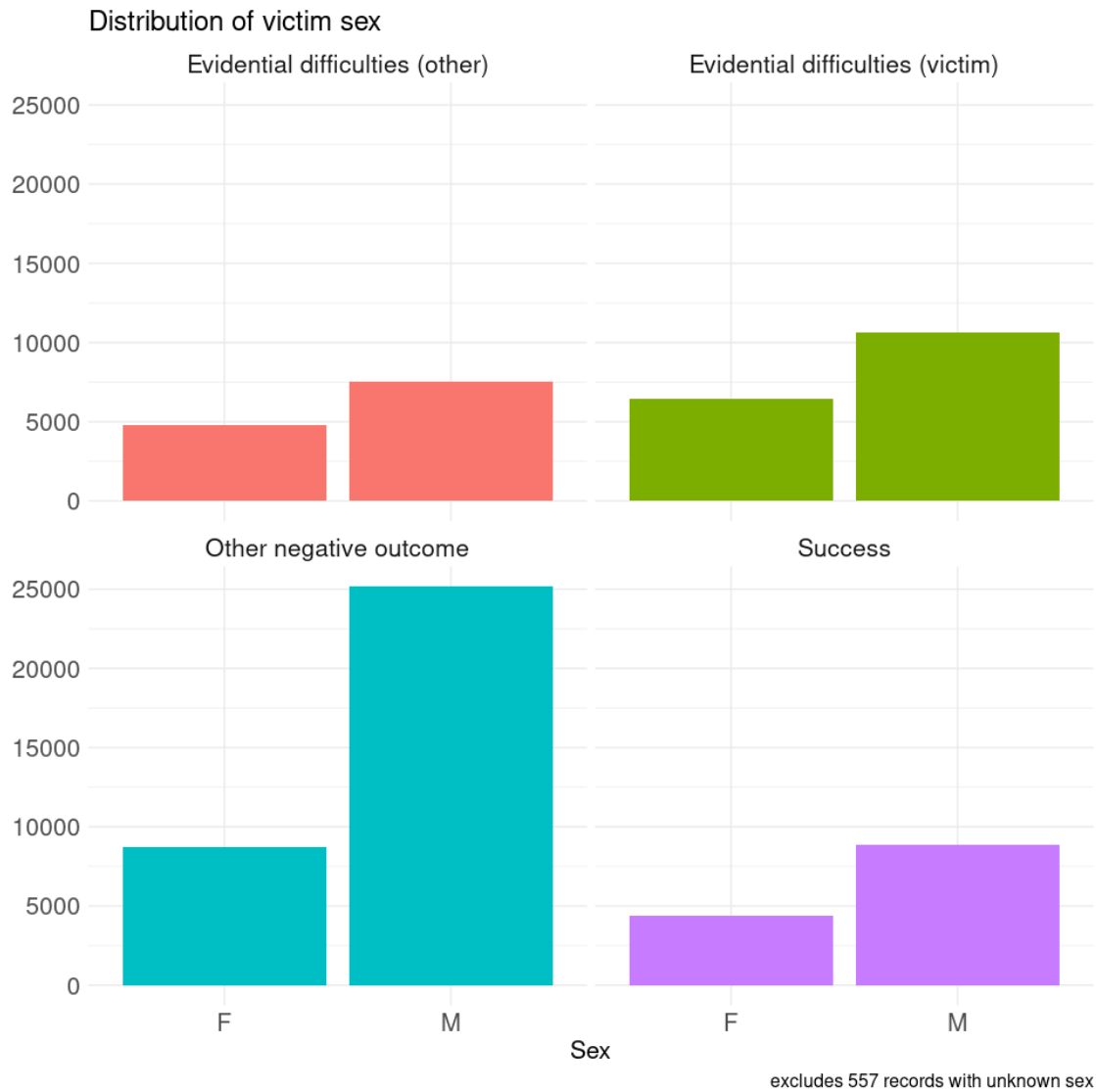


Figure 4: Distribution of the victim's sex across possible outcomes

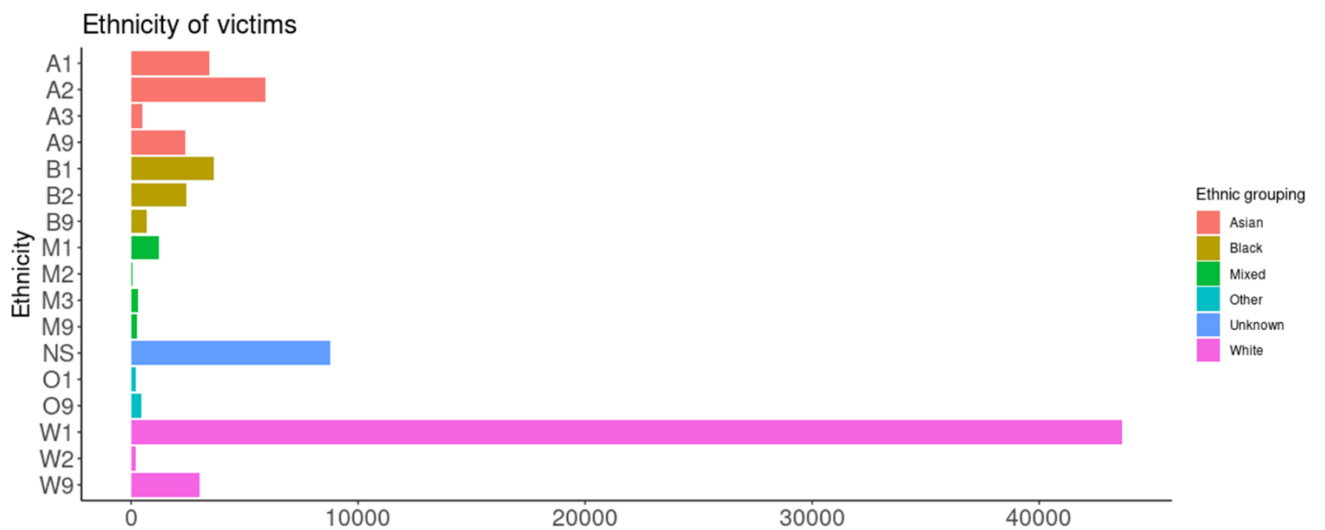


Figure 5: Distribution of victim's ethnicity (see Appendix 7.2 for description of codes)

Figure 5 shows that the vast majority of victims were of white ethnicity. If the groupings are combined the number of Asian victims also outnumbers the number that are unknown. In order to enable comparison with the 2011 census, the 11.4% of unknown ethnicity were discarded, the ethnicities grouped and the percentage for each group (ignoring unknowns) was calculated and is shown in Table 2.

Table 2: Comparison of ethnic groupings from data with 2011 census

| Ethnic grouping | Data % | Census % |
|-----------------|--------|----------|
| White | 68.6 | 70.1 |
| Asian | 17.9 | 18.8 |
| Black | 9.9 | 6.0 |
| Mixed | 2.7 | 3.5 |
| Other | 0.9 | 1.5 |

Given the level of unknowns, and that the comparison is with data from ten years ago, this is a close approximation of the make-up of the population as a whole.

Police area was used as a proxy for deprivation. ONS deprivation data could have been used but would have necessitated identifying LSOAs (lower-level super output areas) via postcodes inevitably further depleting the data for cases with incorrect or missing postcodes.

Variables were created noting any previous history of involvement by the victim in violent crime, either as victim or offender, in the previous 2, 3, 6, 9, 12, or 24 months. Any cases with a previous appearance as an offender where there were no victim or incident data available disappeared once the dataset had been filtered so did not appear at the modelling stage.

Both victims and offenders were checked against records created in the SOC network project. Nominals were scored by the number of times they were mentioned in connection with a gang and then these scores were scaled to fall within the interval 0 to 1 using the empirical cumulative distribution function (ecdf). The scaling was based on the range (count of mentions) of all gang activity across the West Midlands before being linked to nominals in the dataset used here. Figure 6 shows how a sample of the gang counts were transformed in this way. Taking a sample provides a more informative representation of the concept in this case.

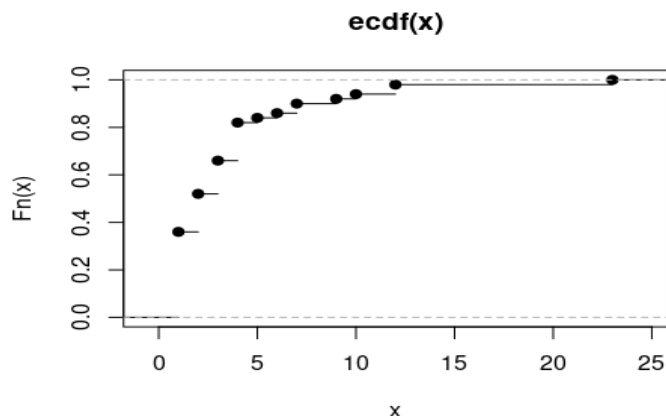


Figure 6: Example of application of ecdf to count data

Other than those cases identified within the outcomes as failing due to the victim not supporting the police, there was no specific flag for victims not co-operating in general. A free text field was used to extract the reason for the victim support being withdrawn. Viewing samples of this variable suggested a number of terms which would indicate lack of co-operation, hence a flag was created related to any cases featuring any of these terms; this identified cases with a lack of engagement at a particular stage (when victim support would be discussed) but was not exhaustive, and would not cover disengagement at other stages.

Victim support is a flag indicating whether Victim Support (support for the victim) was taken up - no further information is available to WMP. There is another flag to indicate whether Victim Support was discussed with the victim; this does not necessarily correspond with whether or not victim support was taken up. Judging by the data it would appear that these discussions only started to be recorded in 2015, but from that point on this information was routinely recorded.

Variables obtained from incident level data were the number of officers involved, response time, deployment time⁹, and response code (P1-P9)¹⁰. An effort was made to obtain information on who contacted the police but there was patchy availability, and nothing could be found in the new system. The distribution of the response codes and the proportion of each outcome within each response code are shown below. Note that the response codes are those assigned when the incident is called in, some will have been re-graded as new information becomes available.

⁹ Response time is the time elapsed from the time the incident was reported until the first response unit arrives. Deployment time is the total time that the officer spends on the incident, i.e. from the time they are allocated until the time they leave the incident.

¹⁰ The definitions for these response codes are shown in the appendix Section 7.7. These relate to the period covered by the data used in this research.

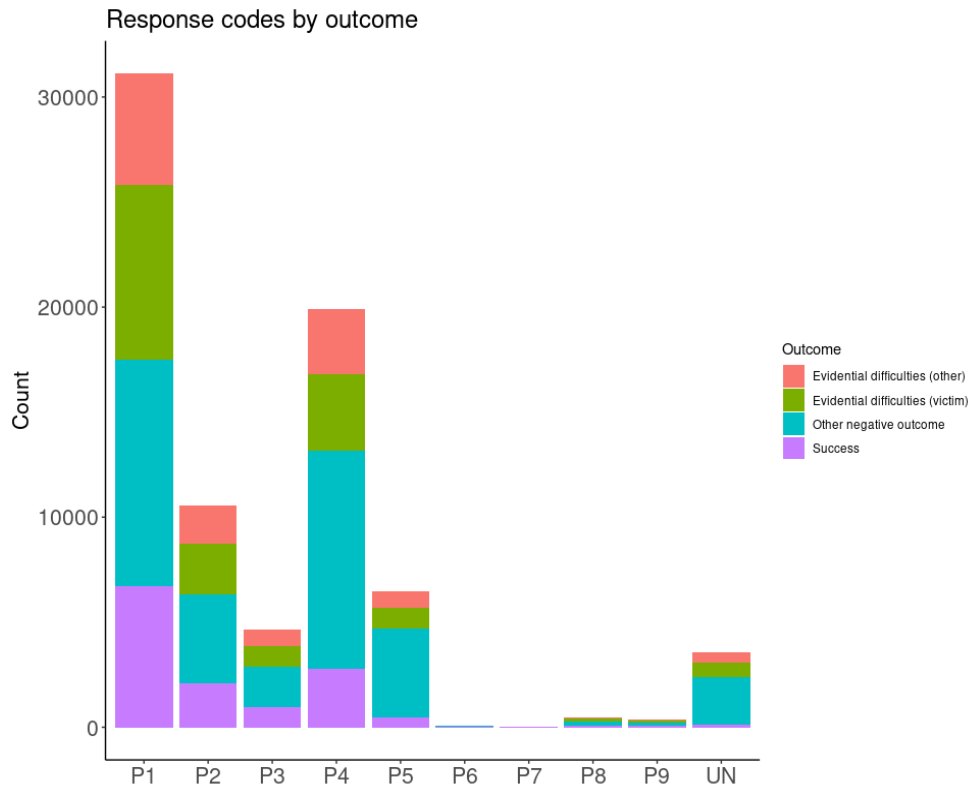


Figure 7: Counts of each response code split by outcome

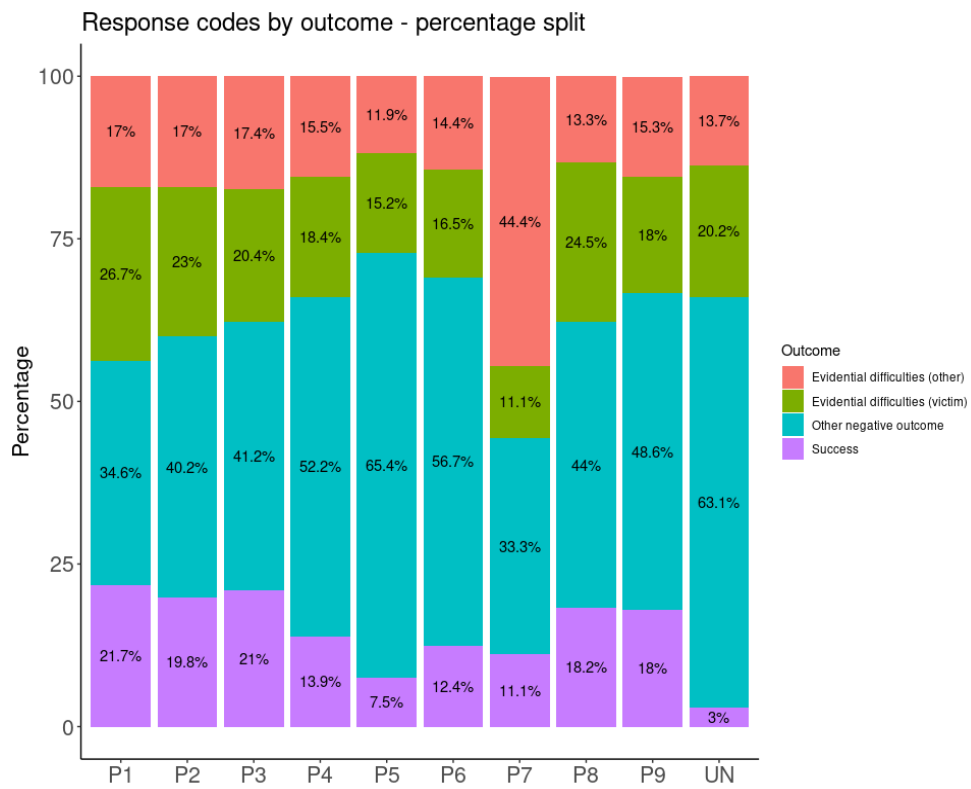


Figure 8: Distribution of outcome within each response code

Variables related to the investigation stage were the number of officers completing logs, the number of logs, and the number of days from the date of the incident to the first and to the last logs for that incident. These were intended to mirror the variables from the incident response data.

A transformation was used on two of the numeric variables (number of officers at incident stage, and number of officers at investigation stage) to reflect any non-linearity in the relationship with the outcome; this results in 3 new variables for each of the original untransformed variables. These new variables were derived through the application of splines. This allows the impact of, for example, officer numbers to vary initially improving the probability of a successful outcome and later reducing or not improving this probability. Non-linear relationships have been found in a number of other projects undertaken by the Lab.

Given the SME comments about the type and seriousness of a crime two measures were extracted from the data: the variable "section" i.e. which section of the Offences Against the Person Act applied (giving an indication of seriousness), and the injury code (which runs from 1 – 5 and gives an indication the seriousness of any injury with 5 indicating no injury).

Two other variables which complement the SME discussions were used. The first is the reporting method. This describes how the incident was reported, for example by an officer on patrol, or 999 call. The second relates to the manner in which the victim was kept informed, for example in person or by email.

All variables which remained relevant just prior to the modelling stage are detailed in Appendix 7.1

5 Models

In order to assess the importance of the various factors associated with either successful outcomes or evidential difficulties, regression models were used¹¹. Both dependent variables, the outcomes, were modelled using a similar technique, a penalized logistic regression.

The models were run looking at different types of outcome:

- Successful outcome – for example a charge or caution – these would include cases which were successful despite having no support from the victim;
- Evidential difficulties (victim) (by default these were unsuccessful cases) – these are cases where the absence of support by the victim is explicit and hence the closest to addressing the original question.

One interaction term was included in the successful outcome model – the interaction between vulnerable victim and the victim receiving support. This was also included in the model for evidential difficulties (victim), alongside the interaction between the age and sex of the victim. This latter interaction was tried with the successful outcome model but was provided no information to the model.

Comparison of these models should help to identify the features which help investigations, and those which hinder investigations. For clarity, in Figure 11 and Figure 12, beneficial features (related to a “positive” result for successful outcome or a “negative” result for evidential difficulties due to the victim) will be highlighted in green, whereas adverse features will be in yellow. The outcome is a binary outcome (success or not) hence a logistic type model is used. The model will estimate the probability of success given the explanatory variables included in the model. Given that these are probabilities of an event, we use specific thresholds against which a success is measured (for example if the probability estimated is above 0.5 then this is considered an estimated successful outcome).

Penalised regression techniques were used for each model, as detailed in “Domestic Abuse”, DAL, presented September 2020. These look to reduce the number of explanatory variables to those that have the greatest impact on the outcome. In some cases, it is beneficial to run a second regression to remove any statistical bias¹² from the estimated coefficients. This is known as a relaxed LASSO (Meinshausen (2007)). The first stage selects the variables, and the second stage estimates the effects. Cross validation on the training datasets was used to identify the best model in each case, with the area under the ROC curve (AUCROC or AUC) being the metric used.

The resulting model for a successful outcome was a relaxed lasso meaning only the most important features were retained, whereas the model for evidential difficulties (victim)

¹¹ This being due to the need for an explanatory modelling approach (where the coefficient estimates are of importance) rather than a predictive modelling approach.

¹² In a statistical sense, this applies to a consistent over or underestimation of an outcome compared to its mean. There is often a trade-off between bias and the variance of the estimates.

was very close to ridge regression meaning that more features were retained. Both models were shown to have comparable AUC values when comparing the test datasets to the training sets, suggesting the model is robust. The AUC values for the test sets were success 0.998 (training set 0.997) and evidential difficulties (victim) 0.862 (training set 0.858). The higher the AUC (the closer to 1) the better.

5.1 Model metrics

Some summary metrics and plots are shown here, full lists of metrics are included in Appendix 7.5, and confusion matrices in Appendix **Error! Reference source not found.** These metrics are based on the test set. Although in this case we are not making predictions this is standard practice as the choice of threshold would be based on the metrics for the training set.

Some metrics and the ROC plots are independent of the threshold selected and are shown first. These are followed by confusion matrix metrics for a selection of 3 spaced thresholds. These measures indicate how good a model is, and where there may be areas of concern.

5.1.1 Successful outcome

The following metrics and plots apply to the successful outcome model

Table 3: Successful outcome, overall metrics

| Metric | Value |
|--------|---------|
| H | 0.97347 |
| Gini | 0.99581 |
| AUC | 0.99790 |
| AUCH | 0.99801 |

These are all close to 1, the maximum possible, suggesting very good separation between the two possible outcomes. The plots below support this conclusion. These values are unusually high, but could be explained by the large number of cases with missing data in one or a number of variables; such cases would be associated with unsuccessful outcomes.

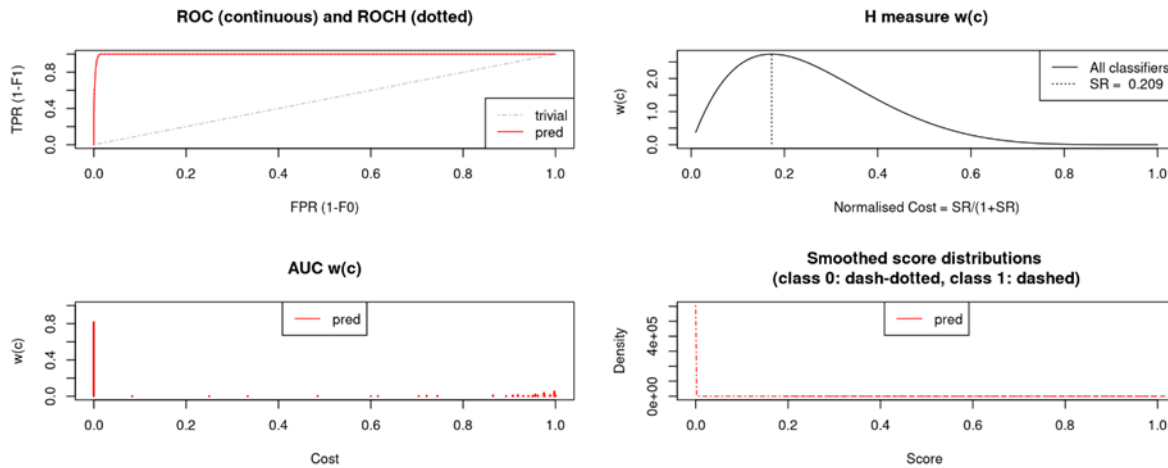


Figure 9: Successful outcome – ROC plots

Table 4: Successful outcome - metrics by threshold

| Metric | Threshold 0.2 | Threshold 0.5 | Threshold 0.8 |
|---|---------------|---------------|---------------|
| Accuracy | 0.98821 | 0.98912 | 0.98485 |
| Balanced Accuracy | 0.99288 | 0.99075 | 0.97050 |
| κ | 0.95982 | 0.96264 | 0.94662 |
| Sensitivity /Recall | 1.00000 | 0.99325 | 0.94859 |
| Specificity | 0.98575 | 0.98826 | 0.99241 |
| Precision / Positive Predictive Value | 0.93607 | 0.94637 | 0.96305 |
| Negative Predictive Value | 1.00000 | 0.99858 | 0.98931 |
| F1 | 0.96698 | 0.96924 | 0.95577 |
| F1 (Sensitivity/ Specificity) | 0.99283 | 0.99075 | 0.97001 |

The confusion matrices and associated metrics are considered together.

A threshold of 0.5 is the usual default value. In this case this threshold has the best balance as the difference between sensitivity and specificity is minimised, and the F1 score is maximised. Where the metric is not the optimal value it is close to the optimal value. If the biggest priority was to avoid false negatives then the 0.2 threshold would be better as can be seen directly from the confusion matrix and the top sensitivity and negative predictive value; it is possible this could be a possibility as the positive result (success) is the minority class. In a similar way the 0.8 threshold minimises the number

of false positives as can be seen by the higher specificity and precision. However given how high and close together all these measures are, there is no reason not to use the default threshold of 0.5.

5.1.2 Evidential difficulties (victims)

The following metrics and plots apply to the evidential difficulties (victim) model.

Table 5: Evidential difficulties (victim) - overall metrics

| Metric | Value |
|--------|---------|
| H | 0.42470 |
| Gini | 0.72231 |
| AUC | 0.86116 |
| AUCH | 0.86272 |

The AUC and AUCH are good results and close together (meaning the AUC is almost optimal in the context of this model), with the Gini being accordingly reasonable. The H value is quite low, suggesting the model may not work as well as the AUC value might suggest.

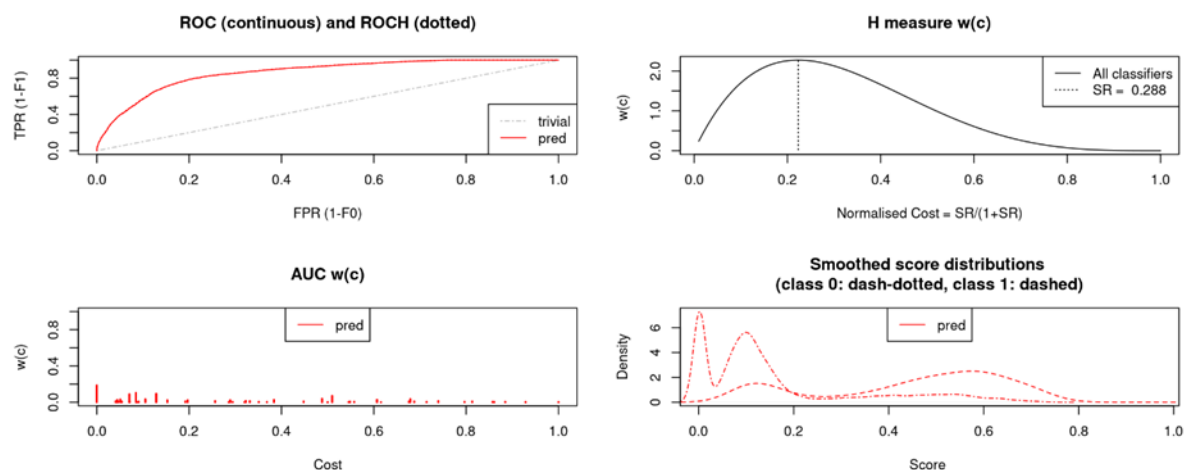


Figure 10: Evidential difficulties (victim) - ROC plots

Table 6: Evidential difficulties (victim) - metrics by threshold

| Metric | Threshold 0.2 | Threshold 0.5 | Threshold 0.8 |
|---|---------------|---------------|---------------|
| Accuracy | 0.78849 | 0.82501 | 0.77689 |
| Balanced Accuracy | 0.79234 | 0.70912 | 0.50044 |
| κ | 0.48950 | 0.45328 | 0.00135 |
| Sensitivity /Recall | 0.79930 | 0.49971 | 0.00087 |
| Specificity | 0.78537 | 0.91854 | 1.00000 |
| Precision / Positive Predictive Value | 0.51707 | 0.63815 | 1.00000 |
| Negative Predictive Value | 0.93156 | 0.86461 | 0.77685 |
| F1 | 0.62793 | 0.56051 | 0.00174 |
| F1 (Sensitivity/ Specificity) | 0.79228 | 0.64728 | 0.00174 |

In this case the 0.2 threshold is the best option for both minimising false negatives (sensitivity and negative predictive value) and for balance (sensitivity/specificity gap, F1 both types, kappa, and balanced accuracy) although specificity is comparatively low. The 0.5 threshold has the highest accuracy score, although this is not generally the best measure to use; it also has values close to the highest ranked for many measures. The 0.8 threshold would be a very bad choice, despite having the best specificity and precision, being little better than predicting everything to have a negative result – this is reflected in extremely poor values for kappa, sensitivity, and both F1 measures. The optimal threshold may fall somewhere between 0.2 and 0.5, perhaps closer to 0.2 where the gap between sensitivity and specificity is very small at 0.00659. The majority of metrics within this range are good.

Overall these metrics have added further insight into how well the models perform. They show that both models show some positive impact and are therefore worth considering in greater depth. In the next section results, in the form of the logistic regression coefficients, are considered.

6 Results

Key results are discussed here, with full ordered lists of coefficients shown in Appendix 7.4. The coefficients show the impact of the variable on the log-odds of the outcome. A positive value shows that there is a positive impact of that variable on the probability of the event occurring whether it is the successful outcome or in the case of the second model, there being victim driven evidential difficulties. Important variables are discussed in tandem for the two models in cases where they appear in both models.

Note that the number of officers splines¹³ shown here relate to the number of officers involved in the investigation.

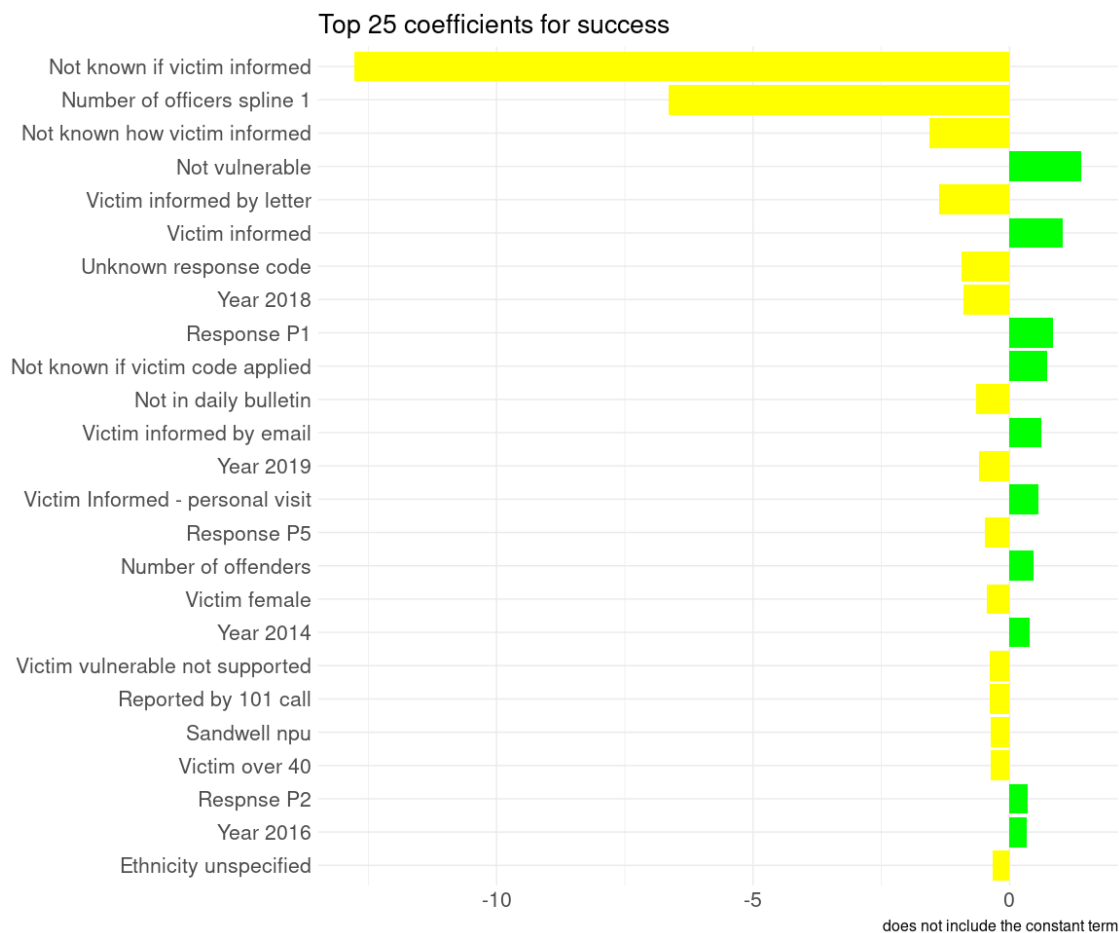


Figure 11: Successful outcome - 25 most influential coefficients (beneficial factors in green)

¹³ Noting that this is a means of incorporating non-linear relationships in the models.

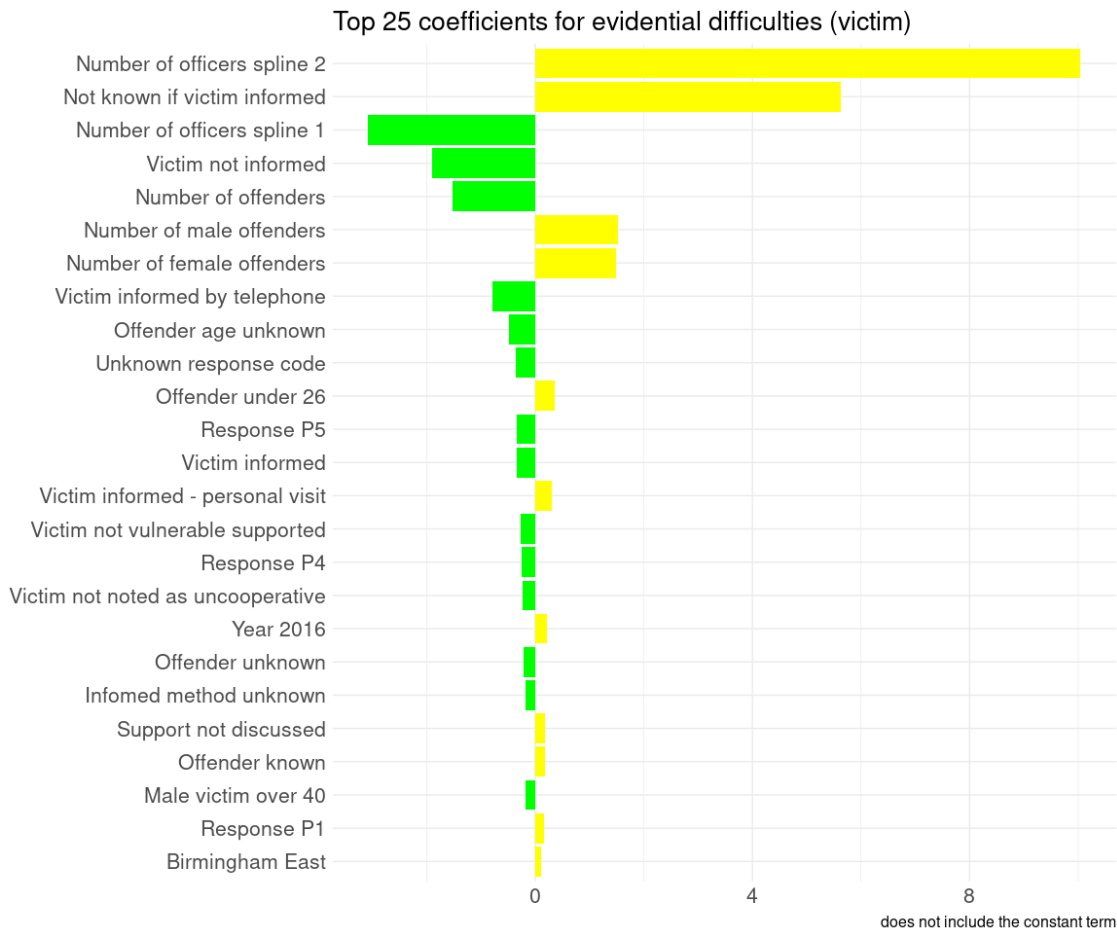


Figure 12: Evidential difficulties (victim)- 25 most influential coefficients (beneficial factors in green)

6.1 Supporting victims

Offering support to victims is a variable that is under the control of the Force in addition to the regulatory requirements; in the context of these results it is mainly represented in combination with whether or not the victim was designated as vulnerable¹⁴. A case where the victim was not identified as vulnerable and was receiving support is associated with a successful outcome (ranked 30 of 36) and is unlikely to fail due to evidential difficulties (victim), whereas a vulnerable victim not receiving support is associated with an unsuccessful outcome. Support not being discussed with the victim (ranked 28 of 39) is associated with evidential difficulties (victim), as is a non-vulnerable victim not receiving support (ranked 32); the first of these could be due to the victim having already disengaged from the process, whereas the latter could be due

¹⁴ Vulnerability is defined for the purposes of incident management as “a person is vulnerable if as a result of their situation or circumstances, they are unable to take care or protect themselves, or others, from harm or exploitation”. <https://foi.west-midlands.police.uk/wp-content/uploads/2021/01/THRIVE.pdf>

to the victim not feeling sufficiently supported. An analysis of the data reveals that only 37% of vulnerable victims were receiving victim support (35% for non-vulnerable victims).

There is no information available regarding the quality and level of support provided, which may be expected to vary, but having victim support does appear to make a difference, as can be seen via the interaction terms with vulnerability. Ensuring that victims are supported most effectively will help ensure that they are more likely to remain interested in seeing the case through to the final outcome. The impact of victim support will vary depending whether the victim is classified as vulnerable, and the level of support needed may vary accordingly. Victims classified as vulnerable are more likely to withdraw their support for the investigations. Thus identifying and supporting them early in the process could be net benefit for the Force as well as a significant benefit to the victim.

One of the SME comments referred to victims in many cases being given a weblink to click on, but no data were available as to the extent of uptake through this medium; perhaps more help in taking that first step would be beneficial. These actions may add a little time to the initial stages of a case, but could pay off in terms both of victim experience and of outcomes. It may be possible to find out in general how many clicks the website gets – this would be an area for further investigation.

Given that the literature and the dip sample both suggest that repeat victims are less likely to support any future investigation, improving the victim experience could help to mitigate this somewhat. As noted in Section 3.3.1 the Victims Code has been recently refreshed; this is expected to lead to improvements in terms of victim support, and may also be used as an opportunity to reinforce the message around the importance of supporting victims. It would also be helpful to work more closely with neighbourhood policing teams, particularly in the case of vulnerable adults, to see whether there are any further avenues for support. At a more general level, the good work being done by the neighbourhood policing teams may also lead to an improved community environment for these victims, especially when these teams can aid the investigating officers gain the trust of the local community and victims specifically.

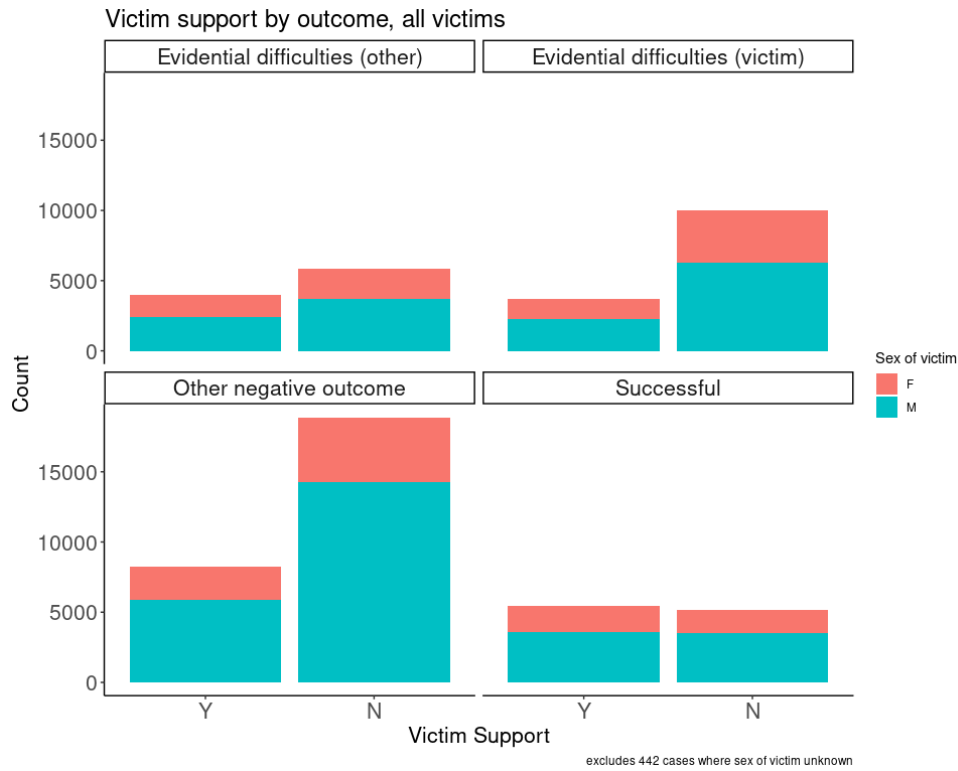


Figure 13: Split of victim support (for victim) by outcome

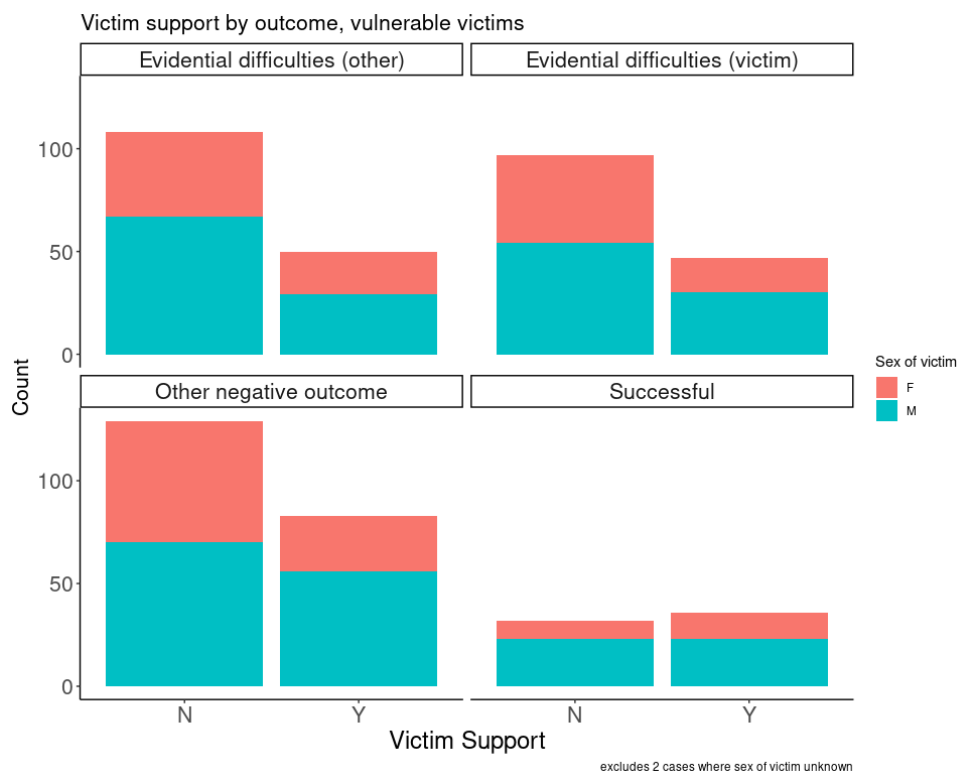


Figure 14: Distribution of victim support by outcome - vulnerable adults only

6.2 Procedural factors

The literature and discussions with SMEs suggested that factors such as timeliness and attendance, the number of officers involved, and the seriousness of the crime would influence the result, and that has proven to be supported by the modelling.

Response codes reflect the timeliness of attendance by police officers with P1s having the fastest response followed by P2s. In terms of successful outcomes, this is confirmed with P1 and P2 responses making a success more likely, whereas P4 (ranked 26 of 36) and P5 responses made success less likely. For evidential difficulties the picture is less clear, with P1 responses being slightly associated with evidential difficulties (victim). Some of these could be cases where the victim has some involvement in crime – none of the identified victims were identified as having been involved in violent crime as an offender in the previous 2 years but this would not preclude their involvement in criminal activity; such victims may well choose to avoid being identified.

The distribution of response codes was shown in Figure 7 and Figure 8 in Section 4. The response codes used in this study relate to initial allocations, maintaining consistency with other work carried out in the lab. Many of these may have been re-graded suggesting the relationship with successful outcomes could have been stronger; in particular some of those associated with evidential difficulties (victim) may have been re-graded from a P1/P2.

Where the crime was reported by an officer on patrol a successful outcome was more likely, with evidential difficulties due to the victim being (slightly) unlikely. This demonstrates the importance of patrols and the targeting of patrols in dealing with violent crime. In such situations the officer is at the incident at an early stage and is thus connected to the widely held belief that the earlier the police attend an incident the better. It is also likely that by catching the incident at an earlier stage that officer would be able to provide more useful evidence. However, such situations may also reflect local enforcement with the possibility of a stronger relationship with the community.

SME comments suggested that the more officers involved in an investigation, the less trust victims may have in the process. The number of officers involved was noted at both the incident stage, and at the investigation stage, and these numbers transformed into splines as described in Section 4 Data. The number of officers at the incident stage did not appear in the final models. Splines for the number of officers at the investigation stage did appear in both models and are best explained graphically in Figure 15.

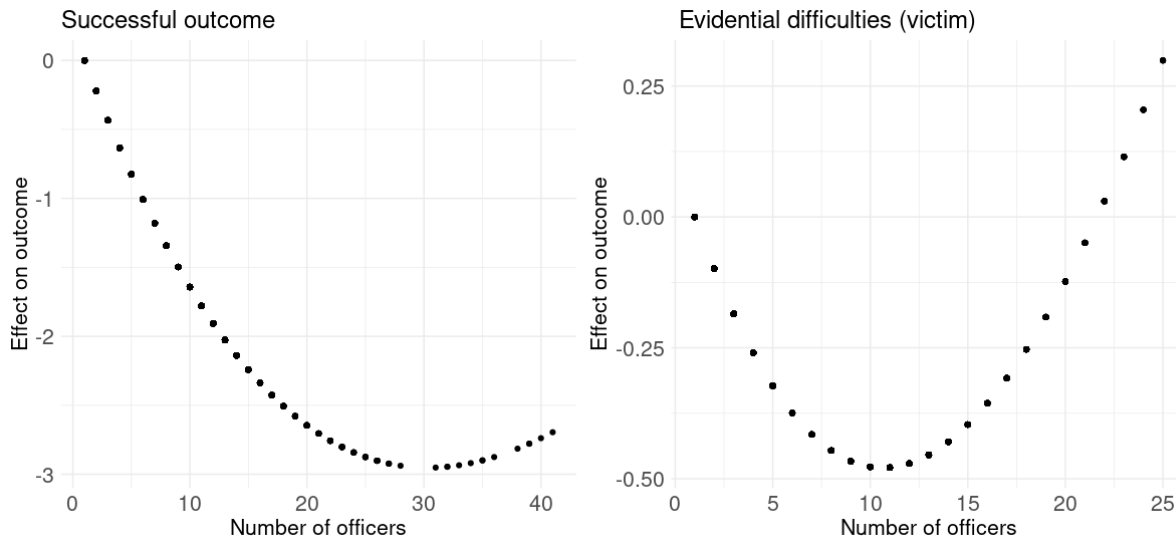


Figure 15: Effects of the number of officers (investigation stage) on outcomes

In terms of a successful outcome, the more officers there are, the less likely a successful outcome, up to around 30 officers, hence the fewer officers the better. Looking at the right hand plot, the desirable outcome is no evidential difficulties i.e. the negative values – this appears to be optimal in the range 10 to 12 officers. It should be noted that the most likely number of officers is 4 with the probability of 21 officers being involved being circa 0.1%. It may be unrealistic to expect many cases to be restricted to 2 or 3 officers, but something close to the 10 to 12 range might be a suitable aim (this could perhaps be relaxed a little). This factor was highly influential in both models, suggesting that measures should be taken to reduce the numbers of officers involved in each case.

Injury codes tell us how serious the injury (if any) was, ranging from fatal to no injury. Serious injury is moderately associated with investigations with successful outcomes (ranked 27 of 36), but does not feature in the evidential difficulties (victim) model. In a similar vein Section 47 offences represent the least serious offences included in the data and are associated with an unsuccessful outcome (rank 29 of 36).

There was not always a direct relationship between the two measures of serious violence, 96.5% of Section 47 were reported under injury code 4, 85% of Section 20s and 41% of Section 18s, whereas Section 18 had 58% reported under injury code 2 and Section 20 13.7%.

A case not appearing in the daily bulletin would also suggest a less serious crime, and this is also associated with an unsuccessful outcome.

These results support the SME comments that more serious violence is prioritised. There was no effect seen in the model for evidential difficulties (victim). Less serious cases may not have the forensic evidence which may be present in more serious cases and may be seen to have little chance of success. However, given the low reporting rate from repeat victims, it is important to still consider the victim experience, in order to

improve the chances that they will report any further incidents which could potentially be more serious.

6.3 Personal attributes

The literature review indicated that some personal characteristics may affect the outcome of the investigation of the crime.

Here the age and sex of victims is discussed together given the effect of the interaction terms. Victims under 26 were associated with successful outcomes, whereas victims over 40 were associated with unsuccessful outcomes. Male victims in general were slightly associated with evidential difficulties (victim), whereas male victims over 40 were more less likely to face evidential difficulties (victim). Female victims in general were associated with unsuccessful outcomes but not with evidential difficulties (victim), while female victims in the central age bracket were slightly associated with evidential difficulties (victim). Some of these results are at odds with the results found in Avdija (2010) and more in line with the original expectations; possibly what held for undergraduates in the USA does not transfer to citizens of the West Midlands. It is not clear whether the differences by age within male or female victims are due to differences between cohorts or to changing attitudes and experiences as people age. The combination of age and sex in the data is shown in Figure 16 and Figure 17 below.

The number of offenders was associated with success and not with evidential difficulties, this would make sense as with more offenders you might expect to have more evidence. Counter-intuitively the number of male offenders and number of female offenders are both associated with evidential difficulties (victim). This could be interpreted as large numbers of offenders of the same sex, comparable with a gang of people, with the victim either being part of the group, being intimidated, or being associated with a rival grouping and thus unwilling to cooperate. Gang associations for both victims and offenders were included in the data, but were not found to be relevant in either model; these were based on recognised gangs, particularly for serious organised crime, and initial connections were based on intelligence so may not pick up all associations. Thus in this case large groups of all males or all females may serve as a better proxy for gang type behaviour encompassing a wider definition of gangs.

The ethnicity of the victim did not affect either model, except where ethnicity was not provided where it was associated with unsuccessful outcomes. This could well be another indicator of cases generally lacking in information.

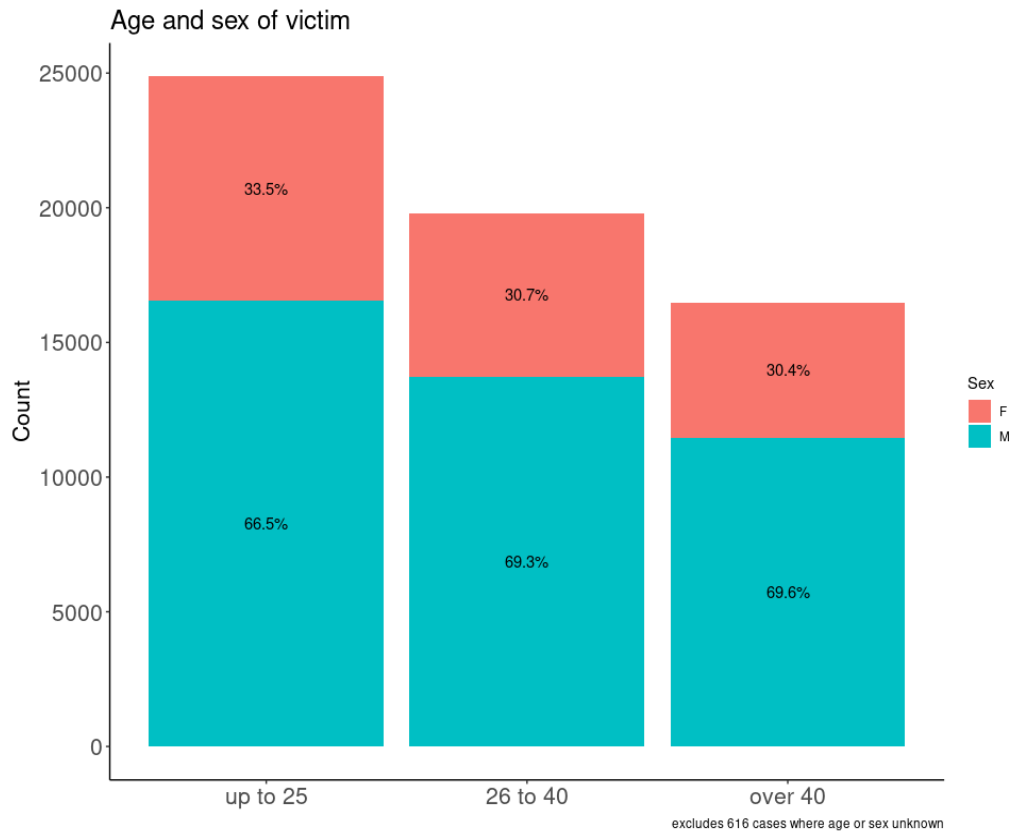


Figure 16: Victim age and sex split

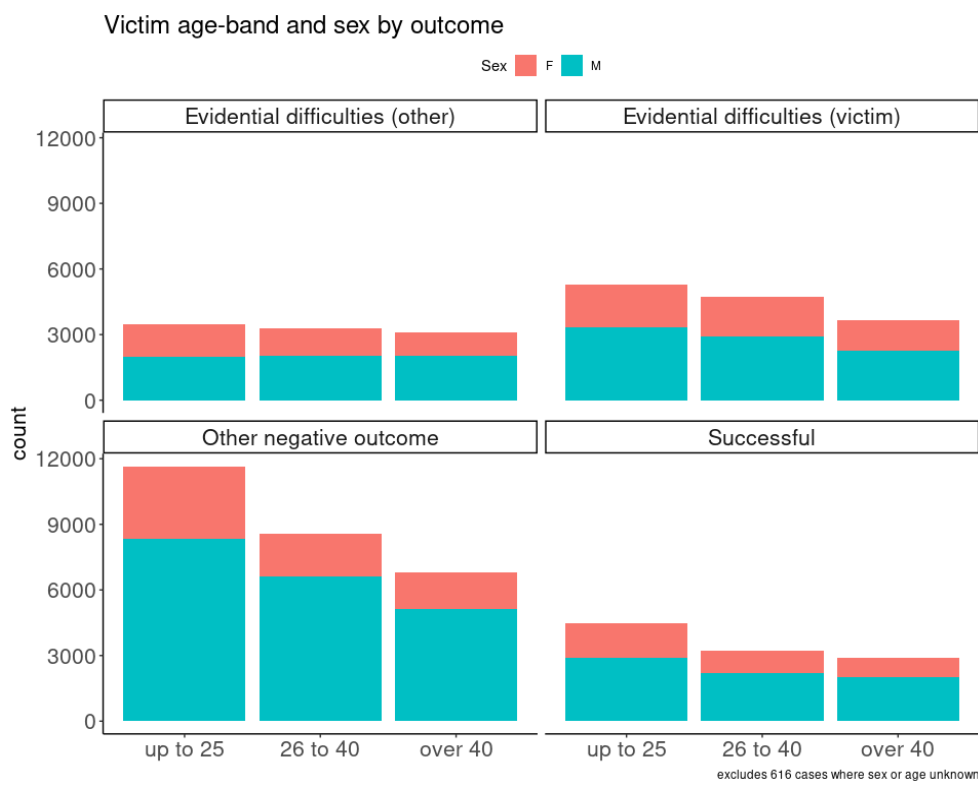


Figure 17: Distribution of victim age and sex by outcome

6.4 Other findings

Although not mentioned in the literature or in SME comments, the method by which the victim is informed as to case progression is seen to be an important factor in determining a successful outcome. This analysis suggests that personal visits and email are associated with a successful outcome with letter associated with an unsuccessful outcome. When looking at evidential difficulties due to the victim, a telephone call is good (negative relationship), but a personal visit is now bad being associated with evidential difficulties. These are all strong relationships appearing in the top 20 for each model. The apparent anomaly may be due to the fact that a personal visit by police would be obvious to anyone watching the victim, whereas a telephone call would be more private; this would be particularly relevant if the victim were afraid of reprisals. The methods of support from officers need to be carefully considered and flexible to suit the victim's needs.

In terms of SME comments of the sort "sometimes victims refuse to give their own details", and "many victims are not id'd". These cases are not included in the data set due to the requirement of victim characteristics for the analysis. There are cases where lack of cooperation was captured to some extent, by identifying specific words or phrases within one free text variable (as mentioned in the data section), and this did have a small effect in making a case more likely to fail due to the victim not supporting. This is potentially an area for further investigation and a recommendation would be for clearer data collection on the nature of the victim's support being withdrawn.

One additional comment relates to the exceptionally high metrics for the success model. As can be seen in Figure 11, several of the most influential variables refer to a lack of information; it would make sense that a case lacking in information would be less likely to be successful. The variables concerned are factor variables containing at least three levels, hence they were included in the models.

6.5 Summary

Victims who are not classed as vulnerable are strongly associated with a successful outcome, with a separate association with success and a negative association with evidential difficulties (victim) when receiving support. Vulnerable victims not receiving victim support are fairly strongly associated with unsuccessful outcomes. In this data set vulnerable victims are only marginally more likely to receive victim support than other victims (37.2% of vulnerable victims compared with 34.8% for victims not considered to be vulnerable). Together these suggest that lack of appropriate support could be contributing to the unfavourable results. It is recommended that steps are taken to improve the level of support provided to victims, with a particular focus on those identified as vulnerable. Improving the victim experience in this way should have the added benefit of increasing the chance of victims cooperating in the future.

Timely presence at an incident is key and associated with that is the speedy and effective hand-over to FCID, a P1 response would be allocated, although a P2 response is beneficial to a lesser degree. There is an additional benefit for these cases when the incident is reported by an officer on patrol, likely due to the quality of the handover. Maintaining continuity with a small number of officers is ideal; in this analysis the

benefit is only apparent for the investigation stage, but it has been found to be important at all stages in other studies. Specifically, higher numbers of investigation officers were associated with both unsuccessful outcomes and with victims withdrawing support. It is therefore recommended that the number of investigation officers is kept to a minimum as far as possible, and in particular the number liaising with the victim. Ideally there should be not more than 21. This should help to maintain continuity.

There were some issues with the way the victim was kept informed, with potential concern that the types of communication where police involvement might be more visible (personal visit in this case, potentially also letter) were associated with victims not co-operating with the police. This suggests that caution is required when using these methods, perhaps carrying them out in a more discreet manner. Victims may be more willing to co-operate if they can be confident that nobody else will know that they are doing so.

Less serious violence was associated with unsuccessful outcomes, although not implicated in evidential difficulties due to the victim. However, as suggested by the literature and discussion with SMEs, a victim of crime of a less violent nature (or any non-violent crime) could become a victim of a more violent crime in future. Hence it is important for future results to improve the victim experience for everyone, regardless of the severity of the offence.

It is further noted that for some distinct sections of the community (males, females aged between 26 and 40) there is a small issue with victims not engaging with police, while others are linked (more strongly) with unsuccessful outcomes (females, victims over 40). While particular sections of the population should not necessarily be singled out for special treatment, it should be noted that these can reflect protected characteristics; officers should recognize that different people have different needs and appropriate support and reassurance should be provided. Additionally the Victims Code has a wider definition of vulnerability, this may be an area which requires additional focus.

There is a potential link to gangs where a large number of all male or all female offenders are involved, with the latter being associated with the victim not supporting the case. In such cases it is important that the details are checked and discussed with Force Intelligence.

Whilst there are elements outwith the control of WMP, the literature tells us that much of this is based on a victim's personal experiences with the police (see Section 3.1). The aspects of trust discussed in Section 3.1 are very specific – related to the perceptions that the police do their best to achieve the best result, and carry out a thorough investigation. In order for victims to remain engaged they also need to be reassured that they are safe and be equipped to handle the potentially lengthy investigation and court case periods; this would be helped by assisting with the arrangement of the appropriate support, especially to those considered to be vulnerable. This could be interpreted to fit into victims' experiential perception, given that the literature found that results of the investigation were less important; the role of communication is important in supporting victims and ensuring that the levels of trust are firmly based. Ensuring officers are able to support those victims effectively and can dispel fears and distrust creating a more supportive community will help develop a long term solution. This two-way relationship builds on trust and is key to policing by consent.

Information regarding the work done by neighbourhood policing teams was only received after the main part of this study was completed. Involvement of these teams would be crucial in building the supportive communities needed.

7 Appendix

7.1 Data Dictionary

| Variable | Type | Class | Notes |
|---------------------|--------------------------------|---------|---|
| success | target 1 | factor | Y or N (1 or 0) |
| vic_ev_diff | target 2 | factor | 1 or 0 |
| outcome | source of targets | factor | Includes targets + other evidential difficulties, and other negative result |
| year | independent | factor | Each year 2014 to 2021 |
| uniform_cid | independent | factor | C = CID, U = uniform, most are X = missing |
| offence_type | source for hate and vulnerable | factor | Useful for VA (vulnerable adult) and HA (hate). Crimes with domestic violence or child abuse indicators were removed. |
| vulnerable | Independent | Factor | Y if offence_type VA, N otherwise |
| report_method | independent | factor | 1 help desk/contact centre, 2 patrol, 11 999 call, 16 101 call, 5 all other types |
| npu | independent | factor | 2 letter npu code |
| daily_bulletin | independent | factor | Y or N |
| offender_unknown | independent | factor | Y, N or D (undetermined) |
| days_to_cu | independent | numeric | Days from incident to clear-up - range 0 to 1607 |
| section | independent | factor | Sections 18, 20, 47 of the Offences Against the Person Act |
| hate | independent | factor | 1 if any sort of hate flag registered or if offence_type code is HA, 0 if not |
| firearm | independent | factor | 1, 0 firearm involved |
| knife | independent | factor | 1, 0 knife involved |
| other_weapon | independent | factor | 1, 0 other type of weapon |
| num_vics | independent | numeric | Count of victims for crime - range 1 - 3 |
| num_offs | independent | numeric | Count of offenders for crime - range 1 - 13 |
| offs_m | independent | numeric | Count of male offenders range 0 - 13 |
| offs_f | independent | numeric | Count of female offenders - range 0 - 8. NB these 2 often do not add up to num_offs due to unknowns |
| num_logs | independent | numeric | Count of logs for crime - range 1 - 239 |
| inv_off spline1 2 3 | Independent | numeric | 3 splines representing non-linear aspects of num_officers |

| Variable | Type | Class | Notes |
|-----------------------|-------------|---------|--|
| min_log_days | independent | numeric | Days from incident to first log - range 0 - 683 |
| max_log_days | independent | numeric | Days from incident to last log - range 0 - 2053 |
| inc_off spline1 2 3 | independent | numeric | Count of officers involved in incident - range 0 - 72 3 splines |
| response_code | independent | factor | P1 to P9, and UN where missing |
| inc_resp_mins | independent | numeric | Time taken to respond to incident - median 341 (outlier affects other measures) |
| inc_deploy_mins | independent | numeric | Time spent deployed on incident - median 139 (outlier affects other measures) |
| victim_officer | independent | factor | Y, N was victim a police officer |
| victim_support | independent | factor | Y, N was victim receiving victim support |
| inj_code | independent | factor | 1 fatal, 2 serious, 3 slight, 4 threats, 5 none |
| officer_on_duty | independent | factor | Y, N |
| self_ass_ea | independent | factor | Ethnicity - see separate table |
| vict_informed | independent | factor | Y, N, X (missing) |
| vict_informed_ method | independent | factor | 1 personal visit, 2 telephone, 3 email, 4 letter, UN missing |
| victim_code | independent | factor | P priority, S standard, X missing |
| support_discussed | independent | factor | Y, N, X for missing |
| vicage | independent | factor | up to 25, 26-40, over 40, unknown |
| vic_lag1 3 6 9 12 24 | independent | numeric | 6 variables giving counts of previous victimisations in previous given number of months |
| vic_gang_score | independent | numeric | Based on count of links to gangs, standardised to fall between 0 and 1 |
| off_gang_score | independent | numeric | Similarly for offenders |
| uncooperative | independent | factor | 1 if any of search terms found, 0 otherwise |
| vic_inf_days | independent | numeric | Days until victim informed - in this case the 0 values indicate NAs (including where victim not informed) and form the bulk of the data. 3rd quartile is 0, max 2012 |
| offage | independent | factor | Up to 25, over 25, unknown |
| vic_sex | independent | factor | F, M, X for missing |

7.2 Ethnicity

Count and percentage relate to the training set

| Code | Description | Count | Percentage |
|------|-------------------------------|--------|------------|
| W1 | WHITE - BRITISH | 34,978 | 56.6 |
| NS | NOT STATED | 6,991 | 11.3 |
| A2 | ASIAN - PAKISTANI | 4,741 | 7.7 |
| B1 | BLACK - CARIBBEAN | 2,897 | 4.7 |
| A1 | ASIAN - INDIAN | 2,738 | 4.4 |
| W9 | WHITE - OTHER | 2,472 | 4.0 |
| B2 | BLACK - AFRICAN | 1,940 | 3.1 |
| A9 | ASIAN - OTHER | 1,898 | 3.1 |
| M1 | MIXED - WHITE+BLACK CARIBBEAN | 981 | 1.6 |
| B9 | BLACK - OTHER | 544 | 0.9 |
| A3 | ASIAN - BANGLADESHI | 405 | 0.7 |
| O9 | OTHER - ANY OTHER | 365 | 0.6 |
| M3 | MIXED - WHITE+ASIAN | 240 | 0.4 |
| M9 | MIXED - OTHER | 198 | 0.3 |
| W2 | WHITE - IRISH | 178 | 0.3 |
| O1 | OTHER -CHINESE | 149 | 0.2 |
| M2 | MIXED - WHITE+BLACK AFRICAN | 55 | 0.1 |

7.3 Search terms to identify uncooperative victim

These were initially set as separate searches

| | |
|-----------|---|
| refuse | "REFUSING REFUSED REFUSES DECLINED" |
| not_eng | (NOT NIT DOES'NT) [A-Z]*(ENGAGE ENGAGING CO-OPERATING DISCUSS INVOLVEMENT) |
| not_want | "NOT WANT [A-Z]*(SPEAK TALK POLICE)" |
| disapp | "DID RUNNER DISAPPEARED" |
| no_longer | "NO LONGER [A-Z]*ENGAG)" |

7.4 Coefficients

7.4.1 Successful outcome

| Variable | Coefficient |
|-----------------------------|-------------|
| vulnerableN | 1.40256 |
| (Intercept) | 1.11727 |
| vict_informedY | 1.02681 |
| response_codeP1 | 0.83971 |
| victim_codeX | 0.73083 |
| vict_informed_method03 | 0.62662 |
| vict_informed_method01 | 0.56424 |
| num_offs | 0.47452 |
| year2014 | 0.39736 |
| response_codeP2 | 0.35705 |
| year2016 | 0.34219 |
| inj_code2 | 0.30120 |
| report_method2 | 0.29971 |
| vulnerableN:victim_supportY | 0.22470 |
| vicageup to 25 | 0.20989 |
| year2015 | 0.13314 |
| num_logs | 0.04370 |
| vulnerableY | -3.46E-10 |
| vic_inf_days | -0.00385 |
| offender_unknownN | -0.20434 |
| sectionS.47 | -0.26056 |
| response_codeP4 | -0.30963 |
| self_ass_eaN | -0.32372 |
| vicageover 40 | -0.36559 |
| npuSW | -0.36562 |
| report_method16 | -0.38820 |
| vulnerableY:victim_supportN | -0.39126 |
| vic_sexF | -0.45266 |
| response_codeP5 | -0.47663 |
| year2019 | -0.60096 |
| daily_bulletinN | -0.64585 |
| year2018 | -0.89745 |
| response_codeUN | -0.93887 |
| vict_informed_method04 | -1.36963 |
| vict_informed_methodUN | -1.55871 |
| inv_off_spline1 | -6.64345 |
| vict_informedX | -12.76834 |

7.4.2 Evidential difficulties (victim)

| Variable | Coefficient |
|-----------------------------|-------------|
| inv_off_spline2 | 10.03951 |
| vict_informedX | 5.62238 |
| offs_m | 1.51941 |
| offs_f | 1.48058 |
| offageup to 25 | 0.35130 |
| vict_informed_method01 | 0.30320 |
| year2016 | 0.21758 |
| support_discussedN | 0.17792 |
| offender_unknownN | 0.17317 |
| response_codeP1 | 0.16506 |
| npuBE | 0.11355 |
| vicage26 to 40:vic_sexF | 0.07915 |
| support_discussedX | 0.05342 |
| vic_sexM | 0.03658 |
| offageover 25 | 0.03470 |
| vulnerableN:victim_supportN | 0.02448 |
| uncooperative1 | 0.00706 |
| report_method11 | 0.00552 |
| vic_inf_days | 0.00308 |
| max_log_days | -0.00014 |
| days_to_cu | -0.00090 |
| victim_supportN | -0.00631 |
| victim_supportY | -0.01387 |
| num_logs | -0.02450 |
| vic_sexF | -0.05746 |
| vicageover 40:vic_sexM | -0.17143 |
| vict_informed_methodUN | -0.18569 |
| offender_unknownY | -0.21431 |
| uncooperative0 | -0.23711 |
| response_codeP4 | -0.24362 |
| vulnerableN:victim_supportY | -0.27050 |
| vict_informedY | -0.34214 |
| response_codeP5 | -0.34531 |
| response_codeUN | -0.35849 |
| offageunknown | -0.47484 |
| vict_informed_method02 | -0.79164 |
| num_offs | -1.52270 |
| vict_informedN | -1.89318 |
| inv_off_spline1 | -3.07428 |
| (Intercept) | -4.63317 |

7.5 Full list of model metrics

Successful outcome

| Metric | Threshold 0.2 | Threshold 0.5 | Threshold 0.8 |
|--------------------------------|---------------|---------------|---------------|
| Accuracy | 0.98821 | 0.98912 | 0.98485 |
| κ | 0.95982 | 0.96264 | 0.94662 |
| Sensitivity | 1.00000 | 0.99325 | 0.94859 |
| Specificity | 0.98575 | 0.98826 | 0.99241 |
| Positive predictive value | 0.93607 | 0.94637 | 0.96305 |
| Negative predictive value | 1.00000 | 0.99858 | 0.98931 |
| Precision | 0.93607 | 0.94637 | 0.96305 |
| Recall | 1.00000 | 0.99325 | 0.94859 |
| F1 | 0.96698 | 0.96924 | 0.95577 |
| Prevalence | 0.17259 | 0.17259 | 0.17259 |
| Detection rate | 0.17259 | 0.17143 | 0.16372 |
| Detection Prevalence | 0.18438 | 0.18114 | 0.17000 |
| Balanced accuracy | 0.99288 | 0.99075 | 0.97050 |
| F1 Sensitivity/ Specificity | 0.99283 | 0.99075 | 0.97001 |
| H | 0.97347 | 0.97347 | 0.97347 |
| Gini | 0.99581 | 0.99581 | 0.99581 |
| AUC | 0.99790 | 0.99790 | 0.99790 |
| AUCH | 0.99801 | 0.99801 | 0.99801 |
| KS | 0.98632 | 0.98632 | 0.98632 |
| MER | 0.01069 | 0.01069 | 0.01069 |
| MWL | 0.00391 | 0.00391 | 0.00391 |
| ER | 0.01179 | 0.01088 | 0.01515 |
| Youden | 0.98575 | 0.98151 | 0.94100 |

Evidential difficulties (victim)

| Metric | Threshold 0.2 | Threshold 0.5 | Threshold 0.8 |
|--------------------------------|---------------|---------------|---------------|
| Accuracy | 0.78849 | 0.82501 | 0.77689 |
| κ | 0.48950 | 0.45328 | 0.00135 |
| Sensitivity | 0.79930 | 0.49971 | 0.00087 |
| Specificity | 0.78537 | 0.91854 | 1.00000 |
| Positive predictive value | 0.51707 | 0.63815 | 1.00000 |
| Negative predictive value | 0.93156 | 0.86461 | 0.77685 |
| Precision | 0.51707 | 0.63815 | 1.00000 |
| Recall | 0.79930 | 0.49971 | 0.00087 |
| F1 | 0.62793 | 0.56051 | 0.00174 |
| Prevalence | 0.22330 | 0.22330 | 0.22330 |
| Detection rate | 0.17849 | 0.11159 | 0.00019 |
| Detection Prevalence | 0.34518 | 0.17486 | 0.00019 |
| Balanced accuracy | 0.79234 | 0.70912 | 0.50044 |
| F1 Sensitivity/ Specificity | 0.79228 | 0.64728 | 0.00174 |
| H | 0.42470 | 0.42470 | 0.42470 |
| Gini | 0.72231 | 0.72231 | 0.72231 |
| AUC | 0.86116 | 0.86116 | 0.86116 |
| AUCH | 0.86272 | 0.86272 | 0.86272 |
| KS | 0.58802 | 0.58802 | 0.58802 |
| MER | 0.17253 | 0.17253 | 0.17253 |
| MWL | 0.14291 | 0.14291 | 0.14291 |
| ER | 0.21151 | 0.17499 | 0.22311 |
| Youden | 0.58468 | 0.41825 | 0.00087 |

7.6 Outcome definitions

In April 2013, the Home Office¹⁵ introduced the new crime outcomes framework, replacing a more narrowly focused one based on ‘detections’. This new framework provides greater transparency on how all notifiable crimes recorded by the police are dealt with. The previous ‘detections’ framework gave only a partial picture of the work police do to investigate and resolve such crimes. The outcomes framework was designed to be more victim focused.

In the context of this project, and in relation to the table below:

A **successful outcome** incorporates outcomes described in items 1, 2, 3, 4, 6, 7, 8, and 22

The outcome **evidential difficulties (victim)** covers items 14 and 16

The other items were not specifically of interest here, although item 15 is separately shown as evidential difficulties (other) for comparison purposes.

| Crime Outcomes Framework (Home Office) | |
|---|--|
| Outcome | Description |
| 1 | Charge/Summons |
| 2 | Caution - youths |
| 3 | Caution - adults |
| 4 | Taken into consideration (TIC) |
| 5 | The offender has died (all offences) |
| 6 | Penalty Notice for Disorder |
| 7 | Cannabis warning |
| 8 | Community Resolution |
| 9 | Prosecution not in public interest (CPS) (all offences) |
| 10 | Formal action against the offender is not in the public interest (police decision) |
| 11 | Prosecution prevented - named suspect identified but is below the age of criminal responsibility |
| 12 | Prosecution prevented - named identified suspect identified but is too ill (physical or mental health) to prosecute |
| 13 | Prosecution prevented - named suspect identified but victim or key witness is dead or too ill to give evidence |
| 14 | Evidential difficulties victim based - named suspect not identified but the victim declines or is unable to support further police action to identify the offender |
| 15 | Evidential difficulties - named suspect identified and the victim supports police action, but evidential difficulties prevent further action |
| 16 | Evidential difficulties victim based - named suspect identified - the victim does not support (or withdraws support from) police action |
| 17 | Prosecution time limit expired - suspect identified but the time limit for prosecution has expired |

¹⁵ Home Office: Crime outcomes in England and <https://www.gov.uk/government/statistics/crime-outcomes-in-england-and-wales-2020-to-2021/crime-outcomes-in-england-and-wales-2020-to-2021>

| | |
|----|---|
| 18 | Investigation complete - no suspect identified. Crime investigated as far as reasonably possible - case closed pending further investigative opportunities becoming available |
| 19 | National Fraud Intelligence Bureau field (NFIB only). A crime or fraud has been recorded but has not been allocated for investigation because the assessment process at the NFIB has determined there are insufficient lines of enquiry to warrant such dissemination. |
| 20 | Further action, resulting from the crime report, will be undertaken by another body or agency subject to the victim (or person acting on their behalf) being made aware of the action to be taken (from April 2015) |
| 21 | Further action, resulting from the crime report, which could provide evidence sufficient to support formal action being taken against the suspect is not in the public interest - police decision (from January 2016) |
| 22 | Diversionsary, educational or intervention activity, resulting from the crime report, has been undertaken and it is not in the public interest to take any further action (Voluntary from April 2019) |

7.7 Response grades

The descriptions of the service delivered for each response grade are accurate for the period relevant to the data used in this analysis.

Some of these were updated in February 2021 and so this table does not necessarily reflect our current service levels.

| Grade | Definition | Service delivered |
|-------|---|---|
| P1 | <p>Immediate - an incident where (one of)</p> <ul style="list-style-type: none"> • There is a danger to life/use (or threat of) violence/serious injury • The crime is in progress or the incident is ongoing and continues to present a risk to others • An offender has been disturbed at the scene or has been detained and poses or is likely to pose a risk to others • The police staff/officer has reason for believing the incident should be graded as immediate | We should arrive on scene as soon as possible and within 15 minutes of receiving the call |
| P2 | <p>Priority Response - an incident where (one of)</p> <ul style="list-style-type: none"> • There is a concern for someone's safety • A key witness or other key evidence is likely to be lost if we do not attend • An offender has been detained at the scene by a member of the public but poses no risk • The police staff/officer has reason for believing the incident should be graded as a Priority Response | We should arrive on scene as soon as possible and within 60 minutes of receiving the call |
| P3 | <p>Priority Investigation - an incident where</p> <ul style="list-style-type: none"> • There is a concern for an individual's welfare but the risk can be safely managed • There is a need for an investigation and it is time critical to prevent key witness or other key evidence being lost • The police staff/officer has reason for believing the incident should be graded as a Priority Investigation | We should arrive on scene as soon as possible and within 8 hours of receiving the call |
| P4 | <p>Scheduled Investigation - an incident where (one of)</p> <ul style="list-style-type: none"> • There are proportionate lines of enquiry and these enquiries cannot be completed other than by physical attendance by an officer • There is a need for an investigation but it is not time critical (i.e. no perishable evidence or particular safeguarding needs) • And any THRIVE+ concerns can be managed until a suitable appointment is available | An appointment should be made for investigation officers to attend within 3 days |

| | | |
|--|---|---|
| P5 | Initial Investigation - an incident which <ul style="list-style-type: none"> • Can be investigated via phone or other means by engaging with the caller • The incident demonstrates a low THRIVE+ requirement | An appointment should be made for investigation officers to complete an initial investigation within 3 days |
| P6 | Neighbourhood Resolution - an incident which has <ul style="list-style-type: none"> • Manageable THRIVE+ concerns which require preventative problem solving to prevent crime, antisocial behaviour or repeat demand | An appointment should be made for neighbourhood officers to attend/make contact within 5 days |
| P7 | Support Incident - an incident where (one of) <ul style="list-style-type: none"> • A police resource is required to complete a task which requires completing in a reasonable time frame • An incident which is being developed prior to a resourcing decision • The police staff/officer has reason for believing the incident should be graded as a Support Incident | Attendance time will be dependent on individual circumstances |
| P8 | Internally Generated Task - an incident which <ul style="list-style-type: none"> • Is internally generated • Is resourced by the department/officer creating the ticket • The incident demonstrates a THRIVE+ requirement | Creating officer addresses the needs of the incident |
| P9 | Contact Resolution - an incident where <ul style="list-style-type: none"> • There is no requirement for the police to attend • It can be resolved via phone or other means • It doesn't demonstrate any THRIVE+ requirements • It has been resolved by Contact Staff | Resolve the matter via phone or other means |
| THRIVE+ refers to a risk assessment framework to assist Contact Staff to allocate the most appropriate response. Threat, Harm, Risk, Investigation, Engagement, and Prevention | | |

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