

HANDBOOK

PROFILING

SMALL ARMS AMMUNITION

IN ARMED VIOLENCE SETTINGS

16 PEACE, JUSTICE
AND STRONG
INSTITUTIONS



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FOR DISARMAMENT RESEARCH

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NOTE

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HANDBOOK

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A NOTE FROM THE AUTHORS

This Handbook should be understood as a technical guide, yet one with profound human implications. While we have strived to be as accurate as possible regarding the technical aspects of ammunition and data gathering, we have also strived to avoid losing sight of the motivation behind this work.

It is our position that aggregated data on ammunition can contribute to the understanding of the conflating factors that enable armed violence, but it is also our view that every round of ammunition represents the potential to cut a life short — putting dreams to an end and families through the nightmare of losing a loved one. And, in terms of lives lost, armed violence is an irreversible injustice. So, as we aggregate data and seek for solutions, we must never forget that each data point represents a preventable injustice.

Big-data should never obscure the human stories behind the statistics —in fact, we understand them as complementary. Public security must be understood as people-centred security. And our efforts to profile ammunition, should be understood as efforts to prevent the further loss of life and promote the socioeconomic wellbeing of affected communities.

We are releasing this Handbook with a call to work together and generate a multiplier effect —and doing so urgently. This Handbook recognizes that the success of our endeavour, cutting illicit ammunition flows with a view to reduce armed violence, requires coordinated action by UN System partners, Member States, the entire national security sector, mayors, academics, practitioners and local organizations.

The solutions to ending armed violence are within reach, but we must reach together.

We can do this. We must do this.

The background features a dark blue, perforated metal surface. Scattered across this surface are numerous bullets of various types, including some with visible casing and others that are more rounded. Overlaid on the image are white geometric lines: a vertical line on the left, a horizontal line near the top, and a diagonal line from the top left to the bottom left. There are also several white circles of varying sizes, some of which are connected to the lines, creating a technical or architectural feel.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Worldwide, more than half a million people die violently every year, with the vast majority of violent deaths (82%) occurring in non-conflict settings, mostly in towns and cities (Hideg and Mc Evoy, Global Violent Deaths 2017: Time to Decide, 2017). Furthermore, more than half of the homicides worldwide are caused by firearms or, more precisely, by their ammunition (United Nations Office on Drugs and Crime, Global Study on Homicide, 2019). The scale and impact of armed violence means that it is consistently a leading policy concern for governments and international organizations. Armed violence causes an ocean of human suffering, hinders economic development and traps communities in vicious cycles.

More than 500,000 people die violently every year, with the vast majority of violent deaths occurring in non-conflict settings.

Focusing on ammunition flows and misuse can help reduce armed violence. There are several potential advantages to focusing on ammunition: Unlike firearms, ammunition must be replenished once used, and restricting its flow can therefore “starve firearms of oxygen”. Also, ammunition supply chains tend to be shorter from transfer to use, increasing the scope for domestic policy to have an immediate effect in reducing armed violence. In short, improved research into ammunition flows and the dynamics enabling lethal outcomes can inform policy responses, with the potential to reduce the impact of firearms-related violence.

The purpose of this Handbook is to offer users a step-by-step guide for ammunition profiling.

The purpose of this Handbook is to offer users a step-by-step guide for ammunition profiling. This means generating an overview of the small arms ammunition that have been diverted, trafficked or misused in settings affected by armed violence. The

main benefit of using this Handbook is that it helps build an evidence base to inform downstream policies aimed at curbing the flow of ammunition that would otherwise be destined for unauthorized hands or unauthorized use. Afterwards, the aggregated evidence and lessons learned collected from settings affected by armed violence can be channelled upstream to inform multilateral and global processes. Therefore, this Handbook presents two distinct contributions to the field:

- i. it codifies a method for any interested user to utilize it and yield results in a standardized manner, and
- ii. it presents the ammunition profiling methodology with an armed violence lens, for replication studies to follow suit.

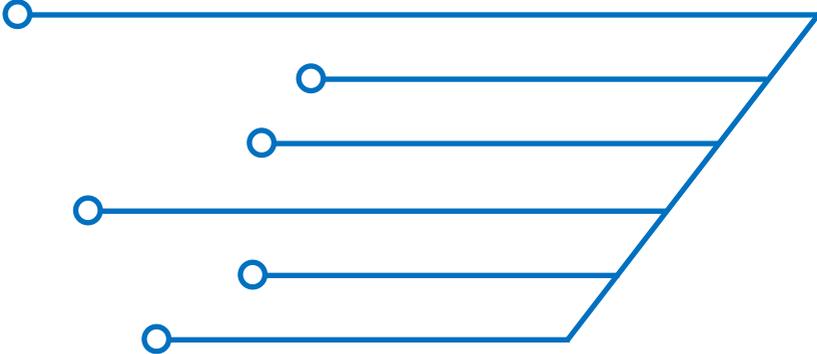
This Handbook is structured in three broad sections: Part 1 provides a brief introduction and sets the context of the problem. Part 2 is the core of the Handbook as it presents the step-by-step guide for ammunition profiling. Part 2 introduces each of four databases in turn.

The databases that ought to be constructed for a comprehensive profile of ammunition are the following:

- **Database 1: Evidence** (ammunition recovered from crime scenes, ammunition seized in domestic operations, and ammunition seized at entry-exit points);
- **Database 2: Records** (ammunition imports, ammunition manufactured in-country, and ammunition stocks);
- **Database 3: Illicit manufacture**; and
- **Database 4: Interviews with affected communities.**

For Databases 1 and 2, the guidelines in are separated into two main actions: (Section A) *data collection* and (Section B) *data analysis*. Part 3 concludes the Handbook by presenting options for a more refined distillation of ammunition-specific findings.

Using this Handbook is voluntary and carries no reporting requirements. Further, all data generated belongs to the utilizing entity. Should technical support be requested, the United Nations Institute for Disarmament Research stands ready to provide guidance on using the methodology.



PART ONE: INTRODUCTION



PART 1. INTRODUCTION

1.1 Why small arms ammunition?

Worldwide, more than half a million people die violently every year, with most violent deaths (82%) occurring in non-conflict settings, mostly in towns and cities (Hideg and Mc Evoy 2017). The scale and impact of global armed violence means that it is consistently a leading policy concern for governments and armed

More than half of the homicides worldwide are caused by firearms or, more precisely, by their ammunition.

and security forces worldwide. This violence is a result of complex drivers, requiring institutions worldwide to continually seek effective and novel approaches to reduce it. Focusing on ammunition flows and misuse can inform this effort. Focusing on ammunition does not mean ignoring firearms; rather, it means studying ammunition flows as an indispensable accomplice in firearms-related violence. Firearms and ammunition do not operate independently, rather they are inextricably tied and interdependent when deployed. As such, in the efforts to reduce armed violence, ammunition should be studied and analysed with the same urgency as firearms.

More than half of the homicides worldwide are caused by firearms or, more precisely, by their ammunition (UNODC 2019). Although armed violence evolves, there are cycles and trends in violence that, if identified, can help inform policy responses. Armed violence tends to occur in concentrated spaces, mostly in urban areas where resources and opportunities are scarce. It is particularly high and widespread across Latin America and the Caribbean, in certain cities in the United States, and in parts of western and southern Africa. Policies in chronically violent contexts have, however, often struggled to sustainably reduce violence (Adams 2012), hence the importance of fresh thinking and approaches to promote effective interventions and combat policy inertia.

So, why focus on ammunition? Research suggests that increases in homicides may be connected to increased firearms and ammunition use (UNODC 2019, 19). If 2017 figures are compared with 2012 figures, firearms-related homicides accounted for 61,804 additional victims in 2017, representing an increase of around 35% from the earlier figure in just five years (UNODC 2014, 2019).¹ When firearms infiltrate spaces, such as urban peripheries, they tend to stay there, creating a weapons sink (Baird, Bishop, and Kerrigan 2018). Beyond the coercive and menacing effect of artisanal and replica weapons designed to resemble modern ones (with little – if any – intent to discharge), firearms only fire when serviced by a flow of ammunition. And as demonstrated by the global ammunition trade, this flow is vast (UN Comtrade 2019). Additionally, diversion and trafficking dynamics allow ammunition flows to reach unauthorized hands (Conflict Armament Research 2016, 2017a, 2017b; PRIO 2013; UNODC 2019; WCO 2019).

Table 1: Reported value of ammunition imports & exports, 2015–2018, UN Commodity Trade Statistics Database²

Year	Total imports trade value (in billions)	Total exports trade value (in billions)
2018	\$10.121	\$14.407
2017	\$10.167	\$15.228
2016	\$10.048	\$14.366
2015	\$8.704	\$13.139

1 The 2013 Global Study on Homicide showed that the number of firearms-related homicides in 2012 was 177,000 (UNODC 2014, 65). The 2019 Global Study establishes that number, five years later, in 2017, at 238,804 (UNODC 2019, 19).

2 See: <https://comtrade.un.org/data>

Although access to ammunition enables and accelerates lethal outcomes in armed violence, ammunition remains understudied. In spite of this, some notable technical and methodological context-specific studies have paved the way for this Handbook. For example, studies led by the United Nations Regional Centre for Peace, Disarmament and Development in Latin America and the Caribbean (UNLIREC) in the Dominican Republic (2018), the Small Arms Survey 2006 primer on ammunition (Pézard and Anders 2006), the Small Arms Survey Ammunition Tracing Kit (Bevan 2008a), and Conflict Armament Research guides on Warsaw Pact-calibre ammunition quantity tables and box marking (2014a, 2014b) have laid the foundations in the field of small arms ammunition research. Both Conflict Armament Research and the Small Arms Survey have applied these profiling efforts to the field, such as in nine countries in Africa (Conflict Armament Research 2012); in northern Mali (Conflict Armament Research and Small Arms Survey 2013); in the Niger (de Tessières 2018); in Kenya (Bevan 2008b); in Afghanistan, Iraq and Somalia (Diehl and Jenzen-Jones 2014); in Côte d'Ivoire (Anders 2014); in Libya and the Syrian Arab Republic (Jenzen-Jones 2014b, 2014a); in the Central African Republic on cross-border weapon transfers in the Sahel; in the Sudan; in a three-year investigation across Iraq and the Syrian Arab Republic; in South Sudan (Conflict Armament Research 2015, 2016, 2017a, 2017b, 2019; LeBrun and Leff 2014); and across seven countries and territories (Florquin and Leff 2014).

Improved research into flows and effective control of ammunition can generate improved and coherent policy and reduce the incidence of firearms-related violence.

The collection and analysis of spent casings in Rio de Janeiro for the 2014–2017 period (Sou da Paz Institute 2017) and in 2018 (Olliveira and Demori 2019) have also offered significant methodological insights on which this Handbook seeks to build. Finally, this Handbook owes gratitude to the

United Nations Office on Drugs and Crime Global Study on Homicide (UNODC 2019) for providing a comprehensive analysis of international homicide figures and improving our collective understanding of the drivers, mechanisms and contributors to violence.

Nonetheless, gaps in understanding remain, particularly regarding how ammunition flows influence rates of armed violence and how the issue compares in different cities. Furthermore, while there are generally robust policies to control drugs or arms flows, these do not consistently respond to the particularities of ammunition flows, hence the need for research to shine a light on their importance.

There are several potential advantages to focusing on ammunition control: Unlike firearms, ammunition must be replenished once used, and restricting its flow can therefore “starve firearms of oxygen”. Also, anecdotal evidence suggests that in scenarios with elevated rates of armed violence, the time frame from transfer to use in the ammunition supply chain tends to be short, increasing the scope for local and national policy to have an immediate impact on reducing lethal outcomes. In short, improved research into flows and effective control of ammunition can generate improved and coherent policy and programming responses with significant potential to reduce the lethality and incidence of firearms-related violence.

Although this Handbook is intended to serve as a how-to guide for ammunition profiling, it is important to recognize the broader socioeconomic and political implications of conducting such work. Inadequately regulated arms and ammunition enable and sustain armed violence and perpetuate socioeconomic injustices.

As the Secretary-General has emphasized:

“Armed violence aggravates poverty, inhibits access to social services and diverts energy and resources away from efforts to improve human development. Armed conflict and high levels of armed violence represent a grave impediment to economic growth. There is nothing more damaging to an investment climate as armed insecurity. Its detrimental effect on poverty and on access to social services, development and economic growth has a profound impact on fundamental economic and social rights”

(United Nations Security Council 2017).

It is clear that progress on virtually all security and development goals is severely hampered, if not outright reversed, in contexts awash with poorly regulated arms and ammunition and high levels of violence. And although the manifestations of armed violence can be profoundly local in their undercurrents, they affect global peace and security and the well-being of all peoples. Therefore, conducting ammunition profiling research, with a view to helping reduce armed violence, can also be considered as an effort to strengthen the foundations of sustainable development processes.

Although the undercurrents of armed violence might be local, and immediate reduction strategies might need to be context-specific, the problem is truly a global one. As such, ammunition profiling efforts and the ensuing lessons learned ought to be shared in multilateral forums in pursuit of global improvements. That is, multilateral processes and global action can be leveraged to mobilize political will and resources at the regional, national and local levels and thus facilitate the establishment of adequate country-level and localized systems. For example, there are several international negotiations and multilateral processes that would benefit from monitoring flows of ammunition and channelling insights upstream; these could, in turn,

jump-start political will and resource mobilization to support programmes at the local level. Profiling and monitoring ammunition flows can inform and improve armed violence reduction efforts, including the following:

- The **United Nations General Assembly Resolutions 72/55 and 74/65 on problems arising from the accumulation of conventional ammunition stockpiles in surplus**, which called for a Group of Governmental Experts to convene and explore possibilities for better ammunition management
- The **Arms Trade Treaty**, especially as the Conferences of States Parties hold thematic discussions on specialized topics such as gender-based violence and diversion
- The **International Ammunition Technical Guidelines and the United Nations SaferGuard Programme**, as the authoritative international body tasked with improving national stockpile management capacity and addressing risk mitigation on ammunition
- The **Sustainable Development Goals**, specifically target 16.1, which seeks to “reduce all forms of violence and related deaths everywhere”, and target 16.4, which seeks to, inter alia, significantly reduce illicit arms flows

All these processes, with their different legal strengths and memberships, benefit from an upstream flow of new evidence regarding the source, supply chain pathways, dynamics facilitating unauthorized use, and overall impact of ammunition flows.

So, what is the added value of this Handbook? This Handbook seeks to generate a catalytic effect, to the extent that anyone interested in conducting ammunition profiling can do so by using this how-to guide as a starting point. In addition, this Handbook aims to codify an ammunition profiling methodology into a tool that extracts useful insights to reduce

armed violence, which mostly occurs in urban environments. **Most of the previous ammunition profiling studies have focused on conflict-affected settings or actual battlefields, yet most global casualties occur outside of conflict settings. As such, this Handbook offers not only a how-to guide for conducting ammunition profiling studies but also an armed violence lens for doing so.** Therefore, this Handbook presents itself as a novel product with two distinct contributions to the field:

- Codifying a methodology for any interested user to use and yield results in a standardized manner
- Presenting the ammunition profiling methodology with an armed violence lens, for replication studies to follow suit across different cities and towns

This Handbook acknowledges that the criminal use of ammunition in some areas may be dependent on diversion from conflicts to feed a certain demand in armed violence settings. As such, research into conflict-related material could provide information on ammunition diversion and its use elsewhere. Hence, this Handbook underscores the importance of sharing research findings across conflict settings and regional partners, in addition to other locations affected by criminal violence, to gain a deeper understanding of supply chains and the dynamics surrounding illicit trafficking networks.

Finally, while some practices described in this Handbook may already exist at the national level, they might not be harmonized or aggregated (e.g. different elements are collected by different national authorities or experts, and hence the output might not be comparable), and in most cases, this data is not collected with the intent to monitor and profile small arms ammunition. As such, one further added value of using this Handbook is that it will yield results in a standardized format, which facilitates internal and international documentation comparison and time series analyses.

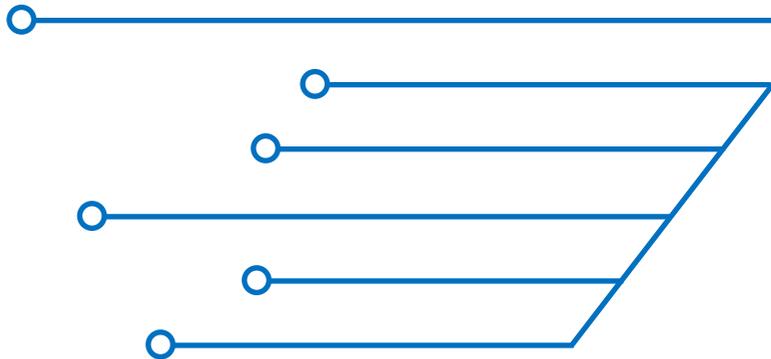
1.2 What is ammunition profiling?

This Handbook offers a road map for ammunition profiling, which is different from ammunition tracing. The key difference is that *tracing* efforts generally intend to determine the exact origin and recreate the supply chain of documented ammunition, when packaging or markings permit and confirmation is received from the relevant entities, whereas ammunition *profiling* is better understood as a data generation tool to gain a baseline of information regarding volumes and origins, variations (trends and patterns), and dates of production. **Ammunition profiling generates baseline data for subsequent efforts to build on. As such, ammunition profiling contributes to understanding of the problems of diversion, trafficking and misuse but, in isolation, will not present definitive answers. That is, ammunition profiling needs to be complemented with additional layers of data and followed by the analysis of context-specific policies and their implementation.**

In the case of this Handbook, ammunition profiling is intended to shed light on the general source of ammunition recovered from unauthorized hands or from unauthorized use in armed violence settings and variations therein, without necessarily being able to recreate the entire supply chain. Ammunition profiling, contextualized with the undercurrents of armed violence in specific environments, can be useful to inform ammunition control and tailor armed violence reduction strategies. In other words, ammunition profiling contributes to building a novel evidence base. At its core, this Handbook understands ammunition profiling as the systematization and analysis of data, built by documenting, at a minimum, the calibres, markings, manufacturers and manufacturing years of the ammunition recovered from scenes of armed violence, as well as accompanying law enforcement reports. To facilitate the data systematization, aggregation and analyses, this Handbook breaks down the effort into separate databases (see Part 2).

1.3 Objectives of this Handbook

- **The objective of this Handbook is to contribute to the generation of new data on ammunition, since baseline data on ammunition is a global shortcoming.**
- **This Handbook offers users a codified how-to guide to creating a profile of small arms ammunition in armed violence settings.**
 - » The main benefit of using this Handbook is that it helps strengthen domestic capacity to build an evidence base that could be subsequently leveraged to inform policies aimed at curbing the flow of ammunition reaching unauthorized hands or unauthorized use in armed violence settings.



1.4 Who can benefit from this Handbook?

This Handbook is written with multiple readers in mind:

- Practitioners working at the operational level, such as authorities working in forensic ballistics and crime laboratories, criminologists, law enforcement, intelligence, and police and military officers on the ground who seek to explore aggregated dynamics of ammunition flows and armed violence in their respective environments
- National policymakers interested in leveraging an evidence base of the ammunition flowing in, out and within a particular setting for better management and regulation of ammunition flows
- Members of regional and international organizations, including specialized United Nations agencies, who, in partnerships with national authorities, seek collaborative pathways to understand flows of ammunition, limit illicit ones, and reduce their impacts
- Field users, academics and members of non-governmental organizations (NGOs), who may find this Handbook a useful guide to capture, analyse and shed light on dynamics enabling armed violence in affected communities
- All other users, including journalists, who are interested in identifying and uncovering trends in ammunition misuse, diversion and trafficking

This Handbook will refer to readers and users as “users”, since following the guidelines below is, at its core, a research effort.

1.5 Guiding principles

The methodology presented in this Handbook has been designed with six guiding principles in mind. These principles underpin the value of this Handbook. The six principles are the following: piloting and iteration learning, national ownership, readiness, affordability, informativeness, and impact. Each of these guiding principles is described as follows:

- 1. Piloting and iteration learning:** The methodology outlined in this Handbook is intended to act as a set of working guidelines that need to be updated to reflect lessons learned from piloting and iterated uses in different context and regions. It is to be understood as a living document intended to shed light on the global problem of ammunition, and it will evolve as the community universalizes its use.
- 2. National ownership:** The methodology seeks to be sustainable, recognizing that national ownership is the key to sustainability. To spur national ownership, political will and operational support must be present. One way to ensure consistent and standardized operational support is to use this research methodology to inform or update national standardized operating procedures (SOPs), within the context of defined national legislation and regulations. To facilitate this, the methodology is designed to be practical and accessible without representing a significant additional burden on operational national authorities and existing procedures.
- 3. Readiness:** The methodology is also designed to be adopted and implemented immediately. This means that it has been designed around data that is readily available to most national authorities. That is, data that has already been collected but is sometimes overlooked, scattered or not systematized. Therefore, the methodology can be

best understood as a road map to systematize information that national authorities have under their jurisdiction.

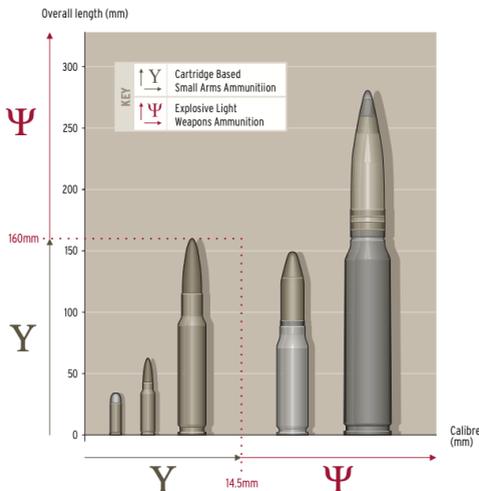
- 4. Affordability:** The methodology is also designed with simplicity in mind. This means that collecting the required data does not require substantial financial investment or recurrent expenses. The methodology attempts to rely on equipment that is affordable for most national actors or likely to be already in their possession. Further, it is a methodology that will not require licences or fees. A certain degree of technical knowledge is needed, but this could already exist at the national or local level or could be easily learned. The United Nations Institute for Disarmament Research (UNIDIR) stands ready to provide technical guidance when applying this Handbook, upon request.
- 5. Informativeness:** The methodology is designed to produce an overview of small arms ammunition flows, which is informative for the national control and management of small-calibre ammunition. It is not designed to solve individual firearms-related cases, but rather to shed light on larger patterns and produce actionable information that might have previously gone unnoticed. The overview will be generated by aggregating case-by-case information and distilling the patterns and trends affecting the determined territory.
- 6. Impact:** The methodology aims to produce actionable information that leads to effective policy prescriptions to reduce armed violence. As such, it seeks to uncover trends that are both informative and impactful. In this vein, the methodology revolves around diversion, trafficking and misuse, as well as the dynamics and conflating factors that facilitate lethal outcomes in firearms-related incidents.

1.6 Scope of small arms ammunition

For the purposes of this Handbook, small arms ammunition will be considered those rounds designed to be fired through firearms with rifled barrels up to a bore diameter of 14.5 mm and cartridges designed for use in smooth bore weapons up to 10 gauge (19.7 mm). For ease of reference, this Handbook uses the terms “small arms ammunition” and “small-calibre ammunition” interchangeably.

Small-calibre ammunition, as referred to in the Handbook, mostly services small arms, which include revolvers and self-loading pistols, rifles and carbines, submachine guns, assault rifles and light machine guns, and shotguns. These are the most common weapon systems used in incidents of armed violence in urban environments. Nonetheless, some heavy machine guns (usually called “light weapons”, as opposed to “small arms”) can also use small arms ammunition.

Figure 1: Small arms ammunition threshold (letter Y)³



3 Source: Bevan 2008a (Small Arms Survey).

Figure 2: Common pistol, rifle and shotgun cartridges⁴



Explosives and explosive ammunition and munitions are outside of the scope of this Handbook. Manipulating explosives and explosive ammunition and munitions requires specialized safety protocols that are not addressed in this Handbook. In addition, manipulating ammunition should always be done under the guidance or supervision of specialized officers, in some contexts referred to as Ammunition Technical Officers (ATO). For safety reasons, this Handbook warns against approaching or manipulating ammunition outside the scope of small arms ammunition, encompassed by the area with the letter Y in Figure 1.

⁴ Source: Bobbfwed. This image is intended to serve as an illustration of commonly recovered small arms ammunition and to illustrate the scope of this Handbook. The image serves an illustrative, rather than a comprehensive or technical purpose.

1.7 Technical overview of small arms ammunition

For those requiring a technical overview of the nuances of identifying small arms ammunition, the Small Arms Survey has an easy-to-use open access handbook on weapons identification, with a chapter dedicated to the [identification of small-calibre ammunition](#), with open access.

For those interested in ammunition tracing and protocols and procedures for recording small-calibre ammunition, including examples of templates to record and report relevant information from the ammunition samples, the Small Arms Survey also has an easy-to-use [Ammunition Tracing Kit](#), with open access. This Ammunition Tracing Kit also includes fully completed examples that could be used as reference.

Further, in conducting ammunition profiling, specialized personnel might need to be consulted. As such, this Handbook advises users to consult with small arms ammunition or weapons intelligence experts to verify the inputting of data and analysis to avoid misidentification.

This Handbook advises users to consult with small arms ammunition or weapons intelligence experts to verify the inputting of data and analysis to avoid misidentification.

1.8 How to use this Handbook

Users requiring a refresher on identifying small-calibre ammunition should consult the sources mentioned in **section 1.7**.

Users ready to begin the process of profiling small-calibre ammunition should jump straight into the guidelines in Part 2.

Users interested in options for a refined distillation of ammunition-specific findings should use Part 3.

Part 2 is the core of the Handbook as it presents a step-by-step guide for ammunition profiling. Part 2 introduces the four databases in turn.

The guidelines for Databases 1 and 2 are separated into two main actions: (Section A) data collection and (Section B) data analysis. These guidelines are designed to assist users who are building an ammunition profile from scratch by presenting self-contained, per database, instructions on how to collect the data and then analyse it. Completing this effort will yield a comprehensive profile of ammunition recovered in armed violence settings.

The databases are discussed separately because the end users might be different, and the information might be stored in different departments or collected by different personnel or agencies. For example:

- **Database 1: Evidence** might be built by crime scene or forensic laboratory officials, tactical law enforcement, or customs officials, working independently or as a multi-agency task force.
- **Database 2: Records** might be built by the national agency tasked with approving and allocating the ammunition supply or, in cases where no central agency controls national distribution, it will have to be built in partnership with the ammunition end users, manufacturers and holders, including armed and security forces.
- In the cases of **Database 3: Illicit manufacture** and **Database 4: Interviews with affected communities**, it is recommended that a trained user in qualitative methods takes the lead. Although the databases might be constructed independently, legislative officials and policymakers might be interested only in a final report, as opposed to stand-alone databases. As such, it is important that the information collected is thoroughly analysed and presented in the form of a briefing

that details the main findings, the implications of these findings, and the recommended next steps.

This Handbook also acknowledges that the collection of data concerning ammunition from crime scenes, seizure from domestic operations, and seizure at entry-exit points may not be the responsibility of one single department or agency. As a result, a certain level of inter-agency coordination may be required at the local and/or national levels in the construction of the databases.

That being said, practitioners may use only the information that is available to them and still gain valuable insights concerning ammunition flows that can help inform policy at either the municipal or national levels. UNIDIR stands ready to provide guidance on inter-agency coordination when applying this Handbook, upon request.

PART TWO: METHODOLOGICAL GUIDELINES



PART 2. METHODOLOGICAL GUIDELINES

To shed light on trends regarding ammunition misuse, trafficking and diversion, this Handbook suggests building four databases, which can be cross-referenced against one another. By organizing the methodology around databases, the data-collection effort is divided into achievable milestones. These guidelines offer a road map to creating the four databases, which encompass three broad types of information:

1. Primary evidence:

Database 1: Evidence

- Built from the following information points: (a) ammunition recovered from crime scenes, (b) ammunition seized in domestic operations and (c) ammunition seized at entry-exit points. When the ammunition recovered from any of these information points is accompanied by a law enforcement report, contextual information from that report should also be included in the spreadsheet.

2. Records of information:

Database 2: Records

- Built from the following information points: (a) records of ammunition imports, (b) records of ammunition manufactured in-country and (c) records of ammunition stockpiled in the country.

3. Contextual information:

Database 3: Illicit manufacture

Database 4: Interviews with affected communities



Database 1 will be, most likely, constructed from unprocessed or semi-processed evidence. To build this database, users will have to extract data from pieces of ammunition and law enforcement reports and input it into spreadsheets. Database 1 will represent the primary evidence of ammunition misused, illicitly held or trafficked. The “information points” can be understood as the source or event where the data originates from, meaning crime scenes, seizures in domestic operations, or seizures at entry-exit points.

Database 2 will be, most likely, already partially documented in records by the responsible national agencies. To build this database, users will have to systematize information from records into a format that facilitates its analysis. Database 2 can be considered the benchmark of information to potentially contrast against Database 1.

Finally, **Databases 3 and 4** will be qualitative research based on interviews, exchanges, group discussion and community knowledge. The importance of these two databases is that they will help contextualize findings from the primary evidence (Database 1) and records of information (Database 2).

2.1 Defining the evidence target

In an ideal scenario, a study focusing on monitoring and diagnosing small arms ammunition diversion, trafficking and misuse would document the entire universe of ammunition in circulation across a determined territory. However, this is often not possible. As such, the second-best option is to document a representative sample. The evidence target defines the sample that will be analysed.

When defining the evidence target, it is important to ensure that the sample is representative of the universe (also referred to as the “population”).⁵ To make such a determination, the scale of the universe must be known, at least roughly. For example, if a territory has had 100,000 documented incidents of ammunition discharge in the time frame under examination, then users must use that number as a benchmark to determine what percentage of those cases would constitute a representative sample. A representative sample allows findings to be generalizable. In addition, the documentation of the sample must be achievable within the limits of the available resources. As such, it is a balance between “representation” and “achievability”.

A representative sample can be defined as a subset of a population that accurately reflects, on average, the characteristics of the universe.⁶ To limit biases, random sample selection is crucial, as it offers the best chance of generating a sample with the same characteristics, on average, as the universe. In other words, it minimizes potential biases that could yield skewed results. Finally, when defining the evidence target, it is crucial to do so by addressing the following: What research questions are the authorities trying to answer?

5 For a definition of “universe” in statistics, see: <https://stats.oecd.org/glossary/detail.asp?ID=2087#:~:text=Definition%3A,and%20coverage%20of%20the%20study>.

6 For more on representative samples and sampling, see: https://link.springer.com/referenceworkentry/10.1007%2F978-94-007-0753-5_2476.

The combination of the four databases aims to paint a comprehensive picture of the ammunition circulating in, out and within a determined territory.

The combination of the four databases discussed in Part 2 aims to paint a comprehensive picture of the ammunition circulating in, out and within a determined territory. Simply put, the more comprehensive the data, the more robust the analysis to draw from to answer the research question. Nonetheless, users should not be discouraged if constructing all the databases or collecting all the data entry points is not possible, since some information, even by itself, can be informative, and the full picture can be built progressively. For

example, collecting five years of information would be very informative but might not be immediately achievable. As such, an acceptable compromise can be to start with the latest year and extract initial findings from only the most recent cases, while clearly stating so when drawing conclusions. In addition, not all databases will necessarily be relevant to every study, since a user might decide to focus only on ammunition diversion or trafficking or misuse or to study a particular point in time to assess the impact of a new regulation, as opposed to studying the three activities at once or studying a longer period of time.

The main takeaway from this discussion is that users should feel free to define their own evidence target, which needs to answer the question identified by national authorities and be based on a representative sample.

2.2 A step-by-step guide, per database

This section is an illustrated step-by-step guide of how to construct each database, with suggestions for their analysis. Moving forward, note that Databases 1 and 2 will need to be systematized into different spreadsheets, with drop-down menus or tabs to input data arising from different information points, whereas Databases 3 and 4 will be recorded as qualitative information. Also note that data inputting should be done at the smallest level of disaggregation possible, yet without doubling the entries for identical samples. For example, should two boxes of ammunition contain identical cartridges, then one entry in the spreadsheet summing the total number of boxes and cartridges recovered will suffice. However, should the two boxes contain different calibres or markings, a separate entry will be needed for each separate calibre or marking identified. Afterwards, to thoroughly analyse the information and create a comprehensive ammunition profile, the analysis section will propose cross-referencing fields among the different databases.

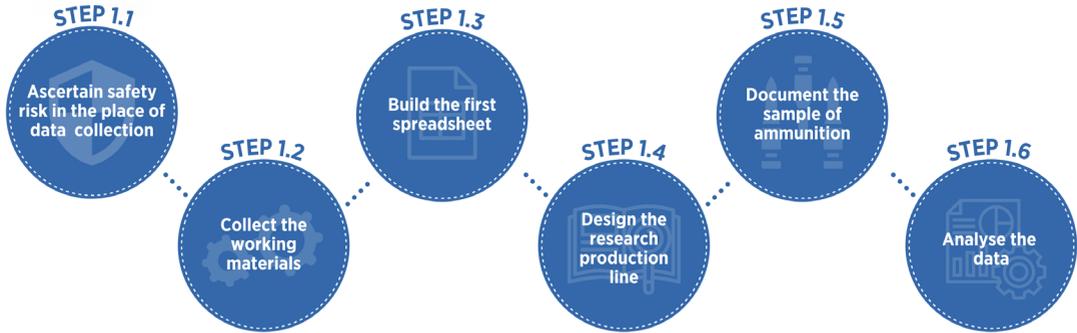
Finally, this Handbook encourages users to avoid duplicating any data that is already being collected and to attempt to source data, where possible, from existing mechanisms.

This Handbook encourages users to avoid duplicating any data that is already being collected and to attempt to source data, where possible, from existing mechanisms.

DATABASE ONE: **EVIDENCE**



DATABASE 1: EVIDENCE



Justification: *Database 1: Evidence* with its three information points will generate overviews of:

- the ammunition used in firearms-related scenes of violence, which can generally be characterized as ammunition misuse;
- the ammunition circulating illegally or as unauthorized possession and seized within national borders; and
- the ammunition trafficked illicitly and seized at border controls.⁷

Information points: This database will be built from the following information points: (a) ammunition recovered from crime scenes, (b) ammunition seized in domestic operations and (c) ammunition seized at entry-exit points.

⁷ To differentiate between illicit possession and illicit trafficking, the United Nations Office on Drugs and Crime defined the terms as follows in its latest study on firearms:
Illicit possession: The unlawful possession of regulated or prohibited firearms, their parts and components or ammunition. Carrying a handgun without a licence is an example of illicit possession.
Illicit trafficking: The import, export, trans-shipment, acquisition, sale, delivery, movement or transfer of arms, their parts and components, and ammunition from or across the territory of one State to that of another State if any one of the States concerned does not authorize it in accordance with national law of one of the countries involved or if the arms are not uniquely marked upon manufacture and marked upon import. Arms that were not properly deactivated according to the national legislation of the destination country can also be illicitly trafficked or smuggled.



Where to find this information: This information might be located in forensic ballistics units, law enforcement evidence storage and case files, firearms focal points, gun crime intelligence centres, crime departments, or the judiciary, if the ammunition is presented as evidence in judicial proceedings. In addition, this data may be stored in depots held by law enforcement agencies, by the armed forces, or by customs, coast guard, port and airport authorities.

SECTION A: DATA COLLECTION

To start the process of monitoring and diagnosing small arms ammunition diversion, trafficking and misuse,⁸ the most important effort is to document the various types of ammunition recovered from circumstances that could be characterized as misuse, illicit possession or trafficking. The difference between illicit possession and illicit trafficking is that the latter involves unauthorized cross-border movement, whereas the former is defined by confiscations within national borders. This data-collection effort can be considered a systematization of information extracted from the ammunition recovered from crime scenes and from seizures in domestic operations and at entry-exit points. Constructing this database relies on documenting, at a minimum, the different characteristics observed on the ammunition headstamps, the packaging and the accompanying law enforcement reports, when available. The ammunition cartridges and packaging will represent the hard evidence, whereas the reports will contextualize the ammunition-specific findings. These two sources of data are mutually reinforcing and deepen understanding of the relationship between ammunition and armed violence.

Step 1.1: Ascertain safety risk in the place of data collection⁹

When planning to handle small arms ammunition as physical evidence, it is imperative to follow all necessary safety prevention procedures, in accordance with the specific conditions of the location. Before entering the place of collection, the first step is to conduct a full risk assessment of the site or storage facility and secure supervision and clearance from a competent specialized officer or Ammunition Technical Officer. Small arms ammunition might be stored in locations or storage facilities that may also contain explosive conventional ammunition, explosives (whether military, commercial, or homemade), explosive stores (detonators and detonating cord), improvised explosive device components, or toxic industrial chemicals and other elements that pose a safety risk, both for the persons and the surroundings. Items beyond small arms ammunition fall outside the scope of this Handbook. Thus, items beyond small arms ammunition should not be sampled or manipulated following the methodology outlined in this document. As such, there should be no interaction with the working site until a full risk assessment has been carried out by a competent Ammunition Technical Officer, the appropriate mitigation measures have been taken, and the site has been cleared for tasks outlined in this methodology to begin. In addition, users are strongly advised to refrain from manipulating any firearm and should leave all clearance of firearms to qualified individuals.

⁹ This section should not be considered an exhaustive manual of safe operating practices, but rather illustrative of the minimum measures that should be considered before entering a scene that could contain firearms, ammunition or explosives. To ensure the safety of users and the surroundings, a full thorough risk assessment of the location must be completed by a competent Ammunition Technical Officer.

More detailed guidance on safety in storage facilities is available in the following publications:

- United Nations Office for Disarmament Affairs, [International Ammunition Technical Guidelines](#)
- UNIDIR, [Utilizing the International Ammunition Technical Guidelines in Conflict-Affected and Low-Capacity Environments](#)

It is highly encouraged to handle all evidence with nitrile gloves. Nitrile gloves serve two purposes: they prevent the transfer of material to the evidence, and they provide protection to the wearer from contamination with hazardous materials such as body fluids, lead, gunshot residue and propellant compositions. Users need to be particularly cautious when handling projectiles since, after impacting, recovered projectiles may be contaminated with body fluids or have exposed lead cores.

Additional safety measures:

- Users should take special precautions with biological residue from evidence that might have been extracted from a deceased or injured person.
- Gloves are sound measures to protect against biological residue, but users should also consider wearing a mask and lenses.
- If the research takes place inside an evidence storage locker or shooting range where lead residue is prevalent, users should wear a mask to avoid inhaling lead.
- When possible, users should use tweezers to manipulate the evidence, as this adds another layer of separation between the user and the evidence.

- 
- » Users must use plastic tweezers (as opposed to metallic ones or metallic ones covered with plastic tips) to avoid adding individualizing marks to the ammunition cartridges recovered as evidence, since the contact and movement between metallic tweezers and ammunition can leave toolmarks and jeopardize forensic ballistics analyses.
 - **Any unfired ammunition which, on examination, is found to be corroded or otherwise damaged should be set aside for inspection by a specialized officer or Ammunition Technical Officer. Cracked cartridge cases or rounds with loose projectiles may cause the spillage of propellant, which is sensitive to flame, friction and electrostatic discharge.**

Step 1.2: Collect the working materials

- The ammunition samples and the reports¹⁰ from which to extract the raw data
- Nitrile gloves to offer some protection to users
- Magnifying glasses to enhance the view of headstamp markings
- Chalk to enhance worn or erased markings for observation and photography
- Plastic tweezers to hold ammunition without leaving individualizing marks on the cartridges
- A magnet to help determine the composition or coating of ammunition cartridge cases and bullets or determine the projectile type¹¹
- A computer with spreadsheet access through which to input and systematize the information
- A digital photographic camera and photo scales (a suitable ammunition gauge or ruler could also be used in lieu of photo scales)
- Callipers (or ammunition gauges) for measuring cartridge case length and cartridge case head diameter to ensure correct calibre identification
- Record-keeping paper forms to document any and all physical evidence manipulated (for more on chain of custody, see Box 4)

¹⁰ In other words, recovered ammunition and the accompanying law enforcement reports.

¹¹ The magnet attracts ferrous materials.

Step 1.3: Build the first spreadsheet

This step is crucial as it can be considered the research design. It will define what characteristics will be extracted from the ammunition sample and accompanying reports, and which ones will not. It is recommended that this process undergoes a thorough national review to ensure all the desired fields are considered. The first spreadsheet will have two parts, each corresponding to a different source of information: small arms ammunition evidence and accompanying law enforcement reports. These sources of information, once systematized into a spreadsheet, will represent *Database 1: Evidence*. To collect the desired information, a sample spreadsheet template can be downloaded [here](#).¹² Alternatively, for users interested in building an organic spreadsheet, some recommended data-collection fields are as follows:

Information from recovered small arms ammunition (part 1 of spreadsheet)

- Unique identifying number (assigned by the users)
- Case number (assigned by law enforcement)
- Number of identical ammunition cartridges, cases or complete rounds¹³
- Information point (crime scene, seizure in domestic operations, seizure at entry-exit point)
- Type of evidence (projectile,¹⁴ fired or spent cartridge, live ammunition, or ammunition in manufacturers' packaging)
- Lot number
- All headstamp alphanumeric and monogram markings¹⁵, following clockwise order documentation

¹² The template can be downloaded at www.unidir.org/Profiling-Template

¹³ The number of cartridges recorded in the spreadsheet should reflect the actual number in the package or box and not just the nominal number printed on the packaging.

¹⁴ For ease of reference, this Handbook uses "projectiles" and "bullets" interchangeably. For more detailed guidance, see Jenzen-Jones (2018).

¹⁵ This Handbook encourages users to note the alphabet type in the 'Additional comments' field, if more than one alphabets are documented

- Import code, if any¹⁶
- Year of manufacture, if known
- Headstamp symbols,¹⁷ if any
- Country of manufacture, if known
- Manufacturer, if identifiable¹⁸
- Factory, if identifiable
- Exporter, if identifiable
- Importer, if identifiable
- Calibre¹⁹
- Length of cartridge case²⁰
- Markings stamped on the body or groove of the cartridge case, if any²¹
- Composition or coating of the cartridge case (brass, steel, copper, aluminium, iron, nickel, plastic, etc.)²²
- Colour of primer annulus sealant, if any
- Projectile lacquer colour²³
- Projectile shape (blunt nose, conical nose, hemispherical nose, parabolic nose, ogive nose, sphere, pellet, etc.)
- Projectile type, purpose or function (ball, lead round nose, wad cutter, semi-wad cutter, semi-jacketed, full metal jacket, semi-jacketed hollow point, jacketed hollow point, BB, BBB, etc.)

16 This Handbook refers to import codes as the markings added at the point of manufacture, upon request of the importer. Import codes are usually unique to the importing entity and would offer important information, when available, to map the life cycle of the ammunition.

17 For data inputting purposes, when there is no possibility to include a visual representation of the headstamp symbols, a written description should be defined, included and used consistently, for example "NATO four-pointed star".

18 The name of the manufacturer could, at times, be confused with the brand (seller or distributor) of the ammunition; for example, ammunition headstamps may indicate manufacturer, whereas the packaging may correspond to the seller or distributor. When recording this field, keep in mind that this Handbook is interested in the manufacturer, defined as the producer of the ammunition, as opposed to the commercial brand. Should this information be unclear or not available, users are advised to consult with an expert or review the resources available in Part 3.

19 As a reference for a calibre homologation framework, see: https://bobp.cip-bobp.org/tr/homologation_public.

20 To assess the case length, it is advisable to use a specialized ammunition gauge. In addition, should there be any doubt regarding the exact calibre, measuring and recording the exact cartridge case mouth internal diameter would assist in making a determination.

21 Markings stamped on the body of the cartridge are mostly present in shotgun cartridges (and shotgun waddings might also present useful information), but some manufacturers can, upon request, also mark the side or groove of all small arms ammunition cases with codes.

22 To discriminate between brass and steel, a magnet is necessary. Some ammunition gauges already incorporate a magnet for this purpose.

23 This is not the colour of the bullet per se, but the code colour, which is usually painted or lacquered on the tip of the bullet. This code depends on the country or organization for which it was manufactured (if applicable). For more detailed guidance, see Jenzen-Jones (2018).

- Notes on firing pin impressions, if any
- Fired by a registered firearm (yes/no)
 - » If yes, firearm identified and type of licence to be added to additional comments
- Reloaded (yes/no)
 - » If yes, observations added to additional comments
- Photography digital file number²⁴
- Additional comments

Contextual information from accompanying law enforcement reports (part 2 of spreadsheet)

- Report case number (assigned by law enforcement)
- Date of the crime or seizure (dd/mm/yyyy)
- Time of the crime or seizure (recommended time format is 24:00)
- Location of the crime or seizure
 - » Household
 - » Public space (port, airport, postal office, public road, building, etc.)
- Address or coordinates of the crime or seizure
- Situational context (if available)²⁵
 - » Organized crime related
 - » Gang-related
 - » Corporate crime-related
 - » Intimate partner/family-related
 - » Inter-communal violence
 - » Terrorism related
 - » Civil unrest
 - » Other crime
 - » Not applicable
 - » Not known

²⁴ For general guidance on photographing ammunition, see Box 3.

²⁵ Typology retrieved verbatim from the International Classification of Crime for Statistical Purposes (ICCS) prepared by the United Nations Office on Drugs and Crime (UNODC, 2015, p 99), see: <https://unstats.un.org/unsd/statcom/doc15/BG-ICCS-UNODC.pdf>

- Outcome of the crime (harm caused in the crime scene)²⁶
 - » Intentional homicide
 - » Femicide
 - » Attempted intentional homicide
 - » Non-intentional homicide
 - » Robbery
 - » Assault
 - » Destruction or damage to property
 - » Sexual violence
 - » Domestic violence or intimate partner violence
 - » Coercion
 - » Kidnapping
 - » Illicit discharge
- Gender of the victim (only for crime scenes)
- Sex of the victim (only for crime scenes)
- Age of the victim (only for crime scenes)
- Gender of the perpetrator
- Sex of the perpetrator
- Age of the perpetrator
- Perpetrator's relationship to the victim (if applicable and only for crime scenes)
 - » Current intimate partner or spouse
 - » Former intimate partner or spouse
 - » Blood relative
 - » Other household member
 - » Friend
 - » Acquaintance
 - » Colleague or work relationship
 - » Authority or care relationship (doctor, nurse, police, etc.)

²⁶ Typology informed by the International Classification of Crime for Statistical Purposes (ICCS) prepared by the United Nations Office on Drugs and Crime (UNODC, 2015), but not retrieved verbatim. This typology is intended to be illustrative, rather than comprehensive. Users should tailor this field to the national context and definitions stipulated in national legislation.

- » Offender known to victim
- » Offender unknown to victim
- » Relationship not known
- Incitement-related factors
 - » Alcohol
 - » Illicit drugs
 - » Gender related
 - » Other
 - » Not applicable
 - » Unknown
- Reason for intervention or detection method
 - » Combination with other detected illicit activity
 - » X-ray
 - » Intelligence-led search
 - » Canine inspection
 - » Random control
 - » Behaviour unit
 - » Emergency services
 - » Gunshot detection systems
 - » Tip-lines or hotlines
- Concealment method (only for seizures)
- Outcome of intervention (only for seizures)
 - » Arrest for presumed illicit possession or illicit trafficking (only for seizures)
 - » Charges filed, but person freed (only for seizures)
 - » Confiscation of ammunition (only for seizures)
 - » Pending further law enforcement investigation (only for seizures)
 - » Returned to owner
- Direction of flow (only for seizures)
 - » Inbound: entering the country
 - » Outbound: leaving the country

- Country of origin or destination (only for seizures)
- Any available police intelligence generated from the scene of the crime or seizure
- Additional comments

Box 1: Gender-based violence and the importance of gender disaggregated data collection

Gender-based violence (GBV) is a form of violence motivated by or directed at victims solely because of their biological sex and/or gender identity. Gender, in this case, is understood as a fluid continuum and encompasses those who identify as non-binary. GBV may include physical, sexual, verbal, emotional and psychological abuse against non-binary persons, men, women, boys and girls. As evidenced by the findings of the Small Arms Survey, lethal violence, including firearms-related violence, is highly gendered. The majority of both victims and perpetrators of firearm violence are male, with most of the female victims being killed as a result of GBV committed by men.¹ The possession and use of firearms and ammunition have been linked to both GBV and gender inequalities entrenched in society. Firearms and ammunition may also exacerbate patriarchal conceptions of toxic masculinity, which associates the use of firearms and ammunition with cultural norms of power and control.

Addressing GBV and, more specifically, the link between GBV and firearms and ammunition, requires gender disaggregated data on victimization, perpetration and other roles played in the facilitation of armed violence. For this reason, it is important to include gender disaggregated indicators in all aspects of data collection. These indicators include those that may be found in crime scene reports when profiling ammunition, including gender of the perpetrator, gender of the victim, relationship between perpetrator and victim, and any incitement-related or exacerbating factors identified. It is also important to keep in mind that outcomes of crimes such as femicide or sexual violence can be indicative of GBV.

Gender disaggregated data collection provides a more nuanced and refined understanding concerning the impact of firearms and ammunition on gender equality. This information could also help determine the levels of GBV committed both with and without firearms and ammunition. Through the collection of gender disaggregated data in ammunition profiling, we can better understand the role that firearms and ammunition play in GBV. With this new evidence base, policymakers and practitioners can better address the gendered aspects of armed violence and ammunition proliferation and improve corresponding national policies and programmes.

¹ Alvazzi del Frate, Hideg and LeBrun (2020)

Step 1.4: Design the research production line

Once the fields of information to be documented have been selected, the primary evidence located, the workplace cleared following safety protocols, and the sample defined and approved by national authorities, users should organize their work to input the ammunition data in the most efficient manner. A clear organization will allow users to document large amounts of evidence in a short period of time and respect safety protocols. However, should users prefer to integrate ammunition-specific data-collection practices into SOPs, authorities will generate this database over time and facilitate time series analyses. In either case, users will likely need to accomplish a combination of the following tasks:

- Determine the universe of information, to define the evidence target.
- Access loose ammunition, ammunition recovered in manufacturers' packaging, and the law enforcement reports.
- Photograph the ammunition sample.
- Extract ammunition-related data and information from the reports.
- Enter the data into the database.
- If applicable, repackage evidence in line with chain of custody requirements.

To accomplish these tasks, users could organize their profiling method in a *research production line*. For example, if the ammunition profiling effort will be carried out at once, as opposed to integrated into national SOPs, users could define specific roles for each one of the members of the team and repeat them throughout the entire data-collection process, following the principles of division of labour and specialization. **As a preliminary step, it is crucial to first count the total number of packages or evidence available (and confirm that none of the packages is empty) to determine the scale of the universe of information. Such a benchmark**

is then used to define a representative sample, otherwise referred to as the “evidence target”. This way, the user will be able to claim that the documented sample represented “X percent” of the entire pool of all existent evidence (for more on sampling and defining the evidence target, see section 2.1. Defining the Evidence Target).

After determining the universe of information and evidence target, and if a team is working together to develop the ammunition profile, one user could start the *research production line* by selecting the evidence and opening the packaging, then the next user could photograph the ammunition (both headstamps and side-profile shots) and evaluate the cartridge and markings to extract relevant information; a third user could input the raw data into a spreadsheet. It is essential that one user is tasked with photographing each individual piece of physical evidence, using photo scales (or a suitable ammunition gauge or ruler) to capture the exact dimensions of the cartridge. That user must also ensure that the photographic digital file numbers are recorded next to the corresponding ammunition entry in the database, in order to verify the data entered afterwards (for more detailed guidance on photographic ammunition, see Box 3).

Once the documentation process is completed, each piece of evidence, if applicable, must be re-stored safely in keeping with national requirements for maintaining the integrity of the chain of custody (for more detailed guidance on chain of custody, see Box 4). Afterwards, a new entry in the database would begin with all users repeating the same task, but with a different ammunition exhibit. This repetition will allow the team to process information rapidly and develop dexterity in their respective tasks. It is recommended that only one piece of evidence or report should be open at a time to avoid misplacing evidence or mixing cases. Orderly operations are key to the safety of users and the location.

Alternative research production options

An alternative method for sustainable data collection is integrating some of these considerations into the SOPs of national authorities, for example at the forensic ballistics or crime laboratories. If the above-mentioned data is collected from a database at the same time as the ballistic information is processed, authorities will generate this database over time and facilitate time series analyses. This option may be the most practical approach in countries where the volume of evidence is high. This approach, however, requires inter-agency coordination and data sharing, as usually no single entity, including the crime labs, would have access all data points.

To counter the often-siloed nature of public security efforts, the establishment of a Firearms Focal Point (FFP) or gun crime intelligence centre, can be leveraged to centralize ammunition data and build a common framework for inter-agency collaboration. An FFP can streamline data collection and provide enhanced intelligence to tackle armed violence. Where an FFP exists, this entity could be well-positioned to lead and consolidate ammunition profiling efforts. In jurisdictions where no FFP exists, but there is interest in creating one, starting an ammunition profiling Task Force could inexpensively set the foundations for the future establishment of a more comprehensive FFP, while moving the issue of inter-agency collaboration and ammunition profiling forward.²⁷

The Small Arms Survey has been piloting the feasibility of performing ammunition profiling by extracting relevant data contained in the Automatic Ballistics Identification System used by some countries. The profiling method pioneered by the Small Arms Survey consists of extracting the “ammunition profiling-relevant data” from these automated systems, which the system acquires automatically when running ballistics correlations, and then offloading the data into a database. It is a method designed to

²⁷ For an example of a Firearms Focal Point initiative, provided by Arquebus Solutions, see: <https://arquebus.uk/firearms-focal-points/>

avoid the labour-intensive task of inputting data, cartridge by cartridge, into a spreadsheet. This method is potentially applicable for jurisdictions that systematically upload all their cartridges into an Automatic Ballistics Identification System.

Box 2: Automatic Ballistics Identification Systems industry cooperation

Ammunition profiling can be labour intensive and represent additional work for jurisdictions that already upload all fired cartridge cases and projectiles into the Automatic Ballistics Identification Systems (ABIS) of different technological suppliers. Thus, to avoid duplicating efforts, it is important to extract ammunition information where it is already available—such as, potentially, extracting data from the different ballistics identification systems, when available and in jurisdictions where all recovered exhibits are systematically uploaded into these systems. **Nonetheless, to streamline this work even further, it is important that commercially available ABIS embrace the ability to automatically acquire and systematize, using standardized lists to avoid inconsistencies or misidentifications, all fields necessary to generate baseline data on recovered ammunition and/or the ammunition profiling database.** To achieve this, engaging with private industry and clearly expressing the needs emerging from public security, with a view to finding practical solutions, is of utmost importance.

In addition, another important opportunity to cooperate with the ABIS industry is to explore ways to make the different technological systems communicate and exchange information among themselves, with enhanced agility; since, to date, proprietary data and non-interchangeable formatting can represent a barrier to information sharing. This solve this challenge it is important to engage with the ABIS industry to promote the uptake of a shared file format, allow for cross-platform intelligence-led searches, and communicate emerging needs as the field of ammunition evolves.

Step 1.5: Document the sample of ammunition

Step 1.5.1: Document information from recovered small arms ammunition

Example 1: Loose ammunition

This step consists of inputting the observed characteristics of ammunition from the sample into the spreadsheet. This is precisely what the Handbook refers to as “constructing a database from raw unprocessed data”. At this point, the users have designed the spreadsheet and can begin inputting raw data from ammunition. For example, consider the photographs of the headstamps in Figure 3 as the first pieces of evidence that will be documented.

Figure 3. Selected examples of small arms ammunition headstamps²⁸



All the information in these headstamps can be distilled into precise data entries and inputted into the spreadsheet (see Tables 2–6). These would

²⁸ Sources: The two headstamp photos on the top have been provided by Rodolfo Gamboa, Senior Technical Officer at UNLIREC, and the two headstamp photos at the bottom by © Hardy Giezendanner, UNIDIR Researcher.

be considered the first four entries in *Database 1: Evidence*. In Table 2, the headstamps have been identified as follows: top-left with ID number 1, top-right ID number 2, bottom-left ID number 3, and bottom-right ID number 4. In Table 6, the associated digital photography file numbers 122, 123, 124 and 125 have been added.

Table 2: Selected example of data input from case information

Case information				
ID	Case Number	Number of rounds	Information Point	Type of Evidence
1	EXAMPLE	1	Crime Scene	Spent Cartridge
2	EXAMPLE	1	Crime Scene	Live ammunition
3	EXAMPLE	1	Crime Scene	Spent Cartridge
4	EXAMPLE	1	Crime Scene	Live ammunition

Tables 3–6: Selected examples of data input from loose ammunition

Lot number	All alphanumerical marking	Import code	Year	Symbols	Country
N/A	EP 00 9mm PARA	N/A	2000	N/A	Brazil
N/A	G 00 5.56	N/A	2000	N/A	Guatemala
N/A	BOF 83 7.62x39	N/A	1983	N/A	Bangladesh
N/A	10 00	N/A	2000	N/A	Bulgaria

Manufacturer	Exporter	Importer	Factory	Calibre
CBC	Brazil	Peruvian Army	CBC	9 x 19 mm PARA
G	Unknown	Unknown	Unknown	5.56 x 45 mm
BOF	Unknown	Unknown	Bangladesh Ordnance Factory	7.62 x 39 mm
Arsenal	Unknown	Unknown	Unknown	7.62 x 39 mm

Length of cartridge	Markings on the body	Composition/coating	Colour of primer
19 mm	N/A	Brass	N/A
45 mm	N/A	Brass	Green
39 mm	N/A	Unknown	Red
39 mm	N/A	Unknown	Red

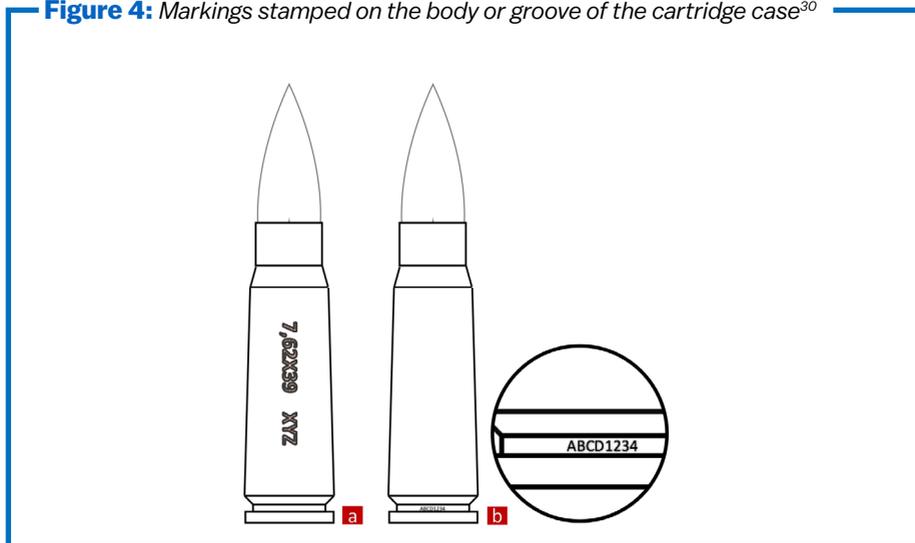
Projectile Shape	Projectile Type/Purpose	Notes	Registered firearm	Photo digital file number	Reloaded	Additional comments
N/A	N/A	N/A	Unknown	122	N	Manufactured for the Armed Forces
Ball	FMJ	N/A	N/A	123	N	N/A
N/A	N/A	N/A	Unknown	124	N	N/A
Ball	FMJ	N/A	N/A	125	N	N/A

From the sample data outlined above, users can see how an overview of small arms ammunition flows begins to take shape. For example, three out of the four documented exhibits were, most likely, manufactured in the year 2000. The more information that is entered into this database, the more reliable and informative the observed trends will be.²⁹

Additionally, some loose ammunition samples might have identifying markings stamped on the body or groove of the cartridge case, as Figure 4 shows. Although body or groove markings may be present in a minority of cases, it is important for users to consider and document such markings in the spreadsheet in its corresponding field, as this might facilitate cross-referencing and shed light on the origin of such rounds. It is also a good marking practice that ought to be replicated, when possible.

²⁹ This Handbook recognizes that users might encounter ammunition markings that may need to be documented and recorded using Cyrillic, Hebraic, Chinese and other characters and symbols that are not included in the example above. The characters encountered will depend on the context and the type of ammunition circulating in that environment or region.

Figure 4: Markings stamped on the body or groove of the cartridge case³⁰

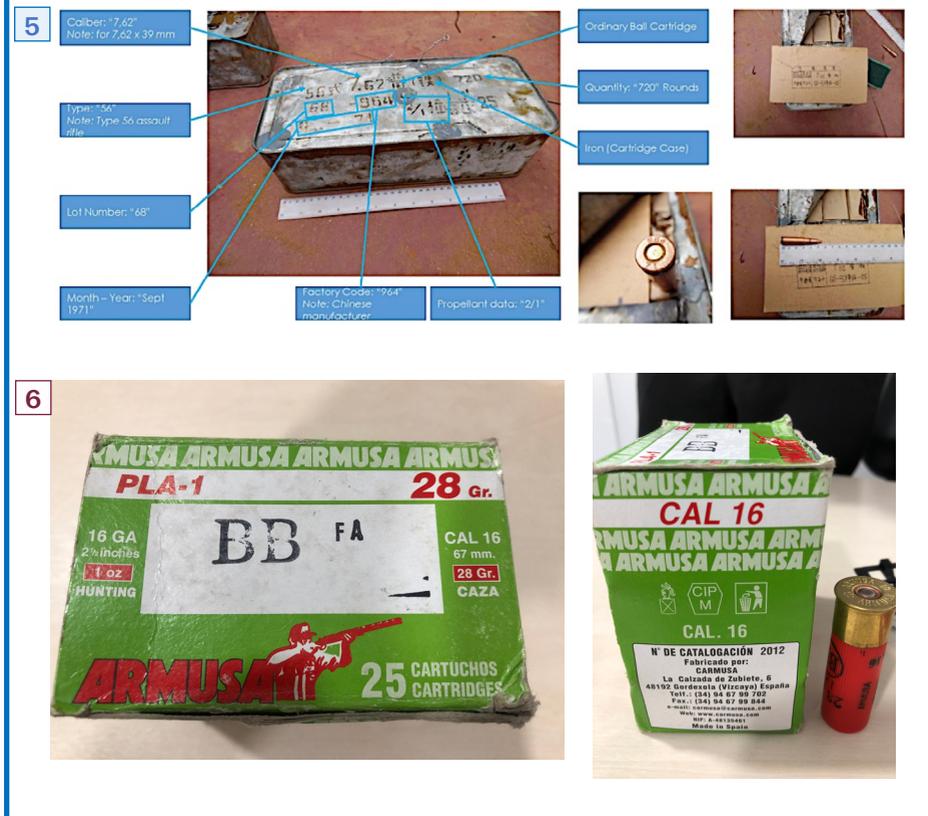


Example 2: Ammunition in manufacturers' packaging

In some cases, the ammunition will not be recovered as loose exhibits, but in the presumed original packaging (boxes or crates) from the manufacturer. While these cases might be the minority, original boxes or crates usually contain significantly more information than loose ammunition. For example, lot-numbered boxes or packaging are, in principle, traceable, and they expedite the inputting of data since all the ammunition cartridges contained tend to be identical. To illustrate this point, consider the photographs of the boxes in Figure 5 as additional pieces of evidence that will be documented in the spreadsheet. The first image corresponds to photography digital file number 133 in the spreadsheet example shown in Table 10, and the second one has photography digital file number 134.

³⁰ Source: Andre Desmarais, forensic ballistics experts at the Small Arms Survey. Note: (a) Example of markings stamped on the body of a cartridge case. First digits: calibre. Second digits: code of the merchant. (b) Example of individual marking in the groove of a cartridge case.

Figure 5: Selected example of ammunition recovered in manufacturers' packaging³¹



The information in these ammunition packaging boxes can be distilled into precise data entries and inputted into the spreadsheet as shown in Tables 7–10. These would be considered the fifth and sixth entries into *Database 1: Evidence*.³²

31 Sources: The photos on the top have been provided by the United Nations Organization Stabilization Mission in the Democratic Republic of the Congo Arms Embargo Cell (MONUSCO AEC), and the two photos at the bottom have been provided by Manuel Martinez Miralles, UNIDIR Researcher.

32 For shotgun cartridges, the lot or batch number is, on occasions, printed on the inside of the packaging rather than the outside.

Table 7: Selected example of data input from case information

Case information				
ID	Case Number	Number of rounds	Information Point	Type of Evidence
5	EXAMPLE	720	Seizure at entry-exit point	Packaging
6	EXAMPLE	25	Crime Scene	Packaging

Tables 8–10: Selected examples of data input from ammunition seized in manufacturers' packaging

Lot number	All alphanumerical marking	Import code	Year	Symbols	Country	Manufacturer	Exporter
68	N/A	N/A	1971	N/A	China	China - 964	Bulgaria
N/A	ARMUSA 16	N/A	2012	N/A	Spain	CARMUSA	Spain

Importer	Factory	Calibre	Length of Cartridge	Markings on the Body	Composition /coating	Colour of primer	Projectile Colour
DRC MoD	964	7.62 x 39 mm	39 mm	N/A	Iron	Red	No colour
Unknown	CARMUSA	16GA	67 mm	ARMUSA 16	Plastic	Red	N/A

Projectile Shape	Projectile Type/Purpose	Notes	Registered firearm	Photo digital file number	Reloaded	Additional comments
Ball	FMJ	N/A	N.A	133	N	Type 56 assault rifle
Pellets	BB	N/A	N/A	134	N	Hunting

Box 3: Guidance on photographing ammunition

Capturing the ammunition recovered as evidence in a photograph will leave an enduring record for subsequent analysis and verification. It is of utmost importance to photograph all unique cartridges since this represents the main quality assurance mechanism built into the methodology. If photographed correctly, the related data entered can then be verified (or even deciphered when in doubt) by an individual expert or group of experts, as long as there is a photographic record linked to the ammunition data. The ability to corroborate the data collected from the physical ammunition exhibits will be dependent on the quality of the photos taken and the use of measuring equipment such as photo scales (or a ruler) to demonstrate the measurements of the cartridge. Photos showing case length against a scale are imperative to confirm calibre. Therefore, each unique cartridge ought to be photographed at least twice, with one image capturing the headstamp and the second capturing the side-profile of the cartridge positioned against a scale or ruler (or an alternative unit of measurement). In addition, a clear electronic photo can be enlarged on a computer afterwards and be used to identify particularities such as character spacing, curving or effaced markings. As such, it is crucial to imbed a step into the methodology for taking good quality photographs. Some general pointers on photographing ammunition are as follows:

- Ensure that the photography area is well lit and that the item is in focus.
- Photograph each unique ammunition sample individually and try to remove all other objects from the background.
- For each unique ammunition sample, capture the entire headstamp, keeping around 150 mm of distance between the camera lens and the headstamp.
- For each unique ammunition sample, capture the cartridge on its side against a ruler or photo scale, with the rim of the cartridge placed at the 0 cm mark of the unit of measurement.
 - » Ensure the photo captures all the markings on the side of the cartridge case, when available.
- Ensure that each photograph's digital file number is integrated or linked to the corresponding ammunition entry in the spreadsheet.

Detailed guidance on photographing small arms ammunition can be found in the following open sources:

- James Bevan (Small Arms Survey), *Ammunition Tracing Kit*, p. 20.
- United Nations Department of Peacekeeping Operations, *Effective Weapons and Ammunition Management in a Changing Disarmament, Demobilization and Reintegration Context: A Handbook for United Nations DDR Practitioners*, annex 6.

Figure 6: How to photograph headstamps³³

Box 3 How to photograph headstamps

Indoor photography

- Light the headstamp from the side using a lamp, or position the cartridge close to a window or door (side lighting shows up stamped marks better).
- Arrange the ammunition on a table or flat surface. Rest the camera on the surface while taking the photograph from the same level as the object, as in the illustration below.

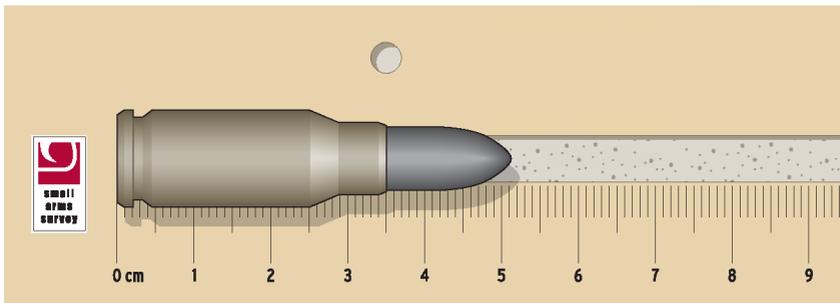


Outdoor photography

- Shade the ammunition from very bright sunlight. The best conditions occur when the sun lights the object at an angle from the side (i.e. early morning or late afternoon).
- Push the bullet or mouth of the spent cartridge into soft ground and, in order to prevent the camera from shaking even slightly, use a bag or other stable, raised object to lean on while photographing downwards onto the headstamp, as in the illustration below.



Figure 7: How to photograph cartridge length³⁴



³³ Source: Bevan 2008a (Small Arms Survey).

³⁴ Source: Bevan 2008a (Small Arms Survey).

Step 1.5.2: Document contextual information from the accompanying law enforcement reports

Example 1: Crime scene reports

The headstamps presented in example 1 of Step 1.5.1, if recovered from a crime scene, will most likely be accompanied by a report prepared by law enforcement. Such a report, if it exists, will contain valuable information since it will contextualize the crime scene and offer a glimpse into the conflating factors that enable lethal outcomes in incidents of armed violence. If the report is available, the users should also attempt to systematize information in the spreadsheet. For example, consider the fictitious report below.

Crime scene report: Fictitious example

On Monday, 17 March 2020, a 22-year-old male was found dead-on-arrival at 45 Excel Street in the Sugar District. The body presents entry and exit bullet wounds and was found lying near the porch of residence 43. One spent cartridge casing was recovered from the scene, which was submitted for forensic analysis under voucher number Ev-A-500. No projectiles were recovered. Neighbours claim to have heard the victim arguing with another male and then a single gunshot at 23:00. No firearm was found in the surrounding areas. The neighbour of the victim who alerted the police had called earlier in the night to file a noise complaint. The initial report indicated the presence of two males and a woman outside the residence. Empty alcohol containers were found in the vicinity of the presumed scene of the crime.

The information from the extract can be systematized as follows in Tables 11 and 12.

Tables 11 and 12: Example of data input from a crime scene report

Date of crime/seizure	Time	Location	Address/coordinates	Situational Context	Outcome of the crime/intervention	Gender of Victim	Sex of Victim
3/17/2020	23:00	Public	45 Excel St.	Community related	Homicide	Male	Male

Age of Victim	Gender of perpetrator	Sex of perpetrator	Age of perpetrator	Perpetrator's relation to the victim	Incitement related factor
22	Unknown	Male	Unknown	Known to victim	Alcohol

The information recorded maintains the anonymity of the victim, the perpetrator and the reporting officer yet documents important information to contextualize the recovery of the spent cartridge casings. Please note that this research methodology is designed to uncover patterns and trends, not to solve specific criminal cases. The same process of imputing data from law enforcement reports also applies to reports from seizures in domestic operations and reports from seizures at entry-exit points.

Example 2: Seizure in domestic operations reports

Similarly, the boxes of ammunition presented in Figure 5, if recovered from a seizure, would most likely be accompanied by a report prepared by the national authorities that conducted the interception. Such a report, if it exists, will contain valuable information since it will contextualize the law enforcement intervention and offer a glimpse into the conflating factors that enabled unauthorized possession and potential lethal outcomes. If the report is available, the users should also attempt to systematize its information into the spreadsheet. For example, consider the fictitious report below. Please note, in some contexts, due to pressing circumstances, limited capacity or practices, or incomplete understanding of the information at hand, there will not be a report accompanying the evidence (or it will not be made available), or it could contain inaccurate information or information that was corrected in the subsequent stages of the investigation. In such

contexts, users might only have access to a depot with the recovered or seized ammunition. When faced with this limitation, users should still document the primary evidence and continue with the other databases.

Law enforcement report: Fictitious example

On Monday, 17 March 2020, at 04:00, a 21-year-old female and a 22-year-old male were stopped for driving a motorcycle without a vehicle licence. The police stopped the motorcycle when passing through the checkpoint located on Lemon Avenue in the Sugar District. During a routine examination, the female was found in possession of a box of ammunition, without appropriate documentation. The ammunition was found in her purse. The female argued she was carrying the ammunition for her uncle, who is a hunter. The male denied any knowledge. The female was taken into custody for presumed illicit possession and the evidence submitted for processing under voucher number H-1-ma-2020.

The information from the extract can be systematized as follows in Tables 13 and 14.

Tables 13 and 14: *Excel example of data input from a law enforcement seizure report*

Date of crime /seizure	Time	Location	Address/ coordinates	Situational Context	Outcome of the crime/intervention	Gender of Victim	Sex of Victim	Age of Victim
17/03/2020	4:00	Public	Av. El Limon, Sugar Distric	Unknown	Illicit poessionion	N/A	N/A	N/A

Gender of perpetrator	Sex of perpetrator	Age of perpetrator	Perpetrator's relation to the victim	Incitement related factor	Concealment Method
Female	Female	21	N/A	N/A	Purse

The information recorded maintains the anonymity of both the presumed unauthorized user and the reporting officer yet documents the necessary information to contextualize the seized boxes of ammunition presented. Please note that this research methodology is designed to uncover patterns and trends, not to solve specific criminal cases. **By building the database, case by case, patterns and trends in how ammunition moves within national borders or across national borders will start to form.**

Box 4: Continuity and integrity of the chain of custody

All evidence must be managed in accordance with national processes and procedures, as determined by the competent national authority. Following guidelines from national authorities in terms of record-keeping as well as examining, resealing, re-stamping and signing evidence packages from criminal procedures will protect the continuity of the chain of custody. It is also recommended that users have a parallel system of record-keeping, ensuring that every piece of physical evidence retrieved and examined from an evidence package is re-stored in the same conditions. At the end of the working session, these records ought to be signed by everyone involved, confirming the integrity of the evidence packages as witnessed by the active participants. The entire process ought to be photographically documented, starting with the evidence itself and including the packaging and its handling. A good quality photographic record can make evidence available to more enhanced analysis from other subject matter experts and act as credible documentation to corroborate findings. As a general rule, to protect the integrity of evidence collected and the chain of custody, it is advisable to only open one evidence package at a time, thus preventing evidence from one case mixing with that from another.

The precautions outlined above follow the prerequisite of obtaining the necessary clearances from the competent national authorities to examine the evidence collected from crime scenes. Such clearances may also need to clarify whether other work related to the cartridge cases has already been done and that the evidence in question is “free” for the profiling documentation. In other words, users should not manipulate, handle or interfere with cartridges that are currently earmarked for fingerprinting and/or DNA lifting or otherwise jeopardize the value of physical evidence, since this could interfere with ongoing crime scene and forensic examinations in open cases. For more detailed guidance on preserving the chain of custody and the value of physical evidence, the United Nations Office on Drugs and Crime has made the “Crime scene and physical evidence awareness for non-forensic personnel” e-book freely available [here](#).

SECTION B: DATA ANALYSIS

Step 1.6: Analyse the data

After inputting primary information from crime scenes, seizures in domestic operations and seizures at entry-exit points into the database, users should proceed with analysing the data. **The question here becomes: What should users look for?** This section is intended to act as a guide to the different analyses and summary statistics that could be extracted from the database. The following guide is not comprehensive, but rather illustrative of the findings that might be possible to extract. This section also limits its scope to the more accessible statistical methodologies using standard spreadsheet options. The discussion explores field by field what useful information could be extracted to build a profile of ammunition.

Time series analyses, when possible, offer a more comprehensive and dynamic picture, as opposed to a static reflection of one particular point in time. That is, for any and all fields to be analysed, should the data represent a sizeable time period, then a separate breakdown per natural year, fiscal year, quarter or month would shed light on chronological trends and patterns.

Step 1.6.1: Analyse information from recovered small arms ammunition

- **Number of identical ammunition cartridges:** At a minimum, this column should be summed in its entirety to compute the total number of ammunition rounds documented.

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The total number of pieces of evidence collected cross-referenced against, and divided by, the total number of cases documented, will yield the ratio of *ammunition-related evidence per case*. This figure can be further disaggregated by information point (see below).

- **Information point:** The information points of crime scene, seizure in domestic operations and seizure at entry-exit point should be placed in a drop-down menu (see screenshot) to isolate entries from each of these sources of data. For example, authorities might be interested in isolating data from crime scenes only and treating the other two information points (ammunition seized in domestic operations and at entry-exit points) as separate units of analyses. This field will allow for such separation.
- **Type of evidence:** This field should be grouped by the type of evidence collected – that is, projectile, spent cartridge, live ammunition, or ammunition in manufacturers’ packaging. A percentage distribution will suffice. This field will yield the distribution of the type of ammunition-related evidence recovered and could be informative of local dynamics surrounding crimes committed with firearms and unauthorized possession.
- **Lot number:** This field should be grouped by the different lot numbers or batch numbers documented. Lot-numbered boxes or packaging are, in principle, traceable and researchers should leverage the lot numbers documented to recreate, as much as possible, the supply chain by requesting confirmation from the relevant authorities. This field can shed light on the legal origin, supply chain, and intended end-user of the documented ammunition.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin and/or intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **All headstamp alphanumerical and monogram markings:** This field will serve as the baseline of information from the headstamp markings, which will be disaggregated in the fields that follow. In case of uncertainty, this field will act as the reference for double-checking correct identification of the desired fields, including manufacturer,

codes and symbols. Not all recovered evidence will have alphanumerical or monogram markings.

- **Import code:** This field should be grouped by the different import codes documented. A percentage distribution will shed light on the origin and/or intended end user of recovered ammunition that was legally imported into the country. Not all recovered evidence will have an identifiable import code.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin and/or intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Year of manufacture:** This field should be grouped by year of manufacture. A percentage distribution will shed light on the age of the marked ammunition. This field will showcase the lifespan of some of the ammunition recovered and could be useful in developing a “time from manufacture to crime” indicator for small arms ammunition use. Not all recovered evidence will have an identifiable year of manufacture. In the absence of year of manufacture markings, age can be estimated by contacting the ammunition manufacturer or by cross-referencing batch or lot numbers (if identified) against records.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin and/or intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Headstamp symbols:** This field should be grouped by symbols. This field will support identification of the legal origin and/or original intended end user (and possibly the supply structure) of the ammunition documented.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin and/or original intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Country of manufacture:** This column should be grouped by the different countries of manufacture documented. A percentage distribution will shed light on the origin of the ammunition documented.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Manufacturer:** This field should be grouped by the different manufacturers' markings identified. On most occasions, this field will be populated with the interpreted name of the manufacturer, yet confirmation will require additional research, cross-referencing and outreach to the presumed manufacturers. In some cases, these markings can also help indicate the brand of the ammunition, which is sometimes different for commercial purposes. A percentage distribution will shed light on the more prevalent manufacturers (and associated brands) of the ammunition documented.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin and/or intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Factory:** This column should be grouped by the different factories documented. A percentage distribution will shed light on the origin and/or intended end user of the ammunition documented.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin and/or intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Exporter:** This field should be grouped by the different exporters documented. A percentage distribution will shed light on the origin of the documented ammunition that was legally imported into the country.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin, findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Importer:** This field should be grouped by the different importers documented. A percentage distribution will shed light on the intended end user of the documented ammunition that was legally imported into the country. If the jurisdiction under observation is not a producer of ammunition, the absence of import references or documentation could be an indication of illicit trafficking. As such, it is important to closely monitor the “unknowns” documented in this field and cross-reference them with *Database 2: Records*.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

- **Calibre:** This field should be grouped by the calibres documented. A percentage distribution will shed light on the more prevalent calibres documented in the different information points. For a more detailed analysis, each calibre may be analysed by itself and cross-referenced against likely manufacturers and relevant data from law enforcement reports.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the legal origin and/or intended end user, the findings from this column should be cross-referenced to the findings from the same column in *Database 2: Records*.

CROSS-REFERENCE ALERT!

To develop a more comprehensive understanding of the relationship between firearms-related crime and calibres, the findings from this column should be cross-referenced to the crime scene reports: address or coordinates, situational context, outcome of the crime, perpetrator’s relationship to the victim, and any available police intelligence, among other information.

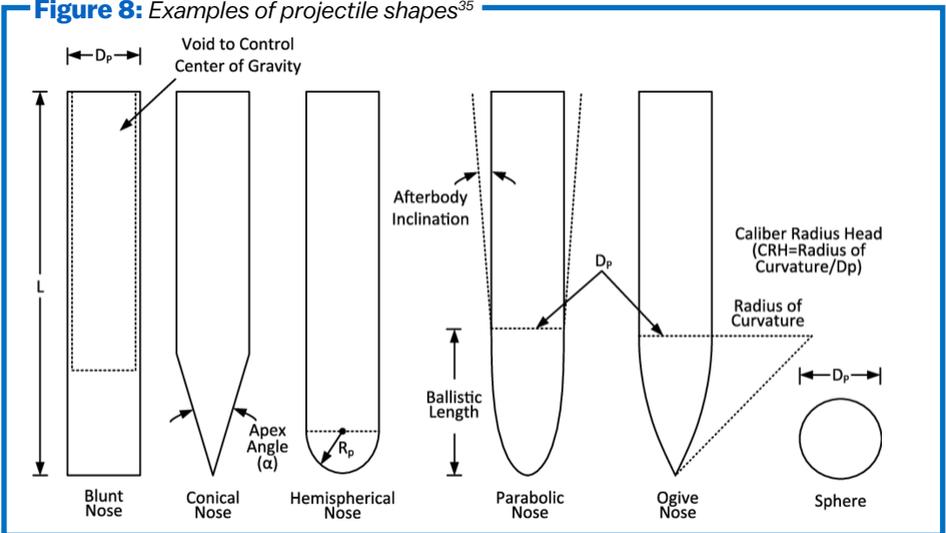
NOTE

To assist in correct and consistent calibre identification, a frame of reference can be useful, whether that is a local frame of reference or an international one. Such a frame of reference can include the dimensions, specificities, glossary and exact name of the calibres, detailing how to input them into the spreadsheet. It is recommended that this field, given its importance, is identified in coordination with a specialist in forensic ballistics or a competent individual with specialized knowledge.

- **Length of cartridge case:** This field will inform the calibre determination of a particular ammunition sample, when in doubt.
 - » Similarly, if the cartridge case head diameter is measured and recorded, it would also confirm correct calibre identification.
- **Markings stamped on the body or groove of the cartridge case:** This field will serve as complementary information from available markings on the body or groove of a cartridge case. In case of uncertainty, this field will act to provide additional information and correct identification of the available fields, including manufacturer, codes and calibre. Not all recovered evidence will have alphanumeric or monogram markings.
- **Composition or coating of the cartridge case:** This field can inform the origin (some materials are characteristic of manufacturing regions) and the purpose of the cartridge and/or calibre of a particular evidence sample, when in doubt.
- **Colour of primer annulus sealant:** This column should be grouped by the different colour rings identified. The colour of the primer annulus sealant can, on certain occasions, shed light on the authorized end user and end use of the ammunition, as some authorized end users and uses are assigned particular colours.
- **Projectile lacquer colour:** This field should be grouped by the different projectile colours documented. Projectile colours are important as they might be an indication of the cartridge load and the organization for which it was produced, and, potentially, shed light on the purpose of the ammunition round.

- Projectile shape:** This field should be grouped by the different projectile shapes documented. A percentage distribution will shed light on the more prevalent projectile shapes of the ammunition documented. Projectile shapes are important as they might be an indication of the cartridge type and could shed light on the purpose of the ammunition round.

Figure 8: Examples of projectile shapes³⁵



- Projectile type, purpose or function:** This field should be grouped by the different projectile types, purposes or functions identified. A percentage distribution will shed light on the more prevalent projectile types, purposes or functions from the ammunition documented. Projectile types are important as they might be an indication of the cartridge function, thus assisting determination of the purpose of the ammunition round. Please note that unless the ammunition is recovered in its packaging, it is difficult to determine projectile type (load) without cutting it or x-raying it.

35 Graphic provided by Rodolfo Gamboa, Senior Technical Officer at UNLIREC.

- **Notes on firing pin impressions:** The notes of the firing pin impressions can be used for identifying class characteristics (rectangular, circular, etc.) on specific samples of evidence. For example, a Glock pistol may leave rectangular firing pin impressions. After systematically recoding notes on the firing pin impressions, specific patterns might emerge from the qualitative observations. This observation requires training in forensic ballistics or specialized knowledge. As such, competent ballistics examiners should provide guidance when recording this field and could, for example, point to cases of misfires.
- **Fired by a registered firearm:** This field should be grouped by “yes” or “no” responses. This field will shed light on the licensing dynamics of crimes committed with firearms, highlighting the proportion of crimes committed with registered or with unregistered firearms from the documented sample. Every jurisdiction defines “registered firearm” differently, and when completing this field, the national definition of the jurisdiction under observation should prevail. The term is used here as an indication of a legally acquired and appropriately licensed firearm. Any remarks related to this field should be included in the “additional comments” column.
 - » For example, ballistics reports can, on occasion, link fired ammunition from crime scenes to test fired cartridge cases or bullets that are stored in national firearms registries. This is possible in jurisdictions where every firearm that is legally imported or acquired and licensed is test fired and imaged onto a database that is later cross-checked against any fired casings or bullets recovered from shooting incidents.
- **Reloaded:** This field should be grouped by “yes” or “no” responses. If a large percentage of the ammunition recovered from a crime scene suggests that the sample has been reloaded, this could be indicative of a challenge with illicit manufacture. Notes from this field should be systematically documented under “additional comments”. This

observation requires specific training in forensic ballistics. Some fields to keep in mind while collecting the data or performing the analysis could be:

- » Original or new cartridge
 - » Sophisticated or rudimentary reloading work (e.g. made with a press, versus basic work made with a hammer)
 - » Perfectly suitable (industrial-made) projectile or home-made bullet
 - » Any new or secondary markings on the reloaded round
- **Photography digital file number:** The digital file numbers of the photos taken from the cartridges and ammunition in manufacturers' packaging should be recorded in the database next to the information extracted from the sample. This way, the photos will act as a record documentation and as the main quality assurance mechanism of the sample and will clarify any questions that might arise when cleaning and analysing the data.
 - **Additional comments:** The additional comments should be used for contextual information on specific samples of evidence. Specific noteworthy patterns might emerge from the qualitative observations.

Step 1.6.2: Analyse contextual information from the accompanying law enforcement reports

- **Date of the crime:** This column should be organized in chronological order. This column will shed light on the temporal dynamics of crimes committed with firearms or seizures in either domestic operations or at entry-exit points.
- **Time of the crime:** This column should be organized by time distribution. This distribution will shed light on the temporal dynamics of crimes committed with firearms or seizures in either domestic operations or at entry-exit points.
- **Geographical location of the crime:** This column should be organized by either “household” or “public” space. This will shed light on the spatial dynamics of crimes committed with firearms and of illicit possession or trafficking.
- **Address or coordinates:** This field should be geo-localized to enable identification of spatial hotspots of crimes committed with firearms or of illicit possession or trafficking.
- **Situational context:** This field should be grouped by the different circumstances identified. This field will shed light on the environmental and societal factors that facilitate or drive crimes committed with firearms, as well as illicit possession and trafficking.
- **Outcome of the crime:** This column should be organized by the physical harm caused to the victim. This distribution will shed light on the more recurrent outcomes after an incident involving a firearm.
- **Gender of the victim:** This column should be organized by the gender identification of the victim. This column will shed light on the gendered dynamics behind victims of crimes committed with firearms.
- **Sex of the victim:** This column should be organized by the sex of the victims. This column will shed light on the sex dynamics of victims of crimes committed with firearms.

- **Age of the victim:** This column should be grouped by the age distribution of the victim. This column will shed light on the age distribution of victims of crimes committed with firearms.
- **Gender of the perpetrator:** This column should be organized by the gender identification of the perpetrator. This column will shed light on the gendered dynamics behind perpetrators of crimes committed with firearms.
- **Sex of the perpetrator:** This column should be organized by the sex of the perpetrator. This column will shed light on the sex dynamics of perpetrators of crimes committed with firearms.
- **Age of the perpetrator:** This column should be grouped by the age distribution of the perpetrator. This column will shed light on the age distribution of perpetrators of crimes committed with firearms.
- **Perpetrator's relationship to the victim:** The relationship of the perpetrator to the victim should be used for contextual information.

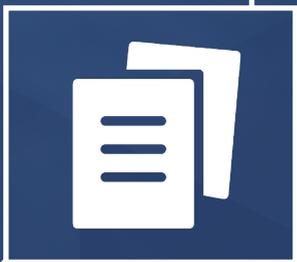
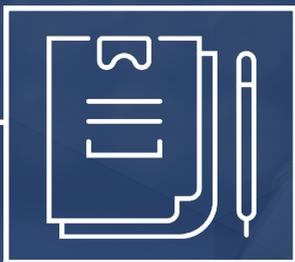
CROSS-REFERENCE ALERT!

Specific noteworthy patterns might emerge from the qualitative observations in *Databases 3: Illicit manufacture* and *Databases 4: Interviews with affected communities*.

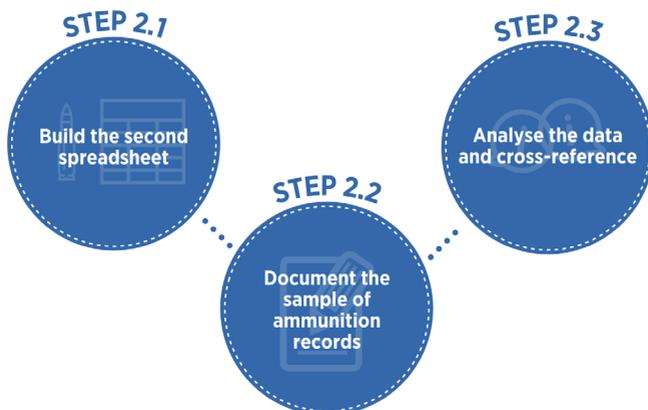
- **Incitement-related factors:** This field should be grouped by the different incitement-related factors identified. This field will shed light on the environmental and societal factors that provoke, facilitate or co-occur with crimes committed with firearms or with illicit possession or trafficking.
- **Reason for intervention or detection methods:** This column should be organized by a typology of law enforcement or border control actions that concluded in the discovery of the crime scene or the seizure of ammunition. This distribution will shed light on the different dynamics behind discovering crime scenes and illicit trafficking and behind controls at entry-exit points and other approaches that have resulted in seizures.

- **Concealment method:** This column should be organized by the different concealment methods identified. This distribution will shed light on the dynamics and concealment modalities surrounding illicit possession or trafficking.
- **Outcome of interception:** This column should be organized according to the resulting consequences faced by the presumed unauthorized holder or trafficker. This distribution will shed light on the more recurrent outcomes after a seizure of ammunition in domestic operations or at entry-exit points.
- **Direction of flow (inbound/outbound):** This column should be organized by the intended flow of the seized ammunition, either inbound (attempting to enter the country) or outbound (attempting to leave the country). A percentage distribution will shed light on the dynamics behind unauthorized movement of ammunition.
- **Country of origin or destination:** This column should be organized by the different countries identified. For inbound flows, the country of origin should be documented. For outbound flows, the intended country of destination should be documented. A percentage distribution of the countries identified will shed light on the dynamics behind unauthorized movement of ammunition. Please note that, for inflows, this field refers to the country of 'immediate' origin, not necessarily the country of production.
- **Any available police intelligence generated from the scene of the crime:** This field should be used for contextual information. Specific noteworthy patterns might emerge from the qualitative observations.

DATABASE TWO: RECORDS



DATABASE 2: RECORDS



Justification: *Database 2: Records* will generate a picture of the ammunition legally imported, manufactured in-country and stockpiled in the country, which will serve as a benchmark for comparison against *Database 1: Evidence*, with its information regarding misuse, illicit possession and trafficking.

Information points: This database will be built from the following information points: (a) records of ammunition imports, (b) records of ammunition manufactured in-country and (c) records of ammunition stocks.³⁶ In contexts with a documented history of diversion from ammunition stored or earmarked for destruction, it might be important to document those holdings in addition to the active stocks.

Where to find this information: These records might be stored by different national agencies. For example, the records of ammunition imports might be stored in the offices that regulate international trade of ammunition or in the records departments of the armed forces or law enforcement supply units. When available from the Arms Trade Treaty reports, focal points can provide information on which entities issue national control lists,



authorize imports or keep records of ammunition imports (e.g. it could be the ministry of interior, the ministry of defence, or the ministry of trade or commerce). Records of ammunition manufactured in-country might be stored by the offices that authorize domestic production, the records department of the armed forces, or State-owned or private ammunition manufacturers. Records of ammunition stocks might be kept by private security companies, law enforcement, or armed forces logistical corps or records departments; if these records are not available or are insufficiently detailed, then the characteristics of ammunition in the authorized civilian and nationally owned stockpiles may need to be physically documented.

SECTION A: DATA COLLECTION

To continue the process of monitoring and diagnosing small arms ammunition diversion, trafficking and misuse,³⁷ it is important to document the various types of ammunition legally imported, manufactured and stockpiled in the country. It is important to document the supply of legal ammunition since it will provide a benchmark of information to compare against findings from other databases. **It is crucial to have this benchmark of legal ammunition because the overwhelming majority of ammunition involved in firearms-related incidents and of ammunition that is illegally held or trafficked had a legal origin and was diverted to unauthorized users at some point during its life cycle.** As such, it is important to understand the types of ammunition that are legally available in the area of interest. This step can also be considered a systematization of information available from the records of ammunition imports, ammunition manufactured in-country, and existent stocks. Constructing this database relies on documenting the different characteristics of the ammunition, the information relevant to its approval process, and the different entities to which the ammunition was allocated. This database will consist of a systematization of records, and each entry will constitute a separate line in the spreadsheet, as detailed in Step 2.1. **The more disaggregated and individualized the entries, the richer the data set.**

³⁷ Monitoring and diagnosing small arms ammunition diversion, trafficking and misuse is part of a project undertaken by UNIDIR's Urban Violence work stream. For more information on the project, see: <https://unidir.org/projects/urban-violence-adapting-arms-control-new-environments-1>.

Step 2.1: Build the second spreadsheet

This step is crucial as it can be considered the research design for the second spreadsheet. It will define which characteristics will be extracted from the records of ammunition and which ones will not. It is recommended that this process undergoes a thorough national review process to ensure all the desired fields are considered. This database could require three information points: (a) records of ammunition imports, (b) records of ammunition manufactured in-country and (c) records of ammunition stocks. However, keep in mind that these records might not all be held by one agency and that the records themselves might not be standardized. These compilations of all the records, once systematized into a spreadsheet, will represent *Database 2: Records*. To enable collection of the desired information, some recommended spreadsheets fields follow:

- Unique identifying number (assigned by the users)
- Record or file number (assigned by the national authorities)³⁸
- Number of live ammunition rounds
- Information point
 - » Records of ammunition imports
 - » Records of ammunition manufactured in-country
 - » Records of ammunition stocks
- Country of manufacture
- Manufacturer
- Factory
- Exporting country
- Exporter
- Transit country
- Importing country
- Importer

³⁸ Record or file number assigned by national authorities should be documented by the users and included in the spreadsheet for referencing and record-keeping, quality assurance, and future verification purposes. This number identifies the record or document under examination. The record of file number will only be used to referencing research purposes.

- 
- Point of entry (for imports only)
 - Lot number or batch number
 - Calibre
 - All headstamp alphanumerical and monogram markings
 - Symbols
 - Import code
 - Year of manufacture
 - Year of import
 - Date of receipt
 - Licensing entity
 - Authorized end user
 - Stockholder
 - End-use additional information

Step 2.2: Document the sample of ammunition records

Example 1: Records of ammunition imports

The records of ammunition imports might have different formats but will most likely contain most of the information suggested below. If the records are made available, users should attempt to systematize information into a spreadsheet. For example, consider the fictitious report below.

Ammunition import record: Fictitious Example - file AA0001

Under authority granted by Law XX, the Homeland National Office for Trade Control, Department of Sensitive Defence Materiel, hereby authorizes the request from the National Police, Northern Department, to procure and import ammunition, as requested in international tender #34-AM-2017, from the selected bidder. This approval should be communicated to Customs Authorities at Port Victoria for coordination of the importation of the controlled materiel as expressed in the memorandum reference #688-2017, with notice of transit authorization through Middleland.

International tender #34-AM-2017 was awarded to Distantland–Central Factory through Ammo Group 6 to produce five lots of 10,000 rounds of 5.56 x 45 mm (STANAG 4172) with an action date of 16 October 2017. The ammunition shall be marked with the year and “PNP”.

While the extract presented above might seem vague, it presents significant information. The information from the extract can be systematized as suggested in Tables 15–17.

Tables 15–17: Example of data input from ammunition import records

File Number	Number of live ammunition rounds	Information Point	Country of Manufacture	Manufacturer	Factory	Exporting Country
AA0001	50,000	Import	Distantland	N/A	Central	Distantland

Exporting Entity	Transit Country	Importing Country	Importer	Point of Entry	Lot/Batch Number	Calibre	Alphanumerical Markings	Symbols
Ammo Group 6	Middle-land	Homeland	National Office for Trade	Port Victoria	Unknown	5.56 x 45 mm	PNP 17	N/A

Import Code	Year of Manufacture	Year of Import	Date of Receipt	Licensing Entity	Authorized	Stockholder	End-use additional information
PNP	2017	2017	Unknown	National Office for Trade	PNP Northern	Police	N/A

Example 2: Records of ammunition manufactured in-country

The records of ammunition production approvals might have different formats but will most likely contain most of the information outlined below. If the records are made available, users should attempt to systematize information into the spreadsheet created with the fields outlined below. For example, consider the fictitious report below.

Records of ammunition manufactured in-country: Fictitious Example - file AA0002

Under authority granted by Law XX, the Office of Defence Materiel of the Armed Forces hereby extends the Military Industries Manufacturing Plant the instruction to produce 9 x 19mm ammunition, as outlined in strategic reference document #07-AMB-15. This order grants authorization for the manufacturing of 12 lots of 1,000,000 rounds, with the corresponding Armed Forces (AF) marking in the headstamp, plus the year of manufacture. This approval should be executed immediately and delivered to the National Strategic Stockpile as envisioned in the five-year supply plan for calendar year 2015.

The information from the extract can be systematized as suggested in Tables 18–20.

Tables 18–20: Example of data input from records of ammunition manufactured in-country

File Number	Number of live ammunition rounds	Information Point	Country of Manufacture	Manufacturer	Factory	Exporting Country
AA0002	12,000,000	Manufacture in country	Domestic	Military Industries	Military Industries	N/A

Exporting Entity	Transit Country	Importing Country	Importer	Point of Entry	Lot/Batch Number	Calibre	Alphanumerical Markings	Symbols
N/A	N/A	N/A	N/A	N/A	Unknown	9 x 19 mm	AF 15	N/A

Import Code	Year of Manufacture	Year of Import	Date of Receipt	Licensing Entity	Authorized	Stockholder	End-use additional information
N/A	2015	N/A	N/A	Office of Defence	Armed Forces	Armed Forces	National Strategic Stockpile

The information recorded paints a picture of the supply of ammunition that has entered the country or been manufactured in-country legally. **By building this database record by record, users are building a baseline of information (or a statistical benchmark) of what exists in the country legally, which can be used to compare against findings from ammunition recovered from firearms-related incidents or seizures. The comparison between this baseline and findings from *Database 1: Evidence* will shed light on the potential supply sources of ammunition that is misused, ammunition illicitly held or trafficked, and ammunition that has been diverted.**

SECTION B: DATA ANALYSIS

Step 2.3: Analyse the data and cross-reference

After inputting primary information into the database, users should analyse the data. **The question here becomes: What should users look for?** This section is intended to act as a guide of the different analyses and summary statistics that could be extracted from the database. The following guide is not comprehensive, but rather illustrative of the findings that might be possible to extract. This section also limits its scope to the more accessible statistical methodologies using standard spreadsheet options. The discussion explores field by field what useful information could be extracted to build a profile of ammunition.

- **Number of live ammunition rounds:** At a minimum, this column should be summed in its entirety to compute the total number of live ammunition rounds documented with a legal origin.
- **Information point:** The information points should be placed in a drop-down menu to isolate entries from each of the sources of data (records of ammunition imports, of ammunition manufactured in-country and of ammunition stocks). For example, authorities might be interested in isolating data from ammunition imports and treating the other two information points as separate units of analysis. This field will allow for such a separation.
- **Country of manufacture:** This column should be grouped according to the different countries of manufacture documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.

- **Manufacturer:** This column should be grouped according to the different manufacturers or manufacturers' markings documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Factory:** This column should be grouped according to the different factories documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Exporting country:** This column should be grouped according to the different exporting countries documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Exporter:** This column should be grouped according to the different exporters documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Transit country:** This column should be grouped according to the transit countries documented. A percentage distribution will shed light on the life cycle of ammunition that was legally procured and transferred. This information may be helpful to the countries through which the ammunition transited, or their neighbouring countries, should they desire to pursue an ammunition profiling exercise.
- **Importing country:** This column should be grouped according to the different importing countries documented. A percentage distribution will shed light on the life cycle of ammunition that was legally procured and transferred. This information could be helpful to the countries

through which the ammunition transited, or their neighbouring countries, should they desire to pursue an ammunition profiling exercise.

- **Importer:** This column should be grouped according to the different importers documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*. If the jurisdiction under observation is not a producer of ammunition, the absence of import references or documentation could be an indication of illicit trafficking. As such, it is important to closely monitor the “unknowns” documented in this field.
- **Point of entry:** This column should be grouped according to the different points of entry documented. This field will be categorized by the names of the ports, airports or land crossings documented. Together with information on ammunition diverted, trafficked and misused, this field could shed light on the points of entry at higher risk.
- **Lot number or batch number:** This column should be grouped according to the different lot numbers or batch numbers documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the likely origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Calibre:** This column should be grouped according to the different calibres documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*. It could also be used to imply the types of small arms for which the ammunition was intended.

- **All headstamp alphanumerical and monogram markings:** This field should be grouped according to the different markings documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
 - » This field can also be indicative of time points within the manufacturing process where key changes may have been made to the ammunition being assembled or manufactured.
 - » If the jurisdiction under investigation has no requirement for end-user or import-specific markings, then this field could overlap with the manufacturer's markings. Nonetheless, this parameter is still worth exploring on its own and having as a full reference field.
- **Symbols:** This field should be grouped according to the different symbols documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Import code:** This column should be grouped according to the different import codes documented, if any. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Year of manufacture:** This column should be grouped according to the different years of manufacture documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Year of import:** This column should be grouped according to the different years of import documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.

- **Date of receipt:** This column should be grouped according to the different dates of receipt documented. A temporal distribution will shed light on the life cycle of ammunition that was legally procured and transferred, demarcating the responsibilities of the different parties involved.
- **Licensing entity:** This column should be grouped according to the different licensing entities, if more than one national approving entity is documented. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Authorized end user:** This column should be grouped by the different authorized end users or allocated entities documented, including law enforcement, armed forces, private security companies, private dealers or shops, or commercial importers or distributors. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*.
- **Stockholder:** This column should be grouped according to the different “holders” of the ammunition documented, including law enforcement, armed forces, private security companies, private dealers or shops, or commercial importers or distributors. A percentage distribution will offer a baseline of information or a benchmark for cross-referencing to assist in determining the origin of the ammunition with a legal presence in the country that was documented in *Database 1: Evidence*. It is probable that the stockholder documented will be the same as the authorized end user.
- **End-use additional information:** This field should be used for contextual information on end-use justifications. Specific patterns might emerge from the qualitative observations from end-use information.

DATABASE THREE: **ILLICIT MANUFACTURE**



DATABASE 3: ILLICIT MANUFACTURE

Justification: *Database 3: Illicit manufacture* will generate a picture of the ammunition produced illegally in the country, which is often done through unauthorized reassembly or in cottage or artisanal industries.

Where to find this information: This information can be obtained by conducting interviews with law enforcement and forensic ballistics departments, legal ammunition manufacturers and sellers, community leaders and outreach organizations, users involved in black or grey market dynamics, shooting sports enthusiasts, and managers of shooting ranges. In addition, users are encouraged to explore and analyse online sources (visible and dark or deep web markets).

Flexibility: This database involves different research methods and is the most flexible of the four as the problem of illicit manufacture varies considerably, in both nature and impact, across different countries. Illicit manufacture ranges from the use of simple home loading equipment and repurposed fired cartridge cases to unauthorized factory-scale manufacturing processes, whether as an instance of overproduction or a completely illicit large-scale operation. At the small scale it may be a single person with a reloading press producing 50 rounds; at the larger scale, it may involve industrial-type processes. As such, this database will be deeply context specific and require extensive local knowledge.

Ethics, safety and danger: Users are bound to respect ethical standards of practice as per national directives or institutional bodies. Here, it is important to highlight that some interviews with individuals or groups connected to the supply, storage and use of ammunition – such as gang members, criminals, prison populations or vulnerable individuals – should be approved by the relevant authorities before taking place, given the potential for danger.



Who: Each institution or organization building the ammunition profile should consider whether they have a user trained in qualitative methods or should consider hiring one when developing this database. This person (or team) should have a strong research background with peer-reviewed publications and postgraduate qualifications in a related field. Such users are often academics from universities or professionals with significant experience from research institutes or NGOs and can be hired as consultants, either nationally or internationally.

Step 3.1: Define the research questions and research methods

This step is crucial as it can be considered the research design of the spreadsheet. The lead research question and secondary research questions, once the latter have been defined, will determine which dynamics and conflating factors are explored. Once the research questions have been identified and agreed on, users should find the best possible research strategy or methodology to answer these questions.

LEAD RESEARCH QUESTION

What is the effect of illicitly produced ammunition on armed violence in urban environments?

Qualitative approaches are interpretive, and therefore flexible, but should maintain focus on the data sought. This is how the lead research question shapes the overall objective.

Secondary research questions

Semi-structured interviews allow for both control and flexibility. Secondary, more precise and detailed questions can also be numbered or coded for later analysis (e.g. questions 1–13 below). This is particularly useful when multiple users collect data, as coding makes the comparison of data easier. “Semi-structured” means that a list of questions is used to direct the interviews or focus groups without rigidly controlling them. This allows respondents to provide insights users may not have been aware of beforehand and provides a better flow to the interview process. This strategy functions best using open (as opposed to closed) questions. **It is also useful to ask concluding questions such as “What have I missed?” or “What else do you think is important that we have not yet discussed?”** to capture the maximum amount of significant data specific to each setting. These secondary questions act as guides, and each user or team should tailor them according to their circumstances to gain the best results possible.

For Database 3, such questions could include:

1. Do forensic ballistics laboratories or any other law enforcement agency keep records of ammunition that seem to have been illicitly manufactured? If so, do these samples seem to have a pattern? Can you show us an example?
2. Where do the projectiles, cartridge cases, propellant charges or live primers (also known as “percussion caps”) come from? Are these components industrially manufactured?
3. Where do the raw materials come from, if not industrially manufactured?
4. What machinery or equipment is used to manufacture the ammunition, and where is this equipment (i.e. press) coming from?
5. Are any specific types of crime being committed with illicitly manufactured ammunition? If so, how?
6. Is the illicit manufacture or unauthorized reloading of ammunition more or less costly than acquiring industrially produced ammunition?
7. Can you explain the relationship between illicit manufacturers of ammunition and users of illegal ammunition? Who do these people tend to be (without naming individuals)? Are the end users of illicitly manufactured ammunition sports aficionados, criminals, gang members or others?
8. In shooting ranges, what happens to the fired cartridge cases that are left after practice shooting?
9. In training, at either armed forces or police ranges, what happens to the fired cartridge cases that are left after practice shootings?
10. Is there a culture of sports shooting that involves the reloading of cartridges? If so, why?
11. Is any geographical region known for the illicit production of ammunition? If so, why?
12. Is there substantial know-how in ammunition manufacturing in a region or area? If so, why?
13. What have we missed? What else is important to know about the illicit production of ammunition?

The user or research team should carefully plan the qualitative methods to be used and carefully consider the ethical considerations involved. The methods need to be tailored to each context to produce the best results. This section outlines some recommended methods:

- [Semi-structured interviews](#) with a range of key actors
- [Focus groups](#) with key populations or groups of key actors
- Field observation of commercial dynamics, whether grey or black market
- Field observation of affected areas, sites and regions associated with illicit ammunition manufacture
- Evidence from crime scenes and notes from *Database 1: Evidence*

The user can use some or all of these methods.³⁹ As a minimum, interviews with key actors should be sought to provide additional background information or context. Field observation means that the user will visit various sites where ammunition is presumed to be illicitly manufactured. This will help the user better understand the specific contexts surrounding the unauthorized manufacture of ammunition and can also help identify key stakeholders for the interviews. Institutional managers should be aware that any fieldwork, particularly involving criminal or potentially dangerous subjects or vulnerable individuals, should adhere to legal ethical standards (see the Ethics, Safety and Danger section above).

³⁹ The method of data collection (e.g. audio recordings, summary notes, field notes) needs careful consideration as it is important to be consistent in the approach because different data-collection methods yield different levels of data quality, and making notes can unconsciously or consciously incorporate observer or interviewer bias.

Step 3.2: Apply the research methods

Identifying a range of key actors and sources of information is essential to generating valid qualitative data. This range should cover State, government and civil society stakeholders, from national to local levels, to provide a broad and therefore balanced range of responses to the research questions. Users should avoid collecting data from just one sector of the State, government or society. The methodology can be applied by structuring the qualitative research around the following forms of research and key actors:

- Semi-structured interviews with a range of key actors
 - » Interviews with legal ammunition producers and legal ammunition retailers
 - » Interviews with reloading sports enthusiasts or commercially oriented reloaders
 - » Interviews with police, intelligence officers, crime scene investigators and crime analysts
 - » Interviews with forensic ballistics specialists and firearms experts
 - » Interviews with managers of shooting ranges, either State-owned or private
 - » If possible, interviews with end users convicted of misuse
- Focus groups with key populations or groups of key actors
 - » Focus groups with members of a region or community associated with illicit ammunition manufacture
- Field observation of affected areas, sites and regions associated with illicit ammunition manufacture
 - » Notes from observing the commercial dynamics of surrounding areas, sites and regions associated with illicit ammunition manufacture
 - » Notes from observing shooting ranges, either State-owned or private

- 
- Field observation of commercial dynamics, whether grey or black market
 - Evidence from crime scenes and notes from *Database 1: Evidence*
 - » Notes on ammunition recovered from crime scenes or seizures, possibly held by forensic ballistics laboratories

The notes from applying the qualitative research methods will be used in the final report to contextualize the findings from Databases 1 and 2 and as stand-alone findings and indications for future research.

Step 3.3: Review and analyse the data

When carrying out qualitative data analysis, always bear in mind that the overall aim is to respond to the lead research question: “What is the effect of illicitly produced ammunition on armed violence in urban environments?” The analysis can be done systematically by following the secondary questions and assessing to what extent they have been answered by the qualitative data collected. The analysis write-up can then be organized according to which insights or main themes and tendencies emerge.

It is important to review the qualitative data set to gain an overall “feel” for what is taking place. This is an “inductive” approach, where the users ask themselves, “What is the data showing?” Users should be open to counter-intuitive or unexpected patterns and activities. For example, illicit manufacture of ammunition may have little effect on armed violence in urban environments, or it may only lead to firearms-related accidents and not homicides. Users should also be aware that unlike quantitative methods, qualitative data is often contradictory and messy as it depicts the “real world”, and they will not necessarily get clean, definitive answers to all research questions. Users should expect unanswered questions and unknown processes occurring (good research should actually come up with new questions). When analysing the data, it is important to recognize the research limitations and reflect on the aspects that need further clarification.

With these caveats in mind, when analysing the qualitative data, users should be looking for:

- *Trends, patterns and tendencies* that provide answers to the secondary research questions.
- Who is involved, and how, why, where and when? What are the key intersections between illicit ammunition manufacturing and violence,



if any? Are there regional dynamics? Are there cultural dynamics? Does any group perceive an advantage in manufacturing their own ammunition?

- How clear is the qualitative data in providing answers to the secondary research questions? How strong are these patterns? How confident can we be in our claims? For example, did all the interviewees agree that stopping illicit ammunition manufacture would reduce violence? If not, what else is going on, why, and what does this tell us?
- What can users learn by analysing the qualitative data together with the other databases? This could provide researchers with the opportunity to identify any differences between information provided by communities and the documented or recovered (seizures, domestic or criminal operations) occurrences of illicit manufacture.

DATABASE FOUR: INTERVIEWS WITH AFFECTED COMMUNITIES



DATABASE 4: INTERVIEWS WITH AFFECTED COMMUNITIES

Justification: Quantitative databases provide statistics around illicit ammunition flows and misuse, creating key insights. Analysing these databases may give some key insights but will tend to only provide a partial understanding of each case study and leave remaining questions for further research. The better the **specific context** and the actors involved in trafficking and criminal misuse are understood, the better the analysis will be. Hence, it is important to contextualize quantitative findings with qualitative contextual information. Adding qualitative methods, by interviewing individuals ranging from national experts to local residents, can strengthen research by incorporating “the stories behind the statistics”. This approach will allow users to generate context-specific analysis and interrogate the data more effectively; tailor the design of intervention policies to each specific context; and compare different case studies across the globe effectively.

Where to find this information: This information can be obtained by conducting interviews with law enforcement; forensic ballistics experts; prosecutors; experts such as academics and researchers; policymakers at governmental and State institutions; civil society representatives from both national and international NGOs; multilateral, development or aid organizations such as in-country United Nations programmes; community leaders; and convicted felons.

Ethics, safety and danger: Users are bound to respect ethical standards of practice as per national directives or institutional bodies. Here, it is important to highlight that some interviews with individuals or groups connected to the supply, storage and use of ammunition – such as gang members, criminals, prison populations or vulnerable individuals – should



be approved by the relevant authorities before taking place, given the potential for danger.

Who: Each institution or organization building the ammunition profile should consider whether they have a user trained in qualitative methods or should consider hiring one when developing this database. This person (or team) should have a strong research background with peer-reviewed publications and postgraduate qualifications in a related field. Such users are often academics from universities or professionals with significant experience from research institutes or NGOs and can be hired as consultants, either nationally or internationally.

Step 4.1: Define the research questions and research methods

LEAD RESEARCH QUESTION

How do changing flows of ammunition impact levels of armed violence in urban environments?

Qualitative approaches are interpretive, and therefore flexible, but should maintain focus on the data sought. This is how the lead research question shapes the overall objective.

Secondary research questions

- Secondary, more precise and detailed research questions should be developed for interviews and focus groups. Semi-structured interviews and focus groups both allow for control and flexibility when probing key interviewees, but interviews are potentially more valuable, open and honest than focus groups. This process is “more of an art than a science” and depends on the skill of the individual user. It is useful to take into account the following:
- The user should develop the secondary questions carefully (sample questions 1–11 below) so that they provide access to the data the user seeks.
- The questions may have to be modified or rearranged to suit different respondents. For example, questions for a customs official may differ slightly from those for a police officer, a community leader or a prison inmate. The overall focus, however, should remain on answering the lead research question.
- The user should attempt to commit secondary questions to memory or write them down on a brief “cheat sheet”. This helps the flow of the conversation. The better the flow, the better the insights tend to be.
- Questions may have to be asked more than once and/or reworded at different times during the interview to gain useful responses. For

example, sensitive issues are best asked later in an interview, when respondents are likely to be more relaxed.

- Whenever possible, the user should voice-record the interviews, after seeking informed consent from the participant, and transcribe the recordings afterwards. Each interview or focus group should be coded or numbered, with real names anonymized according to required ethical standards.
 - » Voice-recording allows the interviewer to concentrate on following the conversation and asking follow-up questions. Subsequent transcription means that no key information will be missed and the potential for biased interpretation will be reduced.
- It is vital that users are responsive during interviews, anticipating that there will be new and interesting insights emerging that require further exploration. This is where the skill and experience of the interviewer is invaluable, and why a trained user is recommended to produce the best results.
- There is substantial literature available on interview techniques with potentially difficult or dangerous respondents (Baird 2017; Crawford et al. 2017; Koonings, Kruijt and Rodgers 2019).

Secondary questions (e.g. questions 1–11 below) can also be numbered or coded for later analysis; see the Coding and Organizing the Responses section in Step 4.2. This is particularly useful when multiple users collect data, as coding makes the comparison of data easier. Simply agree on the questions to be used, and then the responses to these questions can be organized into corresponding codes for later comparative analysis. “Semi-structured” means that a list of questions is used to direct the interviews or focus groups without rigidly controlling them. This allows respondents to provide insights that users may not have been aware of beforehand and provides a better flow to the interview process. This strategy functions best using open (as opposed to closed) questions. For example, “What is

your opinion of...?” or “What do you think about...?” **It is also useful to ask concluding questions such as “What have I missed?” or “What else do you think is important that we have not yet discussed?”** to capture the maximum amount of significant data specific to each setting. These secondary questions act as guides, and each user or team should tailor them according to their circumstances to gain the best results possible. For Database 4, here are some questions that could be asked:

1. Do you think changing flows of ammunition affect levels of armed violence in urban environments? Why or why not?
2. Which areas of the city have the most crime scenes involving the firing of ammunition or recovery of live ammunition? When do these crimes tend to take place?
3. If the supply of ammunition goes up or down, does this have an impact on gun use and, more broadly, armed violence in urban environments?
4. Where does ammunition come from? Is it bought legally, or does it come from the black market, smuggling or some other way? Can you explain how legal and illegal ammunition enters communities? How is it stored, sold, distributed, etc.?
5. Can you explain the relationship between suppliers and users of illegal ammunition? Who do these people tend to be (without naming individuals)? Do these users tend to be criminals, gang members or others?
6. How does the role of men and women differ in these processes (i.e. what is the role of gender in supplying and storing ammunition)? Who tends to hide the ammunition? Who pulls the trigger? Who tend to be the victims? What else is going on in your view regarding gender and ammunition that we are missing?
7. What is the role of youth in these processes; for example, are younger people in gangs the end users, and older people suppliers, or is something else happening?

8. Would stopping the flow of ammunition into communities cause a significant change in violence? In your view, what is the best way to interrupt the supply of illegal ammunition into communities and ultimately to end users?
9. What proportion of ammunition discharge do you think is reported to law enforcement in your country or local region, and what is your opinion based on?
10. How well do you think illicit ammunition is intercepted in your region, and what is your opinion based on?
11. What have we missed? What else is important for us to know about the role of illegal ammunition in armed violence in urban environments?

The user or research team should carefully plan the qualitative methods to be used and carefully consider the ethical considerations involved. The methods need to be tailored to each context to produce the best results. This section outlines some recommended methods:

- [Semi-structured interviews](#) with a range of key interviewees
- [Focus groups](#) with key populations or groups of key interviewees
- Field observation

The user can use some or all of these methods.⁴⁰ As a minimum, interviews with key interviewees (outlined below) should be sought to provide additional background information or context. Field observation means that the user will visit various sites where ammunition is presumed to have been trafficked or misused, for example crime scenes. This will help the user better understand the specific contexts surrounding the use of ammunition and can also help identify key stakeholders for the interviews. Institutional managers should be aware that any fieldwork, particularly involving criminal or potentially dangerous subjects or vulnerable individuals, should adhere to legal ethical standards (see the Ethics, Safety and Danger section above).

⁴⁰ The method of data collection (e.g. audio recordings, summary notes, field notes) needs careful consideration as it is important to be consistent in the approach because different data-collection methods yield different levels of data quality, and making notes can unconsciously or consciously incorporate observer or interviewer bias.

Step 4.2: Apply the research methods

Coding and organizing the responses

Agreed-on questions can be used by one or more interviewers as “codes” to group the responses afterwards. The responses can be collated under codes from a number of interviews or focus groups, which will create a qualitative database that can then be analysed systematically. This data can be compared and analysed in conjunction with the other databases. The overall aim of this analysis is to respond to the overarching research question that the other databases cannot answer alone: How do changing flows of ammunition impact the levels of armed violence in urban environments?

Key interviews and focus groups

Identifying a range of key interviewees is essential to generating valid qualitative data. This range should cover State, government and civil society stakeholders, from local to national levels, to provide a broad and balanced range of responses to the research questions. Users should avoid collecting data from just one sector of State, government or society. Interviews and focus groups could include:

- Expert interviews with individuals from:
 - » State and government institutions, particularly those linked to national security
 - » International organizations
 - » Academia and research institutes
 - » Civil society organizations or NGOs at a national level
 - » Community organizations, including women’s and youth organizations
- Focus groups with members of communities affected by gun violence
- Interviews with individuals who are involved in supply, storage and end use of illicit ammunition:
 - » Local community members, via community visits accompanied by NGOs, community organizations, or women’s or youth groups

- 
- » Smugglers, traffickers, gang members, criminals and – potentially – imprisoned populations
 - » Others engaged in the use of illicit ammunition, depending on the specific urban context (e.g. private security, mercenaries, militias, self-defence groups)

Step 4.3: Review and analyse the data

When carrying out qualitative data analysis, always bear in mind that the overall aim is to respond to the lead research question: “How do changing flows of ammunition impact levels of armed violence in urban environments?” The analysis can be done systematically by following the secondary questions and assessing to what extent they have been answered by the qualitative data collected. The analysis write-up can then be organized according to which insights or main themes and tendencies emerge.

It is important to review the qualitative data set to gain an overall “feel” for what is taking place. This is an “inductive” approach, where the users ask themselves, “What is the data showing?” Users should be open to counter-intuitive or unexpected patterns and activities. For example, reducing ammunition flows may have little effect on armed violence in urban environments, or it may lead to increasing numbers of homicides without firearms. Users should also be aware that unlike quantitative methods, qualitative data is often contradictory and messy as it depicts the “real world”, and they will not necessarily get clean, definitive answers to all research questions. Users should expect unanswered questions and unknown processes occurring (good research should actually come up with new questions). When analysing the data, it is important to recognize the research limitations and reflect on the aspects that need further clarification.

With these caveats in mind, when analysing the qualitative data, users should be looking for:

- *Trends, patterns and tendencies* that provide answers to the secondary research questions.
- Who is involved, and how, why, where and when? Particularly, what do the key intersections of age, gender, race and socioeconomic strata tell



us about ammunition flows and violence?

- How clear is the qualitative data in providing answers to the secondary research questions? How strong are these patterns? How confident can we be in our claims? For example, did all the interviewees agree that reducing ammunition flows reduces violence? If not, what else is going on, why, and what does this tell us?
- What can users learn by analysing the qualitative data together with the other databases? This could provide researchers with the opportunity to identify any differences between information provided by communities and the information documented in law enforcement reports.



PART THREE: INTERPRETING RESULTS



PART 3. INTERPRETING RESULTS

3.1 Distilling findings

3.1.1 Tools to corroborate ammunition-specific observations

In conducting ammunition profiling efforts, users will, at times, encounter unknown headstamps or find certain characteristics of the ammunition markings to be beyond their immediate knowledge. To corroborate ammunition-specific observations and increase knowledge of the documented characteristics, several tools and resources are available. The following list is neither comprehensive nor an endorsement, but rather an illustrative compilation of existing tools and resources that may help users when encountering unknown ammunition. Some of these resources require a subscription, with monetary implications. This Handbook presents the list to provide options for users' consideration.

Table 21: Tools to assist with ammunition identification and associated management

Name	Category	Description	Website
Association of Firearm and Tool Mark Examiners (AFTE)	Organization	AFTE is an international professional organization for practitioners of firearms and toolmark identification. Among the useful resources of the AFTE are an ammunition headstamp guide, glossaries, training seminars and the AFTE Journal.	Accessible Here
CartWinPro	Global database	CartWinPro is commercial software used to identify ammunition. With over 26,800 headstamps recorded, it features calibre measurements, colour code references, cartridge records, manufacturer information and specimen photos of various projectiles. It is currently available in seven languages.	Accessible Here
Cranfield University Ammunition Library	Library	Cranfield University compiles an authoritative list of academic resources for Ammunition Technical Officers.	Accessible Here
International Ammunition Association (IAA)	Informal association	The IAA is an informal association primarily organized for cartridge collectors and has an active forum community that holds dynamic discussions on a diverse set of headstamps. The IAA also hosts its own bimonthly magazine, the International Ammunition Journal.	Accessible Here
Electronic North Atlantic Treaty Organization (NATO) Ammunition Data Base (eNADB)	Database	The eNADB is a web-based ammunition database with over 435,000 items held in NATO inventories, as well as information on NATO and non-NATO nations. Subscriptions are offered on a yearly basis.	Accessible Here
Firearms Guide	Database	Now in its 11th edition, the Firearms Guide allows the user to filter ammunition through a web-based database, featuring producers, ballistic specifications and pictures. Subscriptions run yearly.	Accessible Here

Name	Category	Description	Website
Small Arms Survey, An Introductory Guide to the Identification of Small Arms, Light Weapons, and Associated Ammunition	Handbook	This guide explains the process by which weapons and ammunition are identified and arms flows are tracked, giving the reader “a basic understanding of how to identify and analyse small arms and light weapons, and to track their proliferation”.	Accessible Here
International Ammunition Technical Guidelines (IATGs) by the UN Office for Disarmament Affairs	Technical guidelines	The IATGs form a frame of reference to achieve and demonstrate effective levels of safety and security of ammunition stockpiles.	Accessible Here
iTrace by Conflict Armament Research	Global database	The iTrace project is a global data set that presents verified information required to understand weapons transfers. The project combines an extensive programme of in-conflict field investigations with the world’s most powerful public access weapon tracking database.	Accessible Here
INTERPOL Ballistics Information Network (IBIN)	Ballistics network	While not necessarily a resource to identify ammunition, the IBIN has an important role to play in ammunition-related efforts. Member States using the IBIN can share ballistics data (extracted from ammunition recovered as evidence) from crime scenes and link gun-related incidents using the same firearm, regardless of physical distance, providing valuable investigative leads.	Accessible Here
Individual ballistics experts	Experts	Ballistics experts are a vital resource when confirming ammunition-specific observations, especially local experts. Local ballistics experts are generally well acquainted with the specifics of ammunition reaching unauthorized users or involved in unauthorized use. On most occasions, these experts will work in forensic laboratories (or universities) and have years of experience documenting and analysing ammunition used in crime scenes and testifying in court. It is recommended that ammunition profiling efforts are revised by ballistics experts and the evidence collection effort is done in close consultation with local experts.	

3.1.2 Cases of uncertainty

Some headstamps will be of uncertain origin or present unclear markings; thus, making a determination will require expertise and a baseline of information for guidance. While the uncertain cases will likely be a minority in the documented sample, categorizing these exhibits is specialized work that should be done by technical experts. When uncertainty arises, it is important to look for indicators that could point towards a previously documented case or lead to a probable identification. From past ammunition profiling efforts, in one continent, the following roughly estimated distribution of uncertain cases has been gathered:⁴¹

- Absence of markings (~3%)
- Incomplete or partially effaced markings (~1%)
- Fake markings (>1%)

The cases of uncertainty will require expertise and knowledge-sharing within the community of practice. This situation highlights, once again, the utmost importance of good photographic documentation. Photos will be essential for later verification and for cross-checks from other recoveries. In addition, a clear electronic photo can be enlarged on a computer to enable particularities such as alphanumeric character spacing, curving or effaced markings to be identified.

As deciphering the meaning of markings can lead to mistakes, building baseline documentation will be a key component for correct identification. For example, after an initial documentation of ammunition cartridges, the user may consider establishing a baseline document or “drive storage” with all the photographic documentation (noting the correct identification of country of manufacture, producer and year of manufacture) to help

⁴¹ Estimates based on interviews conducted by the authors with Nils Holger Anders, a leading expert and practitioner in the field of ammunition profiling and tracing.



others in the system with the data entry or for cross-comparisons when uncertainty arises. For example, baseline documentation could include a legend noting what specific codes represent, such as “10 = producer code for Arsenal, Bulgaria”. Not only would baseline documentation reduce uncertainty, it would expedite decision-making processes. In addition, baseline documentation will assist in identifying cartridge samples that were not previously documented or were otherwise unseen in that jurisdiction, thus serving as an early warning system to flag newly introduced inflows of ammunition.

3.2 A word of caution

3.2.1 Data limitations

This Handbook offers a road map for ammunition profiling, which is different from ammunition tracing. The key difference is that *tracing* efforts generally intend to determine the exact origin and recreate the supply chain of documented ammunition, when packaging or markings permit and confirmation is received from the relevant entities, whereas ammunition *profiling* is better understood as a data generation tool to gain a baseline of information regarding volumes and origins, variations (trends and patterns), and dates of production. **Ammunition profiling generates baseline data for subsequent efforts to build on. As such, ammunition profiling contributes to understanding of the problems of diversion, trafficking and misuse but, in isolation, will not present definitive answers. That is, ammunition profiling needs to be complemented with additional layers of data and followed by the analysis of context-specific policies and their implementation.**

This methodology aims to contextualize ammunition profiling in a way that provides insight into incidents of armed violence. Nonetheless, the Handbook promotes caution when interpreting conclusions, as these would be based on a sample of the universe of ammunition recovered as evidence, and anecdotal evidence suggests that only a fraction of ammunition discharges are reported to or detected by authorities. As such, the universe of ammunition discharges documented is likely an underestimate of the “true” or “full” universe of ammunition discharges.

Analysing reports from crime scenes or from seizures in domestic operations or at entry-exit points will require judgement calls and a degree of subjectivity. To reduce subjective interpretations, it is important to define

beforehand the possible categories that will be documented in fields such as, for example, *situational context*, *incitement-related factor*, *outcome of the crime*, *outcome of the intervention*, in line with domestic regulations. In addition, having clear definitions will discipline the research effort into analysable categories. In practice, this means that the information extracted from the reports should be used to contextualize findings and provide a degree of situational awareness to the ammunition recovered. It should not be understood, however, as sufficient to solve particular cases or serve, in isolation, as leverage to make overarching claims about the public security of the jurisdiction under consideration.

A baseline ammunition data set provides valuable, but limited, analytical utility. When drawing conclusions, users ought to be extremely cautious, especially when it comes to drawing conclusions about the supply chain. For example, ammunition might be produced in a particular year and marked with that year, but the transfer might not happen until two years later, or a particular lot of ammunition might have been retransferred but left with import markings from the original intended end user. Additionally, manufacturers might produce different brands, or the packaging might not correspond to the ammunition inside the box. Also, the assembling processes vary, affecting how the casings are being produced. Therefore, it is not advisable to make claims about the supply chain unless all States and entities involved in a particular transfer have been consulted and presented with the data and, consequently, that information has been duly confirmed and verified by the appropriate national authorities and entities. It is thus recommended to argue on the basis of “known” or “interpreted/inferred” information for fields such as ammunition manufacturer, where “known” would imply obtained confirmation and validation from all involved parties and “interpreted/inferred” would imply that headstamp or packaging markings were visible but no confirmation was requested or received.

3.2.2 Vocabulary: Degrees of likelihood

In profiling efforts, claiming certainty and making assurances about, for example, country of origin, manufacturer, manufacturing facility, or other fields of data extracted from the recovered ammunition sample is often beyond the scope of the research effort. As such, ammunition profiling operates in degrees of likelihood. In practice, this means that it is often not possible to “assure”, but it may be possible to argue on the basis of “ammunition with characteristics similar to manufacture in X” or “ammunition with characteristics similar to a production in Y”. Some other language options include “possibly”, “likely” or “very likely” in order to operate in degrees of uncertainty and unverified data by the relevant national authorities.

To claim complete certainty and make assurances, the information regarding the supply chain should be verified and confirmed by all States involved in the suspected transfer. As such, it is recommended that users of this Handbook leverage findings from the research effort to improve human security, while respecting the uncertainty of operating in a greyscale of likelihood.

3.3 Transforming findings into actionable information: A pipeline to transform knowledge into action

The main objective of this Handbook is to offer users a guide to create a profile of small arms ammunition diverted, trafficked or misused in a specific environment. The profile created will provide actionable information about the ammunition in circulation and its misuse. This information could be used to develop targeted policies and strategies to reduce armed violence and curb illicit trafficking. As such, it is an action-oriented Handbook, with the final goal of linking findings to actionable prescriptions. To reach this goal, this section suggests a series of steps.

First step: Understand what the data says and ask the right questions

It is crucial to understand what the data says and the limitations of what it does not say. That is, the data collected should be analysed in its context, with attention given to the time period under scrutiny and policy changes that could have led to variations. The analysis sections provide a road map of what to look for with each database. To understand what the data is trying to say, it is crucial to draw the suggested cross-references and seek to shed light on complex dynamics regarding possible origins, lethality rates and conflating factors enabling armed violence. It is also important to look for big picture trends and understand the databases not as isolated silos, but as pieces of a larger puzzle. **In practice, this means that many findings will require follow-up research to unveil a more disaggregated picture.** As such, understanding what the data says can also be considered as finding the right questions to ask.

Second step: Use the data to define actions

Once it is clear what trends emerge from the data and what questions remain unanswered, it is important to define a road map of actions. While some findings might be mature enough to be turned into policy prescriptions, others might be indications that further disaggregated research is needed. As such, this Handbook recommends a vigorous discussion on the implications of each finding, with a view to defining the right ensuing actions. **In practice, this means that if the first step identified the right questions to ask, this second step identifies the right actions to take.**

Third step: Monitor the data, seeking patterns

Some of the defined actions will involve policy suggestions; others will be more research oriented. In either case, it is crucial to remain vigilant

in monitoring the data and continue building the evidence base. An ever-expanding evidence base will facilitate the observation of clearer patterns and time series analysis.⁴² The basic premise of this step is that the more comprehensive the data, the better. To achieve such comprehensive data, it is important to consider this Handbook as a living guide for ongoing research. **In practice, this means that, as much as possible, ammunition profiling data-collection efforts should be integrated into national practices.** The better the planning of the data collection from the database generation point, the more complete the data set will be. That is, a version of this methodology, or parts of it, should be integrated into, for example, SOPs and other data recording and collection methods used by the different entities involved. Integrating data collection into SOPs will yield an ever-expanding evidence base that will facilitate clearer monitoring efforts to observe variations in trends across time and across different policy interventions.

Fourth step: Channel prescriptions both downstream and upstream

An evidence base will help bring policy prescriptions into light. For example, if over a five-year period, half of the ammunition recovered from crime scenes had the same import code, while that code only represented 10% of total imports, then officials should recreate the distribution pattern of that imported lot of ammunition. Officials should recreate the life cycle of that ammunition, as much as possible, to evaluate why that import code was recovered from crime scenes at a disproportionate rate compared to its market share. If applicable, and once provided with appropriate evidence, policymakers should tighten the controls that were found ill-suited in keeping legally imported ammunition from unauthorized use.

⁴² It is worth cross-referencing peaks and dips with other associated factors or even crimes. For example, when fired ammunition figures are decreasing, is knife crime rising?



It is important to act on the policy suggestions aimed at reducing armed violence at the local level. It is equally important to elevate lessons learned from the local level to multilateral efforts. While solutions to firearms-related violence might be local, the approach to finding these solutions might be globally applicable. **In practice, this means channelling prescriptions downstream to the local level of government office in charge of public security and then sharing the results and methods upstream to institutions engaged in multilateral efforts.** For those working on multilateral negotiations, it means actively listening to the local level, and for those working at the local level, it means documenting and sharing the lessons learned.⁴³

⁴³ Changes in policy or legislation may also cause divergence within regions, so the potential risk and impact for any change needs to be well explored and considered prior to its implementation. Sometimes, local laws do reduce violence in their immediate jurisdiction but then create demand, diversion or effects that increase violence in neighbouring areas as an unintended consequence. Hence, a collaborative and holistic input is required to minimize unintended consequences.

3.4 Leveraging knowledge to reduce violence

This Handbook recognizes that analysing data, asking the right questions, acting on the findings, monitoring patterns and channelling lessons learned are easier to do conceptually than operationally. As such, this Handbook provides an example of how the knowledge generated through the pipeline of analysis can lead to reductions in armed violence.

Illustrative case

FINDING

Data shows that 25% of ammunition recovered from crime scenes in the current year are marked with manufacturer markings consistent with those from an importation that took place the previous calendar year.

First step: Asking the right questions

At least two follow-up questions seem appropriate. First, it is important to determine the intended end user of the legally imported ammunition, as well as the end uses for which it was authorized. This will begin to shed light on the supply chain and identify the last documented users. Second, it is important to determine the comparative size of that importation against the overall inflow of ammunition. This is important because the importation in question might have accounted for 25% of all ammunition imported in the last year or it may have only accounted for a miniscule proportion of the overall inflow of ammunition. The latter would indicate that the distribution patterns of that importation are causing that particular ammunition to end up in crime scenes at a disproportionate rate compared with its relative market size.

Second step: Defining the right actions

For example, if the last documented user is identified as a private security company (first question) and the imported lot turns out to be minimal in comparison with the total yearly inflow of ammunition (second question), then the most appropriate actions would be to recreate and investigate the distribution patterns and uses of that particular private security company.

Third step: Monitoring the data and conducting time series analysis

The current finding highlights what happened in crime scenes in the current year, but it would also be important to look back at all the ammunition distributed to that private security company and maintain the monitoring effort, at a minimum, throughout the rest of the year. These efforts will determine if the current finding is an abnormality or if it is part of a pattern of behaviour within a distribution network that appears to be negatively affecting public security.

Fourth step: Channelling prescriptions downstream and upstream

Should it be determined that the distribution pattern of private security company X is affecting public security, then the data, analysis and implications must be shared with all governmental offices in charge of regulating trade in ammunition and overseeing armed private security and home affairs, for example. This could result in tighter acquisition regulations and oversight, enhanced stockpiling and reporting controls, requirements for secondary markings, removal of licensing privileges, or other policies that the State could choose to pursue. At the same time, the course of action and results should be shared regionally and internationally,



since neighbours and other interested States could be suffering from similar challenges to their public security and could benefit from the strategy taken.

This is just an example of how following-up from a finding can lead to changes in policy for the benefit of public security. Nonetheless, the potential scope of action based on the findings is both widespread and context specific.

3.5 Recommendations

From previous studies of ammunition control practices and profiling efforts, some recommendations have been repeatedly highlighted. This Handbook presents them for national authorities to consider as options when interpreting findings and considering follow-up actions.

- Establish an inter-agency governmental task force to facilitate information exchanges and address armed violence. Governmental institutional design is often dispersed and lacks fluid exchange of information. To reduce armed violence and the threat of armed violence, public responses must be agile. Therefore, building bridges across agencies could be a sound structural response, should a determination be made that policy and implementation lag owing to siloed agency action. One option to enhance inter-agency collaboration would be to establish a Firearms Focal Point or a gun crime intelligence centre. These entities can streamline information flows, generate data on ammunition, and produce actionable intelligence to reduce armed violence.
- Standardize national reporting templates for documentation and record-keeping of ammunition recovered from crime scenes, seized in domestic operations, and confiscated at border controls. If adopted, this recommendation will streamline domestic processes and facilitate data gathering.
- Establish a national ballistics database of registered firearms, with test fires of ammunition of different materials. This will provide a benchmark of information that can be used to compare the ballistics data from ammunition recovered from crime scenes against the repository of legally acquired and licensed firearms. This will aid criminal investigations and inform national policies regarding the firearms involved in shooting incidents.

- » For example, if all firearms in country X were test fired and registered in a national database, should these firearms be used in a shooting incident, the fired evidence from that scene can be forensically linked to the test fires in the registration database. Such documentation when analysing the data could shed light on the frequency with which crimes may be occurring with the same firearm or different firearms within the country. If forensic ballistics experts can draw correlations between the individualized markings from ammunition recovered as evidence and ammunition registered in the national database, and thus identify the responsible firearm, then the exercise of studying ammunition can be elevated to linking the movement of firearms involved in different shooting incidents.
- Request that all ammunition, imported or produced domestically, be marked, per lot, at the point of production with a unique alphanumeric code in either the headstamp or the groove of the ammunition cartridge. This demand-side request will enable tracing of small arms ammunition and facilitate accountability in cases of diversion.
- Establish monitoring mechanisms to observe trends and patterns in ammunition flows. Should an ammunition profiling methodology be imbedded in national SOPs, time series data can be generated with minimal additional work for national authorities.
 - » To facilitate monitoring mechanisms and safeguard the sustainability of the efforts, seek to create or establish baseline documentation for guidance and cross-referencing. In addition, seek to create or establish a text-based standardized coding list to support consistent reporting of alphanumeric characteristics and symbols in future ammunition profiling efforts, such as the different markings of particular factories, manufacturers or symbols (dot, five-point star, triangle, NATO, company logo, etc.).
- Share findings from an ammunition profiling effort with regional partners and organizations. It is important to pursue a regionally collaborative

strategy, since local or national efforts alone will be unable to shed light on regional or global patterns of trafficking or diversion.

- Share ballistics information with neighbouring countries and/or the subregion. This will enable authorities to connect crimes committed with the same firearm by linking the ballistics fingerprint to the responsible firearm; they can use the evidence to inform strategies to disrupt regional armed violence and illicit trafficking networks.
 - » Share ballistics information in bulk, and for every recovery possible, to correlate ballistics data as frequently as possible and not only compare ballistics data in a case-by-case manner at the international level. To facilitate sharing in bulk, if possible and equipped with the Integrated Ballistics Identification System, explore becoming a member of the INTERPOL Ballistic Information Network.
 - » Explore and encourage, where possible, methods for information-sharing of ballistics data across different manufacturing companies of ballistics information systems, as propriety data formats represent a current barrier. For example, for countries using different Automatic Ballistics Identification Systems, explore alternative options for sharing information, such as double-casting or working through existent networks such as CARICOM, Europol or INTERPOL.
- Consider regulating the number of ammunition rounds that can be legally purchased in the private market, particularly in places affected by high levels of armed violence and with diversion (leakages) from private actors identified as a main source feeding the unauthorized supply. This policy could reduce the overall pool of available ammunition, thereby reducing a source of diversion to unauthorized users.
- Consider restrictions on identified conflating dynamics, such as the simultaneous presence of firearms, alcohol, drugs, young men and late-night hours.

- Consider adopting technology that detects and notifies authorities of all ammunition discharges in urban environments. This could take the form of gunshot detection technology, such as [ShotSpotter](#). Adding this technological advance to the toolbox available to law enforcement would provide two crucial advantages: first, immediate notification of a shooting event, and second, a full understanding of the number of ammunition discharges that occur in an urban environment. The former advantage facilitates immediate emergency responses to shooting events; the latter advancement would provide a more accurate estimate of the universe of ammunition discharged in an urban environment. For ammunition profiling efforts, the latter area of improvement would provide a more comprehensive understanding of the full extent of shooting incidents and thus a better grasp of the sample observed.
- Consider creating and contributing to a freely available depository of ammunition with headstamp pictures and information from recovered samples. The shared depository can help future efforts to learn, verify, build on and test the feasibility of technological advances in ammunition monitoring.

3.6 Moving forward

This Handbook is a proposal to facilitate efforts to profile small arms ammunition in settings affected by armed violence. This Handbook also encourages users to use the guidelines as a starting point to think differently about ammunition and to continue building on this approach to find what works best at the local level. As such, this Handbook should be understood as a living document, open to any and all editions and additions as the field of small arms ammunition research advances and different case studies build a comparable and systematic evidence base. While this Handbook carries no reporting requirements, UNIDIR encourages users to share their experience and results. Feedback on the Handbook itself will allow UNIDIR to update the product and results from the case studies, and this will inform the Institute's work on armed violence and in advising multilateral processes moving forward.

This Handbook also presents an opportunity to take a step back and rethink armed violence and reconsider the role of ammunition – a role that is central to lethal outcomes in incidents of armed violence and often understudied. It is the final message of this Handbook that to move forward, on some occasions, it is crucial to take a step back to analyse the full picture. And since the challenge of armed violence is urgent, this analytical step back ought to be taken without delay. **The right solutions to armed violence are within reach, but to find the right solutions, it is crucial to ask the right questions.** The ultimate purpose of this Handbook is to lead users to the right questions.

The Conventional Arms Programme of UNIDIR stands ready to support users of this Handbook in developing an ammunition profile and exploring ways to prevent armed violence.



PART FOUR: ANNEXES



GLOSSARY

- Calibre:** Generally, but not always, the nominal projectile diameter, typically based on the bore of a weapon, as measured across the features of the weapon’s rifling.
(Definition per Small Arms Survey.)
- Cartridge:** A cased quantity of explosives (excluding rocket motors) complete with its own means of ignition.
(Definition per International Ammunition Technical Guidelines [IATG].)
- Diversion:** Movement – either physical, administrative or otherwise – of ammunition from the legal to the illicit realm, in defiance of national and/or international law, to an unauthorized end user or for unlawful end use. Diversion could entail appropriation and/or physical rerouting leading to a potential change in the effective control or ownership of ammunition to actors, groups or entities that have not been authorized by competent national authorities. Diversion could occur at any of the stages of the ammunition life cycle.
- Diverting ammunition to an “unauthorized end user” could refer to a sale, gift, lease, loan or barter exchange of ammunition throughout any of the stages of the life cycle to the armed forces, law enforcement agencies or other security forces of a particular State that has not been specifically authorized by a competent national authority of an exporting and importing State, through licensing arrangements and end-use undertakings. It could also refer to a natural or legal person (an individual, group or corporate entity) not authorized by such an authority.
 - Diverting ammunition for an “unlawful end use” could imply that the end-use assurances will not be observed. *(Definition per GGE/PACAS/2020/3.)*
- End user:** The individual or organization that will operate the equipment or facility.
(Definition per IATG.)

Headstamp: Alphanumeric characters and/or symbols applied to the base of cartridge cases.
(Definition per Small Arms Survey.)

Live ammunition: Ammunition that has not been fired or rendered unserviceable.

Lot: Predetermined quantity of ammunition or components that is as homogeneous as possible and, under similar conditions, may be expected to give uniform performance. *(Definition per IATG.)*

Marking: The application of marks – including colours, descriptive text and symbols – to munitions, parts and components thereof, and associated packaging, for the purposes of identifying, among other things, their role, operational features, and age, and the potential hazards posed by those munitions.
(Definition per IATG.)

Import marking: The application of markings, at the request of the importer, to identify country of import, authorized end user, importer, lot, year of manufacture, among other characteristics of the importation.

Tracing: The systematic tracking of illicit ammunition from the point of its manufacture or import, through the lines of supply, to the point at which it became illicit.
(Definition per IATG.)

Transit: Movement of goods across the territory of a State as part of a transfer between two other States, including the transloading of the goods at the points of entry into and exit from the transit State.
(Definition per Modular Small-arms-control Implementation Compendium.)

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