Second Convening of the Expert Panel on Firearms Data Infrastructure

A Conceptual Framework for a Firearms Data Infrastructure

NORC

at the UNIVERSITY *of* CHICAGO

Executive Summary

The first Expert Panel on Data Infrastructure convening was held in October 2019. Following the meeting, the expert panel released *The State of Firearms Data in 2019*[1] reviewing current and discontinued firearms data systems, datasets, and survey data. The main finding of the first report is that the current firearms data system is very limited. While there are numerous data sources describing particular elements of the relationship between firearms and accidental harm, suicides, and criminal violence, as a system it is incomplete. Firearms data is often difficult to access, collections are narrow in scope, and few data sets and systems can be integrated.

The second convening of the expert panel was held in January 2020 in Bethesda, MD. The goal of that convening—and this report—is to develop a cohesive conceptual framework for a firearms data infrastructure. A useful conceptual framework can guide data collection, incorporate new information into the broader knowledge base, provide a basis for analysis and observe changes in available information. The conceptual framework will also create an overarching set of principles to guide the selection and prioritization of expert panel recommendations.

The data needs of a comprehensive firearms knowledge base evolve over time and as a result, data designed to answer today's policy questions only partially inform a national data infrastructure. As a rule, individual policy and program data are "narrowly focused and unlikely to accord high priority to collecting the core data needed to establish a foundation of information" (National Academy Press, 1997: 13). Existing data collections are typically convenience data, e.g., data that are already collected for a specific purpose where firearm injury and death may be just one of many

This paper is the second of three products that will be generated from the Expert Panel on Data Infrastructure. Commissioned by Arnold Ventures and staffed at NORC at the University of Chicago, the expert panel is convening for three meetings in October 2019 and Winter and Spring 2020. The panel organization and composition generally replicates the standard National Research Council model for expert panels and includes subject matter scholars and policymakers who are both thought leaders and consumers of data and research and who can act as champions at the local, state, and federal levels. This diversity of perspectives will also be prioritized in the selection of witnesses to present expert testimony to the panel. The three products from the expert panel include:

- The State of Firearms Data in 2019. An assessment of the state of firearms data collection and infrastructure in key substantive domains (criminal justice, health, and public health), including both administrative and survey data as well as compilations and systems of data integration. The paper will consider the extant data within the framework of the six essential components of data infrastructure.

- A Conceptual Framework for a Firearms Data Infrastructures. The paper will develop a conceptual framework to guide the identification and adoption of theoretical, technical, and methodological advances in social science, data infrastructure development and architecture, mechanisms for sustainability of data infrastructure, implementation science of data systems adoption, and case studies in sustainable systems science.

- A data infrastructure to serve 21st century policymaking. The final paper, the "blueprint," will synthesize and distill the work of the expert panel, including expert testimony, panel formulations, and staff research into actionable recommendations. By leveraging existing projects, policies, and innovative methods and models for the next generation of firearms data infrastructure, the blueprint will create a set of recommendations for next steps for the development of firearms data infrastructure, including a prioritized list of future projects.

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[1] Roman, John K. 2020. *The State of Firearms Data in 2019*. Bethesda, MD: NORC at the University of Chicago.

important measures. This absence of a coherent structure and the lack of continuity in data collection limit cohesive and consistent analysis and evidence-informed policymaking.

With those ideas in mind, this report describes a conceptual framework that organizes a discussion of data needs and data availability for the purpose of making existing data sets more complete, accurate and user friendly as well as proposing new ways to connect existing data and, recommendations for new data systems, collections and measures. To make this task more manageable, the framework distinguishes between national collections and state, local and regional collections, and, between broad, population level collections and narrower, targeted collections.

From this conceptual framework, four types of data recommendations emerge.

1. At the national-level, population-level data collections would be more useful for research and policymaking if the purpose and scope of these collections were modestly altered.
    a. National-level, population-level data should prioritize enhanced data accessibility for researchers.
    b. Critical missing firearms measures should be added to existing data collections. For example, measures within a primary data collection that come from secondary sources should be included (for instance, if public health data on gunshot health outcomes included criminal justice data on criminal charges and case dispositions).
    c. Today's technology offers many solutions to information sharing and data integration while stringently protecting confidentiality. Funding to integrate federal data collections should be prioritized.
    d. The Foundations for Evidence Based Policymaking Act of 2018 requires data sharing across federal agencies and that data should be prioritized. Limits on sharing of federal data collections with researchers should be lifted.
2. At the national-level, the firearms behavior of many important high risk populations (e.g. recent arrestees) are not currently studied and little data is available.
    a. The universe of targeted data collections is incomplete and would be much improved from renewing and expanding retired data collections. For instance, the Drug Use Forecasting/Arrestee Drug Abuse Monitoring System occasionally included valuable interviews with recent arrestees about their use of firearms in recent criminal incidents and these interviews could be replicated.
    b. Where data are available, the lag between data collection and data availability can stretch to years, substantially reducing the impact and import of these costly data collections. Data should be available for analysis within months of collection.
    c. State by state data are not routinely collected and made available for research. This includes summaries of state data collections and descriptive statistics about compliance with federal laws that vary locally, such as possession of firearm by certain people with a mental illness.

3. At the state, regional and local level, population-level data collections about the social determinants of gun ownership, use and transfer are almost completely absent and policymaking is severely limited. Examples include:

   a. Social determinant data collections to identify high risk populations at the regional, state or local level[2]. For example, data on adverse childhood experiences (ACEs) and gun accessibility and availability in a household.

   b. Data on social norms as described by attitudes, behaviors and beliefs about gun ownership, storage and transfer.

4. Harmonize research data from regional, state or local program evaluations through curation or protected data integration. Despite federal prohibitions on research funding and use of federal data, a modest but rapidly expanding research base exists. However, there are few research efforts to collectively learn from these studies because the research is not available as a body of research.

   a. Where possible, evaluation data should be co-located in a secure environment to facilitate broader research synthesizing past results. A wide array of technological solutions currently exist that can protect confidential data and create a platform for this analysis.

   b. Where data cannot be shared, research findings should be curated to make results easily accessible to many researchers. For example, the University of Michigan maintains the Firearms Safety among Children and Teens Consortium (FACTS) that curates a comprehensive knowledge base. These approach is replicable across other domains.

The conceptual framework builds on a public health model of prevention and intervention, and differentiates data that is collected nationally from data that is specific to a particular place— generally a state, a city or county, or a targeted community. The report first outlines the difficult choices the Expert Panel confronted in framing a policy issue that cuts across many research and substantive boundaries. Next, the report defines the key terms used in designing the framework and discusses how those distinctions can help categorize firearms data into useful buckets that align with political decision making and policy grant-making. The report concludes with policy questions the data derived from this conceptual framework can answer.

Expert Firearms Data Infrastructure Panelists

Chair
Clarence Wardell, PhD

Panel

Ruth Abaya, MD	Erin Dalton, MS	Nancy Potok, PhD
Catherine Barber, MPA	Robin Jenkins, PhD	Daniel Webster, ScD
Phil Cook, PhD	Nola Joyce	Garen Wintemute, MD
Dennis Culhane, PhD	Michael Mueller-Smith, PhD	
Rebecca Cunningham, MD	Fatimah Muhammad, MS	

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[2] The Centers for Disease Control (CDC) define social determinants of health as encompassing "economic and social conditions that influence the health of people and communities."

Creating a Conceptual Framework for Firearms Data

The Current Data Structure

The general finding of *The State of Firearms Data in 2019* is that gun violence crosses numerous boundaries in society and the data systems that seek to measure it should also span those boundaries. However, much of the available data today is siloed. Law enforcement data describes the use of firearms in crimes and the facts of criminal cases brought against illegal offenders. But, there is almost no data on the injuries crime victims suffer and no information about suicides and accidental injury. By contrast, while some public health data does include clinical outcomes for all three types of injury, data on crucial indicators—such as whether a shooting was accidental or intentional—are often missing or miscoded. A central limitation of both data systems is that all of the most widely available firearms data are limited to the aftermath of a firearm injury. Other data are needed to understand how a firearm was acquired and to understand Americans attitudes and beliefs about why people own guns and how they are used. State government data is used effectively to track the transfer of firearms in a few states, but there are no national data systems. Federal data systems maintained by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) are limited to the original purchase of a firearm, not subsequent transfers, but the Tiahrt amendment greatly limits ATF data sharing. Survey data could fill some of these voids, but there are few national surveys with any firearm questions and even fewer still that sample from high risk populations.

As a result, most of the important firearms research to date has been conducted exclusively within one of these silos. Critical research questions that remain unanswered, and there are many, requires that additional data is collected from law enforcement, public health and other sources. Better evidence to prevent future firearms injuries and deaths also requires a greater level of integration. Key to this effort is to avoid the biggest pitfall of the past which is that the development of firearms data and data systems has not followed from any coherent data strategy. Data collection is haphazard and disorganized and it is of no surprise that our baseline understanding of the relationship between firearms and firearms injury and death are equally incomplete. A conceptual framework is an important starting point for a cohesive firearms data strategy.

Aligning Data Design and Research Questions

As much as data is the cornerstone of any research endeavor, creating a conceptual framework for data is unconventional and requires a change in perspective. Putting data first in this process takes some getting used to. The natural process of designing research puts the research question first and the data necessary to answer that question second. The question, 'What data is needed to answer a research question?' is a natural one to most researchers. The question, 'What research questions can this existing data collection answer?' is less conventional, although some research field—such as economics—have increasingly embraced this approach. The question, "How should we design a data infrastructure that aligns many data collections to answer as many research questions as possible?" is much trickier.

The question for the Expert Panel is where to begin. Typically, research begins with a set of research questions that generates testable hypotheses. If a cohesive and coherent data infrastructure already exists, this process is smooth and logical. If, on the other hand, the data is haphazardly organized and missing broad elements and the data cannot be easily combined, new data must be collected for each new research question. This strategy of primary data collection generates new data that follows directly from a research question. These data tend to be quite rich and include the important elements necessary to understand causal relationships—inputs that describe what the program or policy does, outputs that measure key program or policy objectives, and, outcomes which describe the results.

The challenge is that even if there are many studies using primary data collection it is difficult to turn the *data* from those studies into a coherent whole. Studies relying on primary data collection create data that tend test a specific policy, program or practice yielding data that are narrow in scope. These studies also tend to be focused on their own internal consistency rather than broader generalizability and the data collected reflects that focus. While the results of the research can be combined through systematic reviews and meta-analysis, the underlying data is much harder to combine. A messy data landscape, such as the one described by the National Academy of Sciences at the beginning of this report, is a typical result of a field dominated by primary data collections.

The most convenient alternative is for researchers to rely on secondary data collections, usually datasets created and maintained by a government and in particular the federal government for national data. Here, the research questions have to be crafted to fit the data, or the data cleverly manipulated to answer a research question that was not the primary focus of data collection. Limitations of secondary data are equally well known. These data tend to be aggregated and are rich sources of output data, usually counts of events such as the number of deaths from firearm. But these data do little to answer important questions of why and how events occur—why do some guns become crime guns and others do not? How do access and availability affect suicide and violent firearm assaults? Does social norm change have a bigger influence on how guns are used then the threat of punishment?

The data necessary to answer these questions requires information about the predictors of firearm accident, injury, suicide and homicide. Researchers generally divide predictors into two types: mechanisms and determinants.

- *Mechanisms* (or more specifically causal mechanisms) are those events, interventions, behaviors or attitudes that directly lead to a bad outcome. Policy mechanisms—changes in the rules or norms for everyone—are relatively easy to observe in the data or are easily added to the data: a law change, the start of a new program, or a big external shock (such as media reports on an increase in firearms ownership during the pandemic of COVID-19). Mechanisms designed to change individual behaviors—such as a justice system intervention like Gun Court or a community-justice partnership like violence interrupters—are usually described and tested in program evaluations, and not included in any broader data collections.
- *Determinants* are economic and social conditions that influence the health and well-being of a population and their communities. Determinants include population-level conditions that are correlated with more, or less, firearms violence. Poverty, for example is associated with poor health

and higher rates of neighborhood crime. Data on determinants are usually created from Census data, or from broad system-wide data. The determinants of firearms injury are not well studied and are currently limited to a few indicators, such as age and marital status.

The third key data category are outcomes data. These data describe the amount of firearms violence and how it is changing over time from changes in mechanisms and determinants. Key outcomes include the number of homicides, non-fatal shooting injuries, firearms accidents and firearm suicides. The public health system collects all of these data in population-level systems such as CDC's WISQARS™ (Web-based Injury Statistics Query and Reporting System) and the National Violent Death Reporting System (NVDRS). Criminal justice outcomes, such as identification of the offender, at the population-level are collected separately by the FBI. Much richer data is sometimes made available at the local-level by one of the 18,000 local law enforcement agencies.

Thus, in order to understand the relationship between firearms and violence—and in order to create effective policy that reduces that impact—the data describing the predictors of firearms violence must be joined with the data on outcomes. The key idea here is that data on the mechanism by which firearms become dangerous and the social determinants of firearm injury are currently collected separately from data on the outcomes of firearms use. To answer research questions about what these mechanisms are and how to reduce the impact of these mechanisms on firearms injury and death, data on outcomes and data on mechanisms must be jointly accessible. Both the mechanism data and the determinant data must be added to outcome data, the outcome data added to the mechanism data, or, data collections describing mechanisms and determinants must be linkable to data collections on outcomes.

Is Technology the Main Barrier to Firearms Information Sharing?

Having identified the gaps that emerge because mechanism and determinant data are collected and kept separately from firearms outcome data, the question that follows is whether that divide exists because of technological challenges and limitations or if it has simply not been a priority to integrate those data. On first glance, it is reasonable to assume that technological limitations are the cause of data silos. Important firearms data is collected at the local, state and federal level. The data flows directly from criminal justice, public health and other data systems whether the data has been gathered for reasons specific to that system. Some systems—particularly the criminal justice system—have extremely poor data infrastructure. The technology at the local level—including over 18,000 law enforcement agencies and more than 3,00 county court systems—is often antiquated.

To answer this question, Expert Panel staff met with leaders in the computer services industry and the Expert Panel viewed in a demonstration of a sophisticated data platform for data integration and analysis. Expert panelists also brought with them knowledge, and in some cases deep experience, with other data systems science. The consensus from these discussions is that there are many commercial solutions available that could address technical issues in assembling better firearms data. There are flexible and scalable solutions to practitioners inputting data, creating data warehouses to protect and store large, confidential data sets, and a wide variety of software for analysis.

While technological solutions to the creation of a better data infrastructure are available, that is a necessary, but not sufficient condition to improve firearms data. These technological solutions must also be accompanied by greater availability, access and usefulness of firearms data. For instance, police investigators (detectives) create tremendously rich 'case notes' about a shooting that often include details about the type of weapon used in a crime, ballistics information, the relationship between victim and offender, motivation for an offense, and the physical context of the shooting. These data are, by necessity, confidential and off limits to outsiders, including researchers, and often off-limits to insiders as well, including other law enforcement, and public health officials. Thus, when a shooting victim is treated in an emergency department, the emergency responders may not know whether the shooting was intentional or accidental, and without police investigator information-sharing, public health records about that shooting can be incomplete or inaccurate.

Solutions are being tested. For example, some law enforcement agencies employ crime analysts who code key information from the investigators notes that do not violate confidentiality and can be made available to law enforcement partners and researchers. Some agencies are experimenting with data warehouses that protect the confidentiality of data while facilitating analysis. Other cities use cloud-based data sharing, where one agency can access another's confidential data and view it without compromising the data's integrity and confidentiality protections. This latter solution would, for instance, allow health officials to know and record whether a shooting was intentional. In the forthcoming blueprint, the Expert Panel will make recommendations about broader adoption of these platforms as a means to alleviate privacy concerns while broadly expanding information sharing.

In summary, it is the conclusion of the panel that siloed data results from current practices in information sharing and that practical technological solutions can remove barriers to information sharing. It is the conclusion of the panel that the priority should lie in addressing the concerns that lead to conventions about not sharing information rather than recommendations for local, state and the federal government to adopt new technology infrastructure.

Why a Conceptual Framework?

A conceptual framework is a mechanism for organizing general principles about a topic and making generalizations about preferred practices. Here the topic is data and how to organize and prioritize recommendations about data. Organizing data is fundamentally different from organizing research. The first questions about data are how broad the measures are and how inclusive. The causes and consequences of firearms misuse are multidimensional, as are the needs of policymakers in developing effective policy and programs. Are data collected about all the critical dimensions of firearms related activities? The major elements of firearms use and misuse involve how firearms are obtained, how are they used, how is their ownership transferred, when they are misused who misuses them and how, and what are the consequences of misuse.

The idea here is that if a data infrastructure is built on a conceptual framework that priorities the comprehensiveness of data, then the burden on all future firearms research is reduced. A comprehensive data infrastructure, by design, will allow many and varied research questions to be explored and a variety

of hypotheses to be tested. This contrasts with prioritizing the research questions. When the research questions come first, the data that follows tends to fit that particular research need, but few others. This distinction explains the state of the research literature at present. The comprehensive data systems that exist today, such as Census data or responses from the General Social Survey, tend to include only a few firearms related items, and thus are not comprehensive with respect to firearms infrastructure. Other systems, such as NIBRS and NVDRS, are missing key elements and are generally not regarded by researchers as comprehensive. Data designed for program evaluations tend to have very limited usefulness beyond answering the specific research questions within their original scope.

Thus, there is long-term value in developing a conceptual framework for firearms data that can answer a wide variety of research questions. Beyond that, a conceptual framework for firearms data has value in spotlighting potentially broad areas of research investigation where there is little available data. Determining where gaps in the existing data to answer pressing research questions is critical. Also important is identifying data for which there is little data and because there is little data, few pressing research questions. Here, the Expert Panel chose between a variety of different approaches to understanding the causes and consequences of firearms violence and ultimately developed a conceptual framework largely based on a public health perspective.

Choosing a Conceptual Framework: a Merging of Organizing Principles

As described above, many systems contribute important data about firearms violence. Not surprisingly, each system collects and maintains data to meet the specific needs of that particular system. For instance, the criminal justice system is concerned with tracking information about each step in the investigation and prosecution of criminal cases, including the chain of custody of evidence. The public health system is centered on data on morbidity and mortality and the intention of the firearm user. Businesses track customer data on firearm acquisition and to a lesser extent, transfer. The legal compliance structure that includes background checks and ownership prohibitions under specific circumstances is in effect its own system that includes information from business, the criminal justice system (the courts in particular) and the public health system. Each of these systems collects data to serve a different purpose.

The varying purposes of the data collections reflect different underlying conceptual frameworks about what is important to understand from their data systems. Business transaction data are fundamentally about understanding how prices change over time and what causes price changes. Criminal justice data are fundamentally concerned with how crime rates and types change over time and how much certainty of arrest and conviction and the length of sentences changes those rates. Public health system data are concerned with how disease spreads and how treatments and vaccines can interrupt those trajectories. Demography data are concerned with changes in the attributes of the population and Sociology data are concerned about how changes in those attributes, such as social stratification, change outcomes. Data that are collected from each of those perspectives reflects those choices in priorities.

Here, the Expert Panel proposes a conceptual framework for firearms data infrastructure with four priority areas. These four types of data, as described in greater detail below, are organized across two key dimensions. One dimension describes the scope of the collection—is it national in scope and describes the

broad US population, or, is it collected at a smaller scale or a subgroup that describes either a particular place (a state or a neighborhood) or a subgroup of people (young people, for instance). The other dimension is focuses on the risks of firearms injury and death. This dimension asks –it the firearms injury risk general and undifferentiated and thus primary prevention strategies can be effective (such as rules around gun storage) or is that risk known and specific an as a result targeted interventions can be developed (such as program to prevent retaliatory shootings).

A Conceptual Framework for a Firearms Data Infrastructure

The expert panel recommends using a public health framework as the foundation for a conceptual framework for firearms data with some modifications to reflect the need for a layered understanding of the complexity of firearms related death and injury. The conceptual framework for firearms data distinguishes data and data systems that prioritize intervention from data systems whose most likely practical use is to inform research on prevention. And, to reflect the distributed nature of firearms data collections, the framework prioritizes the level at which data is collected in developing data of greatest utility in policy and program research.

Table 1.   A Conceptual Framework for Firearms Data Infrastructure

		Risk Level	
		Population-Level Risk (Prevention)	**Defined Risk** (Intervention)
Level of Data Collection	**National** (US)	**Comprehensive Data for Research and Policymaking**	**Data for the Identification of High-Risk People and Places**
	Sub-National (State, Local and Neighborhood)	**Data for Research and Policymaking at the State and Local Level**	**Data from the Evaluation of Demonstration Programs**

In its broadest conception, the Expert Panel has developed a four-tiered strategy for classifying firearms data. Moving clockwise from the box labelled 'Comprehensive Data for Research and Policymaking' the table describes:

- **Comprehensive Data for Research and Policymaking** describes data collected by the federal government at the population-level (meaning data is collected about everyone) without regard to their risk of gun misuse or victimization. These data are mainly public health surveillance data, and *are used to measure the current state of firearms injury and deaths and trends in those outcomes*. These data also measure the current state of, and trends in, activities designed to respond to or reduce injury and death, including police activity, emergency department and hospital data, and, medical examiner data. Census data would be included in this category.

- **Data used in the Identification of High-Risk People** includes federal data about populations known or hypothesized to be at high risk for gun misuse or victimization. This includes background check data and data that traces the ownership of a firearm used in a shooting. Generally, these data are used to determine who is prohibited for purchasing or owning a weapon and who should be targeted for

special program to prevent shootings. *Research questions using these data would answer questions about what high risk attributes are associated with higher levels of firearms injury and death.* National data are used to identify high risk groups, such as individuals with involuntary detainers for mental health evaluations or people under court issued restraining orders.

- **Data for Research and Policymaking at the State and Local Level** include data that vary at the state and local level data, including police, court and corrections data, as well as social services and health data. Data at the local and state level can include place-based measures that can identify hotspots of violence, suicide or accidents. *Research questions using these data would answer questions about interventions for place-based risks or group-based risks to reduce firearm injury and death.* Most integrated data systems that cross between criminal justice and health are maintained at the local level.

- **Data from the Evaluation of Demonstration Programs** describe the findings from evaluations of programs and policies intended to prevent firearms injury. These data collections focus on specific groups or places known to be at high risk. For example, these data would include data from studies on programs using credible messengers to reduce retaliatory violence. *Research questions will focus on rigorous evaluation of targeted interventions.*

One important reason to develop a conceptual framework is that it highlights areas where there is little data available, the absence of which is both hard to see and limits the evidence-base. This is easy to see in the existing data, which show that two of the four boxes contain almost all the existing data collections. A review of the 43 data collections in the *State of Firearms Data in the US* suggests that existing data are overwhelmingly clustered in the upper left box describing comprehensive data. The NVDRS, Uniform Crime Report (UCR) and National Incident-Based Reporting System (NIBRS) data that are widely used in current firearms research into cluster in the comprehensive data box. The other box that has informed at least some evidence-based policy and practice is the lower right box on 'Data from the Evaluation of Demonstration Programs'. This includes most of the program evaluation data and research on interventions for high risk people and places.

While much can be done to improve the data in those to areas, in terms of creating more valid measures, creating new measures and integrating data across silos, the conceptual framework highlights the paucity of data in the other two boxes. For instance, in the 'High Risk Behavior' box, more data on the predictors of intimate partner violence, domestic violence research and metal health and behavioral problems on firearms misuse is needed. And, new data collections and data analysis are needed to ask research questions about *what other recent behavior* indicates high risk of firearms violence. In the 'Data for Research and Policymaking at the State and Local Level' box, integrated data across criminal justice, health and social services are only beginning to emerge, but with enormous promise as a data tool for firearms policy. Finally, while there are some data collections that intentionally target subgroups with firearm risks, such as the Youth Risk Behavior Surveillance System (YRBSS), there are few state and local data collections for other high-risk subgroups (such as women at risk of firearms intimate partner violence) and fewer still that can be used to study place-based and network risks of firearms violence.

Using the Conceptual Framework to Inform the Blueprint

The Expert Panel will use this conceptual framework in two specific ways to inform the development of the specific recommendations in the Blueprint. First, the panel will overlay the existing datasets described in the *State of Firearms Data in 2019* report with the four domains in the conceptual framework. This exercise will reveal large gaps in the US data infrastructure. In particular, there are few datasets specifically intended to capture national data on high-risk subgroups beyond the few known high risk groups of persons with a restraining order or an involuntary period of detention due to a mental health crisis. And there are few datasets on the social determinants of firearms misuse at the subnational level, even though these determinants are unequally distributed across the country.

Second, the conceptual framework will be used within each of the four domains in a variety of ways. Simply organizing these concepts in this way may reveal data that can be relatively easily integrated to answer pressing research questions. And, it will aid researchers in identifying data items to be added to existing data collections, and overlaps and gaps in existing data. The conceptual framework can identify local collections that can be scaled to answer national questions, and facilitate the transfer of national data to the subnational level to facilitate research into determinants that vary across places.

The goal of the Blueprint for Firearms Data Infrastructure will be to identify as many opportunities as possible to improve US firearms data collections. The expertise of the firearms panel, the testimony of expert witnesses, and the research by staff will be used to identify specific data items and collections for these recommendations. The conceptual framework is a valuable input to inform an even broader set of recommendations, particularly around those data which are very limited at this time. The conceptual framework may also prove valuable for the larger research and policy communities as a foundation for thinking about long-term improvements in the US firearms data infrastructure.

Appendix A - A Closer Look at the Conceptual Framework

The section briefly describes the classification concepts of risks used in the conceptual framework. The next section describes each of the four conceptual areas and research questions for that area.

Risk and Subgroups

The idea of defining a classification system prior to developing a conceptual framework is well known. As an example, the 1994 Institute of Medicine report *Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research*[3] argues that "without a system for classifying specific interventions, there is no way to obtain accurate information on the type or extent of current activities, . . . and no way to ensure that prevention researchers, practitioners, and policy makers are speaking the same language" (Institute of Medicine, 1994, p. 24). Here, the key distinctions of the classification system are between generable risk of firearm injury and specific risk, and whether the data describing the risk are measured broadly or more narrowly by geography or group-based risks.

The conceptual framework borrows the key distinction between prevention and intervention from the public health literature, where these concepts are distinguished by the known contemporary risk of intentional or accidental firearm injury. While guided by theory, this framework provides a platform for practical policymaking. The definitions for these prevention terms are (NPSC, 2020):

- **Prevention** includes policies, programs, practices, or other interventions that have been demonstrated through rigorous research and/or evaluation to effectively reduce general risk conditions and/or increase general protective factors influential in outcomes related to firearms and public safety. Prevention is designed to reduce the likelihood of new incidences of firearms violence.

Following the Gordon framework (1983), we define primary prevention as strategies that are employed universally[4]. Policies permitting or limiting sales of firearms, magazine capacities, firearms registration, and stand-your-ground laws are all examples of nominally preventative policies—if they are effective, their protections extend to all citizens, and no one can be excluded from their benefit.

- **Intervention** includes polices, programs and practices that have been demonstrated through rigorous research to effectively reduce known risk conditions for individuals with prior negative outcomes related to firearms and public safety.

Interventions, rather than primary prevention, are used when the risk of firearms violence for a particular subgroup is known (the language of public health would describe risks as 'selected' or 'indicated'). Data sets and systems to inform where, who and how interventions should be targeted include information on

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[3] Institute of Medicine. 1994. *Reducing Risks for Mental Disorders: Frontiers for Preventive Intervention Research*. Washington, DC: The National Academies Press. https://doi.org/10.17226/2139.

[4] Gordon, R. (1983). *An operational classification of disease prevention*. Public Health Reports, 98, 107-109.

many social and ecological risk factors which together describe the determinants of firearms misuse. Policies and programs designed as 'intervention' typically include a narrower range of variables that measure the specific risk factors that led to the subgroup being identified as 'at-risk'. When research on determinants shows a general risk to a group of people that share those attributes, the 'subgroup' is said to be at higher risk. *One value of this conceptual framework can be to identify new subgroups or more refined subgroups at high risk of firearms violence.*

- **Risk conditions** include measurable constructs that substantially increase the likelihood of a negative outcome at some time in the future. Risk is divided into just two dimensions, a generalized risk (often described as an undifferentiated risk) that can be addressed by primary prevention, and, a known risk which can be addressed by interventions, including laws and regulations
- **Protective factors (assets)** that include measurable constructs that substantially increase the likelihood of a positive outcome at some time in the future.

Risk conditions may occur either for a person or as a shared risk among people in a place. The criminological literature has a consensus that place-based risks are at least as important as person-based risks in predicting victimization. Thus, the unit of analysis is critical in determining the breadth of data elements. Interventions at the policy level typically consider whether an individual is at-risk from among a national population. Interventions at the program level typically consider whether individuals are at-risk from among a narrower subgroup. Protective factors are not specifically included in the conceptual framework, but are added here to highlight the idea that interventions can not only reduce risks but can potentially boost assets independently improve the likelihood of a positive outcome for a person or place.

Comprehensive data for research and policymaking

Most firearms datasets that are operational today fall within this domain of the public health framework. These data collections capture the consequences of firearms use and the social and ecological correlates of firearm use. Similar to the American Community Survey or the General Social Survey, the data collected in this domain is not developed to inform any particular policy consideration but rather is intended to useful for almost any research question. The data would be analogous to the public health surveillance data used by the Centers for Disease Control and Prevention to monitor trends in public health and to offer a platform for researchers and practitioners to query in response to changing local conditions[5]. As well, the system would allow local practitioners and policymakers to develop a clear understanding of how their own local context varies or does not vary from other jurisdictions and how a new policy or program might be expected to do locally as a result of those differences.

At the national-level, population-level data collections on outputs and outcomes would be more useful for research and policymaking if the purpose and scope of these collections were modestly altered.

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[5] See https://www.cdc.gov/surveillance/index.html

5. National-level, population-level data should prioritize enhanced data accessibility for researchers. Several national data collections are difficult to access, requiring special permission or are inefficiently organized.

6. Critical missing firearms outcome measures should be added. 1) Essential measures within a primary data collection that come from secondary sources should be included (for instance, if public health data on gunshot health outcomes included criminal justice data on criminal charges and dispositions) and 2) measures for primary outcomes adjacent to the main collection should be added (for instance, criminal incident data should include nonfatal firearms injury data and not be limited to gun homicides).

7. Today's technology offers many solutions to information sharing/data integration while carefully protecting confidentiality. Funding to integrate federal data collections should be prioritized.

8. The Foundations for Evidence Based Policymaking Act of 2018 requires data sharing across federal agencies and that data should be prioritized. Limits on sharing of federal data collections with researchers should be lifted.

Data in this domain is intended to answer the following research questions:

- How many guns are there in the United States?

- How are those guns used and stored?

- How are guns transferred?

- How can data be used for behavioral research to nudge pro-social firearms ownership behavior?

- How can survey data augment and leverage administrative data collection (and vice versa), particularly on firearms attitudes, behaviors, and beliefs?

- How can agencies across government organize, share, and understand data from other sources to facilitate effective policymaking

High Risk Behaviors - Targeted data for policymaking

This domain includes data collections that are limited to specific subgroups where the risk is known to exist at the subgroup level, but is undifferentiated within that group. Data in these collections might, for example, include survey data for children in school on the firearms behaviors of adults with whom they have frequent contact. Or, they might include administrative data on school children to inform research on the predictors of school shootings. This type of data collection is also mainly absent in current firearms data—there are few data collections that focus on a high risk subgroup where the underlying risk is undifferentiated. As a result, there is limited research that can be designed to inform prevention programs for these higher risk subgroups.

At the national-level, many important high risk populations are not currently studied and little data is available. Thus, subgroups at the highest risk of public safety are not identified.

9. The universe of targeted data collections is incomplete and would be much improved from renewing and expanding retired data collections. For instance, the Drug Use Forecasting/Arrestee Drug Abuse Monitoring System occasionally included valuable interviews with recent arrestees about their use of firearms in recent criminal incidents and these interviews should be replicated

10. Where data are available, the lag between data collection and data availability can stretch to years, substantially reducing the impact and import of these costly data collections.

11. State by state data are not routinely collected and made available for research. This includes: 1) summary of state firearms laws; 2) summary of state data collections and 3) descriptive statistics about compliance with federal laws that vary locally, such as

Data in this domain is intended to answer the following research questions:

- What are the risk factors for firearms violence?
- How do we measure risk associated with violent use of firearms?
- How do we differentiate risk for accidents, suicides and different types of criminal gun violence?
- Are there asset factors that reduce risk?
- How are assets prioritized compared to risk factors?
- Are outcomes and risk measures defined by the data or defined by the research?
- Is the same data we are collecting for risk that same data needed for evaluation of intervention programs?
- How can agencies across government organize, share, and understand risk data from other sources to facilitate effective policymaking
- How can survey data augment and leverage administrative data collection (and vice versa), particularly on risk factors for firearms attitudes, behaviors, and beliefs?

Data for research and policymaking at the state and local level

These data include any national data that is used to target an at-risk subpopulation. Currently, there are few, if any, national datasets that fall into this domain. The goal of these data collections is to inform research about whether a low or policy that targeted everyone in a specific geography or at the federal level would be effective. For instance, many national retailers have restricted access to certain types of firearm by age, prohibiting people under a certain age, often 21, to purchase a firearm. Data in collections in this domain could directly inform the potential effectiveness of these types of public safety measures. Another current example would be red flag laws that prevent individuals with restraining orders from purchasing or in some cases possessing a firearm. These allows pertain to everyone in that jurisdiction, but the restrictions apply only to a certain subgroup. Any broad restrictions based on involuntary mental health detainers would also fall within this domain. An expansion of data intended specifically to answer questions about the effectiveness of any of these types of population-based targeted interventions would be warranted.

At the state, regional and local level, population-level data collections about the social determinants of gun ownership, use and transfer are almost completely absent and policymaking is severely limited. Examples include:

1. Social determinant data collections to identify high risk populations at the regional, state or local level[6]. For example, data on adverse childhood experiences (ACEs) and gun accessibility and availability in a household.

2. Data on social norms as described by attitudes, behaviors and beliefs about gun ownership, storage and transfer.

Data in this domain is intended to answer the following research questions:

- What are the effects of local, state, and federal policies and laws on gun ownership, transfer, and use?
- Do we need the same data to measure context for risk across different types of firearm use or victimization?
- Are the measures at the person- place- community- and state, and federal policies the same?
- How are guns used and stored in residences with minors present?
- What is the variation by type of firearm and location (rural or urban)?
- Do people in different subgroups use different process to transfer guns, and d these different processes affect prevalence and incidence of firearms injury?

Data from the evaluation of demonstration programs

This domain includes data collections that are limited to specific subgroups and with data that are limited to attributes of interventions intended to mediate future firearms misuse among a high risk subgroup, where generally the risk is the result of past firearms misuse. This part of the firearms infrastructure focuses on data collected for specific use in program research and evaluation. Most program data falls into this domain, including evaluations of violence interruption program such as CeaseFire and Cure Violence. To date, there are few data collections that collect data across multiple evaluations of this type. One opportunity that the Expert Panel highlighted in this area is the opportunity to identify data sources used in an evaluation in one geography as a model that can be replicated for data collection in other geographies.

Harmonize research data from regional, state or local program evaluations through curation or protected data integration. Despite federal prohibitions on research funding and use of federal data, a modest but rapidly expanding research base exists. However, there are few research efforts to collectively learn from these studies because the research is not available as a body of research.

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[6] The Centers for Disease Control (CDC) define social determinants of health as encompassing "economic and social conditions that influence the health of people and communities."

1. Where possible, evaluation data should be co-located in a secure environment to facilitate broader research synthesizing past results. A wide array of technological solutions currently exist that can protect confidential data and create a platform for this analysis.

2. Where data cannot be shared, research findings should be curated to make results easily accessible to many researchers. For example, the University of Michigan maintains the Firearms Safety among Children and Teens Consortium (FACTS) that curates a comprehensive knowledge base. These approach is replicable across other domains.

Data in this domain is intended to answer the following research questions:

- How are crime guns obtained?

- How effective are group-based violence interventions?

- How can agencies across government organize, share, and understand data from other sources to facilitate effective policymaking?

- How can community-based organizations use data to improve cultures and norms of behavior to prevent gun violence?