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Survey and Interview Methods to Measure Victimization in Theft for the Dutch National Police

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Executive Summary

Problem and Background

Currently, the Dutch National Police are looking to optimize resource allocation and decision-making through the measurement of the concept: “safety.” However, the measurement of safety does not have a universally defined method in the branch of policing and security. Qualitative data collection methods are being increasingly implemented in police departments around the world to improve safety and security. These data collection methods aim to implement evidence-based policing practices in order to form predictive assessments of future crime. Additionally, qualitative reporting methods such as officer interviews and victimization surveys can complement current quantitative data collection by improving police-community engagement and mitigating "dark numbers" (unreported crimes).

Research

This research aims to address what the implementation of victimization surveys and officer interviews, in coordination with current data collection methods, can add to an optimized police response and resource allocation to future crimes in theft for the Dutch National Police. The research approach of this thesis takes inspiration from commonalities found in a scoping literature review of policing methods around the world and a former joint interdisciplinary project (JIP) with the Dutch National Police. The perspectives of victims and police, which can be partially measured by surveys and interviews, are considered to significantly affect safety and security within society.

The research method was executed through the use of surveys (historical CBS data and theoretical scenario surveys) and officer interviews. These surveys and officer interviews were designed to determine how significantly certain victim *factors*, such as amount stolen, income, geography, and past experiences of theft affect a victim's perception on their reporting threshold, desired outcome after reporting theft, and severity of the theft. The method designed was flexible, as the ability to implement surveys to people that measure income and geography was dependent on both the Human Research Ethics Committee (HREC) and the data security concerns of the Dutch National Police.

Results

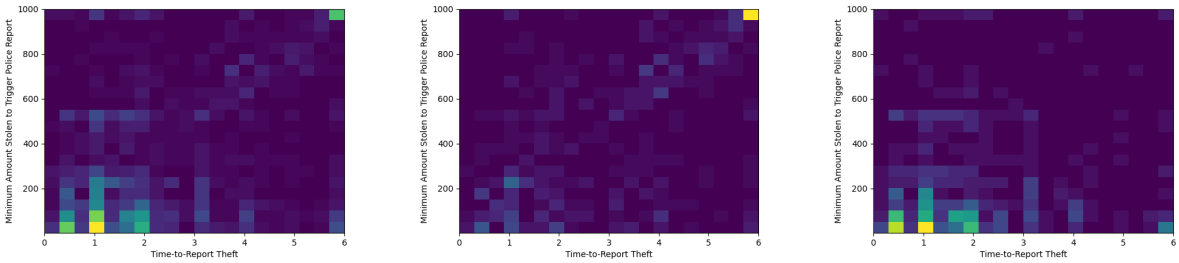
Based on a victimization survey given to 1547 respondents, these victim factors do associate with the perceived significance of theft. The magnitude and significance of these associations are displayed in this report, and comparison with police employee interview results leads to significant insights that may determine why these associations exist. In brief summary, the victim factors of income, geography, previous victimhood, and the amount stolen in theft generally have positive associations with a respondent's victimization chance, reporting threshold, desired monetary compensation after theft, general satisfaction in successful reporting outcomes, and the perceived severity of theft.

Table 1: Victim Profile Table: Influence of Increasing Factors in Theft

Factor (Increasing)	Victimization Chance	Rep. Threshold	Monetary Compensation	Outcome Satisfaction	Theft Severity
Income	+	+	+	+	+
Amount Stolen	N/A	+	+	+	+
Previous Victimization	+	+	+	+	+
Geography (Population)	+	+	N/A	N/A	N/A
Victim Profile	+++	++++	+++	+++	+++

A few key findings are presented here. First, 28% of respondents have suffered from theft in the past year, and of this proportion, 32.1% of these thefts were not reported. The average assumed reporting time listed by respondents is 2.2 hours (with a standard deviation of 1.66 hours), and the average amount stolen to trigger a police report is 273.5 euros. The dispersion of both these averages is significant due to the methods in reporting. However, victim factors also display strong associations with different reporting costs, suggesting that some demographics or moral predispositions may also influence a victim's likelihood to report theft. Non-victims of theft (in the past year) and low-income respondents typically report theft regardless of the amount stolen, while their counterparts do not report theft and assume that the time required to report theft is significantly longer than reality.

Figure 1: Heat Map of Assumed Time-to-Report Theft vs. Minimum Amount Stolen to Trigger a Report



(a) By Total Respondents *(b) By Previous Victims* *(c) By Low-Income*

The overall desired outcome satisfaction of respondents also increases as the amount stolen, previous victimization, and income increase. When the amount stolen is made irrelevant, 53.4% of respondents prefer the perpetrator being caught, 41.2% of respondents prefer re-compensation, and only 5.3% of respondents do not have an explicit preference in the outcome of theft. However, as the amount stolen increases, respondents increasingly prefer the outcome of re-compensation over the perpetrator being caught. Figure 2 shows this inflection point between 1000 and 100 euros being stolen (where "3 S.L" represents money being returned at the expense of the perpetrator being caught and "4 S.L" represents the counter-scenario).

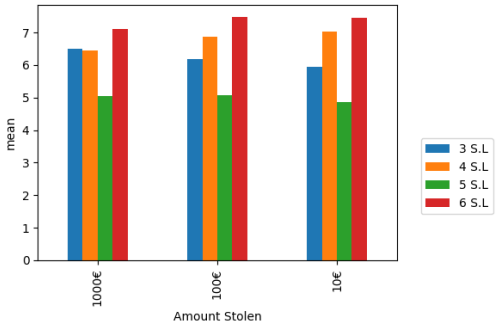


Figure 2: Average Satisfaction Level (S.L) per Scenario (3-6) by Amount Stolen - 1000, 100, and 10 euros

Respondents also perceive the severity of theft scenarios differently according to the amount stolen, previous victimization, and income. When the amount stolen is made constant, the following theft scenario ranking can be made, from least to most severe:

Table 2: Ranking of Perceived Severity of Theft Scenarios

Scenario #	Severity Ranking
A person steals 100 euros worth of groceries from a grocery store	8
A person steals a bicycle, worth 100 euros, parked on the street	7
A person steals electronics, worth 100 euros, from a chain electronics store	6
A person steals 100 euros from an unattended cash register in a local night shop	5
A person directly pickpockets 100 euros in cash, without the victim knowing	4
A person steals 100 euros through online scamming	3
A person steals personal belongings from a victim's bag at a cafe, worth 100 euros, without the victim knowing	2
A person steals 100 euros from a family member while living with them	1

Concluding Recommendations

A concluding recommendation from this research is to consider the further implementation of victimization surveys as a complementary data collection method. Specifically, the correlation of victim factors to the perceived significance of theft can assist in predictive policing through victim profiles that more accurately estimate dark numbers. In addition, the concept of adding qualitative measurement methods on victim factors to a universally-defined equation of safety can serve as a complement to current quantitative crime statistics. Through this implementation, current theft prevention and resource allocation strategies may be improved for the Dutch National Police, leading to a safer society.

Contents

1 Problem Statement

Currently, the Dutch National Police are looking to optimize resource allocation and decision-making through the measurement of the concept: "safety." However, safety is not a universally defined metric in the branch of policing and security. Domestic and international police organizations from around the world use different qualitative and quantitative indicators to define the level of "safety" and "security" found in each respective society. These measurements sometimes contradict each other in their conclusions (Skogan, 1975).

The Dutch National Police currently use various traditional methods to define safety and security regionally in Dutch society, such as crime rates, clearance rates, and police response time. While this is not the only metric the Dutch police use, traditional methods such as these are not optimal in considering a number of factors that significantly impact safety and security, such as unreported crimes, individual victim utility, and community trust (Faull, 2010; Shima, 2020). Furthermore, the lack of evidence-based policing as a form of value engineering may result in improper allocation of police resources based on political and societal pressure (Langton, Berzofsky, Krebs & Smiley-McDonald, 2012). Ultimately, the Dutch National Police actively aim to avoid this through evidence-based policy and decision-making. Their goal is to properly allocate police resources, procedures, and standards based on a variety of evidence and reliable measurement sources, both qualitative and quantitative, found within Dutch society.

2 Scoping Literature Review

Every police organization's approach to defining safety is unique. As a result, a variety of innovative strategies for resource allocation and decision-making in police departments are found throughout the world, not just in the Netherlands. Therefore, a scoping literature review was conducted to analyze the current and upcoming methods of various international police organizations in how they measure their success in providing safety and security. Additionally, the interpretations drawn from a police organization's measurement of safety indicators also reveal conclusions in the goals and values of each organization's culture. Finally, contradictions between safety indicators may be explored in future research, as each measuring technique may under- and over-represent various safety or security-related factors.

Based on various international sources that analyze the current state of evidence-based policing, the following literature review topic has been developed:

The various methods for police to measure safety and security are analyzed in order to find out what indicators are the most effective in quantifying these metrics. This research aims to reveal if certain measurement components are being over- or under-emphasized by the police for resource allocation and decision-making.

The findings of this literature review follow a logical funnel approach to potential knowledge gaps in modern policing solutions to safety and security. By this rationale, the initial findings focus on known and well-documented problems with current and past methods to measure safety and security by police. Innovative quantitative and qualitative methods of "evidence-based policing" were then researched to understand the current solution framework. Finally, with a more holistic understanding of the current policing landscape, "predictive policing" and other fields of study were considered based on their potential application to safety and security by police organizations. Therefore, the findings of this review are split into three main sections: flaws and challenges in traditional policing methods, evidence-based policing, and predictive policing methods drawn from other fields of study.

2.1 Flaws and Challenges in Traditional Policing Methods

Traditionally, police performance has been measured on "operational performance indicators," such as a jurisdiction's crime rate, response times, prosecution rate, or clearance rate (Faull, 2010). In theory, these performance indicators should accurately measure a police department's ability to provide security and prevent crime over time. In reality, simplified indicators such as these, when not combined with other crime evaluation methods, indirectly encourage under-reporting and falsified reports in order to meet performance targets. This practice can be seen globally, from under-reporting in the South African Police Service (SAPS) performance chart (Faull, 2010) to double counting of clearance rates in various counties across the United States (Shima, 2020). Reasons for falsely reporting indicators are quota-based reduction systems based on crime statistics (Faull, 2010). These systems encourage indirect manipulation of crime reporting, as this statistics-fixing is significantly easier than actually improving crime statistics through direct means. Often, matching quota targets are not even malicious; some examples are police recording license plate numbers purely to reflect work done rather than crime prevention (Faull, 2010).

Traditional performance indicators used by police departments also have another significant flaw: they fail to address unreported crimes (Skogan, 1975; Langton et al., 2012). According to the U.S. Department of Justice, 52% of all violent victimizations in the United States were not reported to the police (Langton et al., 2012). With over half of significant crimes not being addressed by police, traditional performance indicators can only address crimes that are brought forward; they lack in providing metrics for safety and security in crimes that often go unreported, such as sexual assault (Langton et al., 2012). Victimization surveys are one method to address this challenge, as they encourage victims to come forward to police even a significant period of time after the crime has occurred. However, traditional forms of surveys used by police also contain a number of flaws. Surveys often inflate events when the informant was guilty, miss "commuter victimization," and suffer from lack of accurate information due to "memory fade" of the victim (Skogan, 1975). Rationale for addressing many of these traditional problems with police surveys are addressed later in this literature review.

Finally, operational performance indicators are a measurement of police effectiveness, but not a solution for it. Police can partially know, based on crime statistics, if relative crime rates in their jurisdiction are trending up or down. However, they can not know if their actions are the direct result of changes in these statistics. These statistics only provide a limited scope of the current state of crime, especially as half of all violent crimes go unreported, and the vast majority of victims receive no resolution for crimes they endured (Skogan, 1975). The solutions to the challenges of traditional policing methods suggested across all sources are the same: standardized reporting throughout the course of a crime, diversification of victim recording statistics in both quantitative measures and qualitative surveys, and the implementation of evidence-based reasoning for performance indicators rather than quota-based reduction systems.

Table 3: Challenges and Solutions in Traditional Policing Methods

Traditional Performance Indicators	
Challenges	Potential Solutions
Inaccurate Reporting	Evidence-based policing and policy
Unreported Crimes	Victimization surveys
Measuring Performance Effectiveness	Diversification of measuring statistics

2.2 Evidence-Based Policing (EBP)

Evidence-based policing is described as "using data, analysis, and research to complement experience and professional judgment, in order to provide the best possible police service to the public" (L. W. Sherman, 1998). While this may seem like an obvious initiative, Lawrence argues that sometimes police agencies act in certain ways because "we've always done it that way." The purpose of EBP is to figure out what police practices are truly effective (or ineffective) based on a scientific approach,

without dismissing police experience. Since the introduction of EBP 25 years ago, advances in digitization, data collection, and additional longitudinal studies have continued to evolve the concept. This literature review separates EBP into two distinct categories, based on form of measurement.

2.2.1 New Quantitative Methods

The first category of evidence-based policing in this literature review focuses on new statistical methods to measure police effectiveness in providing safety and security based on advances in digitization and big data collection by police departments. Three methods of quantitative analysis, accelerated by advanced data collection by police departments, are explored: the advent of CompStat, the Cambridge Crime-Harm Index, and hot spot policing.

CompStat is the quantification program started by the New York City Police Department (Moore & Braga, 2003). It has since been integrated into various police departments around the world. CompStat is unique for two main reasons. First, its introduction in the late 1990s represents the growing need to digitize and subsequently organize vast quantities of police records. Second, a unified framework allows for various forms of data collection by police to be compiled in one system. This second reason does not make CompStat perfect. Police departments are ultimately responsible to develop methods to gather information, especially in the form of surveys and police evaluations (Moore & Braga, 2003).

Introduction of data collection programs like CompStat has allowed for the unique application of data to different metrics in order to determine a crime's severity. The Cambridge Crime-Harm Index serves as an example. The index serves to weigh the severity of different types of crimes with their frequency of occurrence. In the Cambridge CHI, the severity of a crime is determined by the average prison sentencing time (L. Sherman, Neyroud & Neyroud, 2016). With this method, the severity of seldom-occurring major crimes (such as murder) can be relatively compared to frequently-occurring minor crimes (such as petty theft) in order for police to determine where the most severity of crime occurs. Based on previous experience with the Dutch National Police, a Dutch CHI is currently being developed, and the JIP team produced a rudimentary form of a Dutch CHI as a proof of concept in the report.

Increased digitization and unified data collection by police departments also led to the increased use of longitudinal studies to evaluate the success of policing strategies. One such strategy is hot-spot policing. Hot-spot policing is the clustering of police attention to areas of significant crime (Braga, Papachristos & Hureau, 2014). The success of hot-spot policing can be measured over long periods of time (years to decades) in order to determine the reduction of crime in certain geographic areas. The conclusions for hot-spot policing are universal: "hot spot policing programs generate modest crime control gains and are likely to produce a diffusion of crime control benefits into areas immediately surrounding targeted high-activity crime places" (Braga et al., 2014). However, the implementation of this strategy by police departments is not perfect. First, police departments often fail to consider the impact of police-community relations to hot-spot policing; only three evaluations on police-community relations were conducted by the original Campbell review of this strategy, and no evaluations of falsely targeted individuals by hot-spot policing were ever made (Braga et al., 2014). Second, cost-benefit assessments of hot-spot policing are just as important as the implementation; going over-budget may result in issues unrelated to direct police work down the line.

2.2.2 Qualitative Reports and Community Policing

The second category of evidence-based policing is qualitative analysis of victimization reports and community surveys, influenced by the newly arising concept of community (or empathy) policing. Community policing is not a new concept; the practice achieved popularity in the 1980s, and has since been incorporated in various ways by police departments. In essence, community policing differs from traditional policing methods in its systemic use of partnerships with various stakeholders and problem-solving techniques to address public safety issues that come in many forms besides standard crime (Cordner, 2014). Community policing as a concept is effective and challenging to implement for the same reason; achieving the goals of various stakeholders (neighborhoods, victims, judges, etc.)

requires diligent use of community surveys and community interactions. Although the concept has existed for decades, implementation of community policing practices in places such as the United States has remained fragmented due to various factors, such as the growing police involvement in counter-terrorism and the lack of recording standardization across police departments (Cordner, 2014).

Community policing has generated divergent thinking to the purpose of policing, safety, and security. Rather than approach policing from the perspective of only crime reduction, a net social benefit for society must be considered instead. This net social benefit consists of both crime reduction as well as police legitimacy - essentially the public's trust in police. Some circumstances may reduce crime at the cost of police legitimacy (and vice versa), actually leading to a decrease in net social benefit for society (Owens & Ba, 2021). Community policing also has resulted in a number of unique indicators, influenced by the public, to measure police performance. Some examples of these are "feelings of safety after dark" in the National Reassurance Program in England (Tuffin, Morris, Poole, Great Britain Home Office Research & Directorate, 2006), or the "broken window theory" - the idea that dedicated responses to even minor crimes builds community trust (Cordner, 2014). Finally, community policing has encouraged a reevaluation of the purpose of police performance indicators. When using indicators from a qualitative approach, meaningful forms of evaluation should consist of "bringing police work alive and giving people memorable stories" rather than "tick-box measures" (Fielding & Innes, 2006). Police work should engage the community through negotiation and shared interests.

Examples of police evaluation methods that engage the community can be observed globally at varying levels of implementation. The National Police Research Platform in the United States developed the Police-Community Interaction Survey (PCIS). This survey aims to operationalize variables of empathy, neutrality, and respect of police officers according to community members. Analysis of the survey reveals a correlation to cooperation with the police (Rosenbaum et al., 2017). In Canada, only one national survey administered by Statistics Canada asked six questions on police performance in 2015, while various provinces implemented their own independent surveys (Maslov, 2016). More standardization of community-police surveys is needed, as comparing community surveys of unproven scientific rigor across geographies and time is impossible.

Qualitative reporting can also serve as a partial solution to unreported crime. With victimization surveys, victims can come forward to report a crime when they feel safe - even long after a crime has been committed. These types of surveys are so significant that the crime survey of England and Wales (CSEW) has entirely replaced police-recorded crimes as the "national statistics" for recording crime (Ariel & Bland, 2019). However, this does not suggest police-recorded crimes are less valid for measuring temporary trends in crime. Rather, the inferential statistical estimation models based on samples such as the CSEW should serve to complement traditional forms of crime measuring by police. As stated by researchers Ariel and Bland, "neither can serve as the benchmark of the other." Finally, victimization surveys are plagued by the same issues as most policing surveys. There is a severe lack of international standardization of victimization surveys to compare the impact of victimization across regions and countries (Lynch, 2006).

2.3 Predictive Policing with Quantitative Risk Assessment

As previously mentioned, police performance indicators can easily serve as a benchmark for police effectiveness, but using these measures to improve police effectiveness can prove to be more difficult. Advances in quantitative risk assessment through big data and artificial intelligence have increasingly led to the implementation of predictive policing - a proactive (and sometimes controversial) practice used to forecast criminal activity and threats to safety and security. Predictive policing is not a "mysterious" concept; it is an example of artificial narrow intelligence that performs better than what is already being done (Berk, 2021). Predictive policing is simply an iteration of older quantitative risk assessment practices used by police, such hot spot policing (Braga et al., 2014). These algorithms are designed to do better than current forecasting, but they can not be designed to be perfect; in fact, predictive policing algorithms currently outperform many existing policing practices and models, though the margin is minuscule and only limited to certain types of crimes (Berk, 2021). Predictive policing is

not controversial for the accuracy of the algorithms. It is controversial due to the potential for biased selection and misinterpretation of data by police, the unethical use of information, and the execution of tactics based solely on limited data. Researcher Laurel Eckhouse sums up the issue of predictive policing with its fundamental conceptual problem (Eckhouse, Lum, Conti-Cook & Ciccolini, 2019): *"Is it fair to alter the life chances and liberty outcomes of individuals because of their demographic, geographic, and social characteristics?"* There is plenty of disagreement behind this question - as many would argue that, if implemented properly, predictive policing would not affect an individual's liberty. In this case, the new question is simple: "How can predictive policing be ethically implemented?"

Predictive policing is not always focused on the prediction of criminal action. As seen from the concept of community policing, there are a plethora of ways that police can provide safety and security to the public. In fact, assessing the under-reporting of crimes - one of the largest challenges facing police globally - can benefit substantially from predictive policing measures to predict the likelihood of a crime being reported to the police. Through the economic concept of indifference curves, police can accurately predict if a victim will report a theft based on the value of goods stolen and the likelihood of goods being returned by an officer (Idsø & Årethun, 2018). This type of predictive policing can substantially help police in assessing resource allocation to certain types of crime in order to improve victim reporting.

Finally, the success of advanced quantitative risk assessment measures ultimately relies on an officer's understanding of their implementation. If an officer in the field does not understand (or respect) the significance of data being gathered, then biases in the algorithm are inevitable. These problems are rarely malicious; problems in data collection and interpretation often occur due to time constraints, preconceived notions and experience, and lack of understanding the significance of evidence-based research on certain variables. For example, a study of 720 British and American officers exploring the risk factors in a quantitative risk assessment tool for domestic abuse found that there is an over-reliance on a small subset of risk factors (often revolving around physical violence), despite a multitude of other factors relevant for evaluating risk (Robinson, Pinchevsky & Guthrie, 2018). Ultimately, police departments should be responsible in properly informing officers on the value of diverse forms of data collection and measurement, while still respecting and integrating the real-world experience that these officers can provide.

2.4 Literature Review Conclusion

Three goals of this literature review were ultimately met. First, a holistic analysis of the flaws and challenges in traditional policing methods (quota-based performance indicators, unstandardized reporting, and unreported crimes) was explored. Second, various major quantitative and qualitative strategies in newer policing methods that have arisen due to technical (advancements in digitization and data collection) and cultural (community and empathy policing) shifts were analyzed. Third and finally, the general direction of predictive policing through various strategies (AI, big data, QRA, etc.) as well as challenges in implementing these practices in reality was reviewed. On this final topic, a number of potential knowledge-gaps stemming from other fields of study were identified.

2.4.1 Commonalities

Through various sources, evident commonalities across fields of police performance tactics are apparent. Above all else, there is a universal desire by researchers for police departments to standardize police reporting so that police departments may compare data across regions and time (Faull, 2010; Shima, 2020; Skogan, 1975; Rosenbaum et al., 2017; Maslov, 2016; Lynch, 2006). The Dutch National Police already have an advantage over other police organizations, as they are unified under one Dutch criminal code that represents the entirety of the Netherlands. Another commonality discovered in literature is the proven success of police-community engagement in improving police legitimacy (Cordner, 2014; Owens & Ba, 2021; Tuffin et al., 2006; Fielding & Innes, 2006). Despite this proven success, there is fractured implementation of police-community engagement - again due to the lack of standardized surveys, reporting, and willingness to adapt to new forms of measurement. One final

commonality is the trend of converting traditional crime indicators into predictive police performance indicators through improvements in digitized data availability and quantitative risk assessments (Berk, 2021; Eckhouse et al., 2019; Idsø & Årethun, 2018). With these improvements, police are able to accurately measure the effects of their resource allocation and tactics on various crime factors across geographic regions and longer periods of time. This technically advanced form of evidence-based policing ultimately helps address a core problem: proving certain police actions do lead to change in crime, safety, and security statistics.

2.4.2 Application to the Dutch National Police

The purpose of the literature review was to explore past, present, and future methods used globally by police to evaluate safety and security in a constantly changing technical and cultural environment. Several commonalities in global policing literature were revealed. However, this does not mean that the same commonalities (failures and recommendations) also apply to the Dutch National Police. Instead, the methods used by the Dutch National Police to evaluate safety and security were studied in interviews and stakeholder meetings planned during the first two weeks of research. In this way, the commonalities of global police literature were compared with the operating methods of the Dutch National Police specifically.

3 Main Research Question

The culmination of the three topics explored in international policing literature - traditional policing methods, evidence-based policing, and predictive policing - paired with the global commonalities in current general practices to measure police effectiveness, ultimately leads to one central research question.

Main Research Question:

To what extent can victimization surveys and officer interviews, in coordination with current police measurement methods, improve the current theft prevention and resource allocation strategies for the Dutch National Police?

This research can be divided into three sub-questions; each sub-question explores historical data and current practices - both inside and outside the jurisdiction of the Dutch National Police - to determine the most effective methodology.

3.1 Sub-question 1: Victimization Surveys

Victimization surveys are a valid and proven strategy to more accurately record crimes. These surveys come with three core benefits:

1. Future crimes can be more easily assessed, allowing for more accurate predictive policing tools.
2. Reporting crimes later provides victims with a sense of justice, financial utility, and safety (Skogan, 1975).
3. The factors for lack of initial reporting may be determined.

This final point has already been thoroughly researched to determine various factors for lack of reporting (Skogan, 1975). However, there is a noticeable knowledge gap in how these factors can be applied to the first point - predictive policing - and the second point - increased safety. Therefore, the culmination of these three points results in the first sub-question:

Sub-Question 1:

Do certain victim factors, determined by hypothetical victimization surveys, predict the likelihood to report theft, the preferred outcome after reporting theft, and the severity of theft?

There is no doubt that a multitude of factors affect a victim's perception on crime. Therefore, the factors studied in this research depend strictly on data availability both in current research and by the Dutch National Police. Ultimately, this sub-question aims to determine an appropriate police response to "dark numbers" (unreported crimes), based on a victim's perspective.

3.2 Sub-question 2: Officer Interviews

In evidence-based policing, the prior experience of an officer in the field is as critically important as implementing new practices. Therefore, officer interviews are key components to predicting future theft, especially when dealing with unreported crimes. Two reasons are determined for this:

1. Insights into current interactions with the public reveal the most effective method in encouraging victims to come forward.
2. Officers can more easily determine, through experience, which factors most likely hinder a victim from initially reporting crime.

Similar to victimization surveys, there is a knowledge gap in how certain factors may predict the likelihood of reported crime - this time from the perspective of the police. Therefore, the second sub-question is addressed from a new perspective and measurement:

Sub-Question 2:

Do certain victim factors, determined by officer interviews, predict the likelihood to report theft, the preferred outcome after reporting theft, and the severity of theft?

As previously stated, the factors determined by officers stem from data availability. Ultimately, this sub-question aims to determine an appropriate police response to unreported crimes, based on an officer's perspective.

3.3 Sub-question 3: Coordination and Comparison with Current Methods

The comparison of factors from both victim and officer perspective will lead to conclusions on how police work is currently completed and perceived. At the same time, the implementation of victimization surveys and officer interviews must not disrupt the current methods used by the Dutch National Police in order to be effective. These two considerations lead to the final sub-question:

Sub-Question 3:

How can victimization surveys and officer interviews complement (rather than disrupt) current data collection methods?

This new qualitative format for collecting information should not imply that older quantitative data collection methods are obsolete. Instead, a diverse portfolio of data collection methods should be used by the police to fill any gaps in crime reporting. Furthermore, comparisons between traditional crime statistics and victimization surveys may reveal where and when certain data collection methods are most accurate, efficient, or effective.

3.4 Research Question Diagram

The sub-questions define the core objective of this research; victim factors, determined through numerous measurement methods, may influence the *significance* of how theft is perceived for the Dutch National Police. In this case, *significance* of theft refers to the likelihood to report theft, the preferred outcome victims have after reporting theft, and the perceived severity of theft. These three definitions can provide useful insights to the police in terms of improved resource allocation, improved reporting initiatives, and better predictions on "dark numbers" of theft around the Netherlands.

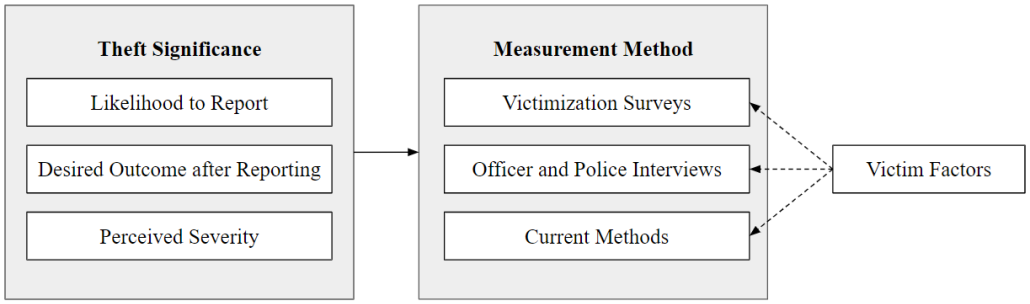


Figure 3: Research Question Diagram

4 Objective and Deliverables

The **objective** of this thesis is to use survey and interview data, in coordination with currently collected police statistics, to add insights to predictive risk and response assessment for future theft. Two sub-objectives are also identified:

1. Victim factors identified in victimization surveys and officer interviews should be analyzed for influence on perceived theft severity, reporting likelihood, and desired outcomes after reporting.
2. Survey data and officer interviews should be compared with current data collection methods to scan for discrepancies in crime reporting.

The **deliverables** of this thesis stem from the three data collection methods: victimization surveys, officer interviews, and analysis of current data. Therefore, three main deliverables are identified:

1. A hypothetical scenario survey on theft will be produced to determine factors that may affect crime reporting. This survey will be based on historical victimization surveys compiled from CBS data in the Netherlands and around the globe.
2. A minimum of four officer interviews will be reviewed, with emphasis on diversity in department and location, to determine factors that officers assume affect crime reporting.
3. A comprehensive analysis of comparisons between the three data collection methods will be provided with recommendations on the potential implementation of future data recording.

5 Research Approach

The research approach for this project stems from two areas: the scoping literature review and previous experience on a TU Delft joint interdisciplinary project with the Dutch National Police. As highlighted in the scoping literature review, there are evident knowledge gaps in the implementation of victimization surveys and officer interviews in predictive policing. Therefore, the research approach for this project is to apply these new measuring components to the concepts examined in the joint interdisciplinary project.

5.1 Joint Interdisciplinary Project (JIP) Background

The initial research approach of the joint interdisciplinary project was to formulate a unified "equation" for how police provide safety. The purpose of this metric was to compare, over time, how police resource allocation and intervention tactics lead to a safer society in the Netherlands. Each variable of the equation was studied individually and the final equation was explained and validated with hypothetical values. This lead to a composite safety factor, b, which was bounded from 0 to 1. The scoring factors for the equation were never finalized, but the project did lead to insights into how police organizations should prioritize the measurement of safety from a number of measurement techniques.

$$\text{Factor of Safety} = \Delta\text{utility} * \text{Crime Severity} * \text{Police Effectiveness}$$

$$b = \Delta u * c * f \tag{1}$$

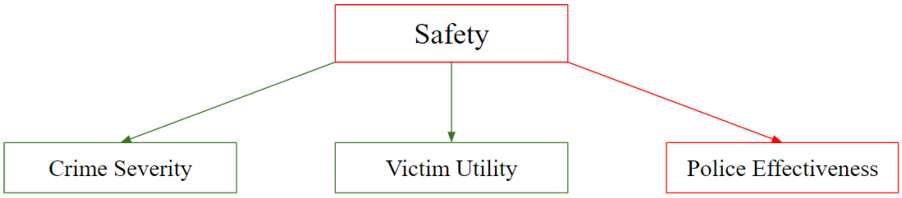


Figure 4: Original Core Variables for Safety

Where:

Crime Severity = c, where c is the moral severity of a crime that has occurred.

Δutility = Δu, where Δu is the change in a victim's utility before and after a crime has occurred.

Police Effectiveness = f, where f is the overall efficiency of the police in handling a crime that has occurred. The effectiveness factor was never finalized in the original JIP.

"Safety" is a general term; the purpose of this equation is to look at how the police provide safety from a *holistic* view in society, where all potential factors that may influence how the police conduct their work are considered. While several approaches, such as cost-benefit analysis and direct trade-offs, may help overcome Arrow's impossibility theorem in this multi-criteria decision problem of conflicting values (Van de Poel, 2015), this was ultimately not the focus of the Joint Interdisciplinary Project. Instead, the JIP served as a comprehensive introduction to attributes that can link to the evaluation criteria of severity, utility, and effectiveness. These values could not be aggregated for this project, but future work on the project may allow for such analysis.

5.1.1 Original JIP Research Methodology

The original joint interdisciplinary project considered three measurement methods: a crime-harm index (CHI), a QALY-based victim utility equation, and police effectiveness questionnaires designed for the public.

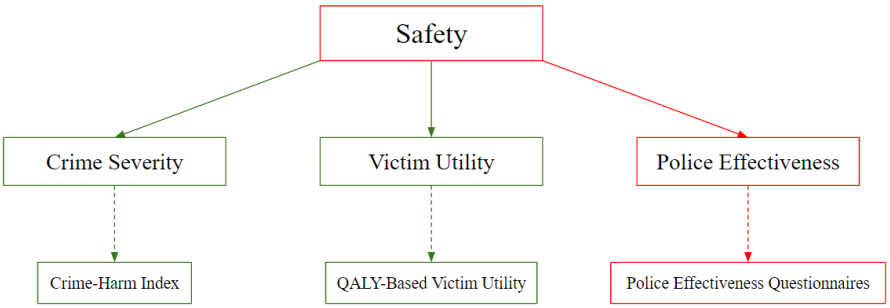


Figure 5: Original Research Methods

A crime-harm index scales crimes according to average prison sentencing times in the Netherlands. Based on the framework of the Cambridge Crime-Harm Index (L. Sherman et al., 2016), a Dutch CHI was created as a proof of concept for how the severity of certain crimes may be determined. However, one limitation of this index is that it only measures the severity of different types of crimes according to law; it does not compare the severity of the same type of crime based on different scenarios.

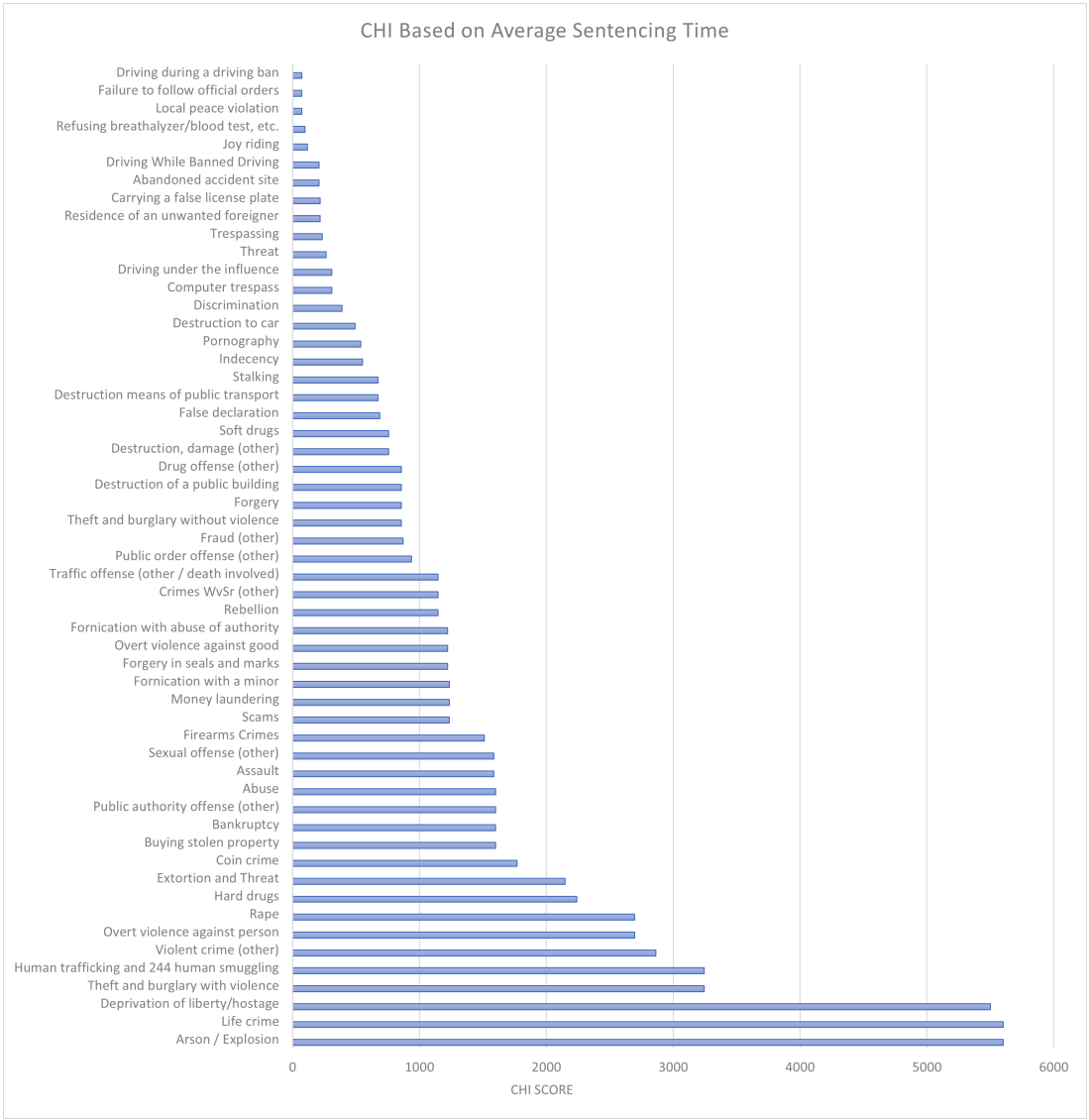
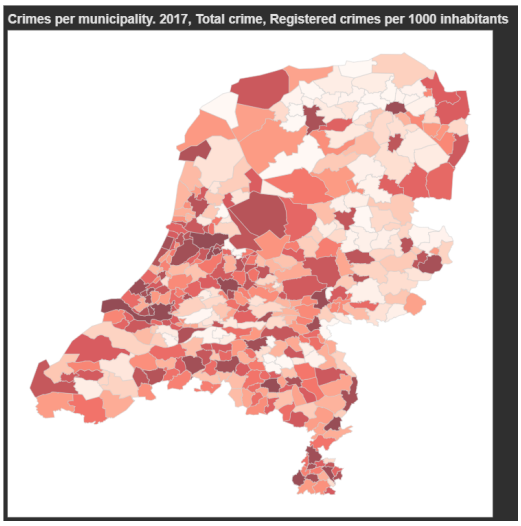
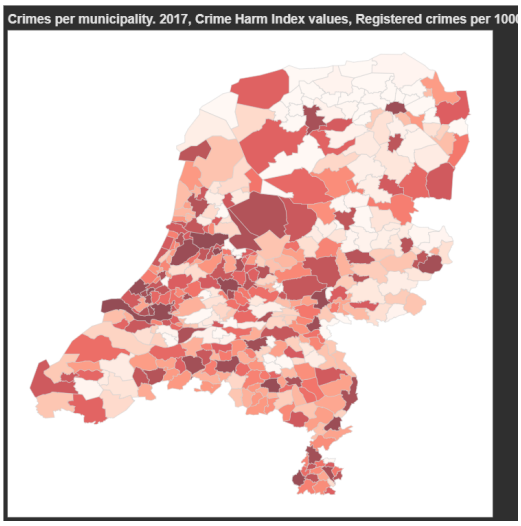


Figure 6: Ranking of all crimes based on average sentencing time

Figure 7: Crimes per Municipality: Total vs. CHI



(a) The amount of crimes in the Netherlands mapped per municipality per 1000 inhabitants



(b) The amount of crimes times the CHI mapped per municipality per 1000 inhabitants

The victim's utility in the JIP was based on their decline in QALY - a medical unit that measures physical health. Additionally, a victim's decline in financial and mental state after a crime were also considered in the equation.

$$\Delta u = U(\text{before}) - U(\text{after}) = \sum_{n=1}^{N} u_n(\text{before}) - \sum_{n=1}^{N} u_n(\text{after}) = \sum_{n=1}^{N} \Delta u_n. \tag{2}$$

Here u_n refers to the utility of the n-th person and Δu_n to the change in this utility.

A further explanation of how the equation was derived can be found in Appendix B as well as the original JIP report. For the equation to work, several victim factors are required to be recorded after a crime, such as financial loss, physical injuries, and mental suffering recorded through qualitative analysis. While a victim-based utility function is effective in determining the amount of harm caused by a crime, it does not consider a victim's preconceived severity and morality of a criminal act (which is also unaccounted in the CHI).

Finally, public questionnaires on police performance were considered the most concise measuring method for police effectiveness. Currently, CBS data provided by the Netherlands is able to measure police contact rate, police satisfaction rate, and faith in police. CBS data based on "faith in police" was compiled on a map below to show how the results differ by region.

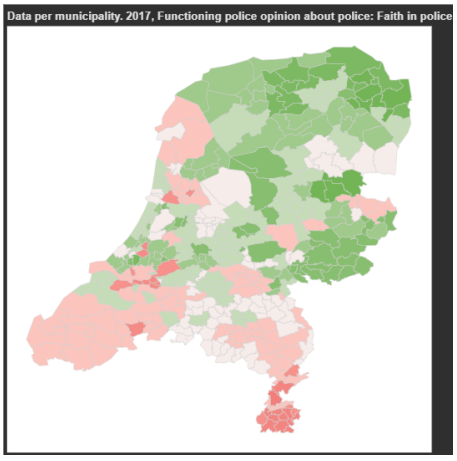


Figure 8: The score of the faith in the police per area

While CBS data compiles statistically significant results on police effectiveness, this data is only published every 2 years. Furthermore, these surveys are more exploratory in their assessment of police effectiveness. Based on these two factors, associating quantitative scores for the public's satisfaction with police through these questionnaires is not recommended.

5.2 Combining Literature and JIP through Stakeholder Interviews

When considering the scoping literature for this thesis and stakeholder interviews, the "variables" for safety can be simplified. This decision process is further explained in the results section on stakeholder interviews. Rather than focus on victim utility (a measurement of harm) and police effectiveness (a measure of success) as two of the three main variables, the generalized perspective of the victim and police should be analyzed instead. With this simplification, "Crime Severity" can also fall under both perspectives: the perceived severity according to the victim (including individual mental distress from crime) and the perceived severity according to the police (including laws, sentencing time, and enforcement). Generalizing the variables to these perspectives considers two previously unaccounted components of safety. First, the reasons and solutions for lack of crime reporting may be discovered. Second, the difference in how significantly victims and police perceive crimes that occur may be compared. The focus of the research approach is to gather data on these perspective-based variables through additional surveys and interviews.

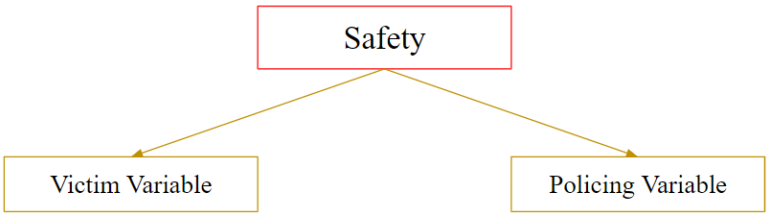


Figure 9: New Core Variables for Safety

5.3 Factors that influence Variables

The *factors* that influence a victim's reaction and willingness to report theft must be based on the data availability by the Dutch National Police. Four core factors were chosen to measure that significantly affect a victim's reservation level (likelihood to report theft), desired (or "preferred") outcome, and perceived severity of theft in victimization surveys and police interviews:

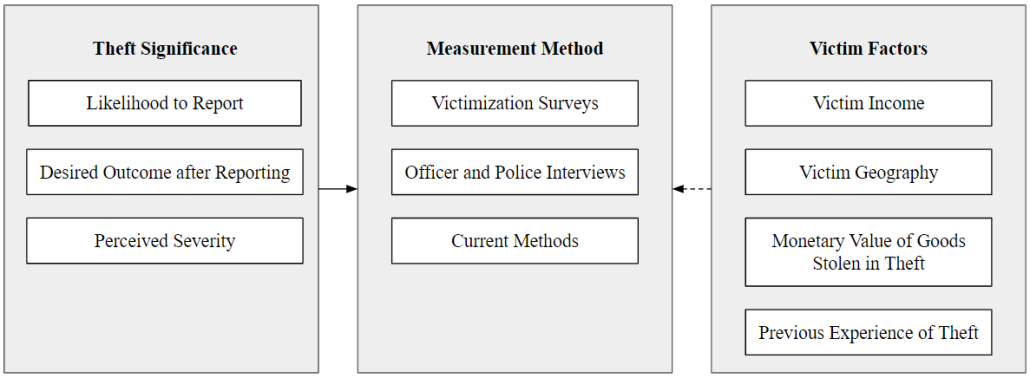


Figure 10: Victim Factors that Determine Significance of Theft

These factors were determined through scoping interviews, as discussed in the interview results section. These four factors may lead to insights on how impacted a victim may be from theft. Specifically, accounting for these factors in victimization surveys and police interviews may reveal the likelihood for victims to report crimes - critical information for the Dutch National Police. Measurement of these factors based on victimization surveys and officer interviews is the core of this research.

5.3.1 Victim Income

Every year, the National Crime Victimization Survey (NCVS) is conducted in the United States to determine the extent of victimization in various types of crimes. The results from these surveys suggest that reporting decisions by victims are based on the severity of the offense, the victim's knowledge of the perpetrator, and practical considerations in crime reporting (Wolfgang, 1985). "Practical considerations" in crime reporting are diverse, but they are usually associated with a victim's assumed probability of re-compensation.

Reporting decisions are often made using a "perceptual shorthand" where situations are evaluated based on a victim's characteristics (Hawkins, 1981). For example, in the NCVS, victims of identity theft with high income were significantly less likely to report the crime to the police (Reyns & Randa, 2017). This may be because high-income victims were less concerned if their credit card is misused when compared to low-income victims.

Based on the "practical considerations," scoping interviews, and known association between income and identity theft, a victim's income has been determined as a significant factor that may influence a victim's reservation level when reporting theft.

5.3.2 Victim Geography

Victim geography can lead to insights on regional reporting costs, regional differences in the perception of crime severity, and potential hot-spots for "dark numbers" in crime reporting. Additionally, comparing geographies in victimization surveys can result in longitudinal studies that compare how police strategies influence victim reporting between regions over time.

A victim's income directly influences their willingness to report a direct loss, in the form of stolen property or money. In addition, there are also indirect reporting costs from the time that has to be spent reporting the crime (Shapland & Hall, 2007). Therefore, while high income victims will be willing to lose more money in theft before reporting a crime, they may also be willing to spend less time reporting a theft of the same value goods when compared to low income victims. These time costs are not only associated with income; they are also affected by a victim's ease of use and proximity to police services. This relates strongly to to the factor of victim geography; victims that spend less time contacting the police will have lower reporting costs (and be more willing to report theft). Discovering a victim's reporting costs in relation to their geography and income is one of the key components of this research.

Regional perceptions of theft reporting may also be discovered based on victim geography. For example, victims of certain municipalities may have different perceptions on the reporting costs of contacting the police, the reasons for not reporting thefts to the police, and the severity of different types of thefts. Based on these considerations, police may learn which strategies to prioritize when encouraging victim reporting, and police can already learn from examples of municipalities or provinces where crime reporting is the most accurate.

Finally, police can compare victimization surveys with historical crime reporting data to determine "dark number" hot-spots based on geography. Some regions of the Netherlands may be underrepresented by crime-rate statistics. The likelihood of this occurrence would be expected; surveys such as the NCVS suggest that the difference between "real crime" and "recorded crime" varies significantly between regions (Xie, 2014). Discovering the level of difference between real and recorded crime based on region would allow police organizations in the Netherlands to allocate resources more efficiently and effectively.

5.3.3 Monetary Value of Goods Stolen in Theft

The monetary value of goods stolen affects a victim's reservation level when reporting theft, regardless of geography or income. As the associated monetary value of stolen goods increases, both the perceived severity of theft and victim's willingness to report theft generally will increase, according

to police. Victims might also hold different forms of justice and retribution depending on the monetary amount stolen. The monetary value of goods stolen in theft leads to associations in these three measurements - a victim's reporting cost, the perceived severity of theft, and the victim's desired retribution. Discovering the extent of association may be completed through victimization surveys and police interviews.

Different values of stolen property will result in different reporting costs for victims. Specifically, from victimization surveys such as the annual NCVS, there is an established correlation where higher monetary values of stolen goods lead to higher reporting rates for victims (Reyns & Randa, 2017). From an economic perspective, this is a rational decision; victims that lose more from a theft will be willing to spend more (in time, effort, or other resources) in order to reclaim their lost belongings. A victim's change in reporting cost based on the amount of monetary loss from a theft may be compared with a rational decision making model. The significance and magnitude of this change is one of the goals of this research.

Victims may perceive theft more severely as the monetary value of goods stolen increases. In addition, perceived theft severity may also change depending on a victim's personal connection to the item stolen and item category (such as inferior, normal, and luxury goods). For example, the theft of a second-hand bike may be less significant to a victim when compared to the theft of a personalized bike of the same exact monetary value. In another example, the theft of basic needs such as food may be perceived differently when compared to the theft of luxury goods such as electronics. One component of this research is to discover how the severity of theft changes based on both monetary values and intangible values such as personal attachment and item categories.

Lastly, a victim's desired retribution may change as the value of goods stolen changes. In one case, as the value of goods stolen increases, victims may value the perpetrator being caught more than the reimbursement of their lost property because they consider the perpetrator to be a threat to society. In another case, victims may value the reimbursement of their lost property over the perpetrator being caught, as the loss of their property significantly hinders their daily life. Regardless of the reasoning, the value of reimbursement of stolen goods compared to a perpetrator being caught as the monetary value of stolen goods increases is not apparent in previous literature. Discovering this association may lead to insights on how victims value justice and retribution over the magnitude of financial loss.

5.3.4 Previous Experiences of Theft

Finally, previous experiences of theft may affect a victim's entire perception of theft in the future. Victims that have suffered from theft may have more accurate ideas about the reporting procedure, including time and effort required to contact the police. Additionally, after having suffered from real theft in the past, victims may have a more firm idea of their desired outcome and perceived severity of theft. Data on previous victimization experience with the Dutch National Police is limited; this influenced the final decision to choose previous experiences of theft as a key factor to explore in this research.

5.3.5 Other Factors

Other victim factors, such as age or gender, may influence the reporting of theft. However, these other factors were not included in this research due to the time constraint of the project and ethical considerations. While factors such as age or gender could have been analyzed, these factors may reveal too much personal information about the anonymous participants being studied, as their municipality, income, and previous instances of theft have already been recorded. Additionally, all victim factors considered must be approved through an ethics committee, which requires a minimum of three weeks for initial review (not including revisions). The implementation of new victim factors during the project was therefore determined as unfeasible. However, additional victim factors such as age and gender are recommended to be explored if this project is continued, especially as these factors are routinely recorded by the Dutch National Police and CBS.

6 Research Methodology

The crime-harm index, QALY-based victim utility equation, and CBS questionnaires are still all effective measurement methods for safety. However, the additional implementation of victimization surveys and police interviews may serve to complement current police measurement methods. Three types of surveys that may assist the police in measuring safety were identified: reporting threshold surveys, desired outcome surveys, and crime-specific severity surveys. Additionally, police interviews provide officer experience and perspective as a core component of measuring safety in Dutch society. The focus of research methodology for this project is on these measurement methods.

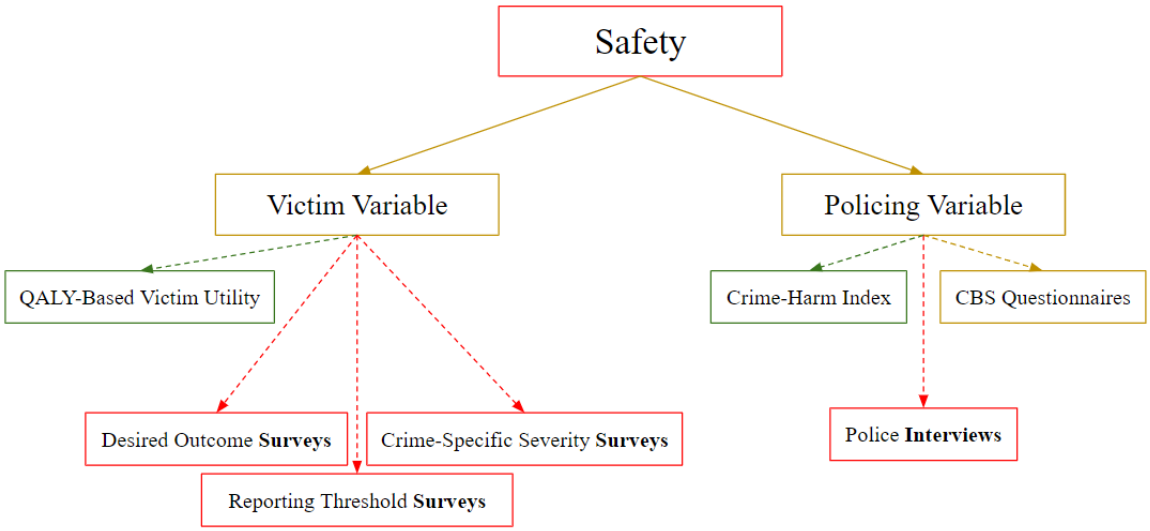


Figure 11: Survey and Interview Research Methods

6.1 Hypothetical Victimization Surveys

The goal behind victimization surveys are diverse and multi-purposed. Three objectives were identified that may be answered through the use of surveys:

1. A victim's reservation threshold for crime reporting
2. A victim's desired outcome and expectations after reporting a theft
3. A victim's perceived severity of different types of thefts

These three objectives were combined into different parts of one general survey for the public. Each survey considers a different hypothetical scenario of theft to specifically address the three main components of theft significance described in the research question.

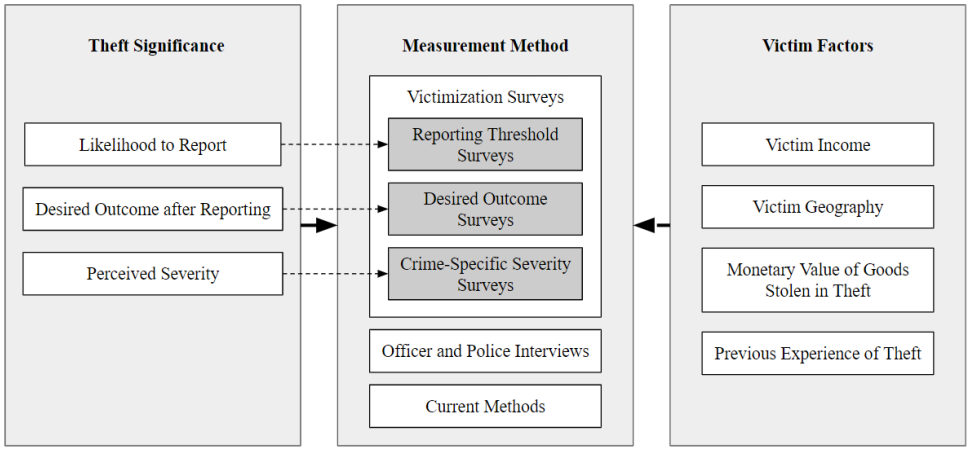


Figure 12: Survey and Interview Research Methods for Significance of Theft

6.1.1 Value Conflicts in Multi-Criteria Decision Problems

One of the largest challenges in implementing an online survey on victimization is the aggregation and comparison of moral values. Arrow's theorem from social choice (Arrow, 1950) references the impossibility for a general procedure to translate individual preferences to a collective preference unless certain conditions (such as collective rationality) are breached. This theorem can be translated to multi-criteria decision problems used in engineering, where values, rather than individuals, order the alternatives to a choice (Franssen, 2005). Value-ranking applies to the surveys given in this research, where respondents are expected to compare moral values that inherently affect their opinions on crime reporting and theft severity. Despite these challenges, Arrow's impossibility theorem can be circumnavigated in value engineering by ensuring options have ratio measurability, unit commensurability, or level commensurability (Van de Poel, 2015). Several different approaches for dealing with these value conflicts are taken in each part of the survey. For a victim's reservation threshold, a cost-benefit analysis based on rational choice is used. For a victim's desired outcome after reporting a theft, direct trade-offs are used to indicate the preference between values of reporting motivations. Finally, for a victim's perceived severity of different types of theft, neither cost-benefit analysis nor direct trade-off is applicable. Instead, the measure of one value - severity - is assessed based on different scenarios. While "severity" is the only value being assessed, this could compose of several second-order values where value conflict occurs due to imperfect trade-offs. However, this sacrifice was necessary in order to preserve each scenario's realism in the survey.

6.1.2 Scoping Questions

Before attempting to complete the survey objectives, five scoping questions needed to be asked at the beginning of these surveys in order to determine significant respondent factors. These questions were written as follows:

1. What is your monthly income?
2. What are the first two digits of your zip code?
3. Have you suffered from a theft such as pick pocketing or stolen property in the past year?
4. If you have suffered from a theft in the past year, did you report the theft to the police?
5. How long do you think it takes to make a declaration of theft to the police?

For the first two questions, respondents were asked their estimated monthly income and region of residence (first two digits of zip code) in order to confirm that this information was up-to-date with the respondent demographics provided by the survey company.

For the third and fourth question, respondents were asked if they had suffered from a theft (such as pick pocketing or stolen property) in the past year, and if they had reported the theft. These two scoping questions serve two central research purposes. First, previous statistics on theft rate and unreported crimes (dark numbers) can be directly compared to this survey data for accuracy. Second, responses with real victims of theft can be compared to non-victims in hypothetical theft scenarios. This second point may lead to insights on how affected victims are by real theft. If the responses of real victims differ heavily from non-victims in these surveys, this may suggest that people perceive theft differently after they actually experience it in reality, even when considering hypothetical scenarios. These questions could have also been combined, but they were purposefully left separated. The reasoning for this decision was to check the coherence behind individual respondent choices. If respondents say they had suffered from a theft in the third question but say they had not suffered from a theft in the fourth question, this would be impossible in reality. Three potential errors would account for this in the survey: respondents are not fully reading the questions, respondents do not understand the questions, or respondents are purposefully putting random answers. In all three cases, answers from these respondents should not be included in the data analysis. Removing a portion of data from this survey collection is anticipated; respondents are paid by the survey company to fill out surveys, but they are not always guaranteed by the company to provide "rational" answers.

The last scoping question asks respondents how much time they think is required to make an initial declaration of theft to the police. This question was purposefully left general in order to see the beliefs that respondents hold regardless of a specific scenario. This question may provide insight to police on how potential victims hold preconceived notions on the effort required to report theft to the police, regardless of its severity. This also allows for a general cost-benefit analysis of theft reporting in a victim's reservation level, found in reporting threshold surveys.

6.1.3 Reporting Threshold Surveys

Contemporary methods of economic analysis can be used to pose crime reporting as a rational choice problem by victims. More specifically, a rational victim will weigh a number of costs and benefits when reporting a crime in order to decide on the most advantageous option. This may serve as an explanation why unreported crimes - or "dark numbers" - exist to varying degrees across different types of crime.

Specifically, there is some "size of loss," x, that serves as a threshold for when rational victims consider the chance of re-compensation, p, to outweigh the costs of reporting a crime. The costs of reporting a crime are diverse, from the time costs associated with contacting the police to the chance of intimidation from a perpetrator. Due to this, only criminal acts of theft (without the victim or perpetrator knowing each other) are considered in this research. In this way, only time costs need to be considered by the victim when making a rational decision. Naturally, a victim's wage rate, w, will significantly affect their decision to report a crime in relation to time, t. When considering these factors, a general decision calculus for a rational victim that suffers from a theft can be formulated (Bowles, Garcia Reyes & Garoupa, 2009):

$$px > wt \tag{3}$$

If the probability of re-compensation, p, for a monetary loss, x, outweighs the victim's lost wages w during the time reporting, t, then they will report the crime. Otherwise, the crime will not be reported.

This equation is a naturally simplified explanation of reality. Unaccounted costs such as insurance, proximity to a police station, and a victim's associated monetary value with personalized stolen property exist. However, taking an economic approach to crime reporting will lead to general predictions on a victim's reservation level.

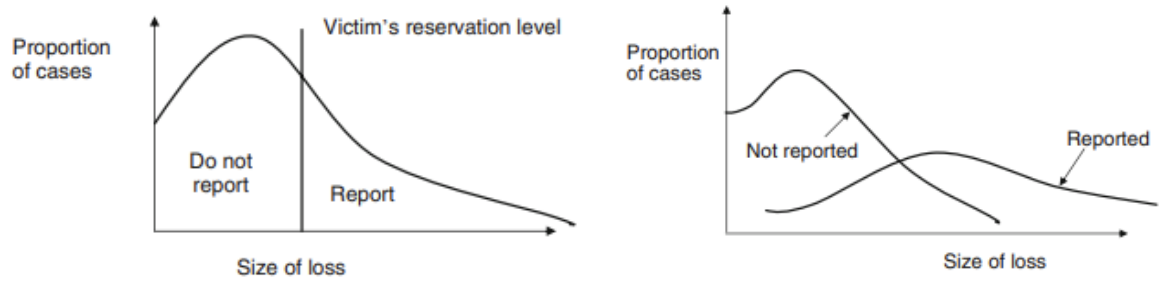


Figure 13: Victim Reservation and Proportion of Reported Cases based on Size of Loss

The goal of reporting threshold surveys in this research is to determine the estimated size of loss at a victim's reservation level, as shown in the first graph of figure 13 (Bowles et al., 2009). By doing so, the proportion of reported and unreported cases of theft may be predicted in society. Additionally, data on victim income and geography may be used to predict how the size of loss changes per individual.

Analysing a victim's reservation level through cost-benefit analysis also serves a second purpose; it allows for a victim's reservation level to be evaluated purely in monetary terms, therefore avoiding Arrow's theorem (Van de Poel, 2015). By using a ratio scale, the values that a victim holds at their reservation level is unified under one unit (money). This scale can also be applied to a victim's wage rate and time spent reporting a crime, making values of time for a victim in this equation comparable

through monetary compensation. There are some expected disadvantages to this cost-benefit analysis, especially in how the questions in the survey are asked. For example, a victim's "willingness-to-pay" to avoid a theft will yield a different result than a victim's expected compensation after a theft. However, depending on the context, these could technically both be considered a victim's reservation level. Therefore, the manner in which the question is asked to respondents in the survey inherently affects the value that they will provide.

One factor that is unrealistic to measure in these reporting threshold surveys is the probability of re-compensation. This is because if victims already know their chance of re-compensation (which is rarely the case in reality when ignoring insurance claims), they will only act according to their value of time based purely on wage rate (w), loss of time (t), and the size of loss (x). Insights into how victims perceive the success of contacting the police would be removed entirely. Value of time (VOT) questionnaires in the form of stated choice experiments are already prevalent in transport and logistics studies (Kouwenhoven et al., 2014), and these experiments are not the focus of this research. Mentioning the probability of re-compensation also removes realism from the hypothetical theft scenarios; if hypothetical victims already know their assumed probability of re-compensation, the focus of this survey becomes more about a victim's calculated value of time based on probability than the monetary threshold for reporting theft regardless of re-compensation chances. Therefore, measuring the value of time with re-compensation probabilities for victims is both impractical and outside the scope of this research. Instead, the reporting threshold surveys have been generalized to include the probability of re-compensation as a preconceived notion held by the victim in association with the size of loss. Every victim will hold independent assumptions on the probability of re-compensation, and this will inherently affect the size of reporting costs that they are willing to endure in a theft. In this way, the focus of this research is on discovering the magnitude of a victim's reservation level for theft according to the combined variables probability of re-compensation, p and the amount stolen, x. By no longer isolating these variables, the victims reservation level is known to be some combination of the variables px, equivalent to the reporting costs wt and other factors.

Based on this consideration, the final choice was made to explicitly keep the theft a generic loss of income without any mention of re-compensation probability in order to preserve this survey scenario's realism and simplified purpose. The theft scenario was therefore written out as follows:

Imagine you experience a theft in which

1. *A certain amount of money is stolen directly from you in public.*
2. *You did not see the crime happen, and you do not know who has stolen the money.*
3. *You do not have theft insurance.*

Each point in this theft scenario was carefully balanced with maintaining simplicity for respondents while also considering unwanted outlier factors that respondents may consider. In the first point, the theft is explicitly mentioned as stolen *money*, in order to prevent personal attachment and item categories from serving as influencing factors in this part of the survey. In the second point, the survey respondent is purposefully informed that the perpetrator is not known or seen in order to remove any potential bias or fear of retaliation when reporting the crime. In the final third point, theft insurance is removed as a potential factor; interviews with Dutch police revealed that many thefts are reported by victims when they are fully confident that they will be re-compensated by theft insurance.

Based on this hypothetical scenario, three general questions were asked to determine the decision calculus and general reporting criteria for respondents. These questions were written as follows:

1. What is the minimum amount of money that could be stolen from you for you to contact the police and report the theft?
2. For the amount you selected, what do you value more: the perpetrator being caught, or the money being returned?

3. For scenarios in which less than the amount of money you selected is stolen from you, why would you not report the theft to the police? You may choose up to 3 choices.

The first question determines the decision calculus of a hypothetical victim from the perspective of a victim's reservation level. This should not be confused with measuring only the size of loss, x; instead, this is a measure of both the probability of re-compensation and size of loss, px. This is because, as mentioned, respondents in this survey are not given information at this point on the likelihood of re-compensation; they must use their own intuition to give a value based on the amount of money that reflects their reservation level. A victim reservation level, px, that is greater than the reporting costs, wt, may suggest that there are other reporting costs that have not been considered in the general equation. A victim reservation level that is lower than the reporting costs may suggest that victims report the crimes for other reasons besides their own costs (such as a sense of civic duty). Reporting costs may be estimated in the last scoping question about time-to-report. Determining the time a respondent is willing to spend reporting a crime, t, will lead to insights on the reporting costs that hypothetical victims possess in theft when combined with the hypothetical victim's wage rate, w. Therefore, wt may be compared with the victims' determined reservation level, px, in this scenario.

The last two questions focus on the reporting criteria for respondents. This serves as useful information for the police to increase reporting rates in the future. If respondents value money being returned over the perpetrator being caught, initiatives such as increased insurance claims for theft may increase crime reporting. Additionally, the reasons why crimes are not reported may vary by income and geography. By knowing the general reasons for lack of crime reporting, police may know which strategies to implement to encourage more accurate reporting based on victim criteria. These final questions also serve as a transition to desired outcome surveys.

6.1.4 Desired Outcome Surveys

Although the outcome of whether to report a crime or not is a complex decision-making process, research from interviews with victims reveal that the motivation values for crime reporting falls into two broad categories: "public duty" and "personal reasons" (Tarling & Morris, 2010). "Public duty" refers to a victim's desire to bring justice to a person that has transgressed the law for the good of society. "Personal reasons" refer to the physical, mental, and financial motivations of safety for reporting a crime that only affect the victim. The type of crime naturally affects the magnitude of significance that the two categories have when reporting a crime; victims may report home burglary more for personal reasons when relatively compared to violent crimes such as armed robbery of the same financial amount. However, the ratio of the desired outcome between "public duty" and "personal reasons" for reporting the same type of crime is lesser known (Murphy & Barkworth, 2014). Certain studies have examined how crimes such as online fraud (Cross, 2018) and domestic violence (Felson, Messner, Hoskin & Deane, 2002) lead to victim reporting motivations, but they have not examined the relative magnitude *between* victim reporting motivations. Therefore, the objective of desired outcome surveys is to determine the general magnitude and preference between the motivating values, "public duty" and "personal reasons," that hypothetical victims hold.

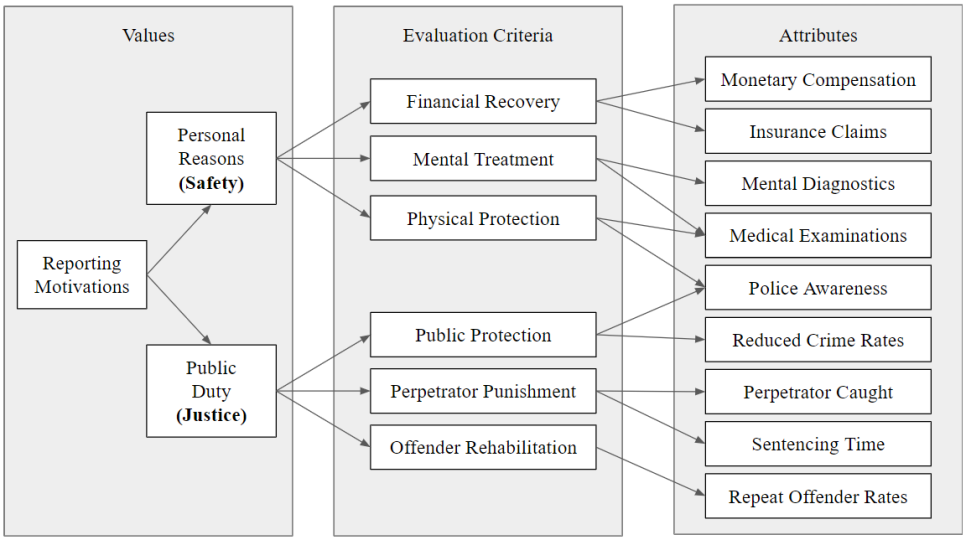


Figure 14: Operationalization of Reporting Motivations (All Crimes)

In order to properly measure if there is a preference in reporting motivations, the reporting motivation value first had to be operationalized. In this sense, the abstract concept of reporting motivations had to be connected to some physical attributes that can be measured (Kroes & van de Poel, 2015), such as attributes like crime statistics or insurance claims. The first step was to find a concrete image for a system of abstract concepts which provides a "good correspondence" between the two (Chang, 2004). To accomplish this, "personal reasons" (also considered as personal safety) and "public duty" (also considered as public justice) were formulated as second-order value judgments to the first-order value, "reporting motivations." While second-order value judgments such as these often undermine the construct validity of measurements, they are still considered as necessary to derive rational meaning from attributes (Kroes & van de Poel, 2015). Three main evaluation criteria were formulated based on both second-order value judgments, followed by a number of measurable attributes. Figure 14 does not represent all of the measurable attributes for each point of evaluation criteria. As shown in the research approach and previous experience with the JIP, multiple attributes, such as a crime-harm index, quality adjusted life years, or public questionnaires are effective attributes to partially determine evaluation criteria for all crimes. This is another reason for the focus of this research to only be on theft rather than all crimes.

"The specification of values in terms of evaluation criteria is context dependent" (Kroes & van de Poel, 2015). Therefore, the operationalization of reporting motivations for instances of *only theft* will result in an inherently different framework than the framework *of all crimes*. Because the crime in the survey is a generic theft (designed for simplicity), only two evaluation criteria are considered in this framework: the outcome of financial recovery for the victim and the outcome of punishment for the perpetrator. In this way, the motivating value of "personal reasons" is contextualized around guaranteed re-compensation for the victim, and the motivating value of "public duty" is contextualized around the perpetrator being caught. Other evaluation criteria undoubtedly exist in reporting motivations for theft, but these had to be excluded based on the time and coherence constraints of the online survey.

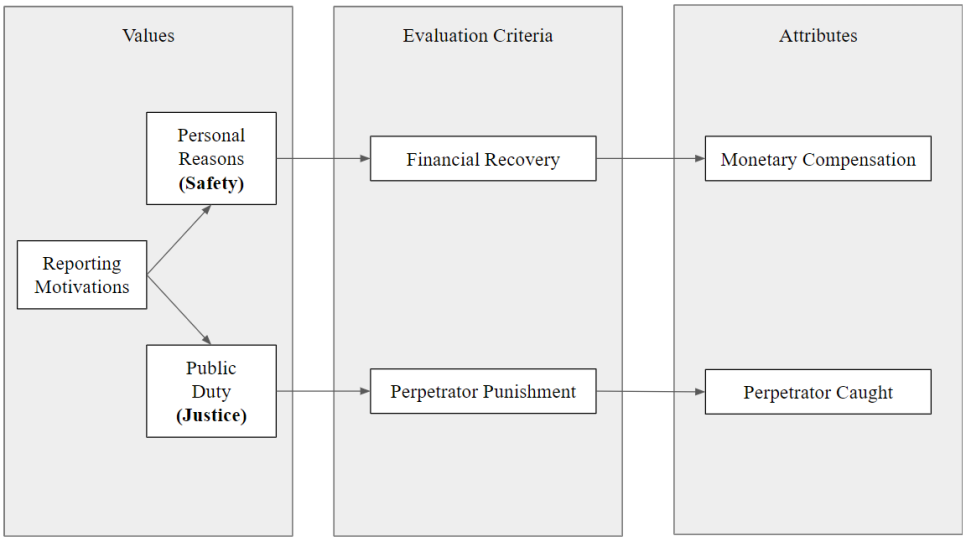


Figure 15: Operationalization of Reporting Motivations (Anonymous Theft)

This framework allows for the creation of a simple 2x2 scenario outcome matrix, where "public duty" is upheld or not upheld, and "personal reasons" are upheld or not upheld. The desired outcome survey was designed on a likert scale in the form of satisfaction of the reporting outcome from 1 (least satisfied) to 10 (most satisfied). The first two scenarios - one where both the money is returned and the perpetrator is caught and one where neither the money is returned nor the perpetrator is caught - were given predetermined scores of 10 and 1 respectively. This bounds the decision of the following outcome scenarios for the respondents. This is done because the objective of the survey is to determine the relative preference between public duty and personal reasons when reporting theft.

Figure 16: Desired Outcome Survey - Baseline Scores

Respondents are expected to complete the 2x2 scenario outcome matrix with the next two questions where either the perpetrator being caught or the money being returned is traded off. The matrix forms a direct trade-off between the two values, which helps avoid Arrow's impossibility theorem which is often associated with value-conflicts (Van de Poel, 2015). In this way, the values of individual respondents can be compared; respondents that answer the third outcome scenario with a higher satisfaction score than the fourth outcome scenario may be motivated more by personal reasons than public duty when reporting a crime. In addition, two other scenario outcome surveys were created in which only half of the money is re-compensated. This may lead to further insights on how much hypothetical victims value personal reasons over public duty when both are provided.

Figure 17: Desired Outcome Survey - Respondent Questions

The amount stolen in this scenario is also divided between three survey types, A, B, and C. The amount stolen in the three surveys is 100, 10, and 1000 euros, respectively. This may answer the question of whether the direct trade-offs are constant over the entire domain of "amount stolen." There is a possibility that the amount stolen may significantly affect a victims desired outcome when reporting a crime. Differences in the "satisfaction score" in these scenarios may reveal this association. One pitfall of using direct trade-offs is that some respondents may consider values like "public duty" to be a taboo trade-off (Van de Poel, 2015). In such a case, respondents would always respond negatively to such a survey as moral values that they hold sacred are being compared to values they consider as incomparable.

Finally, these scenarios can also serve as a second check (similar to scoping questions 3 and 4) for respondent understanding and survey comprehension. Rational decision making would lead to the conclusion that the 3rd outcome (where the perpetrator is not caught but all the money is returned) would always result in an equal or higher satisfaction score than the 5th outcome (where the perpetrator is not caught but only half the money is returned). Respondents that rank the 5th outcome higher than the 3rd either do not understand the survey question logic or do not respond to the questions rationally. In either case, removing these respondents from the data analysis would be preferred.

6.1.5 Crime-Specific Severity Surveys

As discussed previously, a crime-harm index is an effective method to measure the severity of different types of crimes based on the average prison sentencing time according to national law (L. Sherman et al., 2016). However, unless enough data is provided for the circumstances of every criminal act, this is not an effective method to measure the severity *between* the same type of crime. For example, theft can occur under various conditions and circumstances, affecting the victim's perceived severity of the crime by orders of magnitude. The National Survey of Crime Severity, conducted by the United States Department of Justice, aims to solve this dilemma through crime-specific severity surveys rather than statistics on average prison sentencing time.

The NSCS determines crime severity through numerous hypothetical scenarios of crime that citizens rank on a severity scale (Wolfgang, 1985). In this way, both the severity of *different* types of crimes

and the severity *between* the same types of crime can be determined. A baseline scenario - theft of a bicycle - was given a predetermined score of 10; afterwards, survey respondents were expected to rank the severity of each subsequent scenario based on this predetermined score. Scenarios that were perceived as twice as severe would receive a score of 20, while scenarios that were perceived as half as severe would receive a score of 5. There was no upper bound for this survey, and scenarios that were not perceived as a crime would be given a score of 0.

This same concept was used to create the survey for online Dutch respondents. However, the nature of online survey participation limited some capabilities of this methodology, and some adjustments had to be made. First, the NSCS required respondents to manually rank severity scores through audio telecommunication; this option was determined too costly for survey participants online. Instead, the capabilities of the survey company only allowed respondents to adjust scores according to a slider or multiple choice questions, without the option of manually typing in numbers. A boundless scale was not possible based on this requirement, forcing the range of the slider to be significantly limited. Second, the pricing of the survey was based on the time-to-complete per respondent; this required the directions, scenarios, and online slider user interface to be as clear and concise as possible in order to conserve the budget.

Figure 18: Crime-Specific Severity Survey - Baseline Scenario for "Soft Launch"

Two separate "soft launches" of the NSCS survey methodology yielded inconsistent results, suggesting that survey respondents did not have enough time to understand the directions of the survey and that the range was too limited. Therefore, the survey on crime-specific severity was made more understandable in an online format. The online format of the crime-specific severity survey was designed around scenarios being a certain magnitude "more severe" or "less severe" than the first scenario score of bicycle theft. Therefore, scenarios that were perceived as twice as severe would received a score of *2x* while scenarios that were perceived as half as severe would also receive a score of *2x* but in the negative (less severe) direction. The range was adjusted to *5x* severity in both directions. While this survey had more range of values and was more understandable for survey respondents, it also lacked more in precision. This was ultimately determined as a necessary trade-off.

Figure 19: Crime-Specific Severity Survey - Baseline Scenario for "Full Launch"

Because only instances of theft are considered in this project, the implemented crime-specific severity survey only measures the severity between different scenarios of this specific crime. In the earlier survey questions of this research, a victim's knowledge of the perpetrator, association with personalized property, and item category (such as inferior, normal, or luxury goods) were all kept constant in order to determine a victim's standard reporting threshold and desired outcome. This survey purposefully alters these factors to determine how significantly the perceived severity of a crime may change. By altering these factors, eight questions (with the baseline bicycle theft included) were created for respondents:

1. A person steals a bicycle, worth 100 euros, parked on the street.
2. A person steals 100 euros worth of groceries from a grocery store.
3. A person directly pickpockets 100 euros in cash, without the victim knowing.
4. A person steals electronics, worth 100 euros, from a chain electronics store.
5. A person steals 100 euros from a family member while living with them.
6. A person steals 100 euros from an unattended cash register in a local night shop.
7. A person steals personal belongings from a victim's bag at a cafe, worth 100 euros, without the victim knowing.
8. A person steals 100 euros through online scamming.

Each question intentionally alters factors that may affect a victims perceived severity of theft despite the value stolen being the same. In addition to this, two other survey variants, B and C were also created that alters the amount stolen in each scenario besides the baseline bicycle theft. The amounts stolen were randomized in each scenario at 1, 10, and 200 euros. By keeping the first survey variant A at a constant and equal monetary value of theft while altering the other variants, deviations between the surveys can be analyzed to see how influential the amount stolen is compared to the specific scenario of theft. This may reveal how significantly victims perceive monetary value of stolen property compared to other factors such as item category, privacy, or personal association with property.

6.2 Police Interviews

Three types of interviews were planned: scoping, stakeholder, and survey-based interviews. The scoping interviews aimed to identify crucial respondent factors for analysis in the survey and determine significant variables that may impact the validity of research, such as a victim's innate opinions on insurance and typical procedures for reporting theft. Stakeholder interviews aimed to gain the police's perspective on the desired objectives of victimization surveys. Finally, survey-based interviews provided insights from officers regarding respondents' potential reactions to survey questions, as well as offering explanations for the underlying reasons behind such reactions.

There was no predetermined number of interviews scheduled for scoping and stakeholder interviews; once the collected information was deemed sufficient, the subsequent phase of research would commence. For survey-based interviews, four police interviews were scheduled with the purpose of discovering officer perspectives on factors that affect crime reporting. Similar to the surveys, these officer interviews aimed to accomplish three objectives. These were *a police employees' perspective* on:

1. A victim's reservation threshold for crime reporting
2. A victim's desired outcome and expectations after reporting a theft
3. A victim's perceived severity of different types of thefts

These interviews were designed similarly to the hypothetical victimization surveys with three main purposes. First, these interviews served as a good measure to understand police employee awareness on the subject of how victims perceive crime. Second, the difference of opinion between how officers and victims perceive theft could be reviewed. Third and finally, officers may provide the best analysis for

why survey respondents react to hypothetical scenarios in the victimization surveys. Real experience from primary sources (employees in the field) can always supplement any literature review and research on victimization. If officers and police employees are able to predict victim reactions to theft accurately, they may have significant insights on how victims will react to real instances of theft in the future.

6.3 Coordination and Comparison with Current Data Collection Methods

Collection of current data measurement methods regarding victimization was completed throughout the research. These current data collection methods involve current CBS data (reviewed in the police questionnaires of the Joint Interdisciplinary Project) and information from the Dutch National Police that can only be accessed with a security clearance. This secure information from the Dutch National Police was provided as summarized key points by part-time student employees (former teammates on the JIP) that have recently been granted a security clearance for their projects. Additionally, scoping interviews with employees in the Signal & Analysis unit revealed what types of data are currently being recorded and measured for general data collection or predictive purposes.

7 Research Design

The following research design was developed. The purpose of the research design is to display the general line of thinking when this research was conducted.

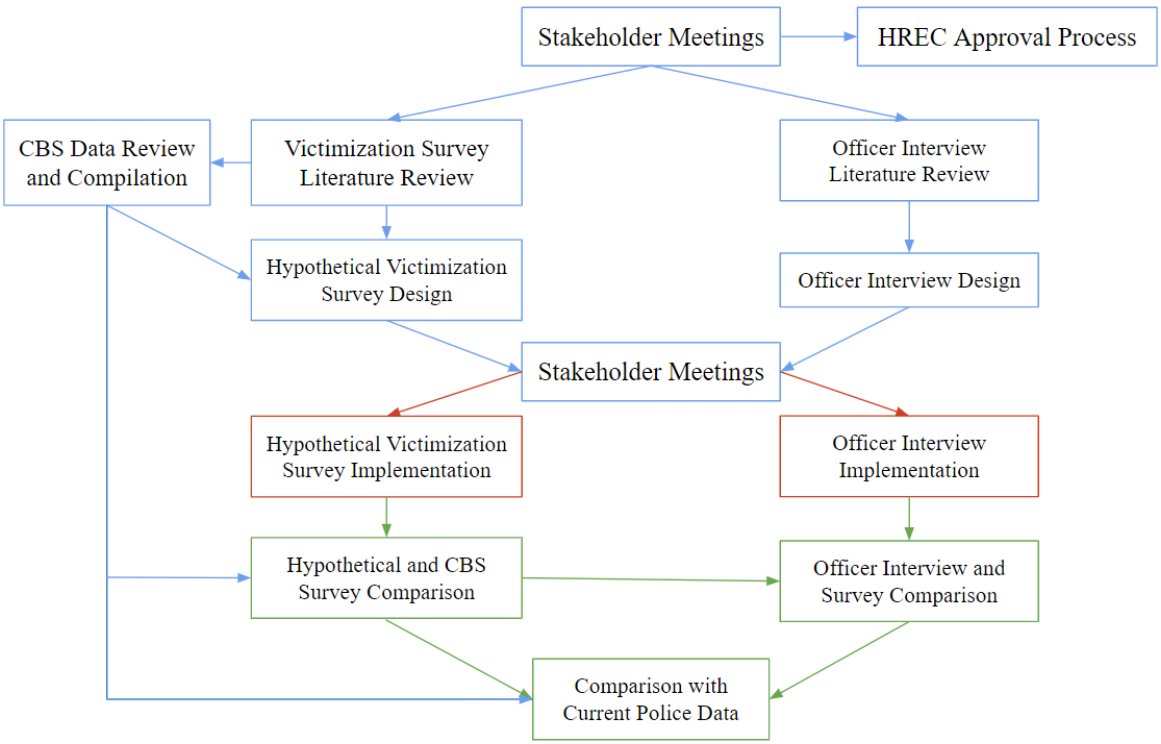


Figure 20: Preliminary Research Design

7.1 Research and Planning Phase

Research and planning was composed of stakeholder meetings, followed by victimization survey and officer interview literature reviews, Central Bureau of Statistics (CBS) data review and compilation, and survey and interview design. The ethics approval process was also completed during this phase.

CBS data review and compilation occurred explicitly before the hypothetical victimization survey design and after the victimization survey literature review. This was in order to gain a holistic understanding of current survey metrics used by the Dutch National Police with additional background knowledge on how victimization surveys are implemented around the world. Previous stakeholder meetings had already revealed that the current implementation of survey use is limited to CBS data. Therefore, a compilation of all factors studied through CBS survey data proved useful in the hypothetical survey design. Based on stakeholder interviews, the factors of the amount stolen in theft, respondent income, geography, and previous experiences of theft were the focus of study for the surveys.

Both the hypothetical victimization survey and officer interview designs were reviewed with final stakeholder meetings before implementation. This was in order to ensure that both designs meet the standards and expectations of the Dutch National Police in improving safety and security. Ideally, the factors recorded in both surveys and interviews should be similar; only the perspective of the respondent is different.

7.2 Experiment Phase

Both the hypothetical victimization surveys and officer interviews should have been conducted synchronously in order to save time. However, the survey implementation was completed ahead of police interviews due to priority of the survey company. Both measurement systems aimed to address a diverse audience. For surveys, this comprised of respondents from different backgrounds based on

income and geography. For interviews, this comprised of police employees from different departments and office locations.

7.2.1 Survey Design

Survey results are based on 1547 respondents from a random sample within the Netherlands. The following are the official questions that were asked in the survey:

1. **Scoping Questions:** What is your monthly income?
2. What are the first two digits of your zip code?
3. Have you suffered from a theft in the past year?
4. If you have suffered from a theft in the past year, did you make a declaration of theft to the police?
5. How much time do you think is required to make a general declaration of theft to the police?
6. **Reporting Thresholds:** Based on the given scenario, what is the minimum amount of money that should be stolen from you in order to report it to the police?
7. For the amount you selected in Question 6, which do you value more: catching the perpetrator or getting your money back?
8. In scenarios where less money is stolen from you than the amount you selected, why would you not report the theft?
9. **Desired Outcomes:** Rank your satisfaction based on the following outcomes after reporting a theft of *[100, 10, 1000]* euros.
10. If you did not know the result of the outcome, how much time would you be willing to spend for a theft of *[100, 10, 1000]* euros?
11. **Crime-Specific Severity:** Rank the severity of each theft scenario.

7.2.2 Factor of Amount Stolen: Sample Surveys A, B, and C:

For the last three questions, three sample surveys were distributed evenly among survey respondents with different monetary amounts stolen listed in the prompts. In the final question about theft severity, the example bicycle theft was always given a value of 100 euros while the monetary amounts stolen in the other scenarios differed in samples B and C.

Table 4: Amount Stolen by Sample Surveys: A, B, C

Scenario #	A: Q9+10	A: Q11	B: Q9+10	B: Q11	C: Q9+10	C: Q11
1	100	100	10	100	1000	100
2	100	100	10	1	1000	10
3	100	100	10	10	1000	1
4	100	100	10	10	1000	200
5	100	100	10	200	1000	10
6	100	100	10	1	1000	10
7	N/A	100	N/A	200	N/A	10
8	N/A	100	N/A	10	N/A	200

In sample survey A, the amount of euros given in every prompt was 100 euros. This ensured that the amount of money stolen was a constant variable in both the perceived outcome and perceived severity of theft. Keeping a constant monetary amount in survey A while differing the amounts in surveys B and C allows for comparison of how significantly the amount of money stolen may result in different perceived theft outcomes and severity.

7.2.3 Survey Comparison of Factors: Income, Geography, and Victimhood

In general, the results of responses in the survey could also be viewed from three other main factors: income, geography, and previous experiences of theft. This allows for analysis of how these factors might result in associations for hypothetical theft scenarios.

For income, three bracket income brackets were created: 0-2249, 2250-3249, and 3250-5000+ euros per month. The reason for selecting these income brackets was based on the even distribution of respondents observed within this range. These income brackets were plotted for each applicable question to determine how different income-levels respond to hypothetical victimization surveys. Statistical analysis was completed based on these three brackets as well as on scalar amounts.

For geography, data was plotted on a map of provinces in the Netherlands, where applicable. This data is usually plotted as a ratio (per capita) in order to prevent bias from more populous provinces. Data is also available on municipality, but this data is not included in this report as there are currently not enough respondents to determine significant associations at a municipality level.

Finally, data was also plotted based on real-victims of theft, referred to as victimhood, (provided in question 3). This factor reveals the associations of how victims of actual theft respond differently to hypothetical theft scenarios compared to victims that have not experienced theft in the past year.

7.2.4 Interview Structure

The interview questions were purposefully non-structured to allow for fluidity in responses from the officers and police employees. The types of interviews designed were *scoping interviews*, *stakeholder interviews*, and *survey-based interviews*. The first two interview types, scoping and stakeholder interviews, followed an unstructured question format guided by desired objectives; for survey-based interviews, open-ended questions based on survey results were the guiding criteria. The initial stakeholder and scoping interviews occurred simultaneously. Additional stakeholder interviews and discussions also occurred weekly throughout the project. Finally, survey-based interviews were conducted after full-launch survey data was compiled.

Figure 21: Timeline of Interviews

Scoping interviews followed an unstructured question format to enable the flow of information to be guided by the police employees. By implementing this approach, the the relevance of topics was dictated by the police rather than being driven by the questions themselves. Therefore, objectives, rather than questions, were formulated before scoping interviews with the police. These objectives were:

1. Identify victim factors that are easy to measure and control in victimization surveys. These factors should influence the perception of theft, in terms of reporting threshold, preferred outcomes, and perceived severity.

2. Identify external factors, usually unrelated to a theft, that are difficult to measure and control in victimization surveys. These factors should also influence the perception of theft.

The same format was also followed for stakeholder interviews. These interviews were scheduled throughout the study to ensure that the research objectives met the expectations of the police. Two main objectives from the police were identified:

1. The research should explore methods to measure safety within Dutch society.
2. The research should attempt to build upon the former Joint Interdisciplinary Project, where different forms of measurement can be unified under one general equation of safety.

Finally, survey-based interviews were contextualized around the results of random participants from the full launch hypothetical victimization survey. These open-ended questions, written and used to guide the interview, were divided across the four objectives.

Theft Reporting Procedures (Scoping Questions):

1. What is the typical reporting procedure for theft?
   (a) What are the reporting options (online vs. in-person)?
   (b) How much time do you think people typically spend reporting a generic theft to the police
   (c) What kind of information do you collect
   (d) Does the type of theft affect the reporting procedure?

Victim Reporting Thresholds:

1. In general, do you think there is a minimum amount of money that needs to be stolen before victims are willing to report a theft to the police?
   (a) What circumstances matter the most?
      i. Traumatizing, frustrating, or fearful events? Making the community safer?
   (b) Does a victim's income affect this? Geography? Repeat victims?
2. What are the reasons you think people do not report a theft? *(Only provide options if requested)*
   (a) They would report the crime regardless of the amount of money stolen.
   (b) The amount of money stolen is not financially significant to them.
   (c) They think contacting the police would take too much time and effort.
   (d) They do not think the police would be able to help them.
   (e) They do not trust the police.

Victim Reporting Motivations:

1. Which outcome do you think victims prefer the most when they report a theft of money: knowing that the victim is caught, or knowing that they will get their money back?
   (a) Do you think the amount of money stolen matters in this decision?
      i. Do you think there is an amount of money stolen from a victim that could change their opinion on wanting the victim caught vs. wanting their money back?
   (b) Is there another outcome that you think victims care about more?

Police Perception of Theft Severity:

1. What do you think makes a theft to be perceived as more or less severe by a victim? *(provide options after initial response, reference options from the survey if needed)*
   (a) Do you think a victim's violation of privacy affects the theft's severity the most?
      i. For example, do you think knowing or not knowing the perpetrator makes the theft more severe?
      ii. Seeing or not seeing the perpetrator?

(b) Do you think the personal association with property matters?

   i. For example, how much more significant is a stolen watch vs. stolen money of the same value?

(c) Do you think the item category stolen matters? (Examples such as luxury goods or basic goods)

   i. For example, stolen groceries, stolen jacket from a clothing store, stolen electronics from an electronics store?

7.3 Analysis Phase

The analysis of the experiment consists of two parts: analysis of how victim factors affect the significance of theft in victimization surveys and comparisons between measurement methods for the Dutch National Police. Three main comparisons were made between the measurement methods:

1. Hypothetical survey and CBS surveys
2. Surveys and police employee interviews
3. The combination of survey / police employee interviews with current police data

The purpose of the first comparison between surveys is to reveal discrepancies between hypothetical victimization scenarios and real victims. In this way, the reliability of hypothetical surveys may be determined for the Dutch National Police.

The purpose of the second comparison is to analyze the perspectives of police employees and victims. This may lead to conclusions on how accurately police employees with prior experience may predict how victims react to theft.

The purpose of the third comparison is to examine how survey and interview data relates to current data collection methods used by the Dutch National Police. If significant gaps in recording methods are revealed in this analysis, then survey and interview data may serve as a potential complement to current data collection and analysis methods in the future.

8 Survey and Interview Results

In short summary, over 150 plots and statistical tests were created in Python from 11 survey questions given to 1547 respondents. The respondents come from a random sample within the Netherlands. Statistical tests, decided by the level of measurement, were used to determine associations between independent respondent variables and dependent variables of theft. Scoping, stakeholder, and survey-based interviews were also conducted to compare officer perspectives to the general perspective of survey respondents. These interviews were conducted with open-ended questions, with key points, takeaways, and common themes being transcribed.

8.1 Survey Results

Major plots, with significant statistical tests, are displayed in this section of the report. These plots reveal the associations (and non-associations) that some relevant victim factors (income, geography, previous experiences of theft, and the amount stolen in theft) have on variables of theft (reporting factors, desired outcome factors, and severity factors). Other plots on more specific data collection and statistical tests are included in Appendix C, while all statistical tests are displayed in Appendix D. Specifically, the Kruskal-Wallis H and non-parametric ANOVA tests were performed for income, Man Whitney tests were performed for victimhood, and Spearman's correlations were performed for the amount stolen. Bi-variate, multivariate, chi-square tests of independence, and Spearman's tests were also performed when applicable. These tests are explicitly discussed throughout the results.

8.1.1 Question 1: What is your monthly income?

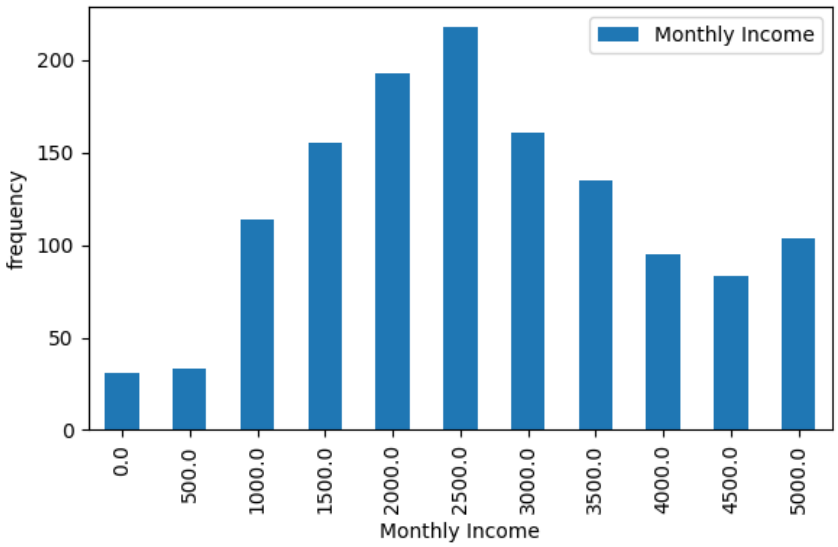
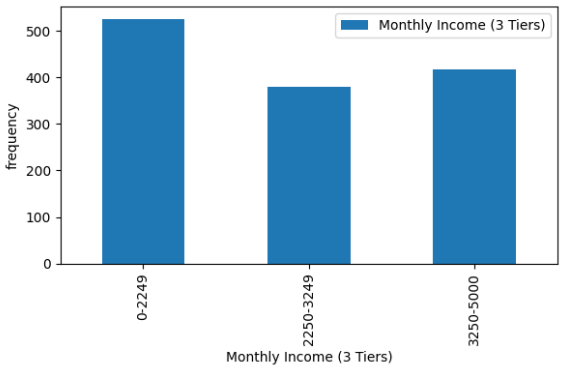
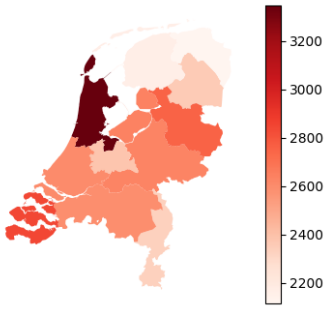


Figure 22: Monthly Income (by 500 euros)



(a) Monthly Income - Tiers



(b) Average Monthly Income (by Region)

Monthly income was categorized into 3 groups in order to allow for ease of comparison and clarity in future plots. These were determined by attempting to make an even distribution of respondents between each category of income. For statistical tests, income was categorized in these three independent groups. The highest average monthly income was recorded in North Holland, at approximately 3300 euros. The lowest average monthly income was recorded in Groningen, at below 2200 euros.

8.1.2 Question 2: What are the first two digits of your zip code?

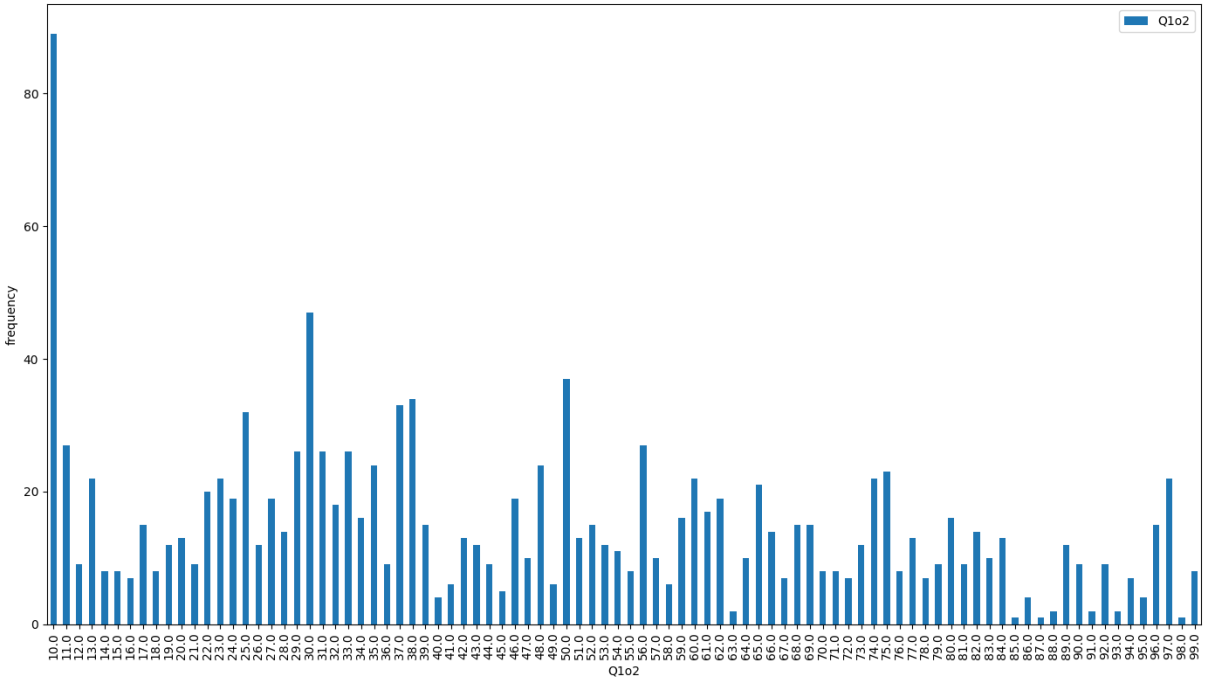


Figure 23: Survey Responses (by first two digits of zip code)

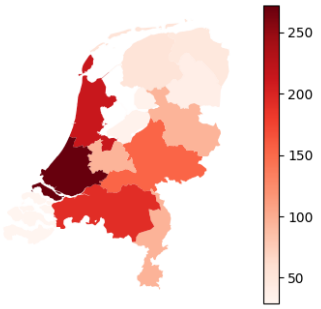


Figure 24: Survey Responses (by province)

While the most survey responses came from the postal codes associated with Amsterdam, the province with the most responses was actually South Holland. Data at the municipality level is also available; however, with 1547 participants, some of the 342 municipalities have few or no responses. This limits the significance of associations at a municipality-level, so the decision was made to display all information by province.

8.1.3 Question 3: Have you suffered from a theft in the past year?

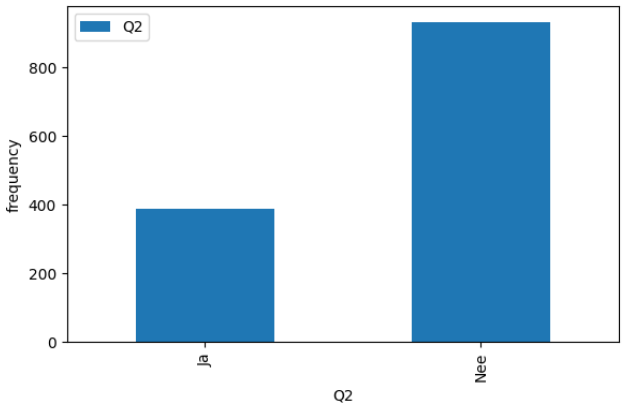


Figure 25: Response to Question 3: Yes or No

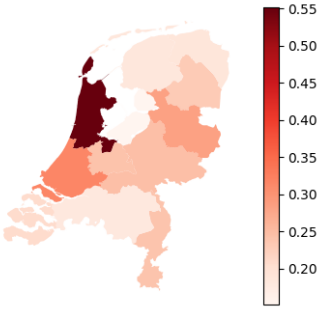
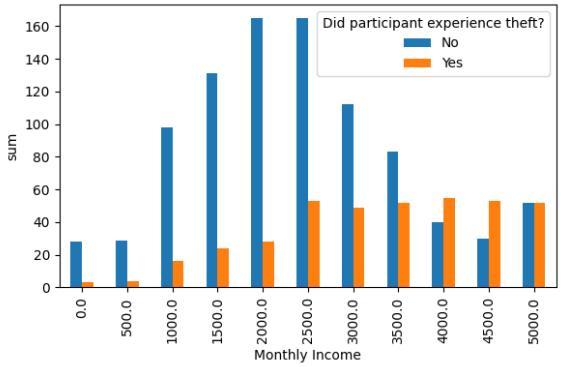


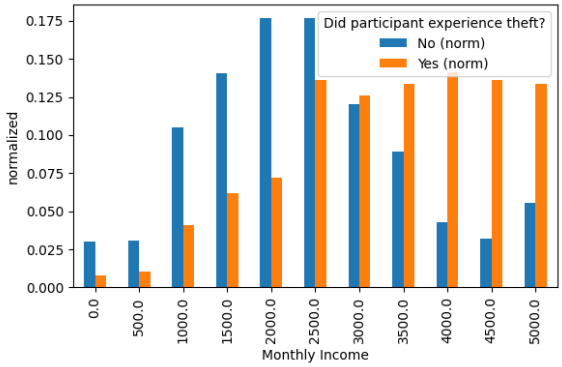
Figure 26: Frequency of Theft (in the past year) by Province - P-value: 1.23e-15

Of the 1547 respondents, 436 (28%) have experienced a theft in the past year. In North Holland, 55% of respondents have experienced a theft in the past year. Based on responses in this survey, residents of North Holland are almost twice as likely to have experienced a theft in the past year when compared the national average.

Figure 27: Frequency of Theft (in the past year) by Income - P-value: 7.92e-32



(a) Frequency of Theft by Income, sum



(b) Frequency of Theft by Income, normalized

Based on the P-values, both the income and geography of a respondent are associated with whether or not they have been a victim of theft in the past year. In general, higher income levels of respondents positively associates with higher instances of theft occurrence in the past year.

8.1.4 Question 4: If you have suffered from a theft in the past year, did you make a declaration of theft to the police?

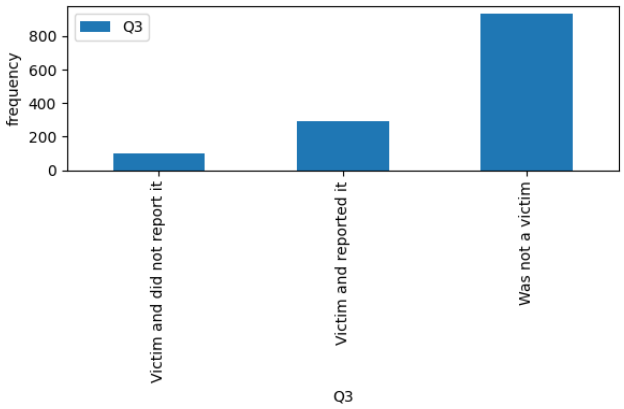


Figure 28: Reports of Theft to the Police (in the past year)

Of the respondents, 164 (10.6%) were victims of theft and *did not* report the crime, 347 (22.4%) were victims of theft and *did* report the crime, and 1036 (70.0%) were not victims of theft. Therefore, 32.1% of thefts in the past year have gone unreported based on results from this survey.

As expected, the responses of non-victims of theft in the past year for this question (1036) partially contradicts Question 3 (1111). Contradictions between questions 3 and 4 account for approximately 5% of responses in the survey; these responses were removed from future questions in order to preserve accuracy of responses by participants.

Figure 29: Reports of Theft to the Police (in the past year) by Province - P-value: 0.079

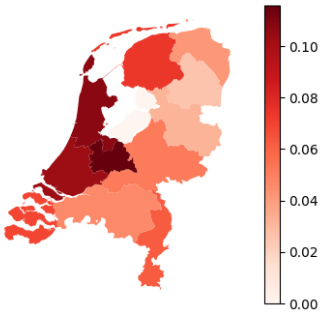
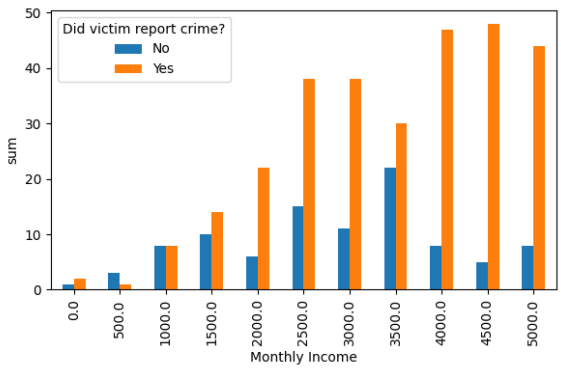
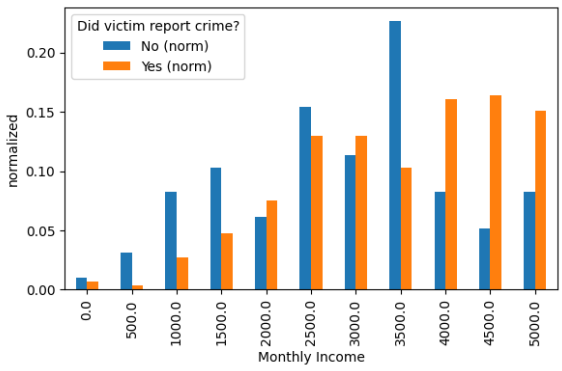


Figure 30: Reports of Theft to the Police (in the past year) by Income - P-value: 8.45e-5



(a) Reports of Theft to the Police by Income, sum



(b) Reports of Theft by Income, normalized

Based on the P-values, the income of a former victim (but not geography) is associated with their choice to report the theft to the police. In general, victims from lower income brackets reported theft at a lower rate than victims from higher income brackets, regardless of province.

8.1.5 Question 5: How much time do you think is required to make a general declaration of theft to the police?

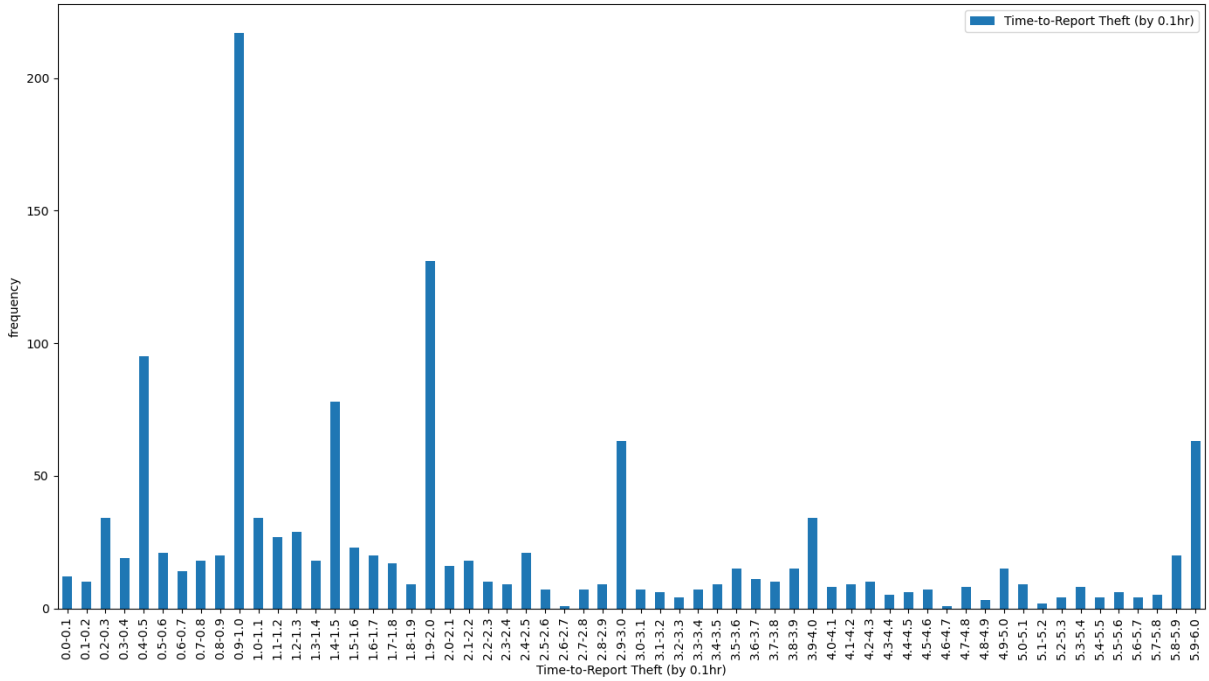
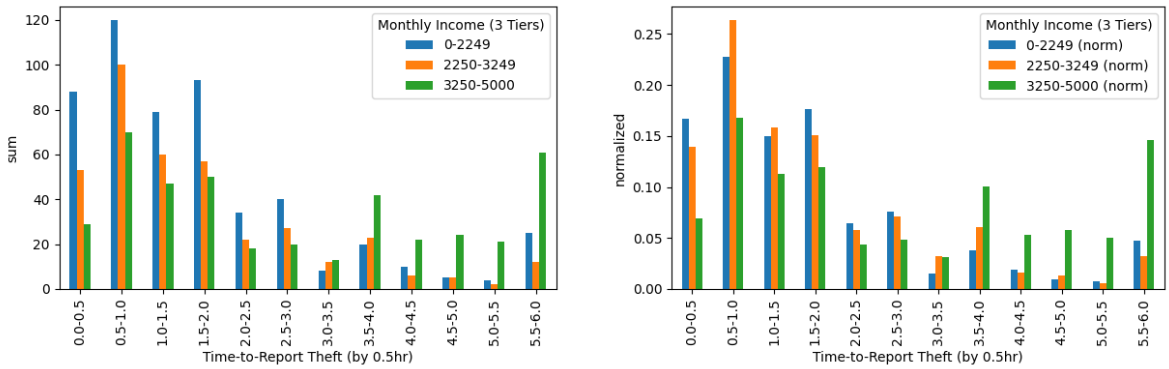


Figure 31: Estimated Time-to-Report Theft

The average time that respondents think is required to make a general declaration of theft to the police is 2.2 hours. The most selected answer was 1 hour, at 244 (15.8%) of responses. Respondents typically chose answers that rounded around the whole and half hour, despite having options to select options up to one decimal place. As discussed in the interview results and analysis, the reason for such dispersion may be due to the three types of reporting methods available: online (15-30 minutes), on-phone (15-30 minutes), and in-person (1-3 hours).

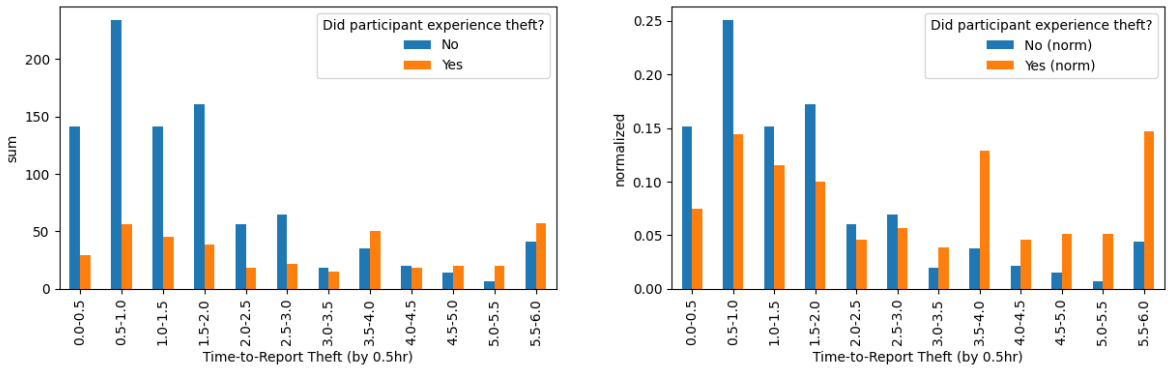
Figure 32: Estimated Time-to-Report Theft by Income (ANOVA: 5.20e-30, Kruskal: 2.77e-21)



(a) Estimated Time-to-Report Theft by Income, sum

(b) Time-to-Report Theft by Income, normalized

Figure 33: Estimated Time-to-Report Theft by Victimhood (Mann Whitney: 2.28e-23)



(a) Time-to-Report Theft by Victimhood, sum

(b) Time-to-Report Theft by Victimhood, normalized

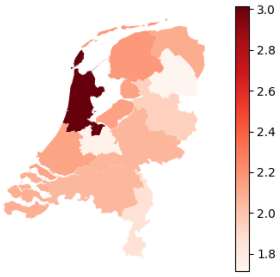


Figure 34: Estimated Time-to-Report Theft by Province (P-value: 1.05e-8)

The standard deviation of the assumed time-to-report theft is 1.66 hours. As discussed in the analysis of officer interviews and survey results, this may be due to the reporting methods. Based on the statistical tests, all three factors (income, previous victimization, and geography) associate with the estimated time-to-report theft. Respondent income and previous victimization are positively associated with time-to-report theft. Geography is also associated with theft, and North Holland records the highest reporting time, at just over 3 hours. The Chi-Square Test for geography was performed by categorizing the time-to-report into 6 bins of 1 hour each. Linear regression tests were also performed for the factors of income and previous victimization, shown in Appendix D.

8.1.6 Question 6: Based on the given scenario, what is the minimum amount of money that should be stolen from you in order to report it to the police?

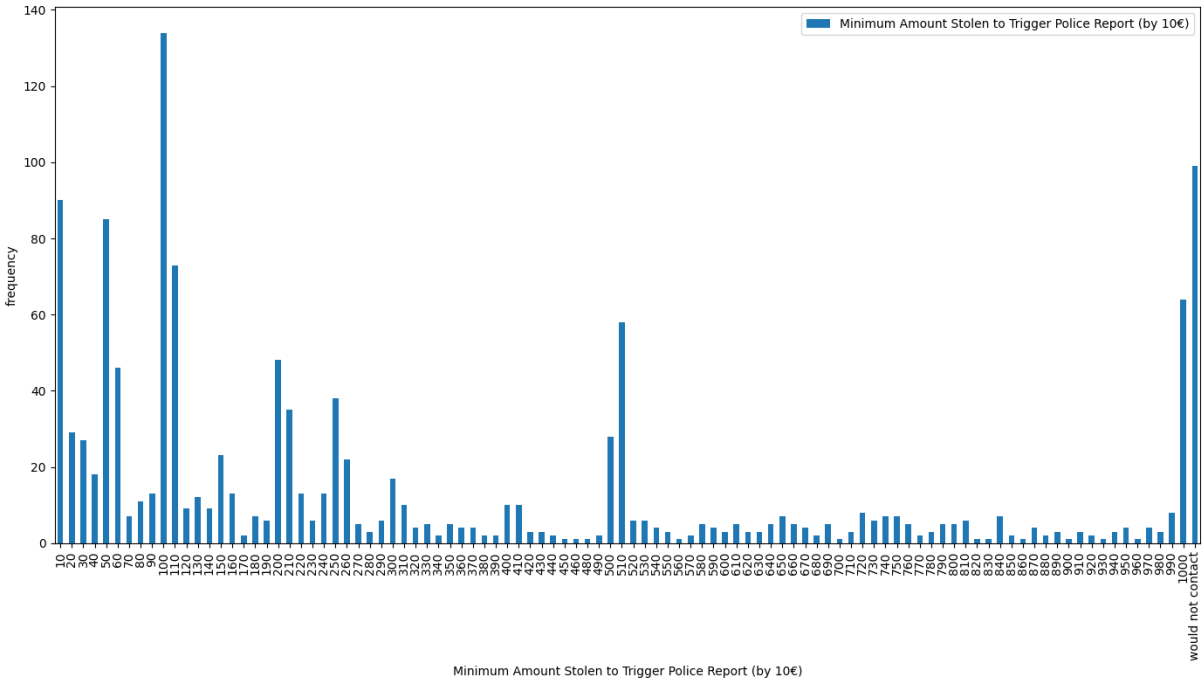
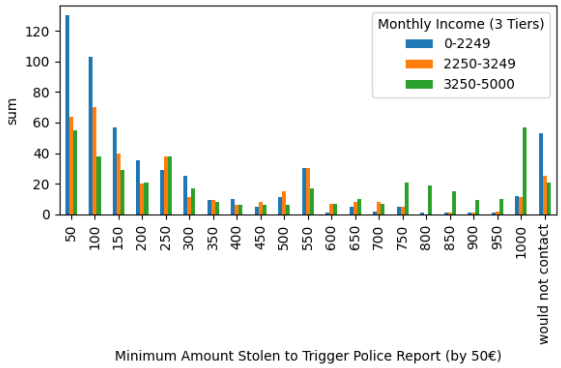


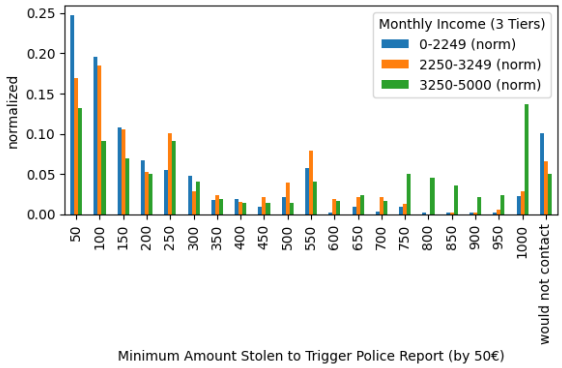
Figure 35: Minimum Amount Stolen to Trigger a Police Report

The average amount of euros that need to be stolen in theft to trigger a police report is 273.5 euros. Similar to time-to-report theft, respondents typically choose half or whole intervals (of 100 euros in this case). The most chosen amount was 100 euros (125 respondents - 8.0%), followed by 1 euro (75 - 4.8%) and 50 euros (71 - 4.6%). There were also 70 respondents (4.5%) that would not report a theft in this scenario even if less than 1000 euros were stolen, and 114 respondents (7.4%) would not report the theft regardless of the amount stolen. As analyzed in the comparison between survey results and officer interviews, these results match the officer interview results where most officers believed the minimum reporting threshold was 50-100 euros. Additionally, officers also believed a significant proportion of respondents either would always report a theft or never report a theft regardless of the amount stolen.

Figure 36: Min. Amount Stolen to Trigger a Report by Income (Kruskal: 4.84e-16)

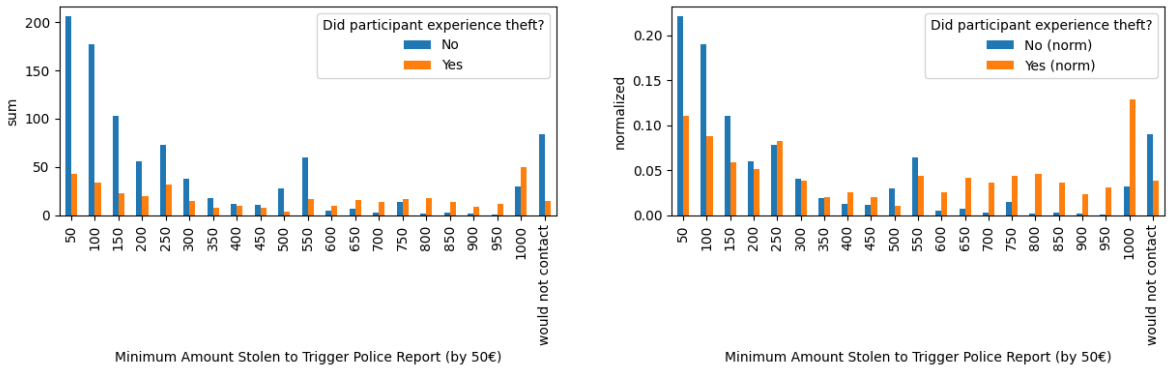


(a) Minimum Amount Stolen by Income, sum



(b) Minimum Amount Stolen by Income, normalized

Figure 37: Min. Amount Stolen to Trigger a Report by Victimhood (Mann Whitney: 1.18e-19)



(a) Min. Amount Stolen by Victimhood, sum

(b) Min. Amount Stolen by Victimhood, normalized

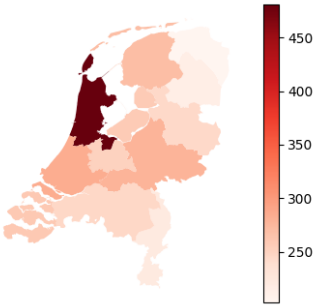


Figure 38: Min. Amount Stolen to Trigger a Report by Victimhood (P-value: 4.15e-10)

Based on the P-values, all three factors (income, previous victimization, and geography) associate with the minimum amount stolen to trigger a police report. Specifically, respondent income and previous experience of theft are moderately and positively associated with the minimum amount stolen to trigger a police report. North Holland records the highest minimum amount stolen to trigger a police report, at just below an average of 500 euros. The Chi-Square Test for geography was performed by categorizing the minimum amount stolen into 5 bins of 200 euros each. Linear regression tests were also performed for the factors of income and previous victimization, shown in Appendix D.

8.1.7 Question 7: For the amount you selected in Question 6, which do you value more: catching the perpetrator or getting your money back (or "don't know")?

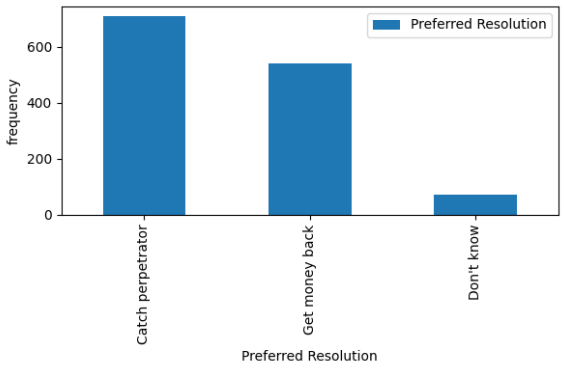
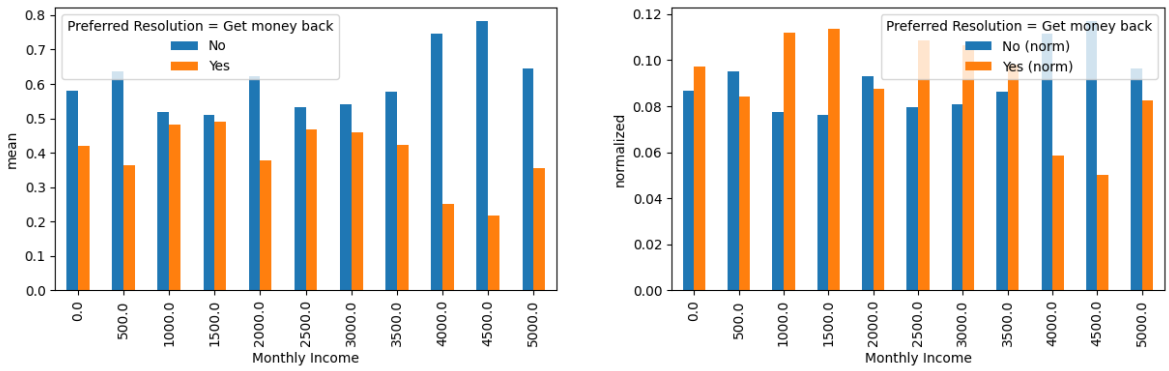


Figure 39: Preferred Resolution from Police

Of the 1547 respondents, 827 respondents (53.4%) preferred the perpetrator being caught after theft, and 638 respondents (41.2%) preferred getting their money back. Only 82 respondents (5.3%) did not know which option they preferred.

Figure 40: Preferred Resolution by Income - Calculated Mean (P-value: 9.89e-7)

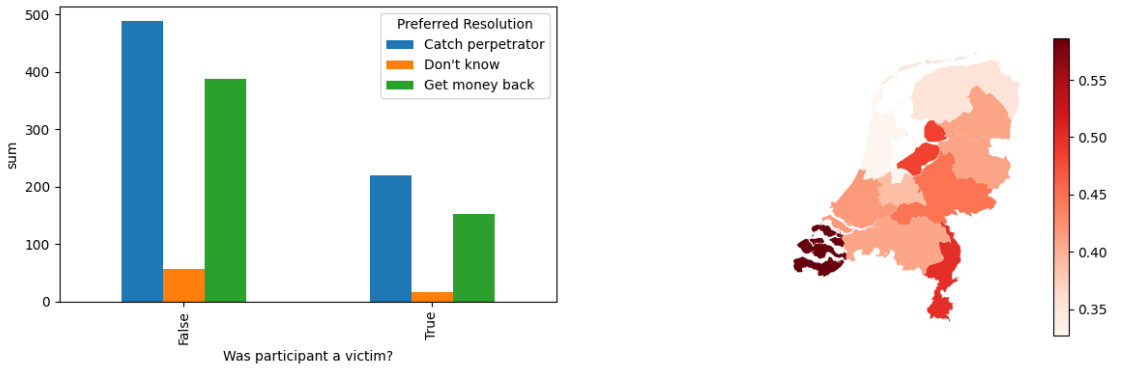


(a) Preferred Resolution by Income - Calculated Mean

(b) Preferred Resolution by Income, normalized

Based on the P-values (determined through Chi-Square Test of Independence), only the income of respondents is associated with their preferred resolution after reporting theft. Neither previous experiences of theft nor geography are associated with the preferred resolution in the theft scenario of this survey.

Figure 41: Preferred Resolution (Victimhood and Geography)



(a) Resolution by Victimhood (P-value: 0.221)

(b) Resolution by Province (P-value: 0.130)

8.1.8 Question 8: In scenarios where less money is stolen from you than the amount you selected, why would you not report the theft?

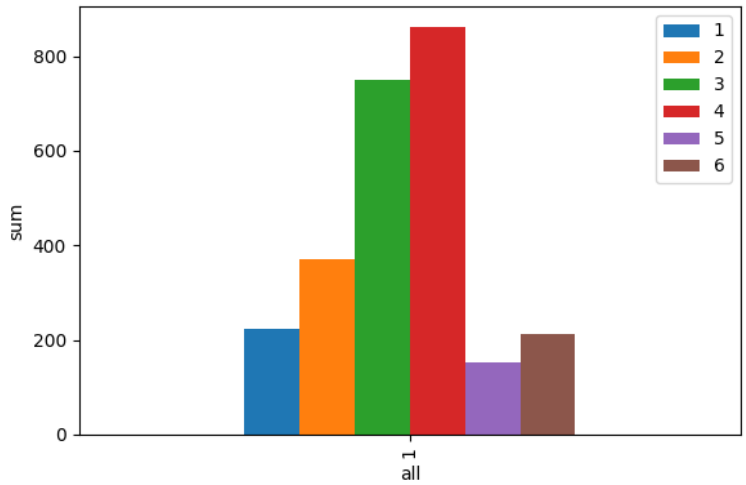


Figure 42: Reasons to Not Report Theft

Table 5: P-Value Reasons for Not Reporting Theft, by Factor

Reason to not report theft #	Income	Victimhood	Geography
#1 I would not report the theft regardless of the amount of money stolen	2.28×10^{-22}	4.99×10^{-31}	5.80×10^{-11}
#2 The amount of money stolen is not financially important to me	3.46×10^{-19}	3.34×10^{-19}	2.53×10^{-2}
#3 I think contacting the police will take too much time and effort	5.63×10^{-4}	5.41×10^{-2}	2.89×10^{-2}
#4 I don't think the police could help me in this situation	4.21×10^{-2}	7.31×10^{-2}	8.10×10^{-1}
#5 I don't trust the police	7.11×10^{-2}	1.30×10^{-11}	6.26×10^{-1}
#6 There's another reason why I wouldn't report the crime	3.65×10^{-1}	2.39×10^{-1}	3.80×10^{-1}

Table 5 presents the P-values (determined through Chi-Square Test of Independence) for the three victim factors and six reasons that participants would not report a crime. The colors green, yellow, and red highlight p-values that are below 0.01, between 0.01 and 0.05, and above 0.05, respectively. The first reason - not reporting a theft regardless of the amount of money stolen - is the only reason positively associated with all three factors - income, previous experiences of theft, and geography. The sixth reason - having another unlisted reason for not reporting the crime - is not associated with any respondent factor. For trust in police, only previous experiences of theft is associated. Participants that have experienced theft in the past year are more likely to use lack of trust in police as a reason to not report this theft scenario. Finally, a participant's geography is only associated with the first reason to not report theft. Specifically, respondents from North Holland are more likely than the rest of the Netherlands to not report the theft scenario regardless of the amount of money stolen.

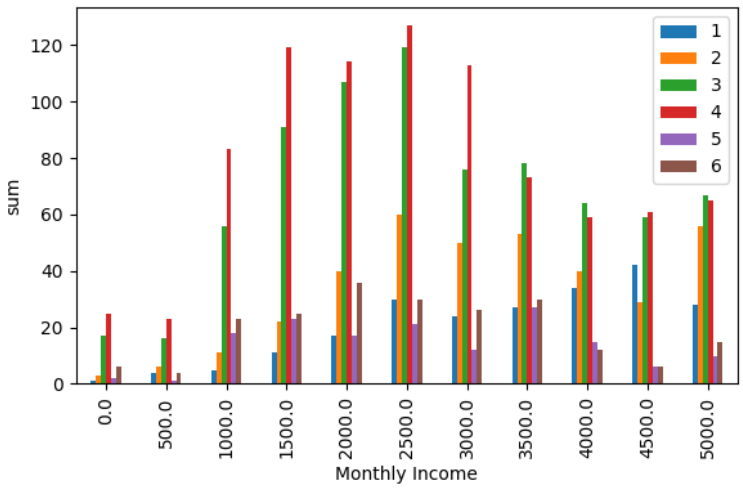
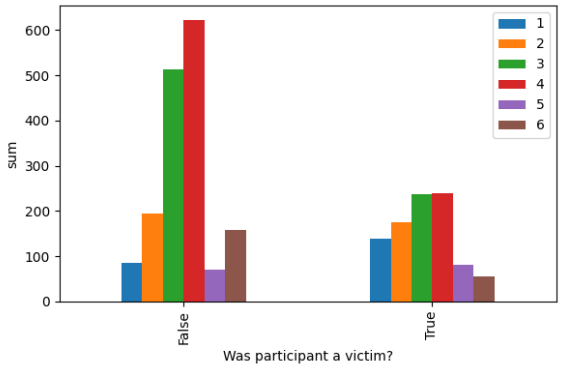
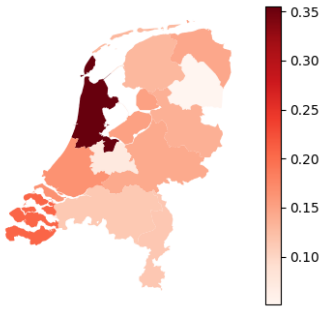


Figure 43: Factor-Based Reasons to Not Report Theft (Income, Victimhood (a), Geography (b))



(a) Reasons to Not Report - Victimhood



(b) "Would not report theft regardless of euros stolen"

8.1.9 Question 9: Rank your satisfaction based on the following outcomes after reporting a theft of *[1000, 100, 10]* euros

For context:

Scenario 3: The money is returned, but the perpetrator is not caught

Scenario 4: The money is not returned, but the perpetrator is caught

Scenario 5: Half the money is returned, and the perpetrator is not caught

Scenario 6: Half the money is returned, and the perpetrator is caught

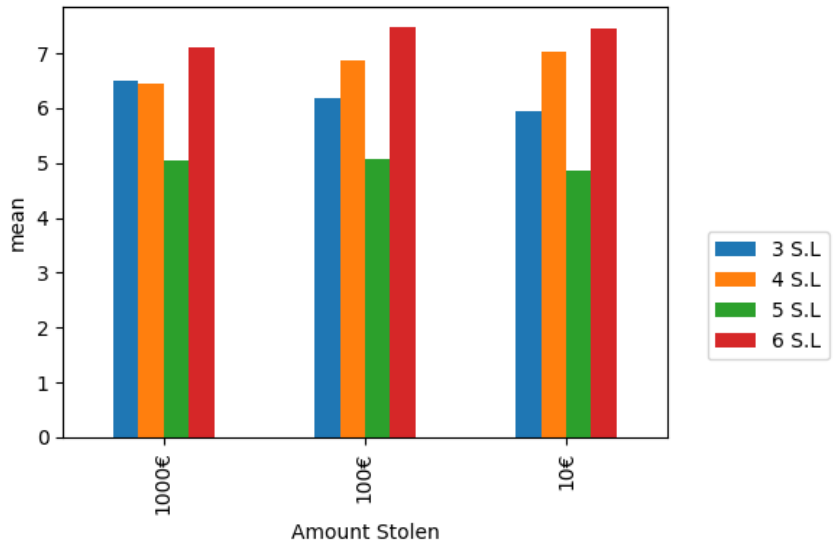
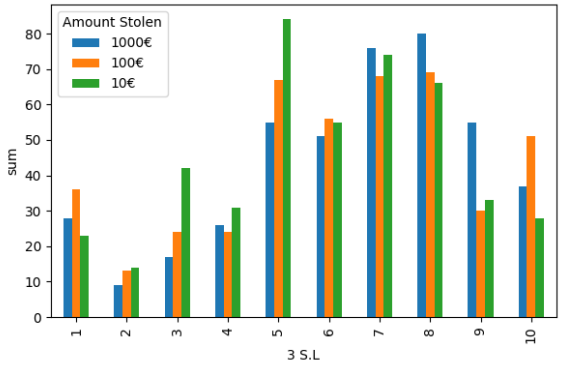


Figure 44: Average Satisfaction Level (S.L) per Scenario (3-6) by Amount Stolen - 1000, 100, and 10 euros

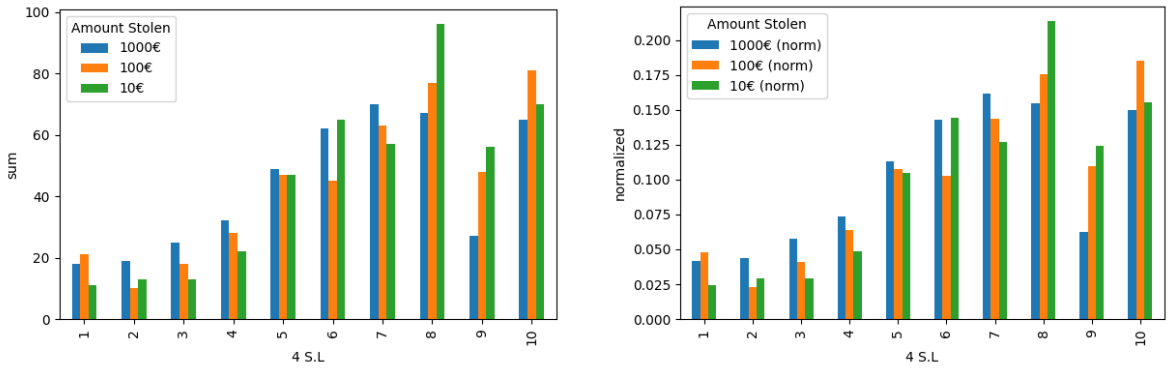
Figure 45: Scenario 3 Satisfaction Level by Amount Stolen (Spearman's: 1.21e-04)



(a) Scenario 3 by Amount Stolen, sum

(b) Scenario 3 by Amount Stolen, normalized

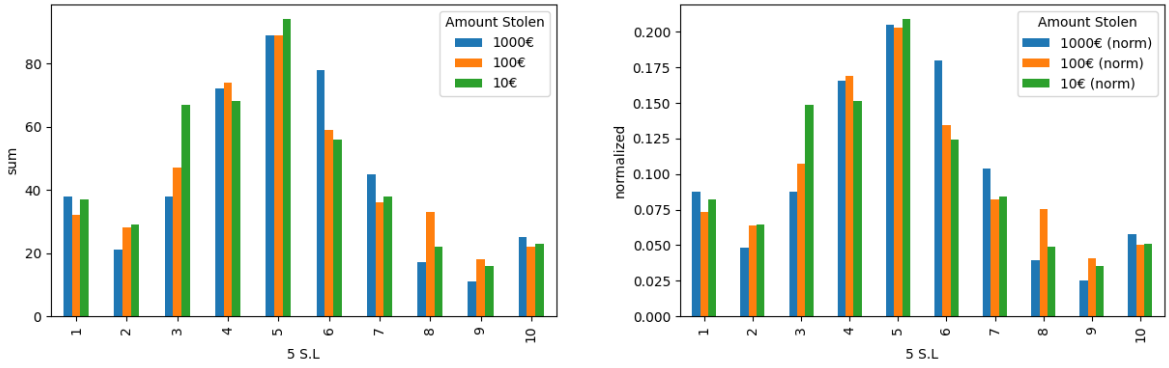
Figure 46: Scenario 4 Satisfaction Level by Amount Stolen (Spearman's: 5.29e-04)



(a) Scenario 4 by Amount Stolen, sum

(b) Scenario 4 by Amount Stolen, normalized

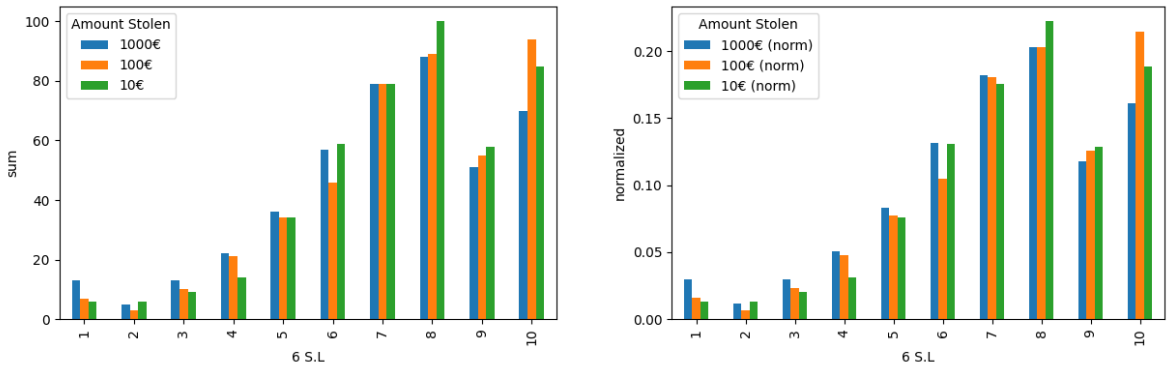
Figure 47: Scenario 5 Satisfaction Level by Amount Stolen (Spearman's 9.79e-02)



(a) Scenario 5 by Amount Stolen, sum

(b) Scenario 5 by Amount Stolen, normalized

Figure 48: Scenario 6 Satisfaction Level by Amount Stolen (Spearman's: 4.31e-02)

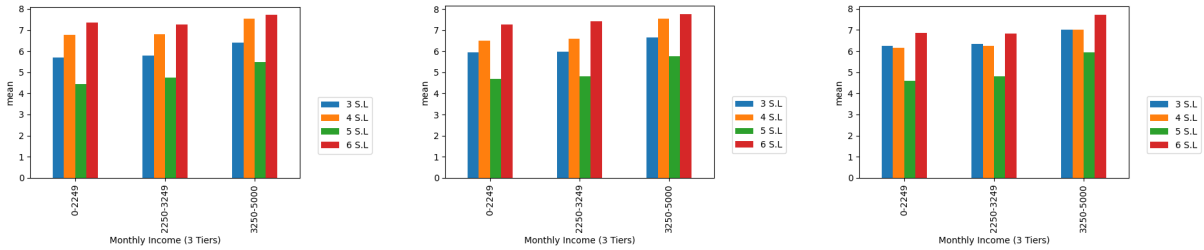


(a) Scenario 6 by Amount Stolen, sum

(b) Scenario 6 by Amount Stolen, normalized

Spearman's rank order correlation, shown in Appendix D, reveals that the amount stolen in scenario 3 shows a weak and positive association with the satisfaction level, whereas the amount stolen in scenarios 4 and 6 exhibits a very weak and negative association with the satisfaction level (P-value $<$ 0.05). Scenario 5 has a P-value of 0.0979, meaning that no significant associations may be determined. As the amount stolen increases, respondents are typically more satisfied with the outcome of scenario 3 (where money is returned) and less satisfied with the outcome of scenarios 4 and 6 (where money is *not* returned).

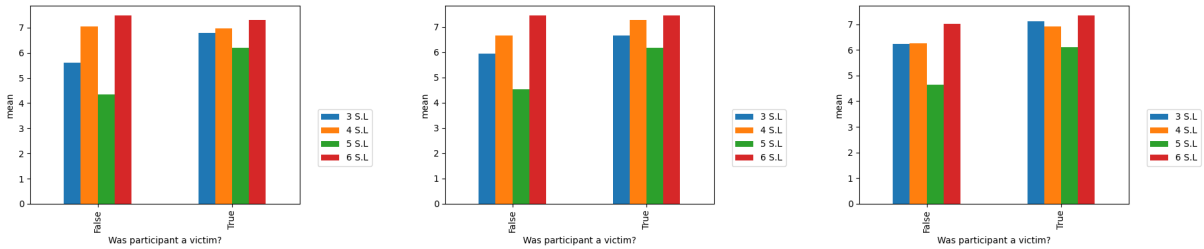
Figure 49: Average Satisfaction Level per Scenario by Income - 10, 100, 1000 euros



(a) S.L per Scenario - 10 euros *(b) S.L per Scenario - 100 euros* *(c) S.L per Scenario - 1000 euros*

According to ANOVA and Kruskal tests, a respondents monthly income weakly and positively associates (P-value < 0.05) with the satisfaction level of every scenario. As monthly income increases, respondents are typically more satisfied with the outcome of every scenario.

Figure 50: Average Satisfaction Level per Scenario by Victimhood - 10, 100, 1000 euros



(a) S.L per Scenario - 10 euros *(b) S.L per Scenario - 100 euros* *(c) S.L per Scenario - 1000 euros*

According to Mann Whitney tests, a respondents previous experience of theft weakly and positively associates (P-value < 0.05) with the satisfaction level of scenarios 3-5. Scenario 6 has a P-value of 0.67, meaning that no significant associations may be determined. Respondents that have had previous experiences of theft in the past year are typically more satisfied with the outcome of the first three scenarios compared to respondents that have not experienced theft.

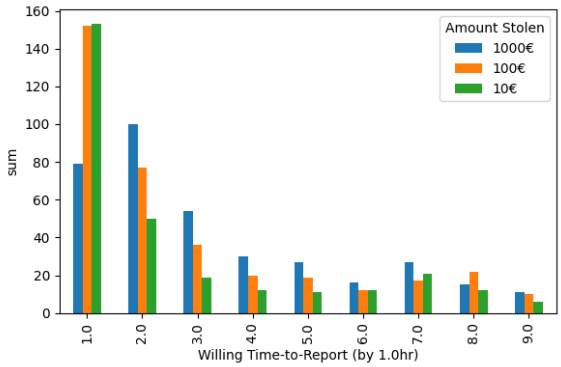
Table 6: Spearman's Rank Order Correlations for Perceived Severity

Scenario #	Amount Stolen	Income	Victimhood
#3 Money returned, perpetrator not caught	0.106	0.127	0.186
#4 Money not returned, perpetrator caught	-0.095	0.153	0.082
#5 Half of money returned, perpetrator not caught	N/A	0.167	0.288
#6 Half of money returned, perpetrator caught	-0.056	0.108	N/A

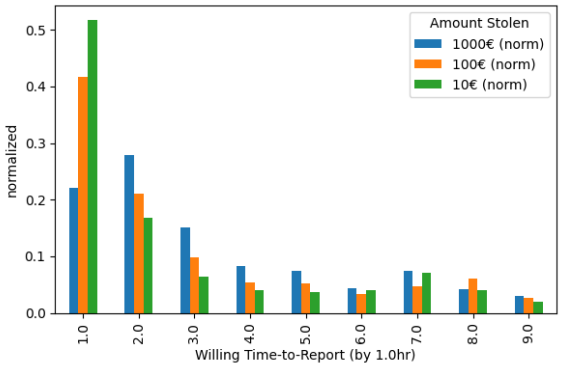
Table 6 (above) shows the significance of these correlations. In the table, N/A represents statistically insignificant results (p-value > 0.05), and colored results represent statistically significant results (p-value < 0.05). Red highlights represent very weak correlations ($x<0.1$), and yellow highlights represent weak correlations ($0.1<x<0.3$). P-values for all scenarios and victim factors are found in Appendix D.

8.1.10 Question 10: If you did not know the result of the outcome, how much time would you be willing to spend for a theft of x euros?

Figure 51: Willing Time-to-Report a Theft of 1000, 100, or 10 euros (ANOVA: 4.22e-04)

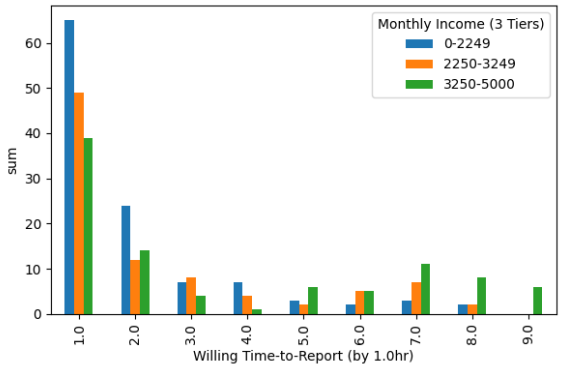


(a) Willing Time-to-Report, sum

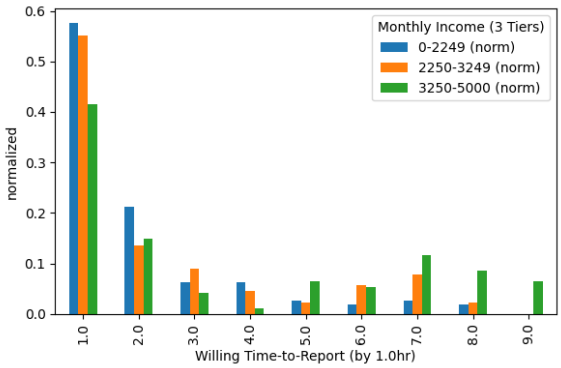


(b) Willing Time-to-Report, normalized

Figure 52: Willing Time-to-Report a Theft (10 euros) by Income

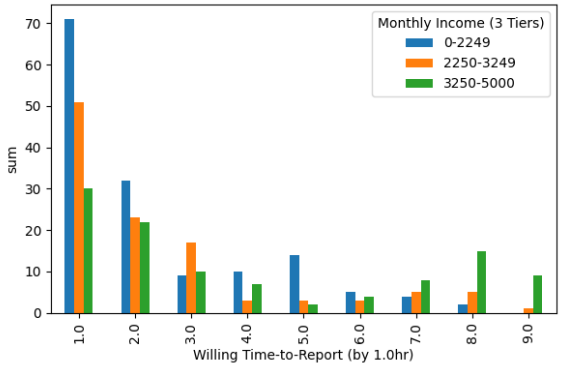


(a) Willing Time-to-Report by income, sum

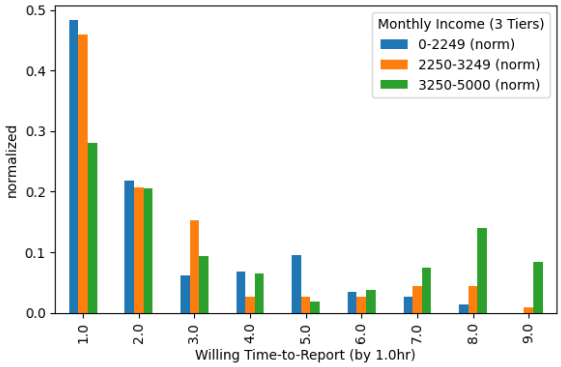


(b) Willing Time-to-Report by Income, normalized

Figure 53: Willing Time-to-Report a Theft (100 euros) by Income

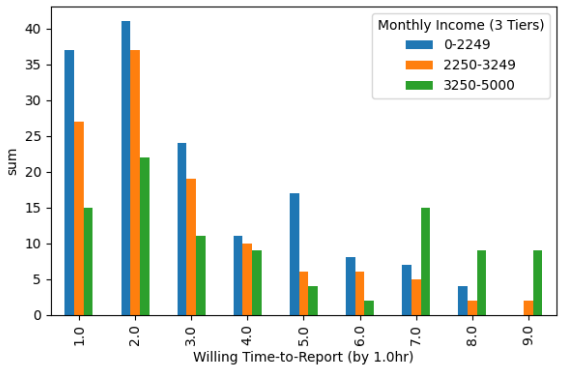


(a) Willing Time-to-Report by income, sum

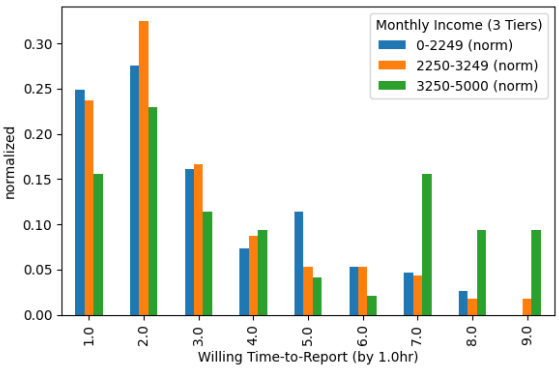


(b) Willing Time-to-Report by Income, normalized

Figure 54: Willing Time-to-Report a Theft (1000 euros) by Income

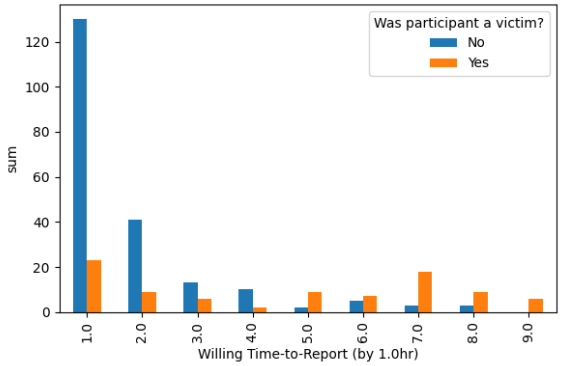


(a) Willing Time-to-Report a Theft by Income, sum

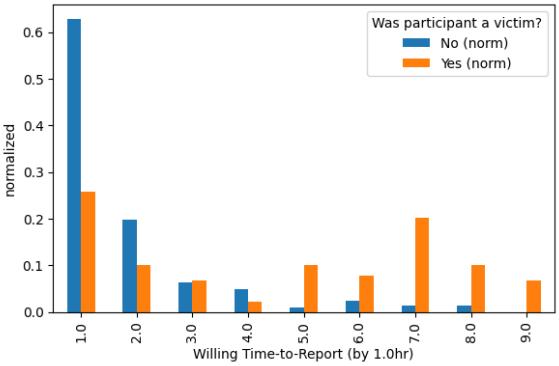


(b) Willing Time-to-Report by Income, normalized

Figure 55: Willing Time-to-Report a Theft (10 euros) by Victimhood

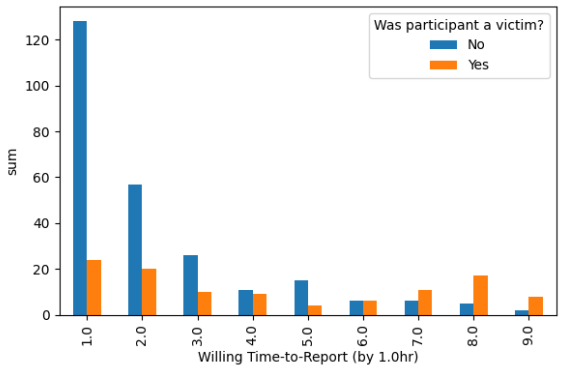


(a) Willing Time-to-Report by Victimhood, sum

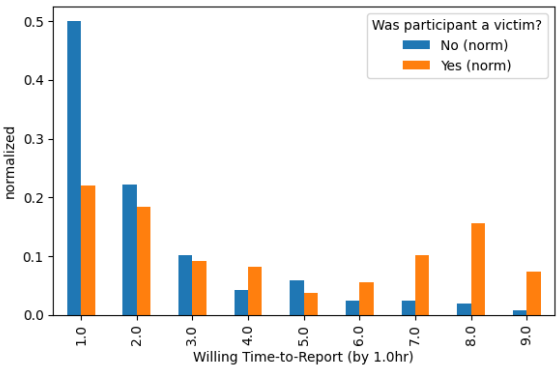


(b) Willing Time-to-Report by Victimhood, norm

Figure 56: Willing Time-to-Report a Theft (100 euros) by Victimhood

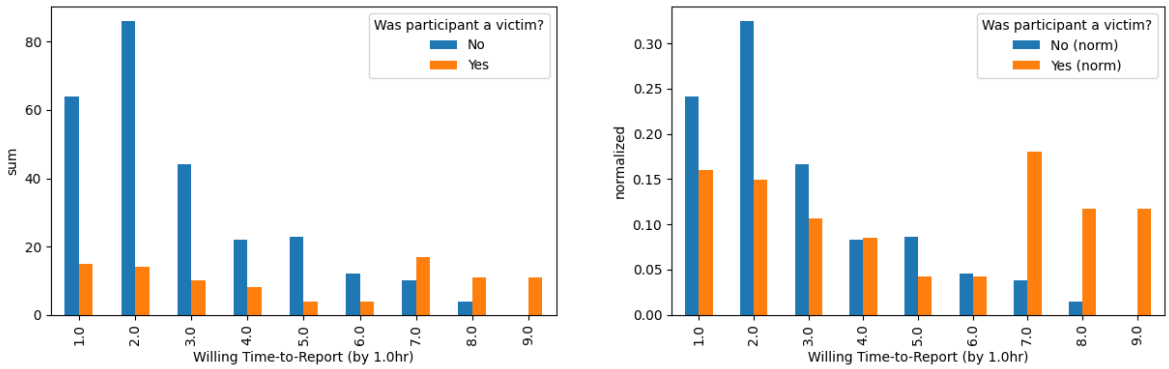


(a) Willing Time-to-Report by Victimhood, sum



(b) Willing Time-to-Report by Victimhood, norm

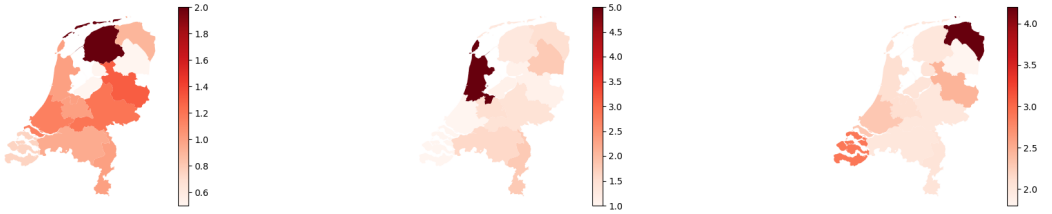
Figure 57: Willing Time-to-Report a Theft (1000 euros) by Victimhood



(a) Willing Time-to-Report by Victimhood, sum

(b) Willing Time-to-Report by Victimhood, norm

Figure 58: Willing Time-to-Report (TtR) a Theft by Geography - 10, 100, 1000 euros (P-values > 0.05)



(a) Willing TtR - 10 euros

(b) Willing TtR - 100 euros

(c) Willing TtR - 1000 euros

ANOVA, Kruskal, Mann Whitney, Pearson's, Bi-variate, and Multivariate regression tests were all performed to analyze how the victim factors of amount stolen, income, previous victimization, and geography associates to the willing time-to-report that a respondent has for this theft scenario. Appendix D shows the results of these statistical tests. For the amount stolen, monthly income, and past experiences of theft, there are statistically significant and positive associations with increases in the willing time-to-report theft. These r values are weak, weak, and moderate, respectively. Geography is *not* associated with the willing time-to-report this theft scenario.

8.1.11 Question 11: Rank the severity of each theft scenario

For context, with *amount stolen* in [brackets - samples A, B, C]:

Scenario 1: A person steals a bicycle, worth [100, 100, 100] euros, parked on the street. *(Baseline)*

Scenario 2: person steals [100, 1, 10] euros worth of groceries from a grocery store.

Scenario 3: A person directly pickpockets [100, 10, 1] euros in cash, without the victim knowing.

Scenario 4: A person steals electronics, worth [100, 10, 200] euros, from a chain electronics store.

Scenario 5: A person steals [100, 200, 10] euros from a family member while living with them.

Scenario 6: A person steals [100, 1, 10] euros from an unattended cash register in a local night shop.

Scenario 7: A person steals personal belongings from a victim's bag at a cafe, worth [100, 200, 10] euros, without the victim knowing.

Scenario 8: A person steals [100, 10, 200] euros through online scamming.

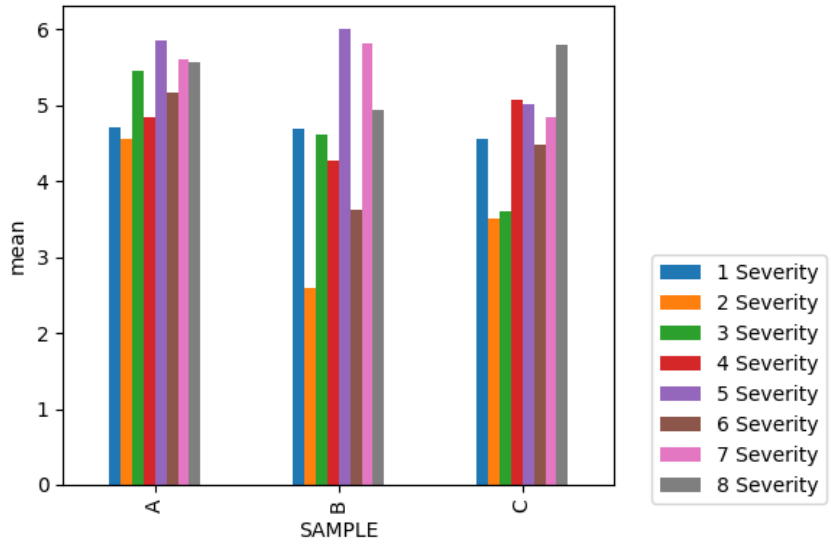


Figure 59: Perceived Average Severity per Scenario

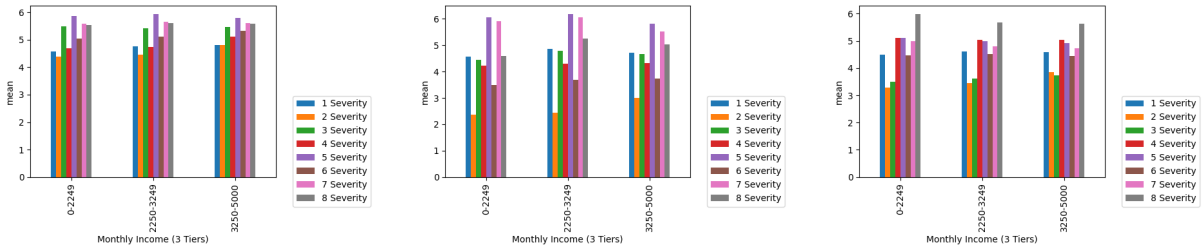
When the amount stolen is constant (*Sample A*), the order of average perceived theft severity (from least severe to most severe) is as follows:

1. **S2** - A person steals 100 euros worth of groceries from a grocery store: **4.58**
2. **S1** - A person steals a bicycle, worth 100 euros, parked on the street *(Baseline Scenario)*: **4.76**
3. **S4** - A person steals electronics, worth 100 euros, from a chain electronics store: **4.88**
4. **S6** - A person steals 100 euros from an unattended cash register in a local night shop: **5.22**
5. **S3** - A person directly pickpockets 100 euros in cash, without the victim knowing: **5.51**
6. **S8** - A person steals 100 euros through online scamming: **5.60**
7. **S7** - A person steals personal belongings from a victim's bag at a cafe, worth 100 euros, without the victim knowing: **5.61**
8. **S5** - A person steals 100 euros from a family member while living with them: **5.84**

Although the baseline scenario was set at 5 (listed as 1x severe on the survey), respondents were still allowed to set their own baseline value at the beginning. The average of this value was 4.76. All other responses were based around this average in the survey.

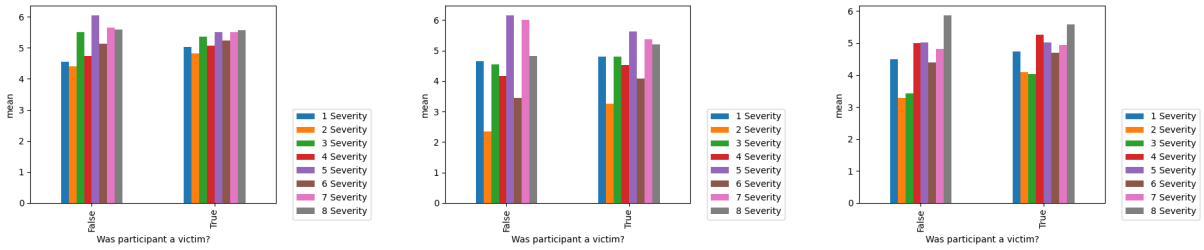
The severity of theft is plotted on a numerical scale of 1-9, where 1 is the least severe and 9 is the most severe. Only one instances of theft (stealing groceries) results in less severity than the baseline scenario of bicycle theft. All other scenarios are considered more severe. The range average of 1.26 indicates that the most severe scenario is approximately two times as severe as the least severe scenario.

Figure 60: Perceived Severity by Income per Scenario - Samples A, B, C



(a) Severity by Income - Sample A *(b) Severity by Income - Sample B* *(c) Severity by Income - Sample C*

Figure 61: Perceived Severity by Victimhood per Scenario - Samples A, B, C



(a) By Victimhood - Sample A *(b) By Victimhood - Sample B* *(c) By Victimhood - Sample C*

Spearman's rank order associations were performed to analyze how the victim factors of amount stolen, income, and previous victimization, associates to the perceived severity of the 8 theft scenarios. In addition, ANOVA, Kruskal, and Mann Whitney tests were also performed on the victim factors of income and previous victimization to confirm statistical validity. Appendix D shows the results of these statistical tests, and Table 7 (below) shows the Spearman significance of these associations. In the table, N/A represents statistically insignificant results (p-value > 0.05), and colored results represent statistically significant results (p-value < 0.05). Red highlights represent very weak correlations ($x<0.1$), yellow highlights represent weak correlations ($0.1<x<0.3$), and green highlights represent moderate correlations ($x>0.3$). For all statistically significant scenarios, there is a positive association indicating that as income, amount stolen, and previous experiences of theft increase, the perceived severity of theft scenarios also increases.

Table 7: Spearman's Rank Order Correlations for Perceived Severity

Scenario #	Income	Victimhood	Amount Stolen
#1 A person steals a bike	0.114	0.180	*Baseline*
#2 A person steals groceries	0.114	0.178	0.381
#3 A person directly pickpockets	0.069	0.100	0.368
#4 A person steals electronics from a store	0.064	0.125	0.188
#5 A person steals from a family member	N/A	N/A	0.227
#6 A person steals cash from a night shop	0.068	0.131	0.316
#7 A person steals personal items from a bag at a cafe	N/A	N/A	0.256
#8 A person steals through online scamming	N/A	N/A	0.229

8.2 Interview Results

The interview results present the main points and summaries derived from the three types of interviews: scoping, stakeholder, and survey-based.

8.2.1 Scoping Interviews

In total, four interviews were accomplished with police employees before sufficient information was gathered on the objectives of the interviews. The desired objectives of scoping interviews were the following:

1. Identify victim factors that are easily measurable and controllable in victimization surveys. These factors should influence the perception of theft, in terms of reporting threshold, preferred outcomes, and perceived severity.
2. Identify external factors, usually unrelated to the crime of theft, that are considered difficult to measure and control in victimization surveys. These factors should also influence the perception of theft.

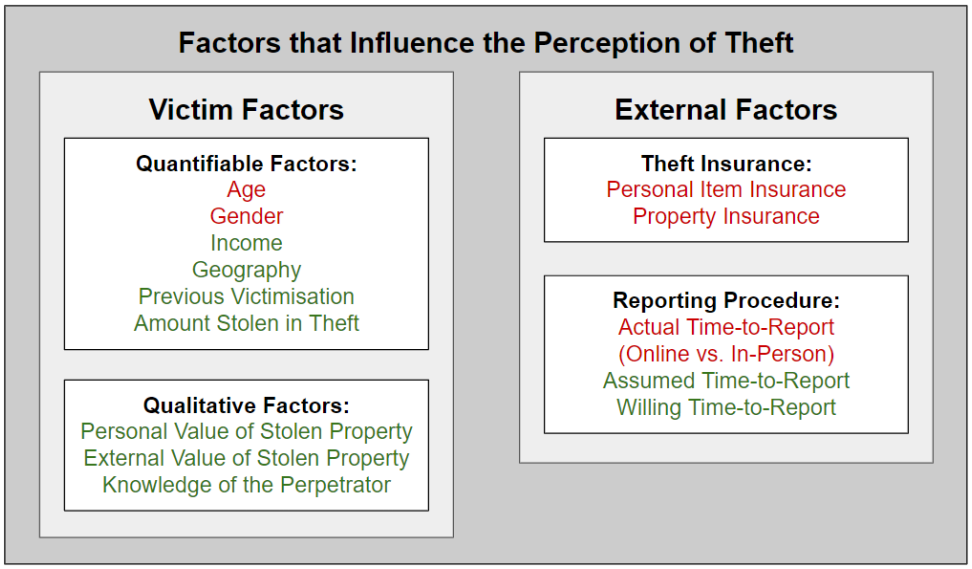


Figure 62: Factors that Influence the Perception of Theft

From the first objective, two main categories of victim factors were determined: quantifiable factors related to a victim's physical profile and qualitative factors related to an individual victim's morality and attitude on theft. The main quantifiable factors determined were age, gender, income, geography, previous instances of theft, and the financial amount stolen from a victim in theft. The qualitative factors determined were personal value of the stolen property (such as property with sentimental value), external value of the stolen property (such as associations with item categories like basic needs or luxury goods), and knowledge of the perpetrator. Based on feedback from scoping interviews, the decision was made to isolate qualitative victim factors under one part of the survey on perceived severity of theft. For quantifiable factors, the decision was made to omit age and gender in order to further ensure the anonymity of respondents. In addition, age and gender data is already actively collected by the police, but the quantifiable victim factors of the amount stolen, previous instances of theft, income, and geography are less explored.

From the second objective, two main external factors that are difficult to measure were identified. These external factors are theft insurance and reporting procedures. Police identified victims with theft insurance for specific property as extremely likely to report theft compared to uninsured victims. However, this factor is difficult to predict, as the number and type of items that are insured usually differ vastly per individual (for example, a shop owner vs. a work-from-home employee). For reporting theft, the procedure also varies heavily by the amount of information provided by the victim and the type of reporting completed (online or in-person). Both of these factors influence a victim's perception

of theft while still being unrelated to the crime of theft and difficult to control in experimental scenarios. Therefore, the decision was made to remove theft insurance from hypothetical scenarios entirely and allow for more focus on the *assumed* time-to-report and *willing* time-to-report theft in two separate survey questions. In this way, respondent opinions on reporting procedure could be explored without the influence of theft insurance.

8.2.2 Stakeholder Interviews

Initial and weekly stakeholder interviews were comprised of interviews with supervisors for the Dutch National Police and interviews with the general public. The desired objectives of stakeholder interviews were the following:

1. The research should explore methods to measure safety within Dutch society.
2. The research should attempt to build upon the former Joint Interdisciplinary Project, where different forms of measurement can be unified under one general equation of safety.

Through the first objective, the initial decision was made with supervisor support to narrow the focus of research both in terms of research methods and the type of crime being studied. Ultimately, surveys and interviews were determined as the best research methods to use for analyzing perceptions of theft. Given that theft is a pervasive crime that commonly impacts individuals regardless of their specific socioeconomic condition, this was deemed the most suitable approach to inspect perceptions on safety in Dutch society as a whole. Furthermore, the abundance of respondents with firsthand encounters of theft facilitates the measurement of the individual factor of prior crime experience (determined as a significant victim factor in scoping interviews). General interviews with the public also display the key point that "petty" theft cases had a serious impact on the "feelings" of safety within a geographic area. While these interviews with the general public are not specifically measurable, they serve as an essential exploratory strategy to determine what values the public holds in regards to societal safety.

The result of the first stakeholder interview objective - the application of surveys and interviews to measure theft instances - partially contradicts the desired results of the second objective. Two specific measurements (surveys and interviews) on one specific crime (theft) are naturally not an all-encompassing measurement for a general equation of safety (as shown in the first diagram of figure 63). However, these first objective results do build on the Joint Interdisciplinary Project when the variables of the Joint Interdisciplinary Project (JIP) are reevaluated. Initially, the main variables of safety for the general equation of safety in the JIP was crime severity, victim utility, and police effectiveness. Stakeholder interviews revealed that a better approach is to consider variables of safety for a general equation through perspectives of those affected. Therefore, the results of the second objective of stakeholder interviews was the application of how key measurement methods can measure safety from the perspectives of the victim and the police. In this way, survey and interview methods build directly on these perspectives when defining safety. As described in the research approach, the objective of the research was to evaluate how these measurement methods may influence an equation of safety, but this equation has not been finalized.

The stakeholder interviews played a crucial role in shaping the new research approach, which focuses on assessing safety through the perspective of victims and law enforcement, rather than solely documenting crime statistics. The formulation of the new research approach that considers both objectives of stakeholder interviews is shown as the final diagram in Figure 63.

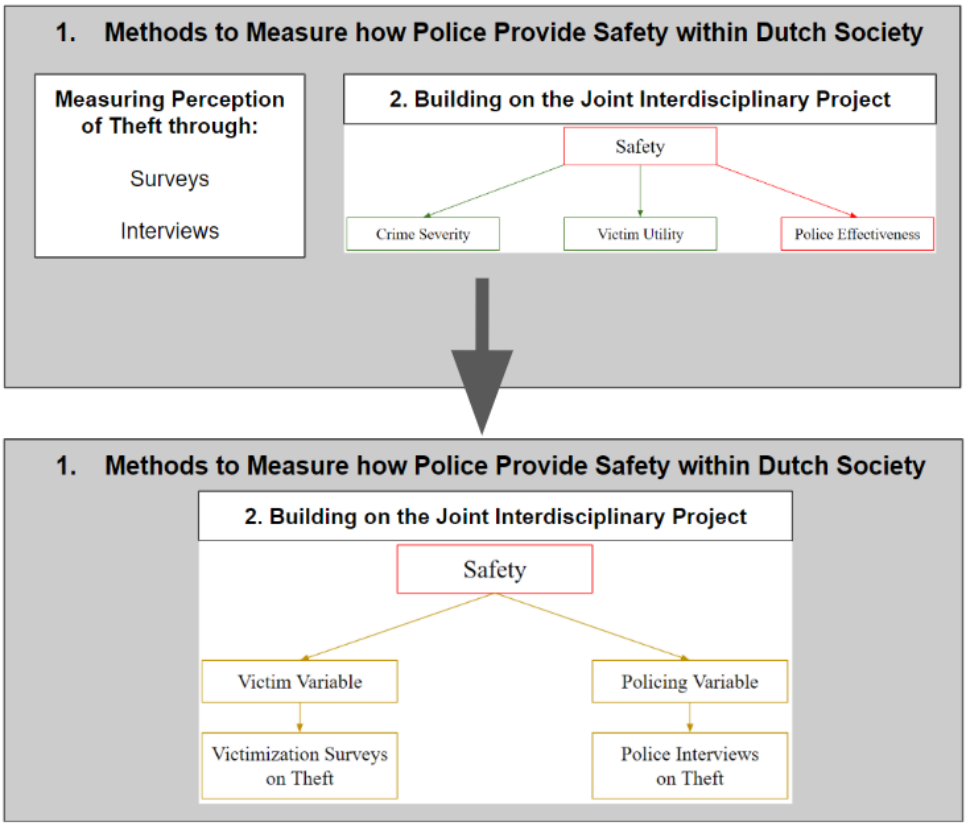


Figure 63: Combination of Stakeholder Interview Objectives

8.2.3 Survey-based Interviews

Four survey-based interviews for police employees were conducted after the full-launch data from surveys were compiled. The following questions and key points, based on the each section of the survey, are listed.

Theft Reporting Procedures (Scoping Questions):

"What is the typical reporting procedure for theft?"

In general, the reporting procedure for theft falls under three categories: *digital/online reports* of smaller theft cases, *phone reports* of smaller theft cases, and *in-person reports* at the police station for larger theft cases. Each reporting procedure encompasses a different reporting time, reason for reporting, and type of theft reported.

For online reports, most crimes reported are typically "minor" acts of theft, such as a stolen bike.

- The estimated time according to officers to report theft online is "15-30 minutes." They believe this is a reasonable amount of time to report theft.
- These thefts are usually reported online for insurance reasons, where a victim will be reimbursed by their insurance company after proof of reporting the theft to the police. Often, these situations do not have a lead, and they are usually archived in the police system with information of the location, time, and specific characteristics of the item stolen (such as a bike number).
- One significant insight is that the option to report online has only been available for about three years now; many officers in the field still direct victims about their option to report theft online, as many citizens are unaware of this option.

For phone reports, most crimes reported are also considered "minor" acts of theft by the police.

- Phone reports also require "15-30 minutes" of time, but require officer support.

- Phone reports are often made because the victim is either unaware or incapable of filing a theft report online. In these cases, the police assist the victim in filing the report themselves.

For in-person reports at the police station, most crimes are typically considered as "major" acts of theft by the police.

- The estimated time according to officers to report thefts to a police station is initially a minimum of one hour and a maximum of three hours. However, scheduled appointments are often necessary to facilitate official reports.
- These crimes usually involve in-person contact with the perpetrator, or the amount of money stolen is financially significant and "life-altering" to the victim. Examples of common cases of theft reported to the police in-person are car thefts and online thefts where significant amounts of money is lost.
- Police believe more thefts can be reported online rather than in-person in order to save both time and resources for both parties.

Finally, police believe income, geography (population size), and amount stolen all positively associate with assumed reporting time, but they believe previous victimization results in a negative association.

Victim Reporting Thresholds:

"In general, do you think there is a minimum amount of money that needs to be stolen before victims are willing to report a theft to the police?"

- All officer interviews yield a response of 50-100 euros.
- The circumstances that matter the most are how severe people determine the theft to be in terms of privacy invasion, the type of item stolen, and a sense of shame for having a perpetrator steal from them. For this last point, employees believe the shame of online theft is a major factor that prevents victims from reporting. The idea of knowing or seeing the perpetrator was not listed.
- Police employees and officers believe higher income income and closer proximity to a police station positively associate with a victim's choice to report theft. They also believe more money needs to be stolen from the city of Amsterdam as the crime rate there is already quite high - so people are more "used" to theft. They do not believe previous victimization or the specific province of victims influences the reporting threshold.

What are the reasons you think people do not report a theft?

Ranked in average order of statements:

- Victims are not insured.
- Victims don't see the need for it - "What's in it for me"?
- Reporting takes too much effort and time.
- There's no chance it will be solved.
- Victims believe they can resolve the theft themselves, especially in the case of knowing the perpetrator (relatives were listed as an example in all interviews)
- The amount of money lost might not be important to victims

Desired Outcomes:

What outcome do you think victims prefer the most when they report a theft?

- "About half" of victims want their money back through insurance, while the other half wants some sort of "justice" after suffering from theft. The amount of money stolen (unless insurance

is involved), income, geography, and previous victimisation does not affect a victim's reporting motivation as much as their own morals.

- Of the four main factors in this research, police believe only the amount stolen may significantly influence a victim's satisfaction in outcomes of theft. However, they are less confident in this assumption than determining how factors influence which outcome victims generally prefer.
- What is stolen heavily dictates people's reporting motivations. Electric bikes and normal bikes are almost always reported for insurance, while more severe thefts of more personalised items are reported for justice.
- A third reason people report is to make their neighbourhood (and society) safer.
- People have to say WHY they file a report now. The reason is that the police want to know the goal, so they can consider if a report is actually needed, in order to prevent insurance frauds. Many companies "insure" products by saying a police report is required, but this is not legally binding. The police need to determine which reports are insurance scams and which reports are legitimate when recording theft, and this is the main reason for asking why victims file a report now.

Police Perception on Theft Severity:

What do you think makes a theft to be perceived as more or less severe by a victim?

- The "emotional impact" against the victim is the most important factor.
- Knowing the perpetrator creates the largest emotional impact, particularly due to breach of trust or betrayal.
- Emotional impact does not necessarily influence online thefts as victims do not know the perpetrator personally. However, online thefts also come with a sense of shame in victims for getting scammed. There are conflicting views on police employees on how severely online thefts are perceived due to this. Regardless, online thefts are increasing significantly relative to traditional thefts, and they particularly impact vulnerable populations (international students and elderly). Banks sometimes offer chances to recover lost money in online theft, but this is not always an option for large scams.
- The thefts perceived as the least severe are those that involve food and "common" thefts. "Common" thefts, such as bike thefts in the Netherlands, occur so often that according to the police people become desensitized to their severity.
- More personal items, such as watches or purses, are perceived as more severe than "common" thefts, but less severe than thefts that involve a breach of trust or betrayal (such as stealing from a family member or online scams).
- Victim blame may also influence perceived severity. For example, a victim that leaves a bag unattended may not perceive the theft as severe because they blame themselves for losing their item. Victim blame has the largest influence on "uncommon" items being stolen.
- Higher income might associate positively with a victim's perceive severity of theft, but geography and previous victimization probably do not. Police officers and employees are not confident on knowing these associations.

9 Analysis

The analysis of this report comprises of three core sections:

1. Survey analysis, including the significance of results and how respondent factors influence these results
2. The comparison of survey and interview results and how these results may lead to common conclusions and contradictions
3. The comparison of results gathered from this research with current data collection methods, including any suggestions to discrepancies and gaps in current methods used by the Dutch National Police.

While many associations may be drawn within surveys and between data collection methods of this research, this does not imply causation. Instead, the purpose of analysis for this research is exploratory in nature; significant associations that invalidate null hypotheses serve as a suggestion for discovering causation between variables in future studies. In this way, the true motivating factors the impact safety for victims in theft may be discovered and predicted for future scenarios of theft.

9.1 Hypothetical Survey Analysis

The hypothetical survey analysis is composed of four sections, in which the general trends of the results are analyzed. Additionally, associations due to respondent factors of income, geography, previous experiences of theft, and the amount stolen in theft scenarios are also analyzed, when applicable. Inferences for why these associations may exist are included in this section, but application of this knowledge for the Dutch National Police is further displayed in the concluding section of this report.

As emphasized before, the associations drawn from the analysis section of this report can only lead to general inferences rather than implied direct causation. Numerous factors, such as error and lack of precision in the survey design, unpredictable respondent outcomes, and false assumptions may lead to incorrect conclusions. To mitigate this risk, extensive scoping interviews, literary research, and soft-launch tests were undertaken, forming the justification for the inferences drawn in this section.

9.1.1 Scoping Questions

From the scoping questions, six analysis topics were formulated. Each topic is listed, followed by the concluding analysis based on survey results, statistical tests, and comparisons to currently available Central Bureau of Statistics (CBS) data.

1. The comparison of monthly income of respondents to current CBS statistics, in terms of wealth distribution and geography:

Based on CBS data from 2021, the largest income bracket for Dutch citizens is at 2000 euros per month, while the respondent data from the victimization survey is at 2500 euros per month. There is a marginal inclination towards higher income brackets in the respondent data, but otherwise, the relative distribution of income matches current CBS data. Therefore, as guaranteed by the surveying company, the respondent data on income can be considered reliable.

2. The comparison of the geographic response distribution to the population distribution of the Netherlands, including any potentially underrepresented provinces:

The total survey responses received from each province also exhibit a strong resemblance to the population distribution across the Netherlands. South and North Holland record the highest response totals (respectively), and Zeeland records the lowest number of responses. Of the 1548 responses, 43 (2.8%) were recorded from Zeeland. This low response amount must be considered when making any comparisons within the province.

3. The influence of income and geography on the likelihood of experiencing a theft in the past year:

The income and geography of a respondent associate with their likelihood to have experienced theft in the past year. Specifically, higher income levels are more likely to experience theft, and residents of North Holland are twice as likely to experience theft as the national average. Both of these factors are naturally associated with each other; the highest earning province according to survey responses is North Holland as determined from earlier scoping questions. One important factor is that survey responses from North Holland are dominated (>50%) by the postal code of Amsterdam. According to the most recent publicly available survey on theft offenses by CBS, residents of Amsterdam are also twice as likely to experience theft as the national average, at an 8.7% registered theft rate (CBS, 2013).

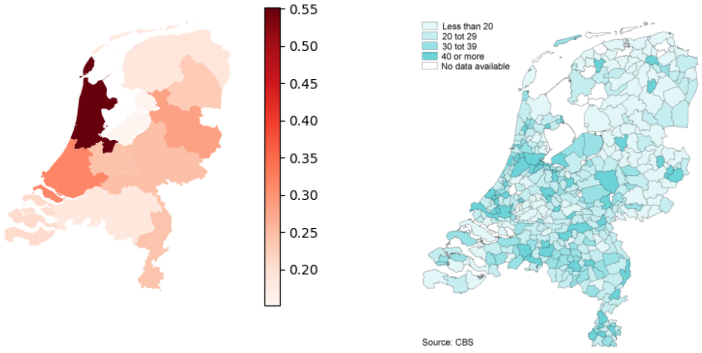


Figure 64: Frequency of Theft: Survey (theft ratio of residents) vs. CBS (thefts per 1000 residents) Responses

The national percentage of *registered* thefts in 2013 according to CBS is 3.8%, while the percentage of *reported* thefts according to this survey is 22.4%. This significant discrepancy may be based on the definitions of "registered/reporting" and "theft" between surveys. What may be considered as a "reported theft" by some respondents may not be considered as a "registered theft" by government organizations. For instance, not every theft scenario may be registered by police if it is instantly resolved by the victim and perpetrator party. This was confirmed in scoping and survey-based interviews, where police employees stated that not all reported thefts are officially registered in police data systems. According to CBS, victims report about only a third of offenses, and a quarter of these offenses are actually recorded (CBS, 2010). Therefore, a reporting rate of 22.4% may actually yield a 5.6% register rate according to this statistic. This rate is much more comparable to the official rate of 3.8%, as well as the most recent rate, 9.0%, for *all* property crimes (including household burglary) (CBS, 2021). Additionally, the manner of recording data for this survey is in a different format than most victimization surveys. While this data is collected in a 10-15 minute survey online, most government surveys and data collection last more time to properly define what constitutes as "registered theft" according to the police. A final factor to also consider is the respondents of this research survey; the socioeconomic conditions of respondents may differ than the national population of the Netherlands, resulting in potentially higher claimed reporting rates. Additionally, this is not a true representative sample of the Netherlands; there is possible bias due to financial gain while participating in this survey, as all respondents are paid for their responses.

4. The influence of income and geography on the likelihood to report a theft to the police:

The factor of income associates with a respondents previous experience of reporting theft to the police. Respondents of higher income brackets (greater than 3250 euros monthly) report theft at a higher rate than respondents of lower income brackets (less than 2250 euros monthly). However, the factor of geography has no determined association with the likelihood for a respondent to report theft to the police. Because geography is measured by province and not municipality due to limited data, the influence of police station proximity could not be measured. The influence of income and non-influence of geography may suggest that victims of theft are indifferent to the overall performance of police departments by geographic location when reporting theft, but their income does influence their choice (and therefore the time) to report theft. One theory is that wealthier individuals have

less reporting costs because they have less to sacrifice (in terms of time off work, lost wages, or other factors) when reporting theft. Another inference is that wealthier respondents may assume that more is stolen from them than less affluent respondents, as the amount stolen was never explicitly defined.

Based on the survey, 32.1% of thefts go unreported. This matches historical data such as CBS, where one third of thefts are listed as unreported, and the US National Crime Victimization Survey, where 30-60% of thefts are considered to go unreported.

5. The distribution of respondent's opinion on the assumed time-to-report a theft:

The distribution of assumed time-to-report theft for responses exhibits significant dispersion with a standard deviation at 1.66 hours. This value is expected for two reasons: unspecified reporting method and unspecified circumstances of theft. As discussed in the interview results, three types of reporting methods can be used by victims of theft: online reporting, phone reporting, and in-person reporting. Online reports typically take 15-30 minutes, while in-person reports typically take 1-3 hours, depending on the amount of information available after theft. Additionally, appointments sometimes must be made for theft when reporting in-person. This diversity of reporting method is reflected in the distributed response results from the survey. Unspecified circumstances, such as the type of theft, are also another potential reason for the significant dispersion; some respondents may imagine this hypothetical theft scenario as a bicycle theft that can be easily reported online while other respondents may imagine a theft scenario in which the perpetrator is seen and must be reported in-person.

Of the 1547 respondents, 81 (5.2%) assume that theft would take six hours or more to report. One reason for this significant number could be that respondents assume an "initial declaration" of theft also involves the duration before they attend a scheduled appointment for an in-person meeting with the police. Another potential reason for this significant figure is that respondents may assume an "initial declaration" of theft also involves also subsequent meetings with the police.

6. The influence of income, geography, and previous victimization on the assumed time-to-report theft to the police:

The positive association of income, geography, and previous victimization with the assumed time-to-report theft may lead to several inferences. First, as previously discussed, higher income respondents may have less time constraints than lower income respondents due to more flexible working hours and less immediate need for basic income. The designated higher income bracket in this survey has an average reporting time of 3.0 hours compared to the lower income bracket's average reporting time of 1.9 hours. This may be because higher income respondents would be more inclined to use the full extent of police resources (and time). Consequently, although higher income respondents may incur greater reporting costs (additional lost wages) attributed to longer reporting times, there might not be an immediate decline in the overall livelihood of these respondents. As expected, residents of North Holland (the most wealthy province in this survey) also have the highest average reporting time, at over 3 hours. One inference from this result may be that the city of Amsterdam, the most populous in the Netherlands, typically has the most constrained use of resources due to a higher crime rate. Assumed reporting time also differs significantly based on victimization. The assumed time-to-report theft for previous victims that have reported their last theft, previous victims that have not reported their last theft, and non-victims is 3.1, 2.8, and 1.9 hours, respectively. There is little difference between victims that have and have not reported theft (less than 20 minutes), but there is over one hour of difference between previous victims of theft and non-victims of theft. This trend can be observed across the survey, wherein respondents with prior victimization experiences respond similarly irrespective of their history of reporting theft incidents, but exhibit notable distinctions when compared to respondents who have not experienced theft in the past year. No definitive inference can be drawn from this trend; however, one idea suggests that following a hindering encounter with theft, respondents may undergo a transformation in their moral character, which could influence their opinion on theft reporting times compared to their predisposition prior to this experience.

9.1.2 Reporting Threshold Surveys

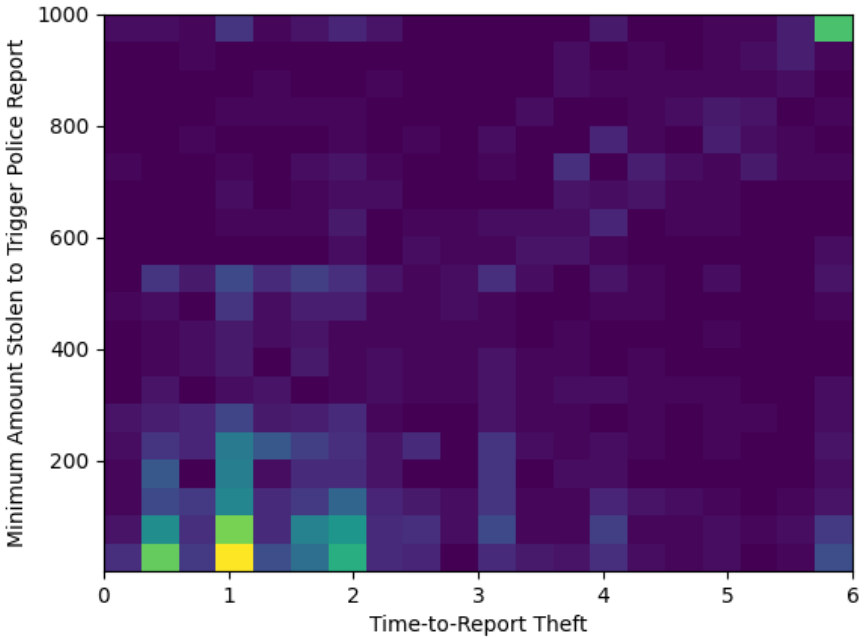


Figure 65: Assumed Time-to-Report Theft vs. Minimum Amount Stolen to Trigger a Report (Heat Map)

Figure 65 displays a heat map of how every individual respondent's answer for assumed time-to-report theft corresponds to the minimum amount of money they would be willing to lose before reporting to the police. If the theory that reporting costs (in this case, time spent reporting theft and lost wages) are the primary determining factor in a victim's reporting threshold is correct, there should be a distinct association between these two questions for individual respondents. In reality, a association can not be determined with the limited range of data (r-squared < 0.2). With a total average reporting time of 2.2 hours and average minimum amount stolen of 273.5 euros, the overall average amount of euros required to trigger theft per one hour of reporting is 124.32. Respondent answers deviate from this value significantly; answers instead concentrate around certain thresholds of time-to-report and amount stolen. For example, respondents that assume one hour is required to report theft would most likely have a minimum reporting threshold of one euro. On the other extreme, respondents that assume theft requires more than six hours to report most often chose reporting thresholds of over 1000 euros. These vastly different reporting threshold averages (1 euro per hour vs. 167 euros per hour) suggest that there is a different factor besides reporting costs that significantly influences a respondent's decision to report theft. From scoping and stake-holder interviews, this trait is determined most likely as some predisposed moral character possessed by respondents; police and general public interviews reveal that some victims feel the moral obligation to report crime no matter the circumstances, while other victims feel the opposite. This "moral predisposition" factor, determined as m, can therefore be added to the original reporting threshold equation from the research approach (Bowles et al., 2009):

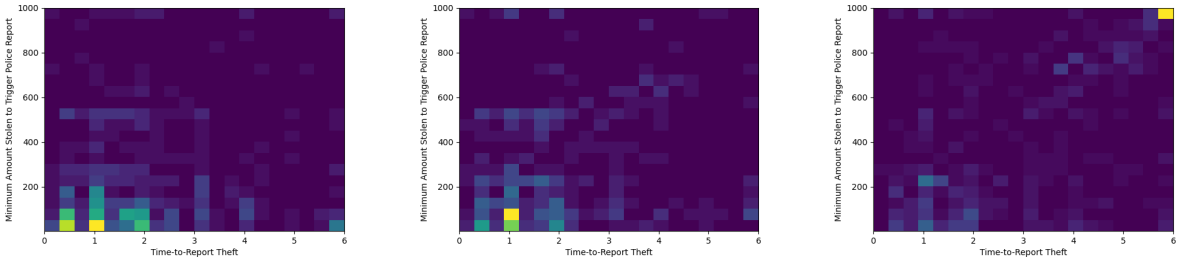
$$px > (wt + m) \tag{4}$$

A respondent's moral character can either positively or negatively influence a victim's reservation threshold. Therefore, future surveys must consider that m can either be positive or negative. One method that may help determine moral character in victimization surveys is the implementation of moral machine experiments at the beginning (Awad et al., 2018). While these experiments are typically used to train algorithms in self-driving vehicles to determine the most "acceptable" moral dilemmas, the methodology is also effective in determining the moral preference of real people. By determining a respondent's predisposed preference for reporting crime before the reporting threshold survey, the

significance of influence for moral character can be relatively compared to the same respondent's time-to-report assumptions and reporting thresholds.

Regardless of whether the affect is more on reporting costs or moral character, the respondent demographics analyzed in this research undoubtedly influence reporting threshold. Specifically, these demographics are income and previous instances of victimization. Geography was not analyzed in a heat map as a victim's choice to report theft in the past year was already shown to have no association with province.

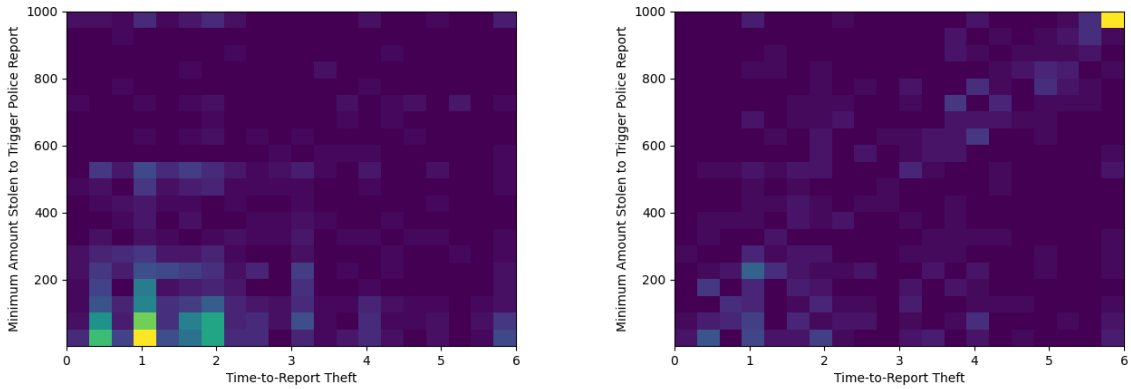
Figure 66: Assumed Time-to-Report Theft vs. Minimum Amount Stolen to Trigger a Report (by Income)



(a) By Income: 0-2249 Euros *(b) By Income: 2250-3249 Euros* *(c) By Income: 3250-5000+ Euros*

A respondent's income significantly influences their reporting threshold. On average, respondents from the lowest, middle, and highest income brackets in this survey are have an average reporting threshold of 105.95, 139.75, and 150.50 euros per hour, respectively. In general, respondents with higher income are willing to experience higher reporting costs when reporting theft. The variation in these reporting costs, however, is again significant. One reason for the different reporting thresholds is that a significant proportion of lower income respondents typically report the theft regardless of the amount of the minimum amount stolen while a significant proportion of higher income respondents only report the theft when the most amount of money is stolen. This may be related to the notion that higher income respondents can sacrifice more time (reporting costs) because their time-off employment is more secure, or this may be related to the idea that higher income respondents have different preconceived notions on reporting culture. As stated before, moral experiments before the survey linked with participants may help determine this question.

Figure 67: Assumed Time-to-Report Theft vs. Minimum Amount Stolen to Trigger a Report (by Victimhood)



(a) By Victimhood: Non-Victims *(b) By Victimhood: Previous Victims*

A respondent's previous experience with theft in the past year also significantly influences their reporting threshold. Non-victims (in the past year), victims that reported theft, and victims that did

not report theft each have an average reporting threshold of 116.05, 156.00, and 144.57 euros per hour, respectively. Figure 67 displays only the heat maps of non-victims and victims (both reporters and non-reporters of theft) as the trend between reporters and non-reporters was minimal. A similar trend to income level can be observed; a significant proportion of non-victims report the theft regardless of the amount stolen while a significant proportion of victims report the theft only when the most amount of money is stolen. Between the ideas of reporting costs and moral character, a change in moral character after experiencing theft and the reporting process seems to be the more likely reason for an overall increase in reporting threshold. Again, moral character experiments on reporting criteria may help confirm this hypothesis.

Finally, for respondent reasons to not report theft, further research may be guided by the association of some victim factors. While some respondent factors do associate with some reasons to not report theft, the purpose of this portion of the survey was not to declare definitive conclusions. For example, no significant conclusion can be drawn from previous victims of theft associating with lack of trust in the police as a reason not to report theft. Numerous other factors that are indirectly associated with victimization may affect a victim's reporting reasons (and lack thereof). One scenario could be that a significant proportion of victims believe they can resolve theft scenarios themselves without police involvement - especially as numerous theft scenarios involve relatives as the perpetrator (CBS, 2022). In these cases, a victim may not "trust" the police to resolve the case without further escalation. To truly determine the reasons for how previous victimization influences reasons to not report theft, interviews (rather than surveys) with victims may be a better option to gather more significant insights at the expense of less responses.

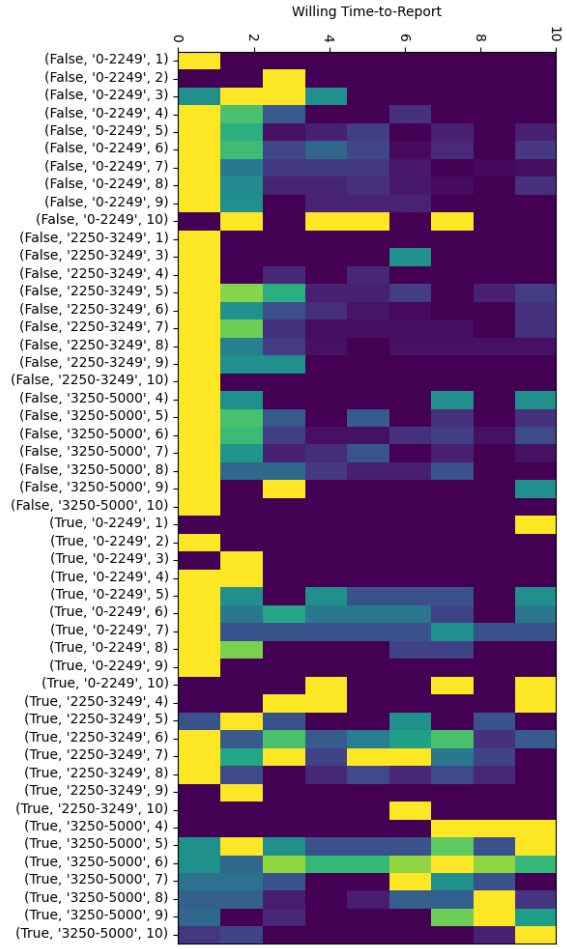
9.1.3 Desired Outcome Surveys

From an economic decision-making perspective, the results of the desired outcome surveys are rational; the satisfaction of full monetary re-compensation scenarios increases as more money is stolen. Another method to track the rationality of these survey responses is to compare question 7 (the preferred outcome at a respondent's reservation level) with scenarios 3 and 4 of question 9 (the preferred outcome when a predetermined amount of euros is stolen). In question 7, 53.4% of respondents valued re-compensation of getting the perpetrator caught. In scenarios 3 and 4 of question 9, respondents only preferred the perpetrator being caught at a stolen amount of 1000 euros; otherwise, they always preferred re-compensation. This may suggest that a respondent's reservation level may serve as an inflection point between their preference of a perpetrator being caught or being re-compensated in theft.

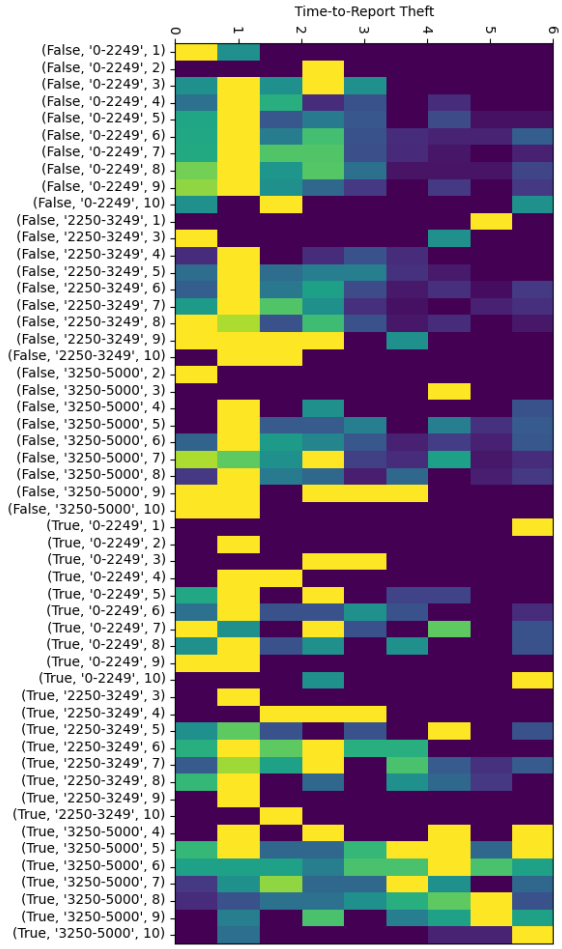
Another inflection point may also be observed in the willing time-to-report theft based on the amount of money stolen in question 10 (Figure 51b). At a willing time-to-report threshold of just under two hours, the preference for how long respondents are willing to report theft flips based on the amount stolen. This decision again matches reality; respondents that lose more would be willing to wait more time to report, and respondents that lose less would be willing to wait less time to report.

Willing time-to-report theft may also be analyzed from a perspective of victim factors *and* average satisfaction level. In this way, the influence of how satisfaction level may influence a respondent's average willing time-to-report may be reviewed for associations. Figure 68 displays the normalized heat map of how a combination of victim factors and average satisfaction level (scaled 1-10, from Q9) might influence both a respondent's willing *and* assumed time-to-report theft when the outcome is unknown. The victim factors analysed are victimhood (True/False) and income (0-2249, 2250-3249, and 3250-5000).

Figure 68: Willing AND Assumed Time-to-Report Heat Map by Victim Factors and Satisfaction Level (norm)



(a) Willing Time-to-Report Theft (Sample A)



(b) Assumed Time-to-Report Theft (Sample A)

From the heat map, satisfaction level does not yield any significant association. However, as expected, previous victims of theft and higher income respondents are both willing to report theft for longer and assuming that theft takes longer to report. One significant insight that can be easily displayed in the graphs is that respondents are willing to report theft for less time than they assume that the theft takes to report. This is most likely due to the fact that in the willing time-to-report question, the amount stolen is defined as 100 euros (sample A); in the assumed time-to-report question, the amount stolen is undefined. Therefore, respondents in the assumed time-to-report question may be basing their response on hypothetical scenarios which require more effort to report than a loss of 100 euros.

Finally, the way in which respondent factors influence satisfaction level follows a unique trend in this survey. Higher income levels and previous victims respond with more satisfaction to *every* scenario except for #6 (statistically insignificant). This may suggest that previous victims and higher income respondents are generally more satisfied, regardless of outcome, so long as the police succeed. However, another idea is that these types of respondents are more pessimistic in the overall outcome of crime; when the police successfully resolve a crime through either re-compensation or a caught perpetrator, these respondents are relatively more satisfied than other respondents due to having lower expectations. Appendix C presents the influence of income and victimhood on every single outcome. Figures 92, 93, and 94 explicitly show a sharp distinction in satisfaction level which may support this idea.

9.1.4 Crime-Specific Severity Surveys

The ranking of crime-specific severity scenarios allows for external factors such as item category, privacy, and personal association with property to be compared. In general, scenarios associated with

privacy violations were considered the most severe (online theft, stealing from personal bag, and pick-pocketing) while theft of items regardless of category were considered the least severe (stolen groceries, bicycle, electronics, and cash). Stealing from relatives was considered the most severe regardless of victim factors; the reasoning for this, as determined and discussed further in the comparison with police interviews, is most likely due to a victim's breach of trust.

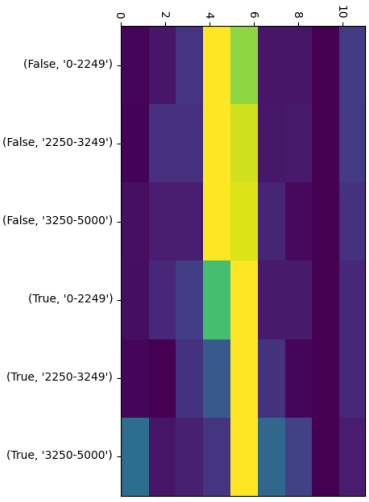
The severity between scenarios was relatively constant when the monetary amount stolen was unchanged. On average, respondents would only perceive the most severe scenario as approximately twice as severe as the least severe scenario. However, the influence of monetary amount stolen on the perceived severity of theft presents the strongest correlation in the entire survey. The weakest correlation coefficient was 0.1877 (luxury good: stolen electronics) while the strongest correlation coefficient was 0.3817 (basic good: stolen electronics) for these scenarios. This may suggest that respondents associate the severity of stolen basic goods more with the monetary value stolen when compared to the severity of stolen luxury goods. The second weakest correlation was money stolen from a family member; respondents tend to perceive theft from a trusted family members as extremely severe regardless of the amount stolen.

While the amount stolen associates with the severity of every scenario, income and victimhood do not make this association. Specifically, income and victimhood present no association with severity in the scenarios of stealing from a family member, stealing from a personal bag, and stealing online. Non-coincidentally, these are also considered the top three most severe scenarios in the survey. Both of these results may lead to the conclusion that respondents perceive these scenarios as particularly severe regardless of their income or victimhood; instead, their severity is dictated by some moral judgment - perhaps in terms of privacy violation or a breach of trust. The weakest correlation shared between income and victimhood relates to pick-pocketing while the strongest correlations shared between the two factors are with scenarios that involve common goods (groceries and bicycles). This again affirms the theory that a privacy violation may overrule the influence of income and victimhood in certain theft scenarios.

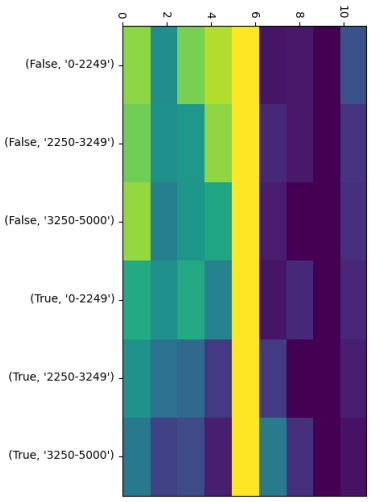
If the theory suggesting that income and victimhood affect the severity of theft scenarios involving stolen basic goods, but not the severity of theft scenarios concerning privacy violations, is accurate, it could greatly enhance the ability to predict unreported crimes of certain victim groups that pertain to specific types of theft. This finding might have a substantial impact on improving the accuracy of crime prediction for these specific cases. Finally, the perceived severity of theft in this survey may also serve as an exploratory question about how the police define appropriate prosecution of theft in these scenarios; however, whether the police and government should base justice off of society's perceived severity of certain crimes is a question that will not (and can not) be answered in this research.

Figure 69 displays how the combined factors of income (0-2249, 2250-3249, 3250-5000+) and victimhood (False, True) influence the perceived severity in all eight scenarios. As previously described, the influence of income and victimhood can easily be distinguished by the progressive shading along the y-axis (as most visible in the first two scenarios). Some scenarios (such as the last two) do not have any distinguishable shading, signifying that a significant influence of the factors does not exist. As discussed in the theft severity comparison between surveys and interviews, future crime-specific severity surveys should further classify scenarios that are affected by privacy and breach of trust.

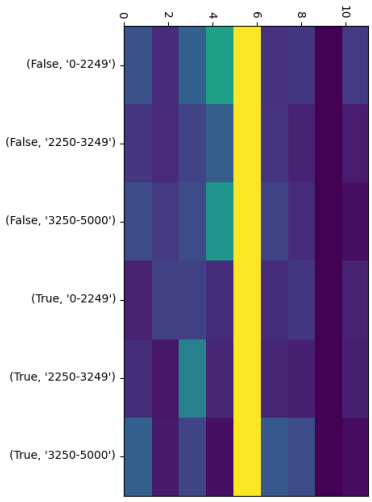
Figure 69: Perceived Theft Severity Heat Map by Victim Factors, Sample A (normalized)



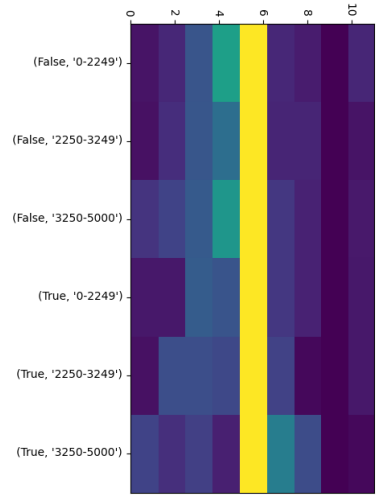
(a) S1: Stolen Bicycle



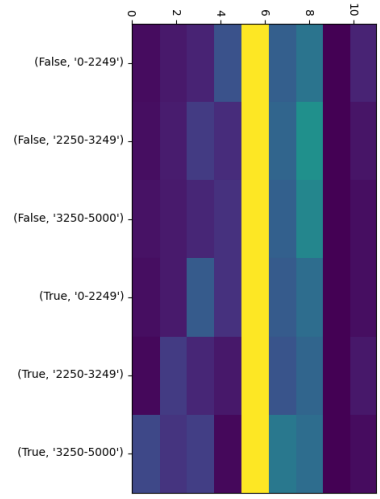
(b) S2: Stolen Groceries



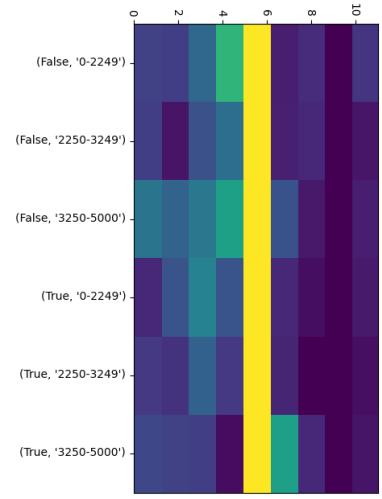
(c) S3: Pick-Pocketing



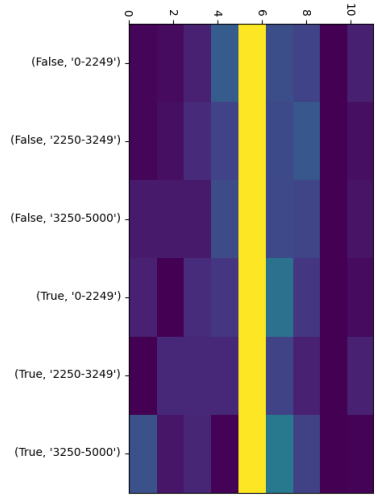
(d) S4: Stolen Electronics (store)



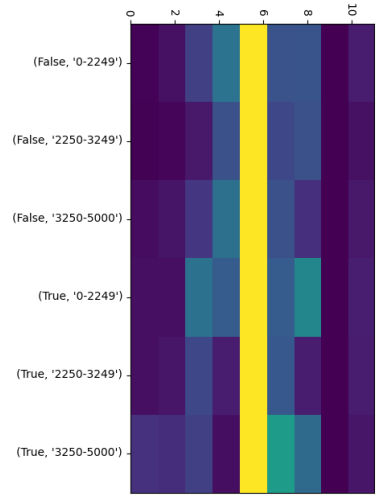
(e) S5: Stealing from Relatives



(f) S6: Stealing from Cash Register



(g) S7: Stealing from Personal Bag



(h) S8: Stealing Online

9.2 Survey and Interview Comparison

In this section, the results of all interview types are compared with survey responses and associations. This analysis may reveal how the perspective of the general public compares to the police, and the insights gained from police interviews may provide some reasoning to results within victimization surveys. Therefore, this analysis involves a comprehensive examination of each section of the survey (and survey-based interviews), focusing on identifying similarities, differences, and potential explanations from a police perspective regarding the responses to survey questions.

9.2.1 Theft Reporting Procedures (Scoping Questions)

As discussed in the survey-based interview results, the three reporting options for theft are online, on the phone, or in-person. This diversity in reporting options result in a large range of time-to-report thefts, ranging anywhere from 15 minutes (for online reports) to 3 hours (for in-person reports). This may suggest that an average assumed time-to-report theft of 2.2 hours according to the survey is reasonable. However, according to the police, a vast majority of thefts reported to the police in-person or on phone could actually be reported online within 15-30 minutes. Therefore, while the range of responses on assumed time-to-report theft in the survey is accurate in reality, the average may suggest a significant insight for police. Because the system of reporting online is relatively new (3 years), many citizens still choose to report thefts in-person when they can still achieve their same motivation for reporting (usually insurance claims) by reporting online in less time. Therefore, with enough public notice over time, the average assumed time-to-report theft may decrease if this survey is implemented again. The rate at which average assumed time-to-report theft may be used to analyze the success of police departments in notifying the public about reporting options.

The victim factors of income, geography, previous victimization, and amount stolen - as determined through scoping interviews - are also considered to affect reporting procedures. Police believe that as long as insurance is guaranteed, victims will always report theft regardless of other factors. However, when insurance is removed as an option, police believe that higher income, denser population centers, higher amounts stolen are all positively associated with assumed reporting times. Police did not assume that previous victimization would positively associate with reporting time; they believed the opposite.

Table 8: Factor Association with Assumed Time-to-Report Theft

Factor	Surveys	Interviews
Income	+	+
Geography (Population)	+	+
Amount Stolen	Not Asked	+
Previous Victimization	+	-

According to the police, knowledge of online reporting after victimization should result in previous victims to assume lower reporting times compared to non-victims; this is not the case in the hypothetical victimization survey. Various external influences may account for this. In one case, respondents that consider themselves a "victim of theft" in the past year may only be considering more severe cases that take more time to report, while less severe cases of theft are ignored by most respondents. This would actually result in a positive association between victimization and reporting time, as suggested by the survey data. Future assumed time-to-report surveys should account for the type of reporting method and type of theft (with examples provided by police in the results) in order to more accurately measure how the public perceives reporting time.

9.2.2 Reporting Thresholds

Although police employees believe that a reporting threshold (minimum amount of money stolen in theft) is difficult to determine without understanding the circumstances of theft, they all believe (unprompted) that a reservation level of either 50 or 100 euros is the most reasonable amount. This

corresponds with the most chosen values in the reporting threshold section of the survey. Police also believe that there are a significant proportion of victims that will always report theft and never report theft, regardless of victim factors - though they are unsure of this proportion.

Police believe the only factors from the survey that significantly influence reporting threshold is income and geography. For income, they believe higher incomes corresponding to higher reporting thresholds. For geography, they believe Amsterdam will dominate the reporting threshold because theft occurs the most often in that city.

Table 9: Factor Association with Reporting Threshold (Minimum Amount Stolen to Report)

Factor	Surveys	Interviews
Income	+	+
Geography (Population)	+	+
Previous Victimization	+	No Association

Similar to the case with assumed time-to-report theft, the police employees' predicted association with previous victimization does not match the positive association of the surveys (where previous victims actually have higher reservation thresholds). This may be for the same reason as previously described; "previous victims" might only choose to base their last victimization experience on more significant thefts. However, another explanation may be that previous victims now have a new reporting threshold due to their experience of theft and the reporting process. There is a chance they believe reporting theft is "not worth" the reporting costs unless a significant amount is stolen. This conclusion can not be definitively proven from this reporting threshold survey; one option is to create victimization surveys purely for victims to analyze their opinion on the reporting process for theft.

Table 10: Ranking of Reasons to not Report Theft

Reason	Surveys	Interviews
I don't think the police could help me in this situation	1	2
I think the contacting the police will take too much time and effort	2	3
The amount of money stolen is not financially significant to me	3	6
I would not report the theft regardless of the amount of money stolen	4	4
There is another reason I would not report the theft	5	5
I do not trust the police	6	7
I am not insured	N/A	1

When lack of insurance is ignored as an option in interviews, the unprompted reasons for victims not reporting theft according to the police almost match the responses in the survey. One significant difference is that police believe that the financial amount stolen is usually a low-priority reason for not reporting theft, when in reality, this is the third most chosen reason to not report theft by survey respondents. Police also believe that one of the major "other" reasons for victims to not report theft is that victims believe they can resolve the crime themselves. While this reason may be more applicable to cases of theft where the victim knows the perpetrator (such as a family member), this insight could still be included as an option in future victimization surveys.

9.2.3 Desired Outcomes

The police employees interviewed believe "about half" of victims prefer full re-compensation of their stolen property over having the perpetrator be caught; according to the survey, this amount is 41.2% of respondents. The police also believed that personal morals, rather than factors, dictates a respondent's desired outcome.

Table 11: Factor Association of Desired Outcome after Theft (Question 7 - Money is reimbursed and the perpetrator is not caught)

Factor	Surveys	Interviews
Income	-	No Association
Geography (Population)	No Association	No Association
Amount Stolen	Not Asked	No Association
Previous Victimization	No Association	No Association

The insight that respondent's personal morals determine their desired outcome in theft over other factors is a reasonable interpretation and closely relates to the operationalization of victim reporting motivations (discussed in the research approach). One possibility for the influence of income based on this idea is that income can also influence a victim's evaluation criteria of financial recovery. This would influence the attribute of a victim's desired monetary compensation after theft. Future desired outcome surveys could include survey questions that determine a respondent's moral character; the conclusion of this report discusses the possibility of these "victim profiles."

Police also believed that a respondent's *satisfaction* in theft scenarios would not be influenced by income, geography, or previous victimization. However, in all interviews, they were less confident in this assumption. The lack of confidence in determining an association can also be contextualized in the victimization survey; although all factors displayed positive associations, these correlations were relatively weak (less than 0.2 - based on Spearman's Rank Order).

Table 12: Factor Association of Satisfaction from Outcome Scenario (Question 8, Scenario 3 - Money is reimbursed and the perpetrator is not caught)

Factor	Surveys	Interviews
Income	+	No Association
Amount Stolen	+	+
Previous Victimization	+	No Association

If future desired outcome surveys are used, a third outcome to consider, as suggested by police employees, is that people are reporting thefts specifically to make their neighborhood safer. Therefore, future surveys should make a distinction between the desired outcomes of reporting for personal justice (such as punishing the perpetrator for the victim) and public justice (such as making the community a safer place).

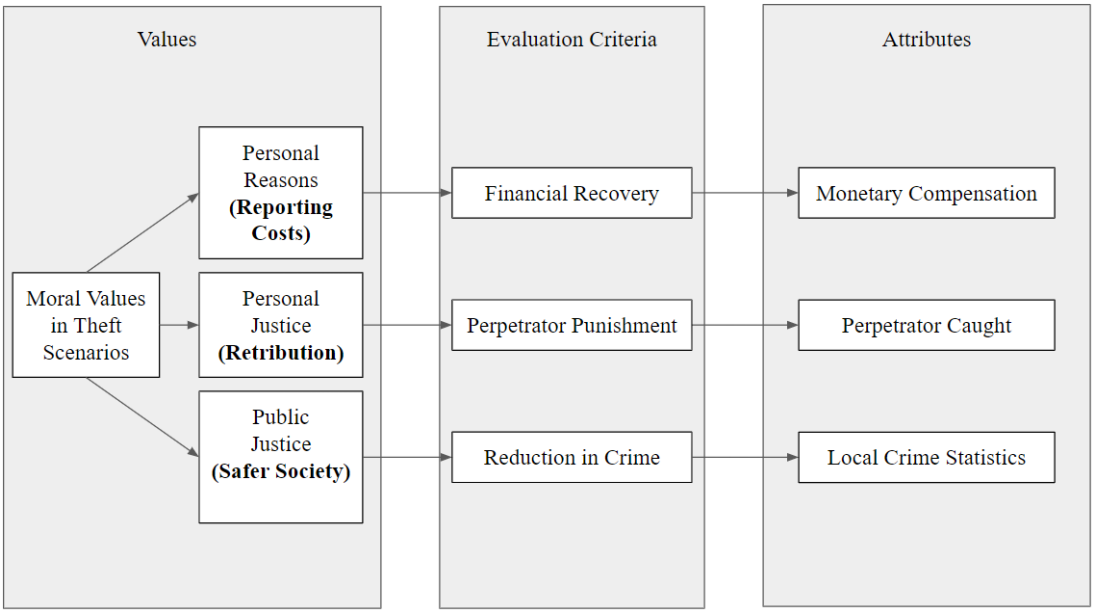


Figure 70: Operationalization of Reporting Motivations in Theft (According to Police Interviews, no Insurance)

9.2.4 Crime-Specific (Theft) Severity

Police categorized theft severity into two main categories: thefts that involve significant "emotional impact" and thefts that cause less significant "financial impact." Of these categories, police believe that the emotional impact caused on a victim is almost always perceived as more severe, except in cases of relatively large financial loss, where victims lose a significant proportion of their life savings. Several evaluation criteria can contextualize the categories, and specific theft scenarios can serve as measurable attributes for these criteria defined by the police.

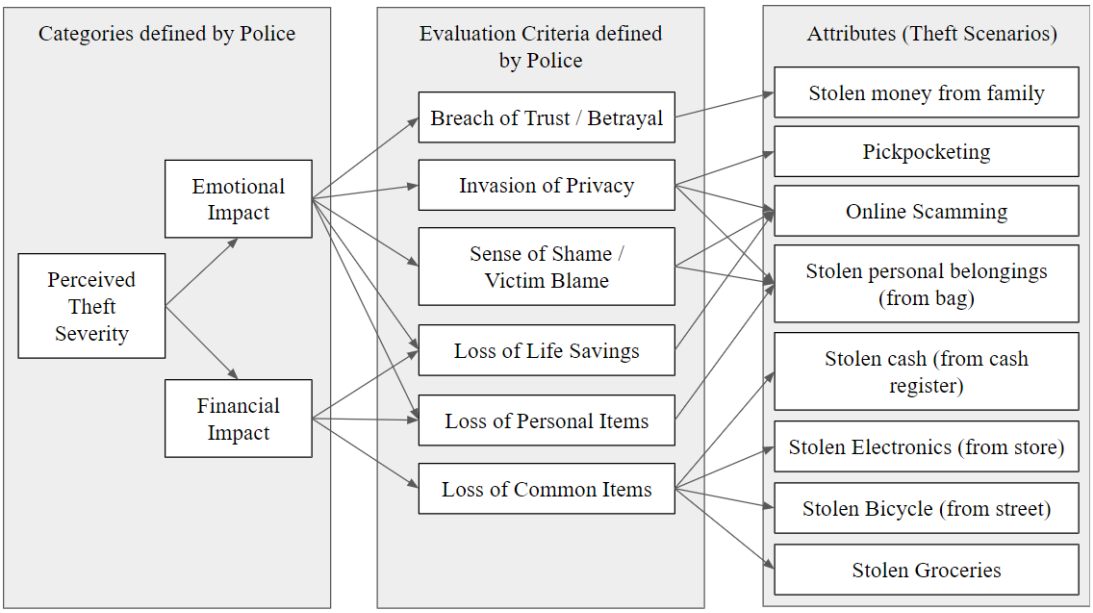


Figure 71: Operationalization of Theft Severity (According to Police Evaluation Criteria)

Hypothetical theft scenarios from the victimization survey can be ranked according to police evaluation criteria. However, there are some contradictions in the defining attributes. The most significant is the evaluation of a sense of shame. Police believe a sense of shame actually leads to victims perceiving theft as *less severe*. Therefore, when victims suffer from a theft in which they blame themselves (such as leaving a bag unattended in public or failing to recognize an online scam), they do not perceive the theft as worth reporting because they are blameworthy. However, when other evaluation criteria also affect a theft scenario, such as invasion of privacy, this makes ranking these types of scenarios impossible. Police believe that the perceived severity of scenarios such as online scamming also depends significantly on the circumstances of the victim. Victims that are more vulnerable to online scams (such as international students and the elderly) will be more affected than other types of victims. Therefore, scenarios with evaluating criteria of shame and victim blame and other evaluating criteria were not able to be ranked by police.

Table 13: Ranking of Perceived Theft Severity

Reason	Surveys	Interviews
Stolen Groceries	8	8
Stolen Bicycle (from street)	7	7
Stolen Electronics (from store)	6	6
Stolen Cash (from cash register)	5	5
Pick-pocketing	4	4
Online Scamming	3	?
Stolen Personal Belongings (from bag)	2	?
Stolen Money from Family	1	1

The absence of a severity ranking for online thefts is significant, given that online thefts persistently

demonstrate a substantial annual increase compared to all other types of theft. Therefore, a future theft severity survey should aim to determine the severity of online theft alone. In this way, evaluating criteria of shame, privacy invasion, and financial loss can all be analyzed independently to determine their influence in reporting costs.

9.3 Application of Current Data Collection Methods

Several of the factors that influence theft in this research were chosen deliberately because they are not consistently used in analysis by the central bureau of statistics. While CBS analyses how factors of age, gender, sexual orientation, and education level influence crime statistics annually (CBS, 2021), the bureau does not provide easily accessible statistics to the influencing factors of income and previous victims. From this survey, the influence of victim income and previous experience of theft is statistically proven to associate with perceptions of theft scenarios. If CBS chooses to include future factors that affect crime statistics, the factors measured from these victimization surveys should serve as a decent exploratory measure of their influence.

In addition, the factors currently being measured are only being used by CBS for yearly crime statistics analysis and not for predictive policing. One option by the police is to compile these factors to formulate future projections of theft and theft reporting. Scoping interviews have revealed that certain monitors in the security & analysis unit already have the organised capability to perform these assessments. By including the parameters of how significantly certain victim factors influence crime reporting, dark numbers - discussed in the conclusion of this report - can more accurately be geographically predicted with current police data collection methods.

CBS also presents the Security Monitor, commissioned by the Ministry of Justice and Security (CBS, 2022). This monitor goes into detail about security perception, traditional crimes, online crimes, and the interaction between citizens and police. However, the perception of reporting costs and desired outcomes by victims of crime are less explored. Therefore, desired outcome surveys and reporting threshold surveys may serve as a useful addition to these sections, as they complement the types of questions being asked to respondents. For example, police satisfaction levels are currently measured; one addition to this section could be a victim's satisfaction with how police can solve their crime. In another example, feelings of insecurity are measured by region; another measure that may complement this statistic is feelings of crime severity by region.

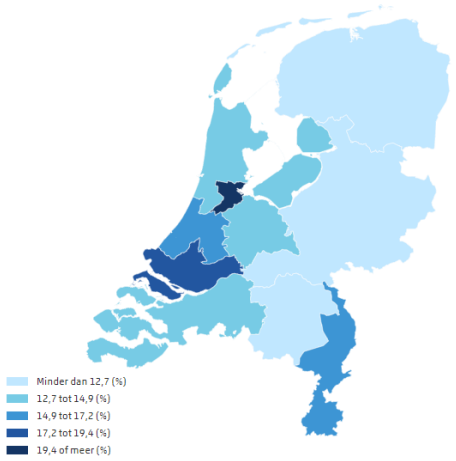


Figure 72: Feelings of Insecurity by Region (CBS, 2022)

The police also already have experience in interviewing victims; they currently perform a study called the "Slachtoffermonitor" (Victim Monitor) that reviews how victims of crime rate the support that they receive from the police. The English summary of results from this monitor are discussed in Appendix E. While this monitor is useful in analysing victim values regarding police support, an alternative approach could involve incorporating a section within this monitor to explore how victims perceive crime itself, rather than solely focusing on police responses to crime. The same method for

reaching out to respondents could be used, without the need to rely on external survey companies (which may result in significant data privacy concerns).

Therefore, all components of the victimization survey completed in this research can already be applied to CBS and police monitors. Scoping questions, reporting threshold surveys, and desired outcome surveys can complement current security monitors used by CBS while crime-specific perceived severity surveys can complement victim monitors performed by the police. The strategy for finding respondents for these surveys is already well established by both CBS and the Ministry of Justice; these strategies should continue to be used to ensure respondent privacy if these additional surveys are incorporated.

10 Discussion and Conclusion

The following research question has been explored in this report:

Main Research Question:

To what extent can victimization surveys and officer interviews, in coordination with current police measurement methods, improve the current theft prevention and resource allocation strategies for the Dutch National Police?

Main Research Answer:

Victimization Surveys can reveal a respondent's knowledge of reporting procedures, reporting thresholds, desired outcomes after reporting, and perceived severity of theft. These components of theft significance can help the police determine strategies to encourage theft reporting and provide victims with proper support. In addition, the victim factors of income, geography, previous victimization, and the amount stolen in theft are shown to have associations with the components of theft in this report. Police interviews can provide unique officer experience on how victims are affected by theft. Because officers have the most interaction with how victims perceive theft, they can interpret and implement the results of victimization surveys the most effectively. When combined, police interviews and victimization surveys can improve current theft prevention and resource allocation strategies through improving current police evaluation methods on unreported crime ("dark numbers") with victimization profiles. Finally, analyzing theft from the perspective of victims and officers provides a more holistic view on how the police define safety and security provision in society.

10.1 Relevance to Management of Technology

One of the core purposes of Management of Technology is to implement scientific methods and techniques to analyze a problem in a technological context. The conclusions drawn from this research complement this objective. Specifically, the use of victimization surveys and officer interviews to facilitate resource allocation for the Dutch National Police offers a unique perspective on the use of new measurement methods to improve organizational efficiency. This research was also completed through an internship with innovation sector of the Dutch National Police; the development of these data measurement methods in such an environment has allowed for this research to serve as a corporate resource to improve the strategy of how the police measure crime. This same level of development and efficiency would not be as achievable from a pure university research perspective. The course-level subjects of Research Methods, Social and Scientific Values, and Inter- and Intra-organizational Decision Making are also highly relevant to the specific context of this project. The ethical importance attributed to the crime of theft aligns with the ethical constraints discussed in Social Values. Additionally, the measurement techniques employed in this project are grounded in the fundamental principles taught in Research Methods and Inter- and Intra-organizational Decision Making. Finally, this research approaches the measurement of theft from an innovative way: perspective. Taking into account the viewpoints of both the police and the victims allows for a comprehensive understanding of theft, enabling the identification of its defining characteristics. This novel measurement approach aligns with the overarching goal of the Management of Technology, emphasizing improved measurement techniques through novel approaches.

10.2 Limitations of Research

The results of formulating a novel approach to measuring theft comes with expected limitations. First, as with all research, correlation *does not* imply causation. Drawing definitive conclusions on the associations between victim factors of theft and the significance of theft is not feasible. Instead, the significance of theft may be influenced by underlying confounding variables that have not been defined in this research. For example, previous victims of theft may share a number of characteristics and

co-related factors that have a more pronounced effect on their perceived significance of theft than past experiences of victimization. These unmeasured factors may serve as a better explanation for how the public perceives theft. Second, the respondents of this survey are not a perfect representative sample of the Netherlands; they are a representative sample provided by the survey company. While the income and geography distribution of respondents closely resembles the demographics of the Netherlands, all respondents of this survey share one common characteristic: they are paid by the company to fill out answers to surveys. This may inherently influence the perceived significance of theft, such as the likelihood to report theft or the likelihood to trust police (as the survey responses are recorded by the company). Third and finally, incorrect inferences may be drawn from the manner in which questions were designed for this survey. For example, a victim's reporting threshold can be considered to represent different measurements, such as a victim's reporting cost with *assumed* probability of re-compensation or *known* probability of re-compensation. In another example, clarifying a precise definition of a "declaration of theft" to the police is not feasible in a survey that is designed to take 10 minutes. Independent surveys that detail the guiding criteria of each question would need to be designed to mitigate the ambiguity in these questions.

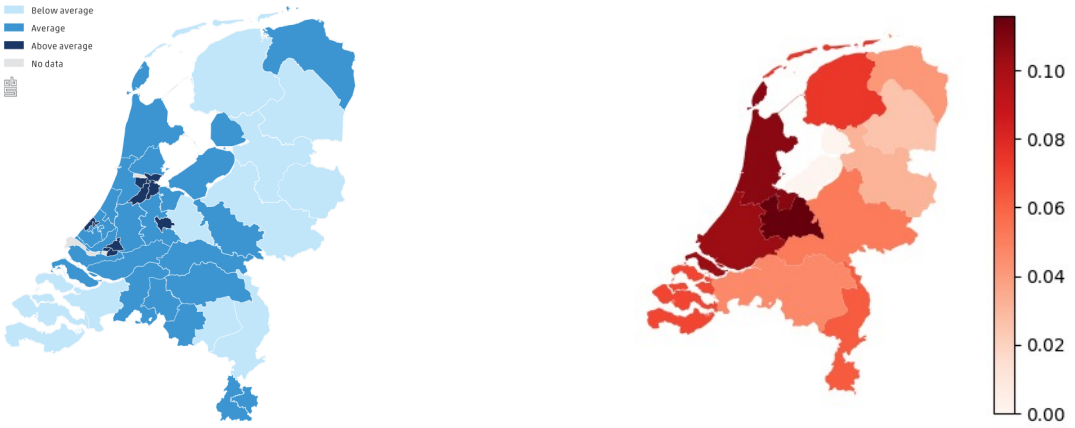
10.3 Recommendations to the Dutch National Police

Victimization surveys and officer interviews, in coordination with current police measurement methods, can add significant value to current theft prevention and resource allocation strategies for the Dutch National Police. Specifically, survey methods are effective in determining how the victim factors of income, geography, previous victimization, and the amount stolen in theft influence the likelihood for victims to report theft, the preferred outcome after reporting theft, and the perceived severity of theft. Interviews with police provide unique insights to the varying degrees of victim-factor influence, especially as officer perspectives are often not easily accessible to the public. When the experience from officer interviews are compared with victimization surveys, the application of these methods can facilitate predictive policing. Unreported theft (dark numbers) can more accurately be applied to hot-spot policing tactics, and the creation of victim profiles may serve as a useful prevention tool for victims more susceptible to theft. Finally, the implementation of standardized victimization surveys and officer interviews will ultimately help the Dutch National Police determine how to define security in Dutch society from a diverse set of complementary perspectives.

10.3.1 Unreported Theft (Dark Numbers)

Hot-spot policing is already used as an effective resource allocation method by the Dutch National Police. However, the basis of hot-spot policing on reported crime statistics does not match reality as significant proportion of crimes in the Netherlands are not reported. Therefore, as determined through interviews with the signal & analysis unit based in the headquarters of The Hague, current hot-spot policing measures already incorporate some prediction of dark numbers into their current hot-spot policing methods.

Figure 73: Crime Rates vs. Proportion of Respondents - Victims but did not Report Theft in the Past Year



(a) Crime Rates (CBS, 2016)

(b) Proportion of "did not report" (P-value: 0.046)

This research suggests that the application of hot-spot policing within the Netherlands can go one step further. With the incorporation of victim factors in victimization surveys, police can determine *what* influences victims to not report theft and *why* these victims do not report theft. Therefore, hot-spot policing can be updated with more accurate dark numbers based on population demographics, *and* dark numbers can also be further mitigated through increased theft reporting initiatives by police. As discussed in the literature review of this research, other countries such as the United Kingdom already make extensive use of victim factors from surveys to formulate predictive measures. At the same time, the Ministry of Justice in the Netherlands also believes the police have the resources for these same capabilities. Therefore, a steering initiative from the headquarters in The Hague with further emphasis on data analysis of victim factors in regional police departments is recommended to further the goals of more effective policing.

10.3.2 Victim Profiles

Dark numbers can be more accurately predicted through a creation of victim profiles. These victim profiles may serve as an indicator to the perception of theft for victims based on a number of indicators both associated with the victim and with the circumstances of the theft itself. For instance, a victim of higher income that suffers from a theft of a relatively "high" amount stolen is generally more likely to report the theft, prefer monetary compensation over the perpetrator getting caught, be willing to report the theft for longer, and perceive the theft more severely compared to a victim of lower income that suffers from a "lower" amount stolen. Figure 74 displays an example of a victim profile that considers two factors: income and the amount stolen in theft. The dashed line represents the inflection point in which either a change in income or the amount stolen in theft causes a victim's perception of certain components of the theft to increase or decrease.

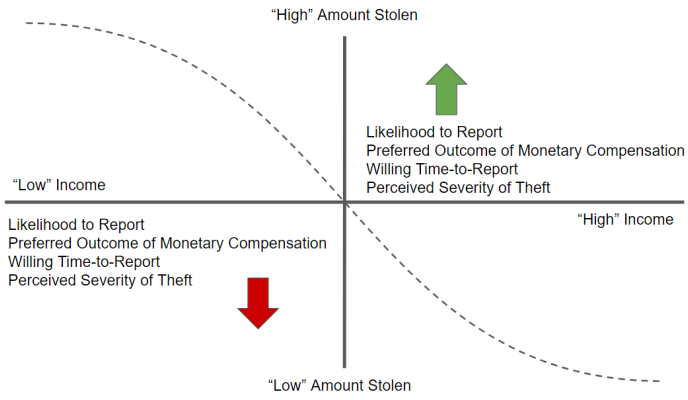


Figure 74: Victim Profile on Income and Amount Stolen in Theft

While this may seem like an obvious scenario, other victim factors and theft factors can also be applied to this same victim profile. Table 14 shows a brief summary of how some of these factors associate with certain perceptions of theft. N/A signifies that these factors were not measured in each respective question.

Table 14: Victim Profile Table: Influence of Increasing Factors in Theft

Factor (Increasing)	Victimization Chance	Rep. Threshold	Monetary Compensation	Outcome Satisfaction	Theft Severity
Income	+	+	+	+	+
Amount Stolen	N/A	+	+	+	+
Previous Victimization	+	+	+	+	+
Geography (Population)	+	+	N/A	N/A	N/A
Victim Profile	+++	++++	+++	+++	+++

As every factor increases, there is a positive association with the listed characteristics of theft. For example, a high-income respondent that is a former victim from a high-population province (such as North Holland) is significantly more likely to have a higher reporting cost than a respondent that does not match all of these factors. The association of these factors generally match historical research. For instance, high income individuals and previous victims of theft are usually more likely to suffer from theft again due to patterns of routine activities that make them more susceptible to theft (Wittebrood & Nieuwbeerta, 2000; Anderson, 2006). Previous research also confirms that people of higher income are more likely to only report crimes at higher amounts stolen (Bowles et al., 2009). CBS data even suggests that victim factors such as income may influence a victim's satisfaction with police, which relates to their overall satisfaction in the resolution of theft. Regarding the severity of theft, the conclusions on the influence of income, amount stolen, and previous victimization all align with historical research conducted by the NSCS in 1985. (Wolfgang, 1985) *However*, there is insufficient background research on how victim factors may associate with the desired outcome of theft. This may suggest that this section of research is the first of its kind.

One component of this research to continue is to determine the magnitude of how each factor affects characteristics of theft. In this way, a victim of high income that has never experienced theft may be compared with a victim of low income that has experienced theft in the past. The association in the results of this research already provide suggestions to the magnitude of each factor on certain characteristics of theft. If this research is continued, more factors and determination of factor magnitudes will be necessary to complete a more holistic victim profile.

One significant addition to these victim profiles is the moral predisposition of respondents, discussed further in the conclusion. The analysis of reporting thresholds makes apparent that respondents of theft are motivated to report by some factor besides their reporting costs. Most likely, respondents hold some preconceived notions about the reporting costs and their reporting motivations; if these moral predispositions can be determined in victim profiles, police may be able to more effectively encourage increased reporting and provide more catered victim support.

10.3.3 POISE: POlice Intervention Security Effect

This research initially started as a continuation of a former joint interdisciplinary project with the Dutch National Police. In this initial project, the objective was to formulate a "universal equation of safety and security," in which some numerical value could help police determine the level of safety and security in society. Although the equation for this numerical value was never explicitly defined, the measurement methods that determine this value have continued to be explored. Even as the scope of this project became further defined, the same initial theme of an equation for safety was never abandoned.

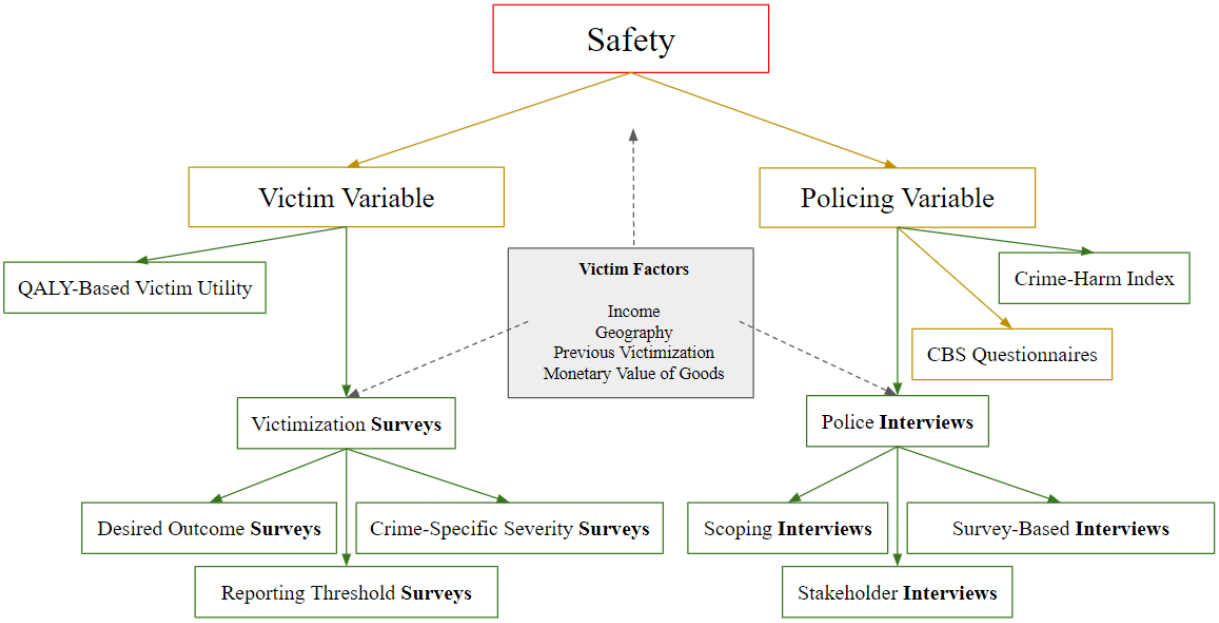


Figure 75: Updated Diagram for Safety

Figure 75 displays the final diagram for this equation of safety based on two new measurement methods: victimization surveys and police interviews. The analysis of *victim factors* within these measurement methods are shown in this research to influence the perspectives that victims and police possess on the significance of theft. Perhaps there are other victim factors that also significantly influence victimization. For example, the Netherlands is the only major country in the world to sponsor surveys that measure the victim factor of sexual orientation. The extensive use of victimization surveys in the Netherlands has shown the significant association of this factor with certain types of crimes. This research also achieves a similar objective, at a smaller scale; the framework of this research may therefore serve as an exploratory method to scope the influence of newly determined victim factors.

By approaching the measurement of safety from perspectives, the comparison of theft between methods may demonstrate unique insights that would otherwise be inexplicable in standard crime measurement methods. Conclusions drawn from this research are naturally limited to the scope of theft scenarios from a victim's perspective. However, theft is one of the most prevalent crimes in the Netherlands, and it has an indisputable influence on people's overall perception of safety in society. Therefore, theft serves as a well-established introductory crime to test new measurement methods for analyzing safety.

Finally, victims are people, not statistics. By taking a qualitative approach through surveys and interviews to see how people that are affected by theft perceive safety in these scenarios, a more holistic determination of what defines safety can be formulated. This is not to say current crime statistics and predictive policing methods are outdated or obsolete; on the contrary, qualitative methods can serve as a complement to more readily available and data-rich quantitative methods. Safety can and should be operationalized by numerous methods. The Dutch National Police have the capability in terms of resources and human expertise to incorporate more extensive victimization surveys and interviews in their current data collections. The final recommendation, as concluded from the analysis of victimization survey and interview results in this research, is to explore the implementation of these methods in the current police framework.

10.4 Recommendations for Future Research

The survey results from this research serve as a good exploratory introduction to future research opportunities. Specifically, the association of the studied victim factors with the significance of theft may lead to several inferences that impact how the police provide safety and security to the public. Three subjects of recommendation for future research are the concepts of reporting privilege, classification of perceived severity in online thefts, and a moral predisposition factor in reporting thresholds.

10.4.1 Reporting "Privilege"

As seen in the Victim Profile Table (Table 14), income positively associates with every sub-component of theft. This *may* imply that increased wealth provides respondents with some form of reporting "privilege," where they perceive theft and the reporting costs associated with theft differently. If this implication is true, this would have significant indirect effects on how the police interact with different income brackets regarding theft. Victims of theft from higher income brackets may hold different expectations from the police while reporting compared to victims of lower income brackets. This may cause victims of lower income brackets to be underrepresented in reporting due to not perceiving theft as severely or not being as satisfied with the outcomes of theft resolution. A future recommendation of research is to focus purely on a victim's income to determine if some form of reporting "privilege" exists. Here, "privilege" refers to the representation that victims from different income brackets have when reporting theft; this representation can come in many measurable forms, such as reporting costs (time and lost wages available to report), ease of access to police services (especially for those with little knowledge on how to file online reports), and the victim's perceived value of actually reporting the theft in the first place. By accounting for these reporting privileges, police may be able to more accurately and holistically provide support to all people in the Netherlands that are affected by theft, not just those that have the easiest time reporting.

10.4.2 Classification of "Perceived Severity" in Online Thefts

Online theft is the only type of theft that has continued to significantly increase over the past decade. In 2021, 17% of the Dutch population suffered from online theft, yet only three-fourths of this percentage reported it (CBS, 2022). This poses a significant problem for the Dutch National Police: online theft is quickly becoming the most common and financially devastating form of theft, but it is also the least documented (and therefore addressed) by police. Based on the results from the crime-specific (theft) severity survey in this research, the lack of reporting may be due to conflicting components of victim shame and invasion of privacy. While victims perceive crimes where their privacy is invaded (such as pick-pocketing) as extremely severe, they do not report privacy-invasive crimes that also involve a sense of victim-blame. According to police interviews, this may be because the victims are ashamed of their inability to prevent the theft themselves. For online thefts, this sense of victim-blame may overrule the invasion of privacy that makes the theft be perceived so severely. Therefore, while victims suffer significantly more (both financially and mentally) from online thefts, they are also unwilling to report the theft and receive some form of justice or re-compensation. Future research from the severity surveys of this project could focus on determining the magnitude of victim-blame and privacy invasion in online theft scenarios. In this way, police may determine when victims are most likely to report online theft, depending on the amount stolen and the circumstances of how it was stolen.

10.4.3 A Moral Predisposition Factor in Reporting Thresholds

Through surveys that measure reporting thresholds, a "moral predisposition" factor, determined as m, can be added to the original reporting threshold equation from the research approach (Bowles et al., 2009):

$$px > wt \tag{5}$$

$$px > (wt + m) \tag{6}$$

Determining the magnitude of this moral predisposition factor through moral experiments may serve

as inspiration for future research. Specifically, victims of theft may hold differing preconceived notions on the value of reporting theft to the police, irrespective of demographics or other victim factors. If the extent of these preconceived notions can be determined through moral experiments in the form of questions at the beginning of a victimization survey, police may be able to extrapolate this data to the general public. Therefore, police would know ahead of time the proportion of victims that hold certain moral values on reporting theft to the police, thus creating a more accurate reflection of dark numbers. Research on moral predispositions can even go beyond the prediction of dark numbers; a respondent's moral predisposition on theft reporting also likely correlates with their opinions on crime, safety, and police cooperation in general. This research is critical to the police, as the likelihood for victims to report crime in general may be based on a moral predisposition that can be influenced through proper community policing rather than financial incentives and lower reporting costs.

Appendix A (Literature Review Search Description and Criteria)

This topic was inspired by a former project with the Dutch National Police during TU Delft's Joint Interdisciplinary Project (JIP). The purpose of that project was to create a unified "equation" for safety, based on a crime-harm index, utility, and police effectiveness, in order to assist the police in decision-making. While many sources from that project are available to explore further, the purpose of this literature review is to consider the more general scope of safety and security measurement forms utilized by police organizations around the world. As a result, entirely new sources have been analyzed based on the search criteria for this literature review.

The general plan for research was formulated for three purposes. First, general flaws in policing measurement practices were researched. Second, new solutions to common flaws in police security and safety measurement methods were explored. Third and finally, the potential for knowledge gaps, stemming from the newest policing techniques and nearby professional fields of study, were considered as potential methods for measuring safety and security by police organizations.

Two scholarly databases, Google Scholar and Web of Science, were used. The same general line of thinking was implemented to both databases, with the same search terms being used for research in both. In fact, the search procedure for Web of Science only differed from Google Scholar in its specific limitation of fields of study. Google Scholar was the first database used for research. First, this database was used for the term "Police crime measurement." The term "measurement" was subsequently replaced by other terms, "statistics" and "rates." Furthermore, the term "crime" was subsequently replaced by other terms, "safety" and "security." Rather than research the combined terms, "police crime OR safety OR security measurement OR statistics OR rates," which yielded over 2.5 million results, these keywords were searched individually to discover which terms provided the most relevant sources to the topic. The dates and field of study were explicitly not limited, as the purpose of this initial search was to discover further key words that related to research on safety and security measurements by police. Articles with the most citations were prioritized, and their abstracts were skimmed to garner a general understanding of current and past research on police. This was not a tedious task, as the number of peer-reviewed and significantly cited articles (>100 citations) is relatively limited in police research compared to other fields of study. Several key phrases and terms relevant to the topic were discovered from this initial search.

First, "flaws in crime measurement" was a general theme found in almost all relevant and cited articles. As a result, the term "policing OR police flaws OR errors OR mistakes in crime OR safety OR security measurements OR statistics" was searched to narrow this focus. The same process, selecting significantly cited articles and skimming their abstracts, was followed to discover relevant sources: (Faull, 2010; Shima, 2020; Skogan, 1975; Langton et al., 2012). Years of publication or fields of study were not excluded to garner a holistic view of flaws in policing from multiple viewpoints.

Second, the initial search also yielded "evidence-based policing" as a general solution to current policing flaws. A search of the term "evidence-based policing" was subsequently searched, following the same general procedure of relying on heavily-cited and reputable sources. Additionally, dates were now limited to after 2000, as the primary goal of this research was to discover "newer" methods in policing. This resulted in the discovery of two new and distinct policing strategies: new statistical measurement methods (influenced by digitization, big data, and AI through quantitative data) and community/empathy policing (influenced by community-police interactions through qualitative data). Therefore, two distinct searches were conducted. The first was "evidence-based policing AND statistical OR quantitative measurement methods OR statistics," resulting in several useful sources: (L. W. Sherman, 1998; Moore & Braga, 2003; L. Sherman et al., 2016; Braga et al., 2014). The second was "evidence-based policing AND community OR empathy policing," also resulting in several useful sources: (Cordner, 2014; Owens & Ba, 2021; Tuffin et al., 2006; Fielding & Innes, 2006). Further sources on the topic of community/empathy policing were discovered by searching more specifically for the style of surveys currently being employed by police. "Police victimization surveys," "Police community surveys," and "Police effectiveness surveys" all provided reputable sources on qualitative indicators used by police departments worldwide: (Rosenbaum et al., 2017; Maslov, 2016; Ariel & Bland, 2019; Lynch, 2006).

Finally, an exploration of potential knowledge gaps in police measurement systems was conducted. The source of these potential knowledge gaps stem from two categories: more advanced methods (such as predictive policing) and nearby fields to policing, safety, and security. From previous experience in the Joint Interdisciplinary Project, these nearby fields were known to be value-engineering, health and welfare, medicine, economics, and ethics/philosophy. From suggestions of supervisors, former coworkers, and current police employees, more specific topics on quantitative risk assessment, the quality-adjusted life year (QALY), the life quality index (LQI), and economic concepts of utility and indifference curves were assessed with linkages to modern policing. Therefore, research criteria for knowledge gaps in police measurement systems involved both general and specific search terms. First, the terms "police quantitative risk assessment," "police value-engineering," and "economic OR medical concepts in policing" were all searched. Then, "quality-adjusted life year in policing," "life quality index in policing," and "utility OR indifference curves in policing" were also searched. The culmination of these searches resulted in several significant sources (with varying degrees of relation to policing), mainly stemming around the concept of "predictive policing:" (Berk, 2021; Eckhouse et al., 2019; Idsø & Årethun, 2018; Robinson et al., 2018). These may serve as a future thesis topic that addresses a significant knowledge gap in current policing measures on safety and security.

Appendix B (Utility Function Derivation Based on Health, Longevity, and Wealth)

The types of harm we consider are financial, physical and mental. For this reason we need cardinal utility functions that can measure these harms. We have decided to consider utility functions with longevity t, health h and wealth w as their variables. Financial harm results in a decrease of w, mental harm results in a decrease in h and physical harm in a decrease of h and possibly t.

The general form for a cardinal utility function $u(h,t,w)$ based on health h, longevity t and wealth w is derived in the paper by Hammitt (2013) (Hammitt, 2013). It is assumed that there is a cardinal utility function $Y(h,t)$ for health and longevity, such as the QALY, with $Y(h,0)=0$ and $Y(h,t)\geq 0$. Moreover, it is assumed that $Y(h,t)$ is consistent with preferences over health and longevity for any fixed level of wealth. In other words it should hold that for all fixed levels of wealth w', $Y(h',t') > Y(h'',t'')$ if and only if $u(h',t',w') > u(h'',t'',w')$. These assumptions imply that

$$u(h,t,w) = Y(h,t)a(w) + b(w) \tag{7}$$

is the general form of a utility function based on health, longevity and wealth (Hammitt, 2013). Here a and b are functions of wealth, where $a(w) > 0$ for all w. $U(h,0,w) = b(w)$, so b represents the utility a person assigns to the inheritance they leave behind after they die (Hammitt, 2013). It is assumed that b is non-decreasing in w and a is strictly increasing in w ($b'(w) \geq 0$ and $a'(w) > 0$) (Hammitt, 2013). Note that it is implicitly assumed in the paper by Hammitt (Hammitt, 2013) that a and b are (continuously) differentiable.

If we assume that for any fixed level of wealth, the QALY is a cardinal utility function for health and longevity, then we obtain the following utility function if we assume constant health and wealth:

$$u(h,t,w) = a(w)q(h)t + b(w). \tag{8}$$

There are a number of questions that should be answered about the above utility function. First of all, what is meant exactly by a person's wealth? Should this be interpreted as a person's income, their net worth or something else? Based on the interpretation of $b(w)$ as the utility of an inheritance in the paper by Hammitt (Hammitt, 2013), it seems appropriate to interpret w as a person's net worth. To be comparable across different years the effects of inflation should ideally be included in the utility function. We have decided to leave the effects of inflation outside the scope of the JIP case, but it should be considered in future research.

The next question is how to generalize the above utility function in case health states and wealth are allowed to vary throughout a person's lifetime. We have decided to generalize it in a way similar to the QALY. In particular, suppose that a person's health h and wealth w are functions of time t in years. Based on the utility formula for constant health and wealth, $a(w(t))q(h(t))$ can be viewed as the amount of utility gained per year by that person at time t. Furthermore $b(w(t_e))$ can be interpreted as an additional source of utility based on the inheritance left behind. Here t_e is the person's time of death, so $w(t_e)$ is the net worth of their inheritance. So if the health state and wealth is allowed to change over time the lifetime utility formula can be generalized to

$$u(h,w) = \int_{t_0}^{t_e} a(w(t))q(h(t))dt + b(w(t_e)) \tag{9}$$

Note that if h is assumed to have a constant value h_0 and w a constant value w_0, then the above simplifies to $a(w_0)q(h_0)(t_e - t_0) + b(w_0)$, which is essentially the utility function for constant health and wealth from before.

If wealth and quality of health are measured only at discrete moments, then the utility function can be approximated by considering h and w to change at a finite number of times and to be constant in between those times. To make this more precise, suppose $t_0 < t_1 < t_2 < \cdots < t_N = t_e$ and the person is in health state h_n with wealth w_n between times t_{n-1} and t_n. So $h(t) = h_n$ and $w(t) = w_n$ for $t_{n-1} \leq t < t_n$. In this case the lifetime utility from the integral formula reduce to

$$\sum_{n=1}^{N} a(w_n)q(h_n)(t_n - t_{n-1}) + b(w_N). \tag{10}$$

In summary we obtain individual lifetime utility functions of the form

$$u_i(h_i, w_i) = \int_{t_{0,i}}^{t_{e,i}} a_i(w_i(t))q(h_i(t))dt + b_i(w_i(t_e)). \tag{11}$$

Here the underscore i is to show that the function or variable belongs to the i-th person. If utility differences can be compared inter-personally, then we can define a total utility function for a society of N people by defining

$$U(h_1, \ldots, h_N, w_1, \ldots, w_N) = \sum_{i=1}^{N} u_i(h_i, w_i) = \sum_{i=1}^{N} \left(\int_{t_{0,i}}^{t_{e,i}} a_i(w_i(t))q(h_i(t))dt + b_i(w_i(t_{e,i})) \right). \tag{12}$$

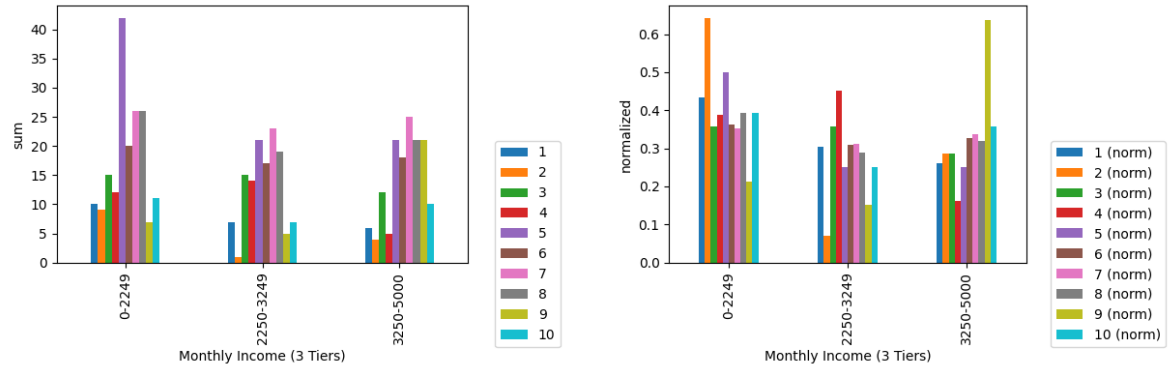
Here U depends on the individual health and wealth functions (or trajectories) of the members of society. Two related questions to be addressed are how to choose the functions a_i and b_i, and how to make sure that utility differences can be compared inter-personally. We recall that to allow for the interpersonal comparison of differences in utility and to justify the summation of individual utilities to obtain a total utility some assumptions need to be made on the allowed transformations of the tuple $(u_1, \ldots, u_N)$ of individual utility functions. In particular, the allowed transformations of $(u_1, \ldots, u_N)$ are $(cu_1 + d_1, \ldots, cu_N + d_N)$, where $c > 0$ and $d_1, \ldots, d_N \in R$ or a subset of these transformations (Blackorby, Donaldson & Weymark, 1984).

To make sure that we do not allow too many transformations, we make the assumption that $a_i = a$ and $b_i = b$ for all i, so the functions a_i and b_i are the same for each person. This decision has some added benefits. For one, it seems easier from a practical point of view, because it is no longer necessary to determine appropriate functions a_i and b_i for each person separately. Secondly, this simplification can be considered more fair, as each person's utility is assessed equally based on their time-dependent health and wealth. A downside is that the individual utility functions might no longer represent each person's preferences accurately. Under this simplifying assumption we have that

$$U = \sum_{i=1}^{N} u(h_i, w_i) = \sum_{i=1}^{N} \left(\int_{t_{0,i}}^{t_{e,i}} a(w_i(t))q(h_i(t))dt + b(w_i(t_{e,i})) \right). \tag{13}$$

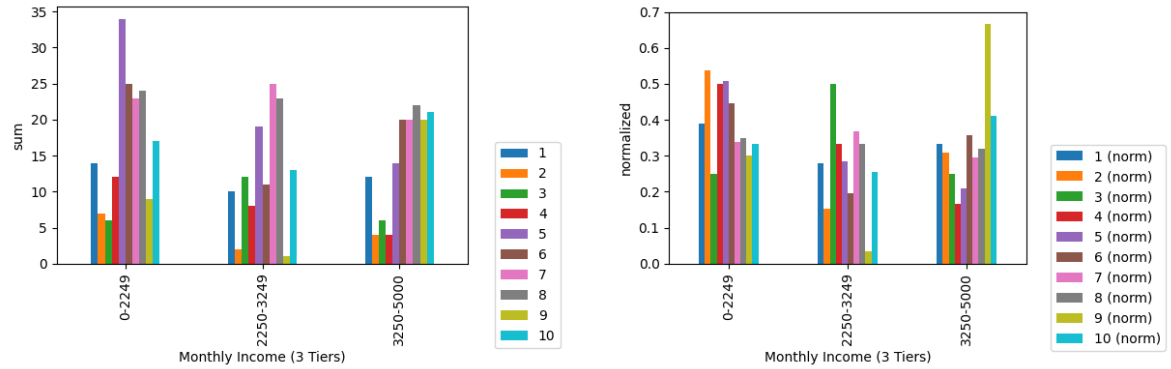
Appendix C Question 9 Secondary Plots

Figure 76: Scenario 3 by Income (10 euros)



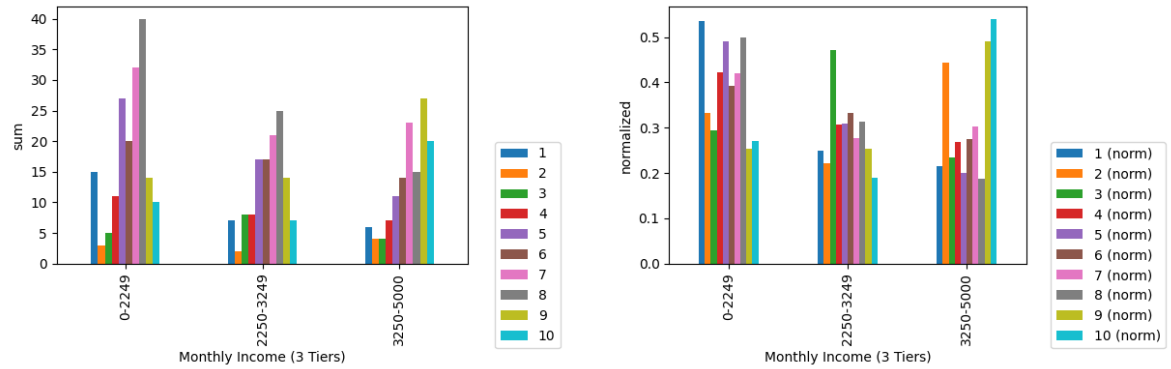
(a) Scenario 3 by Income (10 euros), sum *(b) Scenario 3 by Income (10 euros), norm*

Figure 77: Scenario 3 by Income (100 euros)



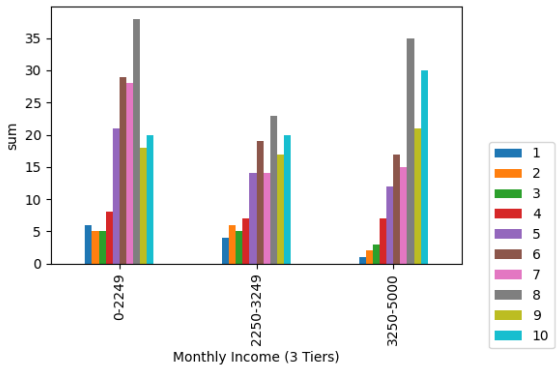
(a) Scenario 3 by Income (100 euros), sum *(b) Scenario 3 by Income (100 euros), norm*

Figure 78: Scenario 3 by Income (1000 euros)

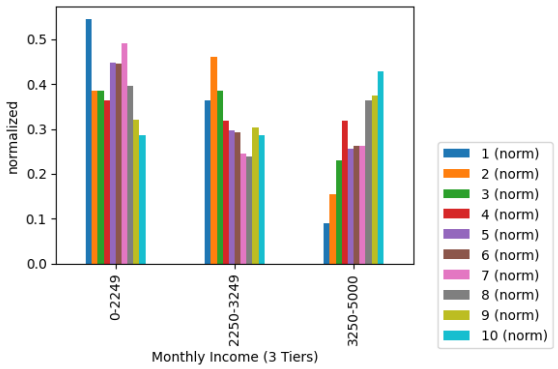


(a) Scenario 3 by Income (1000 euros), sum *(b) Scenario 3 by Income (1000 euros), norm*

Figure 79: Scenario 4 by Income (10 euros)

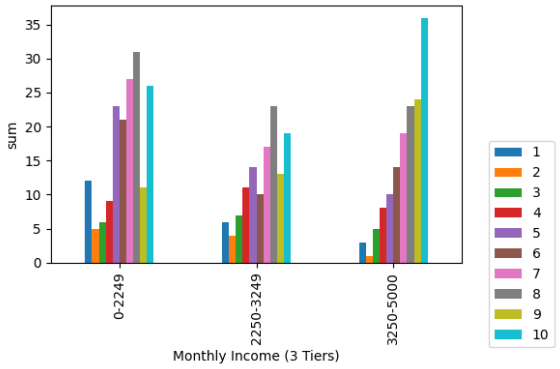


(a) Scenario 4 by Income (10 euros), sum

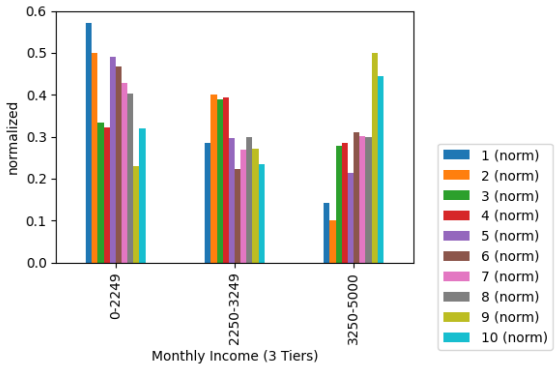


(b) Scenario 4 by Income (10 euros), norm

Figure 80: Scenario 4 by Income (100 euros)

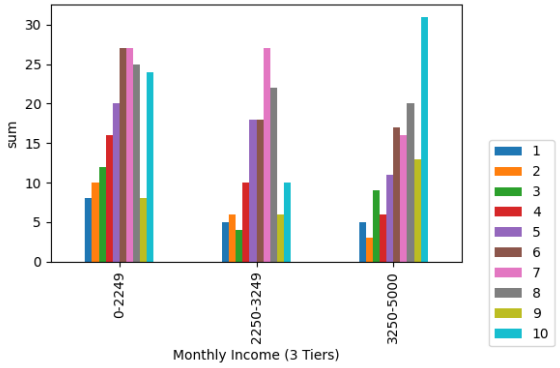


(a) Scenario 4 by Income (100 euros), sum

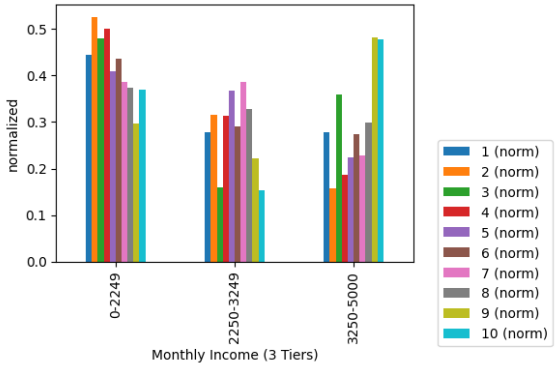


(b) Scenario 4 by Income (100 euros), norm

Figure 81: Scenario 4 by Income (1000 euros)

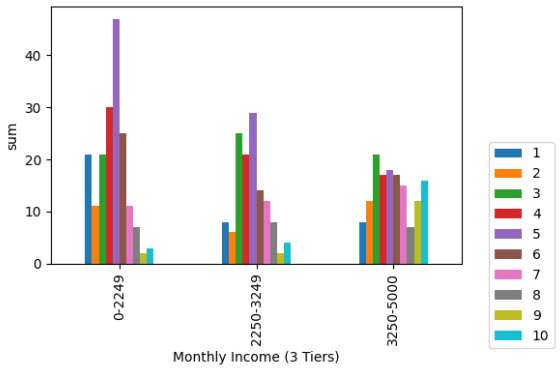


(a) Scenario 4 by Income (1000 euros), sum

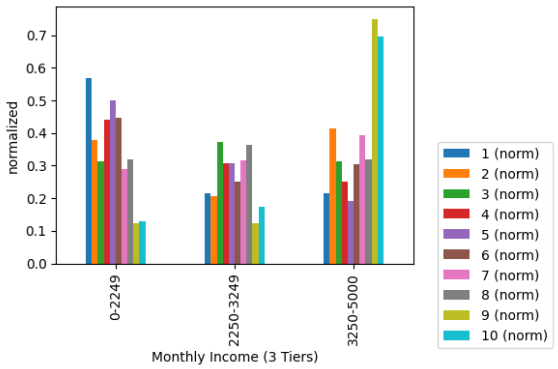


(b) Scenario 4 by Income (1000 euros), norm

Figure 82: Scenario 5 by Income (10 euros)

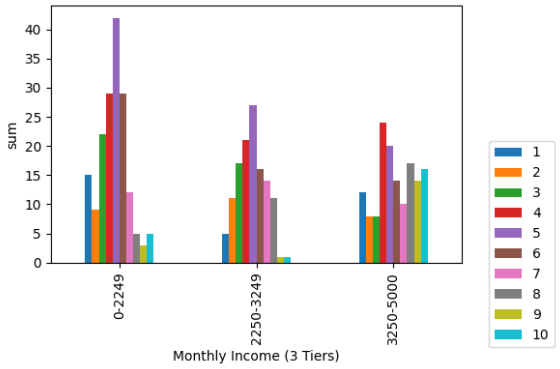


(a) Scenario 5 by Income (10 euros), sum

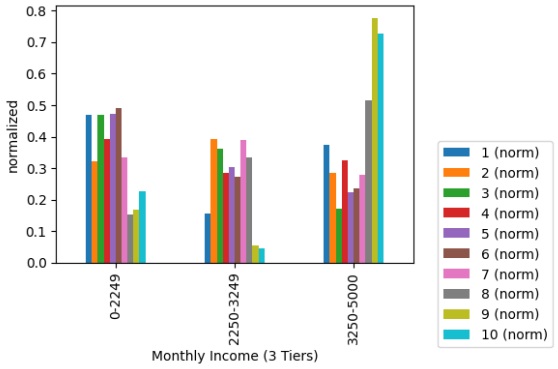


(b) Scenario 5 by Income (10 euros), norm

Figure 83: Scenario 5 by Income (100 euros)

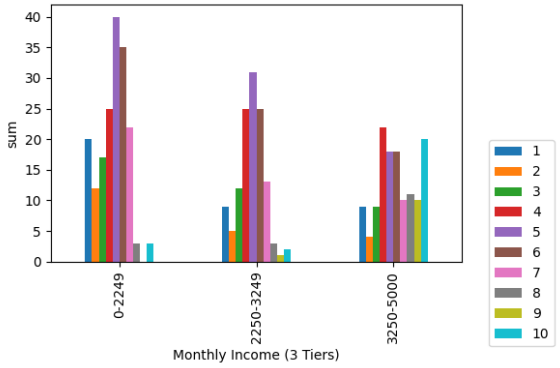


(a) Scenario 5 by Income (100 euros), sum

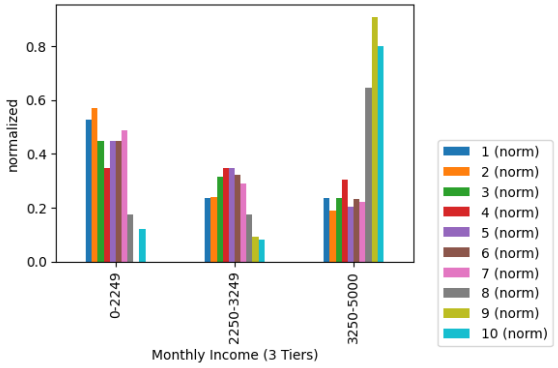


(b) Scenario 5 by Income (100 euros), norm

Figure 84: Scenario 5 by Income (1000 euros)

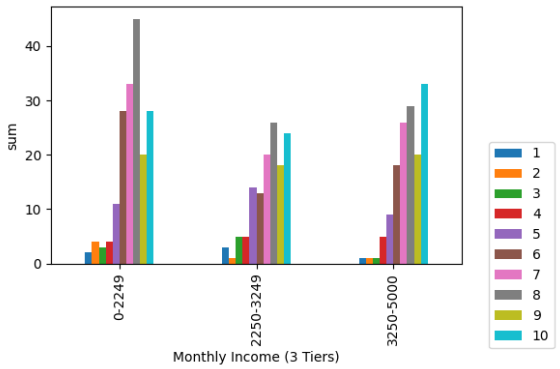


(a) Scenario 5 by Income (1000 euros), sum

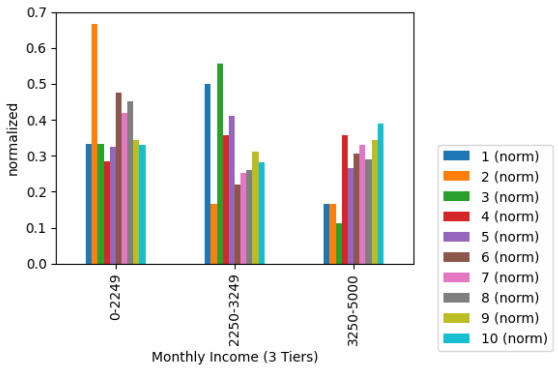


(b) Scenario 5 by Income (1000 euros), norm

Figure 85: Scenario 6 by Income (10 euros)

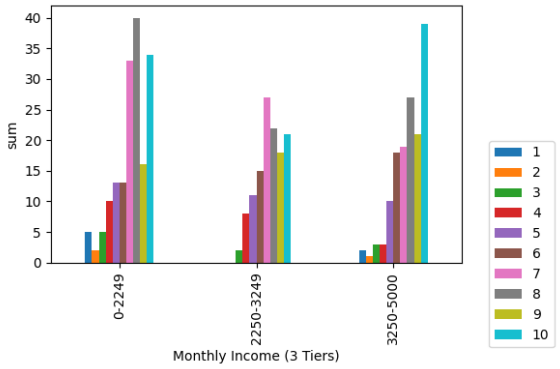


(a) Scenario 6 by Income (10 euros), sum

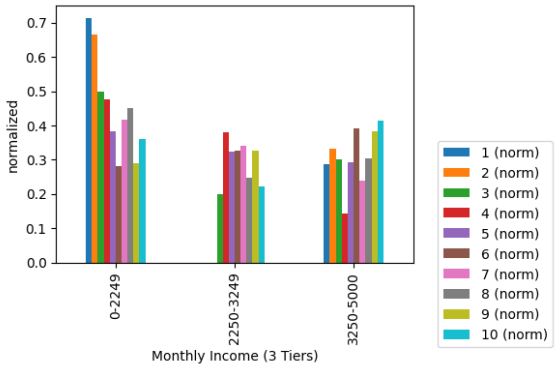


(b) Scenario 6 by Income (10 euros), norm

Figure 86: Scenario 6 by Income (100 euros)

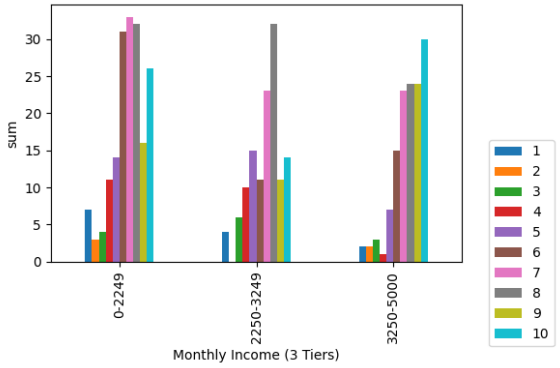


(a) Scenario 6 by Income (100 euros), sum

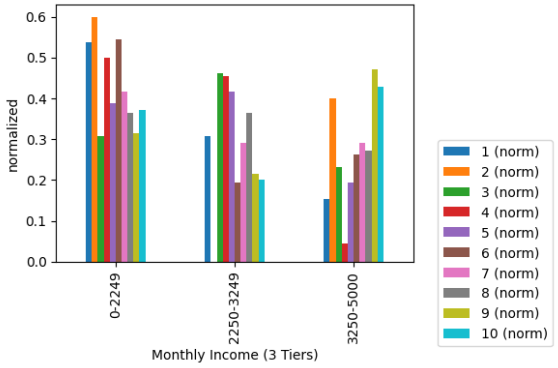


(b) Scenario 6 by Income (100 euros), norm

Figure 87: Scenario 6 by Income (1000 euros)

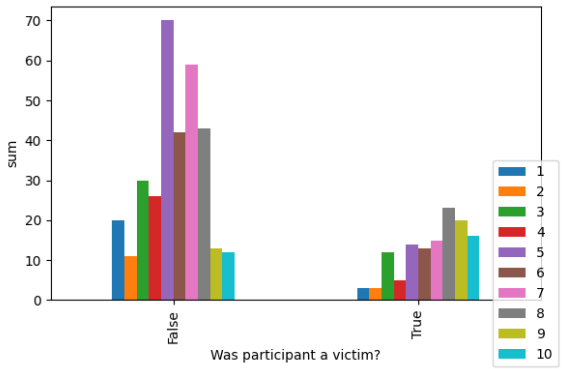


(a) Scenario 6 by Income (1000 euros), sum

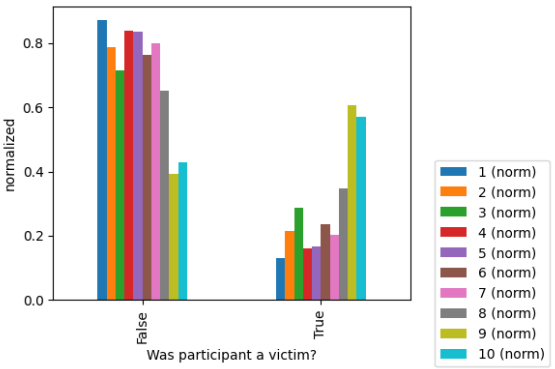


(b) Scenario 6 by Income (1000 euros), norm

Figure 88: Scenario 3 by Victimhood (10 euros)

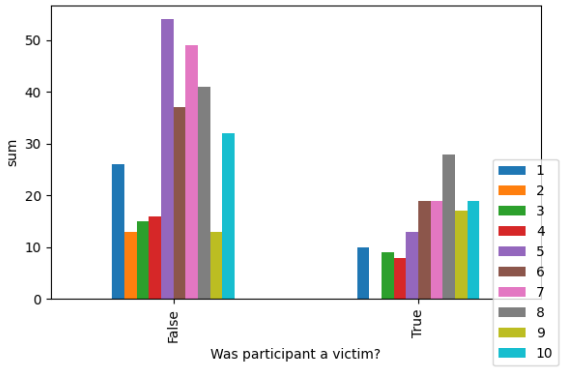


(a) Scenario 3 by Victimhood (10 euros), sum

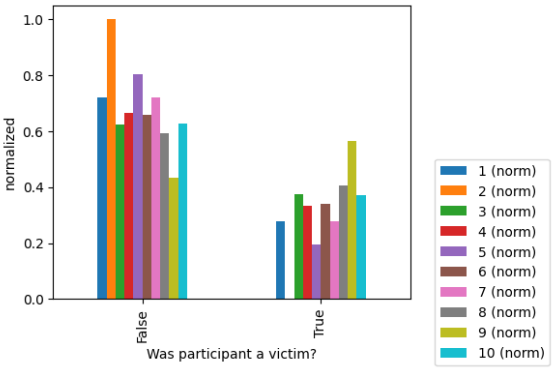


(b) Scenario 3 by Victimhood (10 euros), norm

Figure 89: Scenario 3 by Victimhood (100 euros)

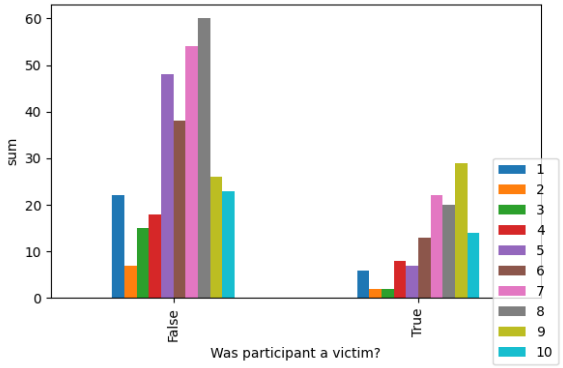


(a) Scenario 3 by Victimhood (100 euros), sum

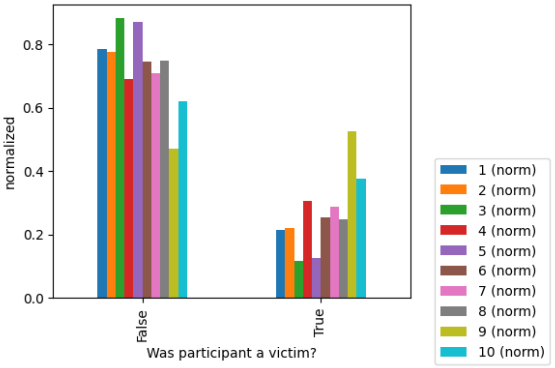


(b) Scenario 3 by Victimhood (100 euros), norm

Figure 90: Scenario 3 by Victimhood (1000 euros)

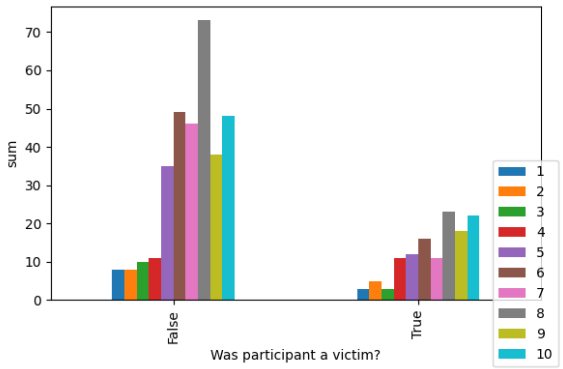


(a) Scenario 3 by Victimhood (1000 euros), sum

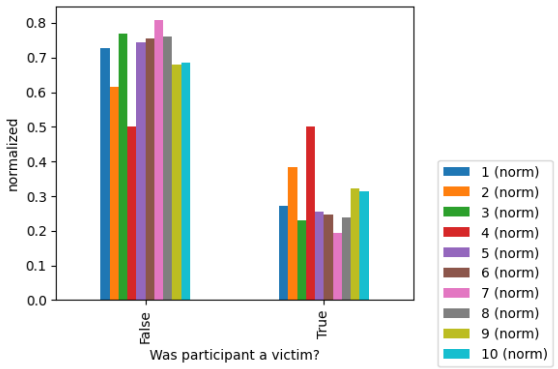


(b) Scenario 3 by Victimhood (1000 euros), norm

Figure 91: Scenario 4 by Victimhood (10 euros)

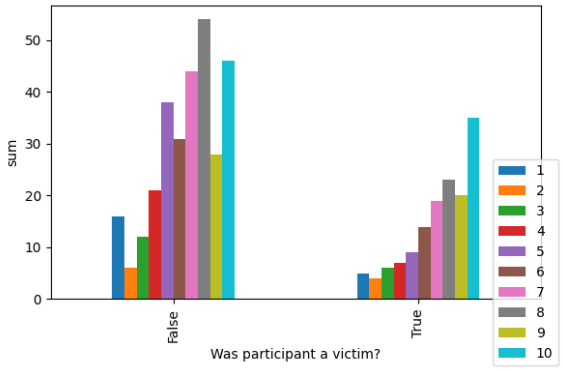


(a) Scenario 4 by Victimhood (10 euros), sum

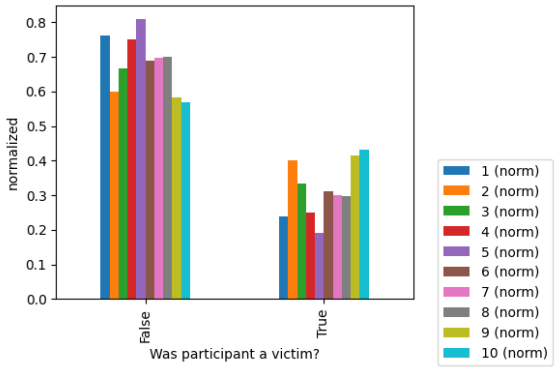


(b) Scenario 4 by Victimhood (10 euros), norm

Figure 92: Scenario 4 by Victimhood (100 euros)

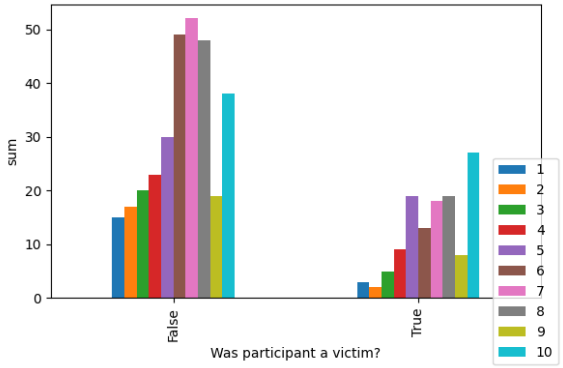


(a) Scenario 4 by Victimhood (100 euros), sum

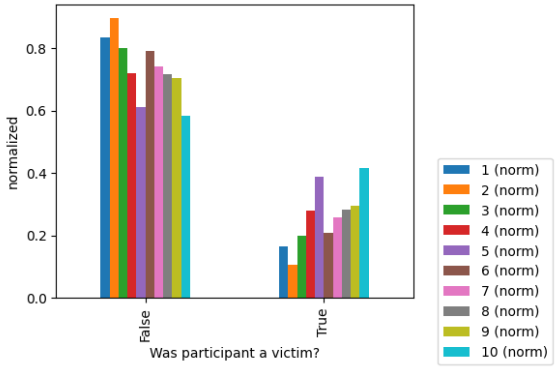


(b) Scenario 4 by Victimhood (100 euros), norm

Figure 93: Scenario 4 by Victimhood (1000 euros)

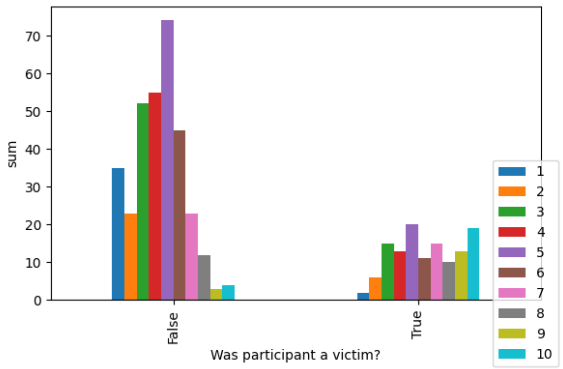


(a) Scenario 4 by Victimhood (1000 euros), sum

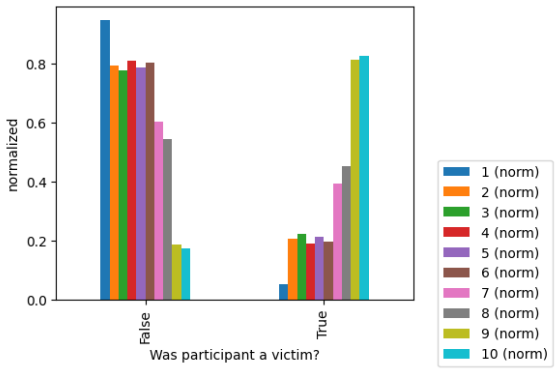


(b) Scenario 4 by Victimhood (1000 euros), norm

Figure 94: Scenario 5 by Victimhood (10 euros)

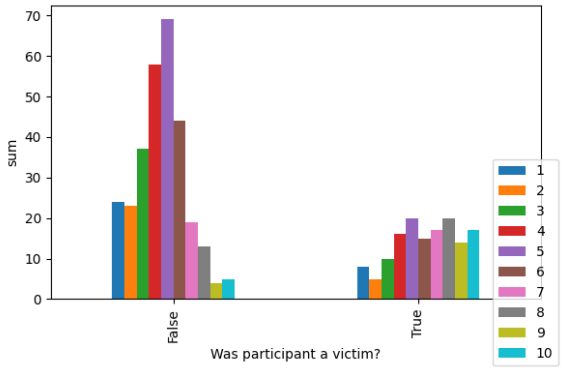


(a) Scenario 5 by Victimhood (10 euros), sum

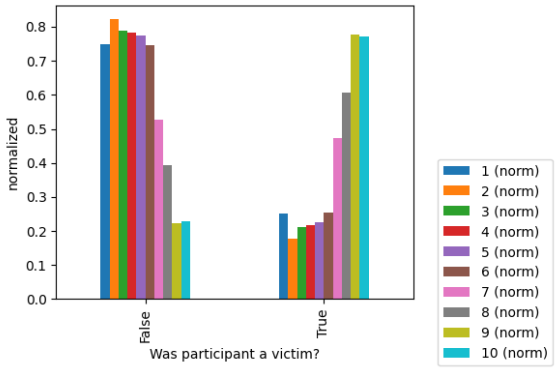


(b) Scenario 5 by Victimhood (10 euros), norm

Figure 95: Scenario 5 by Victimhood (100 euros)

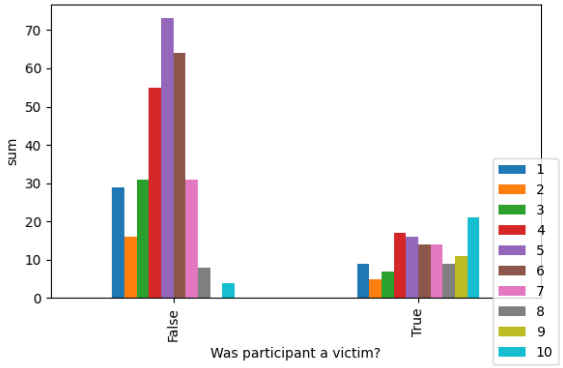


(a) Scenario 5 by Victimhood (100 euros), sum

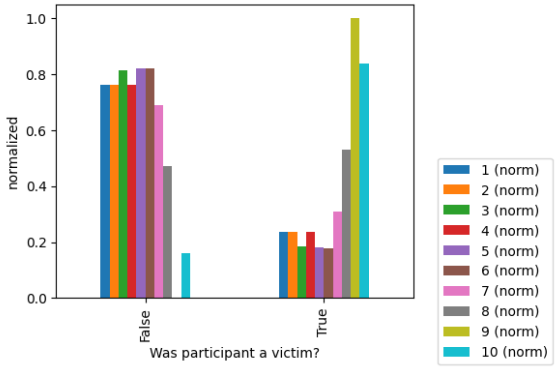


(b) Scenario 5 by Victimhood (100 euros), norm

Figure 96: Scenario 5 by Victimhood (1000 euros)

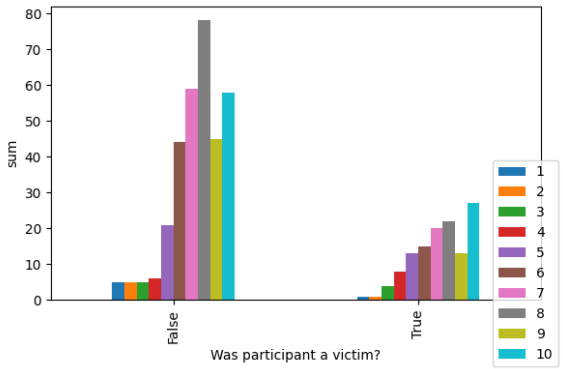


(a) Scenario 5 by Victimhood (1000 euros), sum

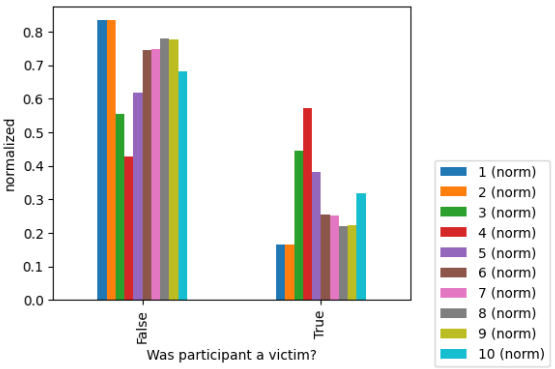


(b) Scenario 5 by Victimhood (1000 euros), norm

Figure 97: Scenario 6 by Victimhood (10 euros)

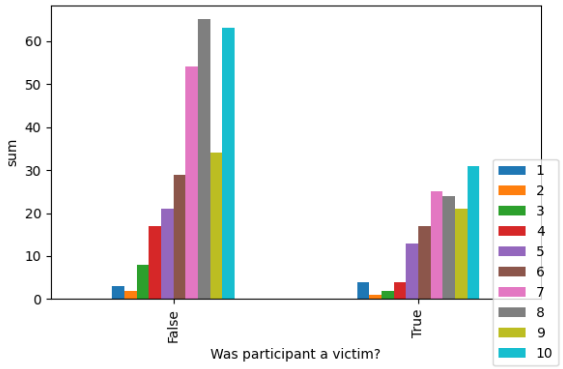


(a) Scenario 6 by Victimhood (10 euros), sum

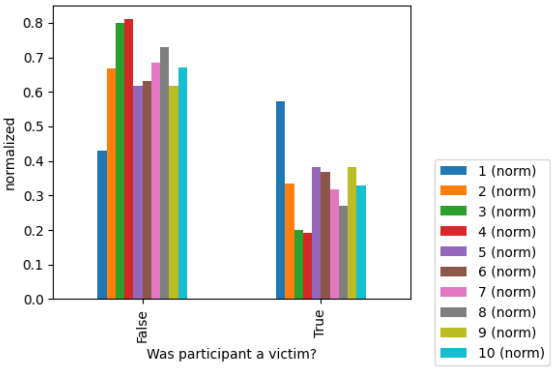


(b) Scenario 6 by Victimhood (10 euros), norm

Figure 98: Scenario 6 by Victimhood (100 euros)

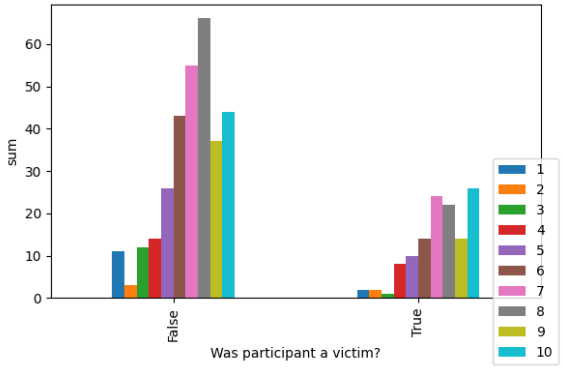


(a) Scenario 6 by Victimhood (100 euros), sum

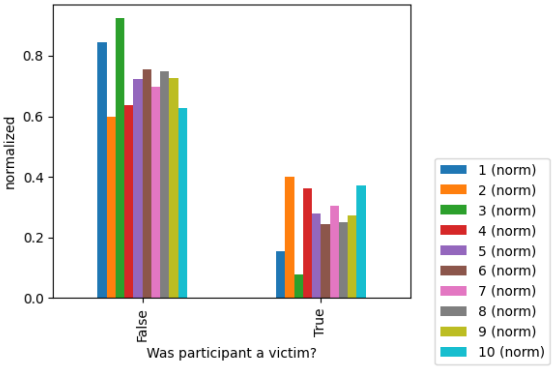


(b) Scenario 6 by Victimhood (100 euros), norm

Figure 99: Scenario 6 by Victimhood (1000 euros)



(a) Scenario 6 by Victimhood (1000 euros), sum



(b) Scenario 6 by Victimhood (1000 euros), norm

Appendix D Statistical Tests Tables

Table 15: Bi-variate Tests and Pearson Correlation Coefficients

	independent	dependent	coefficient	intercept	r-squared	pearson-r	pearson-p
0	Monthly Income	Time-to-Report Theft	2.05e-03	-2.92	6.20e-01	0.26	1.55e-21
1	Participant Experienced Theft	Time-to-Report Theft	1.13e+00	1.85	9.98e-02	0.32	4.95e-32
2	Monthly Income	Minimum Amount Stolen	8.22e-02	72.58	1.24e-01	0.35	5.01e-37
3	Participant Experienced Theft	Minimum Amount Stolen	2.46e+02	218.78	1.46e-01	0.38	1.08e-43
4	Amount Stolen (Numerical)	Willing Time-to-Report	2.55e-03	3.88	6.98e-03	0.12	1.26e-04
5	Monthly Income (3 Tiers Numerical)	Willing Time-to-Report	3.78e-03	-8.59	6.79e-01	0.26	1.49e-17
6	Participant Experienced Theft	Willing Time-to-Report	9.28e+00	0.87	8.99e-01	0.43	7.43e-47

Table 16: Multivariate Test

	independents[0]	independents[1]	independents[2]	dependent	coefficients[0]	coefficients[1]	coefficients[2]	intercept	r-squared
0	Amount Stolen (Numerical)	Monthly Income (3 Tiers Numerical)	Participant Experienced Theft (Numerical)	Willing Time-to-Report (by 1.0hr) (Numerical)	3.34e-03	-3.19e-03	15.84	7.94	0.97

Table 17: Anova Tests

	groupby	dependent	anova (statistic)	anova (pvalue)
0	Amount Stolen (Numerical)	3 S.L	5.66	3.56e-03
1	Monthly Income (3 Tiers Numerical)	3 S.L	11.26	1.42e-05
2	Participant Experienced Theft (Numerical)	3 S.L	39.64	4.15e-10
3	Amount Stolen (Numerical)	4 S.L	6.81	1.14e-03
4	Monthly Income (3 Tiers Numerical)	4 S.L	18.48	1.22e-08
5	Participant Experienced Theft (Numerical)	4 S.L	7.81	5.28e-03
6	Amount Stolen (Numerical)	5 S.L	1.11	3.31e-01
7	Monthly Income (3 Tiers Numerical)	5 S.L	32.51	1.65e-14
8	Participant Experienced Theft (Numerical)	5 S.L	157.13	3.87e-34
9	Amount Stolen (Numerical)	6 S.L	3.88	2.10e-02
10	Monthly Income (3 Tiers Numerical)	6 S.L	10.67	2.52e-05
11	Participant Experienced Theft (Numerical)	6 S.L	0.15	7.00e-01
12	Monthly Income (3 Tiers Numerical)	1 Severity	2.12	1.21e-01
13	Participant Experienced Theft (Numerical)	1 Severity	10.34	1.34e-03
14	Monthly Income (3 Tiers Numerical)	2 Severity	7.85	4.09e-04
15	Participant Experienced Theft (Numerical)	2 Severity	36.99	1.61e-09
16	Monthly Income (3 Tiers Numerical)	3 Severity	1.04	3.54e-01
17	Participant Experienced Theft (Numerical)	3 Severity	5.56	1.86e-02
18	Monthly Income (3 Tiers Numerical)	4 Severity	0.90	4.08e-01
19	Participant Experienced Theft (Numerical)	4 Severity	9.01	2.74e-03
20	Monthly Income (3 Tiers Numerical)	5 Severity	1.03	3.59e-01
21	Participant Experienced Theft (Numerical)	5 Severity	8.82	3.04e-03
22	Monthly Income (3 Tiers Numerical)	6 Severity	0.87	4.21e-01
23	Participant Experienced Theft (Numerical)	6 Severity	11.65	6.64e-04
24	Monthly Income (3 Tiers Numerical)	7 Severity	1.71	1.81e-01
25	Participant Experienced Theft (Numerical)	7 Severity	3.44	6.39e-02
26	Monthly Income (3 Tiers Numerical)	8 Severity	0.67	5.14e-01
27	Participant Experienced Theft (Numerical)	8 Severity	0.13	7.23e-01
28	Monthly Income (3 Tiers)	Time-to-Report Theft	71.00	5.20e-30
29	Monthly Income (3 Tiers)	Minimum Amount Stolen to Trigger Police Report	1.75	1.75e-01
30	Monthly Income (3 Tiers)	Willing Time-to-Report (by 1.0hr) (Numerical)	41.20	6.22e-18
31	Participant Experienced Theft	Time-to-Report Theft	146.38	4.95e-32
32	Participant Experienced Theft	Minimum Amount Stolen to Trigger Police Report	2.96	8.54e-02
33	Participant Experienced Theft	Willing Time-to-Report (by 1.0hr) (Numerical)	229.23	7.43e-47
34	Amount Stolen	Time-to-Report Theft	1.68	1.87e-01
35	Amount Stolen	Minimum Amount Stolen to Trigger Police Report	0.11	8.99e-01
36	Amount Stolen	Willing Time-to-Report (by 1.0hr) (Numerical)	7.83	4.22e-04

Table 18: Spearman Correlation Coefficients

	dependent	independent	spearmanr-correlation	spearmanr-pvalue
0	3 S.L	Amount Stolen (Numerical)	1.06e-01	1.21e-04
1	3 S.L	Monthly Income (3 Tiers Numerical)	1.27e-01	3.62e-06
2	3 S.L	Participant Experienced Theft (Numerical)	1.86e-01	1.05e-11
3	4 S.L	Amount Stolen (Numerical)	-9.52e-02	5.29e-04
4	4 S.L	Monthly Income (3 Tiers Numerical)	1.53e-01	2.17e-08
5	4 S.L	Participant Experienced Theft (Numerical)	8.18e-02	2.91e-03
6	5 S.L	Amount Stolen (Numerical)	4.55e-02	9.79e-02
7	5 S.L	Monthly Income (3 Tiers Numerical)	1.67e-01	9.99e-10
8	5 S.L	Participant Experienced Theft (Numerical)	2.88e-01	1.37e-26
9	6 S.L	Amount Stolen (Numerical)	-5.56e-02	4.31e-02
10	6 S.L	Monthly Income (3 Tiers Numerical)	1.08e-01	7.82e-05
11	6 S.L	Participant Experienced Theft (Numerical)	1.08e-02	6.96e-01
12	1 Severity	Monthly Income (3 Tiers Numerical)	1.14e-01	8.80e-05
13	1 Severity	Participant Experienced Theft (Numerical)	1.80e-01	5.34e-10
14	1 Severity	Scenario 1: amount stolen	NaN	NaN
15	2 Severity	Monthly Income (3 Tiers Numerical)	1.14e-01	9.99e-05
16	2 Severity	Participant Experienced Theft (Numerical)	1.78e-01	9.22e-10
17	2 Severity	Scenario 2: amount stolen	3.82e-01	7.55e-42
18	3 Severity	Monthly Income (3 Tiers Numerical)	6.91e-02	1.82e-02
19	3 Severity	Participant Experienced Theft (Numerical)	9.96e-02	6.50e-04
20	3 Severity	Scenario 3: amount stolen	3.68e-01	6.94e-39
21	4 Severity	Monthly Income (3 Tiers Numerical)	6.45e-02	2.75e-02
22	4 Severity	Participant Experienced Theft (Numerical)	1.25e-01	1.82e-05
23	4 Severity	Scenario 4: amount stolen	1.88e-01	9.97e-11
24	5 Severity	Monthly Income (3 Tiers Numerical)	1.89e-03	9.49e-01
25	5 Severity	Participant Experienced Theft (Numerical)	-5.07e-02	8.34e-02
26	5 Severity	Scenario 5: amount stolen	2.27e-01	3.76e-15
27	6 Severity	Monthly Income (3 Tiers Numerical)	6.77e-02	2.06e-02
28	6 Severity	Participant Experienced Theft (Numerical)	1.31e-01	6.79e-06
29	6 Severity	Scenario 6: amount stolen	3.16e-01	1.34e-28
30	7 Severity	Monthly Income (3 Tiers Numerical)	1.36e-02	6.41e-01
31	7 Severity	Participant Experienced Theft (Numerical)	5.81e-03	8.43e-01
32	7 Severity	Scenario 7: amount stolen	2.56e-01	6.83e-19
33	8 Severity	Monthly Income (3 Tiers Numerical)	4.44e-02	1.29e-01
34	8 Severity	Participant Experienced Theft (Numerical)	5.45e-02	6.24e-02
35	8 Severity	Scenario 8: amount stolen	2.29e-01	2.35e-15

Table 19: Kruskal Tests

	groupby	dependent	kruskal (statistic)	kruskal (pvalue)
0	Amount Stolen (Numerical)	3 S.L	14.72	6.36e-04
1	Monthly Income (3 Tiers Numerical)	3 S.L	27.19	1.25e-06
2	Participant Experienced Theft (Numerical)	3 S.L	45.49	1.53e-11
3	Amount Stolen (Numerical)	4 S.L	13.81	1.00e-03
4	Monthly Income (3 Tiers Numerical)	4 S.L	38.98	3.43e-09
5	Participant Experienced Theft (Numerical)	4 S.L	8.84	2.94e-03
6	Amount Stolen (Numerical)	5 S.L	3.21	2.01e-01
7	Monthly Income (3 Tiers Numerical)	5 S.L	41.93	7.85e-10
8	Participant Experienced Theft (Numerical)	5 S.L	109.25	1.43e-25
9	Amount Stolen (Numerical)	6 S.L	6.67	3.56e-02
10	Monthly Income (3 Tiers Numerical)	6 S.L	21.77	1.87e-05
11	Participant Experienced Theft (Numerical)	6 S.L	0.15	6.96e-01
12	Monthly Income (3 Tiers Numerical)	1 Severity	15.75	3.80e-04
13	Participant Experienced Theft (Numerical)	1 Severity	37.97	7.19e-10
14	Monthly Income (3 Tiers Numerical)	2 Severity	16.87	2.17e-04
15	Participant Experienced Theft (Numerical)	2 Severity	36.94	1.22e-09
16	Monthly Income (3 Tiers Numerical)	3 Severity	5.69	5.81e-02
17	Participant Experienced Theft (Numerical)	3 Severity	11.58	6.65e-04
18	Monthly Income (3 Tiers Numerical)	4 Severity	5.98	5.02e-02
19	Participant Experienced Theft (Numerical)	4 Severity	18.25	1.94e-05
20	Monthly Income (3 Tiers Numerical)	5 Severity	0.41	8.16e-01
21	Participant Experienced Theft (Numerical)	5 Severity	3.00	8.34e-02
22	Monthly Income (3 Tiers Numerical)	6 Severity	5.35	6.88e-02
23	Participant Experienced Theft (Numerical)	6 Severity	20.10	7.33e-06
24	Monthly Income (3 Tiers Numerical)	7 Severity	0.33	8.50e-01
25	Participant Experienced Theft (Numerical)	7 Severity	0.04	8.43e-01
26	Monthly Income (3 Tiers Numerical)	8 Severity	2.56	2.78e-01
27	Participant Experienced Theft (Numerical)	8 Severity	3.47	6.25e-02
28	Monthly Income (3 Tiers)	Time-to-Report Theft	94.67	2.77e-21
29	Monthly Income (3 Tiers)	Minimum Amount Stolen to Trigger Police Report	70.53	4.84e-16
30	Monthly Income (3 Tiers)	Willing Time-to-Report (by 1.0hr) (Numerical)	47.18	5.69e-11
31	Participant Experienced Theft	Time-to-Report Theft	99.20	2.28e-23
32	Participant Experienced Theft	Minimum Amount Stolen to Trigger Police Report	82.28	1.18e-19
33	Participant Experienced Theft	Willing Time-to-Report (by 1.0hr) (Numerical)	132.26	1.32e-30
34	Amount Stolen	Time-to-Report Theft	3.90	1.43e-01
35	Amount Stolen	Minimum Amount Stolen to Trigger Police Report	0.02	9.88e-01
36	Amount Stolen	Willing Time-to-Report (by 1.0hr) (Numerical)	40.28	1.79e-09

Table 20: Mann Whitney U Tests

	groupby	dependent	mannwhitneyu (statistic)	mannwhitneyu (pvalue)
2	Participant Experienced Theft (Numerical)	3 S.L	139158.5	1.53e-11
5	Participant Experienced Theft (Numerical)	4 S.L	162827.5	2.94e-03
8	Participant Experienced Theft (Numerical)	5 S.L	115995.0	1.43e-25
11	Participant Experienced Theft (Numerical)	6 S.L	179029.0	6.96e-01
13	Participant Experienced Theft (Numerical)	1 Severity	114069.0	7.20e-10
15	Participant Experienced Theft (Numerical)	2 Severity	113755.5	1.22e-09
17	Participant Experienced Theft (Numerical)	3 Severity	127946.0	6.66e-04
19	Participant Experienced Theft (Numerical)	4 Severity	123451.5	1.94e-05
21	Participant Experienced Theft (Numerical)	5 Severity	154912.5	8.34e-02
23	Participant Experienced Theft (Numerical)	6 Severity	122265.5	7.34e-06
25	Participant Experienced Theft (Numerical)	7 Severity	144808.0	8.43e-01
27	Participant Experienced Theft (Numerical)	8 Severity	136087.0	6.25e-02
31	Participant Experienced Theft	Time-to-Report Theft	118664.0	2.28e-23
32	Participant Experienced Theft	Minimum Amount Stolen to Trigger Police Report	124128.0	1.18e-19
33	Participant Experienced Theft	Willing Time-to-Report (by 1.0hr) (Numerical)	59032.0	1.32e-30

Appendix E Slachtoffermonitor (Victim Monitor) English Summary

The "Slachtoffermonitor" (Victim Monitor) is a study about how victims of crime experience the support they receive from police and other organisations (such as the legal system and organisations that specifically support victims) following the crime. The study has been conducted at least twice (in 2012/2013 and again in 2016/2017) through questionnaires directed at victims of crimes.

The victims were asked questions regarding their experience with the police following the crime. These questions gauge how well the police managed to support the victim in six different categories. The categories are essentially the same in both instances of the slachtoffermonitor, but two of the categories have been renamed. The categories are as follows:

1. "Bejegening": The treatment of the victim by the police. This includes things like politeness, having compassion for the victim, taking the victim seriously, respecting their privacy, etc.
2. "Veiligheid/Schadeherstel": How well the police managed to make the victim feel safe and restore their damage. This includes making the victim feel safe, helping them to be compensated for the damage they suffered and advising them on how to avoid becoming a victim again in the future.
3. "Politietaak (2012)" / "Intake/opsporing (2016)": Everything related to solving the crime. This includes informing the victim about what happens after they report the crime, including the steps the police will take and keeping the victim updated on the progress. This also includes if the police made enough effort to find and arrest the perpetrator.
4. "Hulp aan/positie van slachtoffer (2012)"/"Informatie over hulp en rechten slachtoffer (2016)": Helping and informing the victim. This includes informing the victim about their rights and which organizations can help the victim and how.
5. "Inspraak/Participatie": Participation of the victim. This includes whether the police listened to the victim and asked for sufficient information before taking action and making decisions. This also includes if the police took the rights, needs and wishes of the victim into consideration when making decisions.
6. "Stroomlijning": Streamlining. This includes how long the victim had to wait before reporting the crime and if they had to repeat their story or not.

Each category contains several questions, where victims rate how well the police performed on a specific aspect of that category. Here the ratings can be very negative, negative, neutral, positive or very positive. The respondents were also asked to rate how important they consider the different aspects to be.

Next to presenting a general overview of the responses to these questions, the responses were also compared based on a number of criteria. Differences in responses based on gender, age, country of origin (2016 only) and level of education of the respondents were compared. Differences in responses were also compared based on the type of crime. Three different types were considered, namely

1. Violent crimes
2. Property crimes
3. Public order and destruction

The 2012 version also compared responses based on the outcome of the case (compensation of the victim and whether the perpetrator was arrested).

E.1 Summary of 2012 Victim Monitor

The main conclusions of the 2012 version are as follows:

The police received a positive rating in categories 4 and 5 about 60% of the time. In category 1 they received 80% positive ratings. About 45% of the respondents gave a negative rating to the compensation of victims and the restoration of their safety (aspects in category 2). Negative ratings were also given by 40-50% of respondents regarding keeping the victim updated on the progress as well as making enough effort to find and arrest the perpetrator (aspects in category 3).

The respondents consider all aspects to be important. The four aspects that are considered most important are:

1. Confidential treatment of personal data
2. Taking the victim seriously
3. Making an effort to find the perpetrator
4. Making an effort to arrest the perpetrator

More than 75% of respondents consider the above aspects to be of the highest importance, while less than 2% consider them to be of least importance.

Victims had the option to refuse participation in the survey. The group of respondents and the group of non-respondents were no different in terms of gender, age and their opinion on how well the police support victims (based on a single question answered by all victims). In the group of non-respondents, there is small over-representation of victims of violent crimes compared to the group of respondents and a small under-representation of victims of crimes of destruction and against public order. Overall there is no reason to assume that the results are skewed because a selective group refused participation.

There is no significant difference in experience with the police between the three types of crime considered. There are, however, differences between the three types of crime in terms of which aspects are considered important by the respondents. Respondents that were victims of property crimes consider most aspects to be more important than victims of the other two types, with the biggest difference being between victims of property crimes and victims of violent crimes. Victims of property crimes find it more important that police employees show compassion than victims of violent crimes. Moreover, victims of violent crimes seem to consider certain aspects to be significantly less important than victims of other crimes, mainly those in category 2. The biggest difference occurs between victims of violent crimes and victims of property crimes, where the former consider being escorted home or to a safe place to be less important than the latter group.

Respondents that were fully compensated for their damage were more positive about their experience compared to respondents that were only partially compensated or not at all. This holds true for five of the six categories (all except 2). For category 2 the respondents that were not compensated were more negative than those that received a full or partial compensation. The same results hold when looking at the separate aspects. This can be clearly seen by looking at (obvious) aspects such as "providing the victim with information about compensation of damage", "properly assessing damage" and "effort made to compensate damage". But it also holds for other aspects such as "taking the rights of the victim into account in decision making" and "asking the victim for sufficient information to take further steps after the initial report".

Respondents were also more positive about the police in case the perpetrator was caught in all categories except for category 6. The same holds for most of the individual aspects. Logically, respondents were more positive about the efforts made by the police to find and arrest the perpetrator in those cases where the perpetrator was arrested. A large difference is also visible when looking at the aspect "reducing the danger of future victimization".

When looking at the aspects that the respondents indicated as very important, the police generally received positive ratings for "Confidential treatment of personal data" and "Taking the victim seriously",

while they received negative ratings for "Making an effort to find the perpetrator" and "Making an effort to arrest the perpetrator". This indicates that there is not so much a problem with the quality of victim support by the police, but instead that victims are very critical about police performance when it comes to certain core tasks such as finding and arresting perpetrators.

E.2 Summary of 2016 Victim Monitor

The main conclusions of the 2016 version are as follows:

More than half (56%) of respondents are positive about their experience with the police. About 1 in 7 respondents is negative about their experience. Victims are most positive about category 1. The majority is also positive about categories 4, 5 and 6. Almost half of the respondents are positive about category 3, while one quarter is negative. More victims are negative about category 2 than positive. Within this category the aspect where the police performed the worst is "reducing the probability of becoming a victim again in the future".

Victims of violent crimes are more positive about their experience with the police than victims of the other types of crimes when it comes to all categories with the exception of category 6. Within the group of victims of violent crimes, the victims of sex crimes are also more positive about their experience with the police than victims of other violent crimes when it comes to all categories with the exception of category 6.

The experience with police has generally improved compared to the 2012 version. Respondents are in particular more positive when it comes to categories 2 and 3 than they were in 2012.

All aspects are considered to be important by a clear majority of respondents. Categories 1, 3 and 5 are considered the most important. There is no significant difference in importance of the different aspects compared to the 2012 version.

Category 3 is both considered to be important and respondents have more negative experiences with the police when it comes to category 3. In particular this applies to finding and arresting the perpetrator. Aside from aspects in category 3, improving on the aspects "the police increased my feelings of safety", "the police have kept me updated on developments in the case" and "the police have explained my rights as a victim to me" is a priority (these aspects are both considered important and respondents are not that positive about these aspects).

Two aspects that were a priority to improve on in 2012 are no longer a priority. "Police employees have explained to me the process after making a report" is no longer a priority, because respondents are more positive about this aspect compared to 2012. "Police employees have taken my rights as a victim into account" is no longer a priority, because respondents consider this aspect to be relatively less important than in 2012.

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