Medicolegal death investigation data commonly collected and exchanged

A Report by the Organization of Scientific Area Committees (OSAC) for Forensic Science's Medicolegal Death Investigation (MDI) Subcommittee, part of the Medicine Scientific Area Committee.

Summary

The National Institute of Standards and Technology (NIST) Organization of Scientific Area Committees (OSAC) for Forensic Science Medicolegal Death Investigation (MDI) Subcommittee,[1] which is comprised of medical examiners, coroners, medicolegal death investigators, public health researchers and other stakeholders, identified the types of data commonly collected and held by MDI offices. The data, if stored and available in a secure manner and in a standard form, could assist the MDI community and other stakeholders.

This report outlines the process to identify and prioritize the MDI core data elements. In addition, the paper provides the background and rationale for this work, outlines the importance of the MDI data for improving death investigation, for the MDI community, stakeholders and forensic science researchers, and presents challenges in exchanging data such as security concerns. This report also presents approaches others have taken to standardizing data in other disciplines and other issues related to data standards development.

This report is intended to inform the wider MDI community as well as stakeholders on the essential information on the death collected during every competent death investigation as well as the issues related to such data.

Background and rationale

The information that medical examiners and coroners collect during the course of a death investigation varies by many factors, including the cause of death. Authoritative reports have discussed the need for more standardized and automated approaches to collect and exchange data among medical examiners, coroners, forensic toxicologists, and other groups.

For instance, in September 2016, the National Science and Technology Council, in a report entitled "Strengthening the Medicolegal Death Investigation System: Improving Data Systems,"[2] recommended that:

- *To enhance the quality, timeliness, and accessibility of MDI data, Federal agencies should work with State, local, and Tribal entities to envision and adopt a 21st-century-electronic-data system*

[1] National Institute of Standards and Technology (NIST) Organization of Scientific Area Committees (OSAC) Crime Scene/Death Investigation Medicolegal Death Investigation (MDI) Subcommittee https://www.nist.gov/topics/forensic-science/medicolegal-death-investigation-subcommittee

[2] National Science and Technology Council, White House Office of Science and Technology Policy, Strengthening the Medicolegal Death Investigation System: Improving Data Systems, 2016. (Available at https://www.ncjrs.gov/pdffiles1/NIJ/251423.pdf).

while strengthening and promoting interoperability among current electronic systems used within the MDI community, including electronic death registration systems.

- *Federal agencies should coordinate with State and local entities to assess current needs as well as opportunities to foster standards to support high-quality post-mortem toxicology testing among decedents with possible exposure to drugs, chemicals, and other toxins in the workplace, home, environment, and transportation sector.*

Likewise, the 2009 National Academies Report on Strengthening Forensic Science observed that:[3]

- *Computerization of case records and the development of case information databases should be standard in any death investigation office, so that death data may be tracked for trends, response to public health and public safety interventions can be streamlined and accelerated, and continuing quality assurance measures can be implemented. There is no standard method of sample and data collection for ME/C systems. Multiple systems are commercially available that can be structured to meet the particular needs of any death investigation system. The initial cost of such systems is significant, and they require continuing maintenance, which rules out their utilization by small and/or underfunded offices. Even if such computer systems were present in each office, there is no standardization that would allow them to talk to one another, a necessity in a multijurisdictional event such as the Hurricane Katrina disaster, for which databases across states were critical to the identification of the dead and the tracking of survivors.*

Important uses of data collected during medicolegal death investigations include monitoring the nation's health and safety, ensuring equal justice across jurisdictions, and conducting sound forensic science. In addition, MDI data supports program, policy and rule-making decisions by federal, state and local agencies.[4] While data sharing between offices of medical examiners and coroners and with stakeholders is critical, it is not currently being done using modern, standards-based methods of exchange.

MDI offices also rely on others to provide information needed to investigate and ultimately diagnose the cause and manner of death. These types of data include toxicology, medical records reports, emergency medical system information, and prescription drug monitoring program information[5]. Many of these data are available in electronic form, and automating its input can increase efficiency and reduce error. For example, some case management systems are currently able to receive toxicology information electronically[6].

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[3] National Research Council of the National Academies, Committee on Strengthening Forensic Science in the United States, Strengthening Forensic Science in the United States: A Path Forward. The National Academies Press: 2009, Chapter on Medical Examiner and Coroner Systems: Current and Future Needs. (Available online at: http://www.nap.edu/download.php?record_id=12589)

[4] National Science and Technology Council, White House Office of Science and Technology Policy, Strengthening the Medicolegal Death Investigation System: Improving Data Systems, 2016. (Available at https://www.ncjrs.gov/pdffiles1/NIJ/251423.pdf).

[5] Morrow JB, Ropero-Miller JD, Catlin ML, et al. The Opioid Epidemic: Moving Toward an Integrated, Holistic Analytical Response, Journal of Analytical Toxicology, Volume 43, Issue 1, January 2019, Pages 1–9, https://doi.org/10.1093/jat/bky049

[6] Personal Communication, NMS Labs.

In some MDI offices, including larger jurisdictions investigating many deaths, the information collected during the course of an investigation is captured and stored electronically in case management systems (CMS). The systems vary in the level of detail in the information they store, but there are many commonalities, such as the information recorded on the death certificates (e.g., decedent identity, cause of death, date and time of death). However, the data may be structured and coded in different ways, which complicates comparing or aggregating information across jurisdictions. In some offices, typically in smaller jurisdictions, information is collected and stored in paper files. Others do not systematically store the information and rely solely on the death certificate as the record of death.

To address these concerns, the Medicolegal Death Investigation (MDI) Subcommittee is undertaking the first steps towards the goal of achieving standards-based approaches to data exchange, that is to outline the process to identify and prioritize the MDI core data elements. This process requires identifying the data that are commonly exchanged by reviewing historical reports, reviewing data elements as a group, and comparing to current status offices. In addition, identifying the purposes for which the data are analyzed (i.e. the use-case) helps prioritize the importance for establishing these exchanges.

Importance of MDI data, stakeholders who rely on MDI data, and process flow

Many stakeholders rely on MDI data to help save lives and promote justice, inform resource allocation decisions, offer explanation to grieving families, expedite organ and tissue procurement, evaluate public health and safety responses, support decisions by government agencies, facilitate research, and develop data-driven policies and strategies to promote healthier and safer communities, among many other important endeavors.

Information collected during the course of investigation includes details about the circumstances of the death (e.g., death scene investigation, witness interviews); medical, prescription, legal and social history; findings from the postmortem physical examination of the body (e.g., autopsy, x-ray, imaging, biopsy), and toxicology, genetic, or other laboratory tests. The medical examiner or coroner uses the information to perform their first line functions which are to identify the decedent, determine the cause and manner of death and certify the death. In addition, information collected is used for many other purposes by the medical examiners and coroners and by other stakeholders (see Figure 1).

The stakeholders who use MDI data, the types of data the stakeholders typically request from the MDI community, and how they use that data are described in more detail in Appendix B. The stakeholders identified include: Chief medicolegal officials (i.e. medical examiners, coroners, justices of the peace); forensic pathologists; families of the deceased; law enforcement and legal justice entities; organ and tissue procurement organizations; hospitals, trauma and other health centers; forensic science and other research communities; policy makers; and media.

The MDI community already provides information to stakeholders on an ongoing basis, even though this service to others requires significant effort. In addition, the data are not always provided in the most efficient, timely or consistent way. As the demand for MDI data continues to increase there is a need to establish a commonality across jurisdictions so multiple parties can reliably get the information they need to help fulfil their missions.

Process flow diagrams are used by information technology professionals and systems analysts to document and show users how data moves between different processes in a system. High value process flows were mapped out by the committee. These include (1) death certificate, (2) organ procurement, (3) annual report writing for office accreditation, and (4) drug overdose death toxicology data. These process flow diagrams are available upon request.

Challenges with exchanging data across jurisdictional boundaries

When faced with challenges in exchanging data a first step is to identify what are priority items to exchange. For instance, the healthcare sector faces similar challenges that the MDI community currently faces: fragmentation of health care services (e.g., doctor's offices, hospital, trauma centers) across jurisdictional boundaries (e.g., county, state), variation in workflows and practices, matrix of statutory and regulatory restrictions (e.g., HIPAA), and other barriers. The Office of the National Coordinator (ONC) for Health IT[7] located within the Department of Health and Human Services was established to promote a national health information technology (HIT) infrastructure and oversee its development in order to allow health care providers to better manage patient care through sharing of health information. The ONC defined a three-stage process to help achieve more consistent ways of accessing and exchanging health care information:

- Develop and adopt a consistent data model for a core subset of clinical data.
- Demonstrate how to safely and securely push the core subset of clinical data to other care settings.
- Adopt technical standards that allow third parties to query data from existing electronic health records.

Law enforcement has also faced challenges similar to healthcare and has addressed the challenges by first identifying the most important information for exchange[8].

The MDI community can explore a similar process as those common to healthcare and law enforcement by

- Identifying, prioritizing, and adopting a core subset of data to be used across MDI jurisdictions.
- Demonstrating how to safely and securely push the core subset of MDI data to other organizations, such as public health or public safety organizations.
- Adopting technical standards that allow third parties (such as researchers and other MDI jurisdictions) to query data from MDI case management systems in a secure manner.

This report outlines how the MDI subcommittee identified and prioritized a core subset of data to be used across MDI jurisdictions.

[7] Office of the National Coordinator (ONC) for Health IT https://www.healthit.gov/

[8] Hollywood JS, Winkelman Z Improving Information-Sharing Across Law Enforcement: Why Can't We Know?. Santa Monica, CA: RAND Corporation, 2015. https://www.ncjrs.gov/pdffiles1/nij/grants/249187.pdf

Confidentiality and data security concerns

Records of the death investigation are maintained, and accurate record keeping is an accreditation requirement.[9] Laws and policies on sharing these records vary by jurisdiction. In addition, the information may be sensitive to families and law enforcement. For these reasons, it is important for the jurisdictions to maintain control of the information flow, and to have clear policies and documentation on when and with whom the data are shared.

Using modern data exchange, it is easier to document exactly what was provided, how it was provided, and to whom. Protocols and sharing frameworks for health care data and law enforcement data can be adapted to the MDI environment. In addition, common requirements for what to share for specific purposes could be developed. For instance, MDI offices are required to provide information to aid in the organ and tissue donation process in many states. A standard set of information to share with these organizations could be identified and widely adopted among offices.

Standards Development Organizations

Standards development organizations develop and publish standards. The MDI Subcommittee identified two standards development organizations which focus on data standards and are relevant for MDI data. These are the Health Level 7 Fast Healthcare Interoperability Resources (HL7 FHIR)[10] and the National Information Exchange Model (NIEM)[11]. Both these HL7 FHIR and NIEM are currently used to enable exchange of information. The American Academy of Forensic Science (AAFS) Standards Board (ASB) is an ANSI-accredited Standards Developing Organization that provides science-based consensus standards and is also an option for a standard outlining the core set of data elements[12].

HL7 FHIR is used in the medical and public health setting. There is currently a HL7 Implementation Guide for death certificate information, referred to as the Vital Records Death Reporting (VRDR), which has passed the ballot process and is approved for trial use[13, 14]. The VRDR includes all information that is included on the US standard death certificate, including cause and manner of death, along with demographics of the decedent, time and place of death, and disposition status.

NIEM is common vocabulary that enables information to be exchanged across diverse organizations. It is designed to share critical information effectively and efficiently throughout the justice, public safety,

[9] National Association of Medical Examiners' Inspection and Accreditation Checklist https://www.thename.org/assets/docs/NAME%20Accreditation%20Checklist%202019%20-%202024.pdf
[10] HL7 Fast Health Interoperability Resources http://hl7.org/fhir/,
[11] National Information Exchange Model https://www.niem.gov/
[12] American Academy of Forensic Science (AAFS) Standards Board (ASB) https://www.asbstandardsboard.org/, AAFS Standards Board - Profile | American Academy of Forensic Sciences
[13] HL7 FHIR Vital Records Death Reporting v0.1.0 - STU Ballot #1 http://hl7.org/fhir/us/vrdr/2019May/DeathCertification.html
[14] Nightingale and Canary -- Reference Implementation and testing framework for exchange of information with Electronic Death Registration Systems https://github.com/nightingaleproject

emergency and disaster management, intelligence, and homeland security enterprise[15]. It is used in many settings, including by law enforcement[16] and some of the terms already included in the system could be reused or adapted for MDI. Depending on the medicolegal data element being considered, the appropriate standard (e.g., FHIR, NIEM) could be applied.

Status of computerization in offices of medical examiners and coroners

Medical examiner and coroner offices that are accredited are required to maintain information related to death investigation, and a record keeping protocol is a mandatory component of accreditation[17]. These records are not limited to text, and include photographs, fingerprints, and radiography.

Larger medical examiner and coroner offices have electronic case management systems (CMS) with functions well beyond compiling basic information needed for determining cause and manner of death. Smaller offices in rural areas may not have electronic systems, particularly if they have very small caseloads.

The Bureau of Justice Statistics recently conducted a survey of medical examiner and coroner offices and asked specific questions regarding CMS[18]. In larger jurisdictions serving populations of over 250,000, over 95% had either a completely or partially computerized record keeping system. In mid-sized jurisdictions (serving populations of 25,000 to 249,000) about three-quarters were completely or partially computerized. In smaller jurisdictions (serving less than 25,000 persons) only about 50% of the offices are computerized. Since this survey was taken, several states have developed basic case management systems for their state MDI. For instance, Indiana and Wyoming have built such systems.

A few offices can send and receive information about cases electronically. In some cases, this is through a manual import and export type process and in other cases the two electronic systems are interoperable (i.e. no human in the loop). For instance, a few CMS automatically exchange data that support filing information to the state electronic death registration system and receiving toxicology results[19].

Previous recommendations on MDI data elements

[15] National Information Exchange Model, Helping Children at Risk – A Case Study, Published 2009 NIEM_helping_children.pdf

[16] Hollywood JS and Winkelman Z, Improving Information-Sharing Across Law Enforcement: Why Can't We Know? Santa Monica, CA: RAND Corporation, 2015. https://www.ncjrs.gov/pdffiles1/nij/grants/249187.pdf

[17] National Association of Medical Examiners, Accreditation Checklist. https://www.thename.org/inspection-accreditation

[18] U.S. Drug Enforcement Administration, Diversion Control Division. (2018). 2017 Medical Examiner/Coroner Office Survey Report. Springfield, VA: U.S. Drug Enforcement Administration https://www.nflis.deadiversion.usdoj.gov/DesktopModules/ReportDownloads/Reports/NFLIS-MECSurveyReport.pdf

[19] Personal communication, Margaret Warner with NMS Labs and with Utah State Health Department. 2019

In 1995 CDC published a report entitled *Medical Examiner/Coroner Death Investigation Data Set* which outlines more than 140 commonly collected items in medical examiner and coroner offices. [20] The report, which was authored by Drs. Randy Hanzlick and Gib Parrish, was based on standard reporting forms used at the time. As a starting point, the MDI Subcommittee reviewed and prioritized these data elements. The Subcommittee acknowledged that, while the recommendations document was dated (January 1995), the content was still relevant and generally reflected information that was already being captured, or should be captured, in their respective case management systems.

The Subcommittee agreed that collection of almost all the recommended elements from the 1995 report were still necessary and had suggestions for additional elements that are commonly collected in competent offices today. Six jurisdictions (Clark County NV, Los Angeles County CA, Jefferson County AL, Orange County CA, Johnson County IA and Washington DC) also reviewed the suggested data elements in detail and indicated whether their offices collected the recommended pieces of information. All six offices collected at least half of the recommended data elements.

Death investigation data commonly shared

The Subcommittee focused on the data elements needed to accomplish the task of determining the cause and manner of death. Common core data elements are items that are collected for all causes of death (see Figure 2). Based on the characteristics of the decedent or circumstances of the death, circumstance-specific core data elements may also need to be collected to determine the cause and manner of death. These elements include characteristics of the decedent (e.g., infant deaths) or circumstances of the death (e.g., drug overdose) and are considered part of the core set since they are needed to determine cause and manner of death but are not part of the common core because they are not needed for every death.

There are other data elements which are commonly collected during the course of an investigation which may be useful for purposes other than cause and manner of death. Elements in this category include items needed for case management (e.g., who notified of death, time call came in), as well as items of interest to public health and safety (e.g., smoke detector present).

The list of data elements is included as Appendix A.

Next steps

NIEM lays out foundational work to assist in the development of the data standards. The MDI Subcommittee followed the beginning stages of the process and accomplished the following:

- Documenting the medicolegal process involved in investigating and certifying a death.

[20] Parish G and Hanzlick RH, Medical Examiner/Coroner Death Investigation Data Set, Medical Examiner/Coroner Information Sharing Program, National Center for Environmental Health, Centers for Disease Control and Prevention, January, 1995

- Identifying points in the process in which the exchange of data occurs, during the phase where information is entered in the MDI case management systems, and the phase where information compiled during the investigation is shared with stakeholders.
- Creating a set of scenarios to track the data to stakeholders.
- Mapping each scenario to show the points of exchange.
- Specifying the data elements necessary to meet the data exchange requirements.

Next steps include (1) receiving feedback on the list for input from offices, including comparing to data schemes used in these offices, and (2) comparing data elements for items to existing data standards.

Conclusion

This report provides background information on the needs for MDI data, presents some of the opportunities and challenges for exchanging information, and specifies the most salient information to collect during the course of an investigation.

Figure 1. MDI data collection and data flow

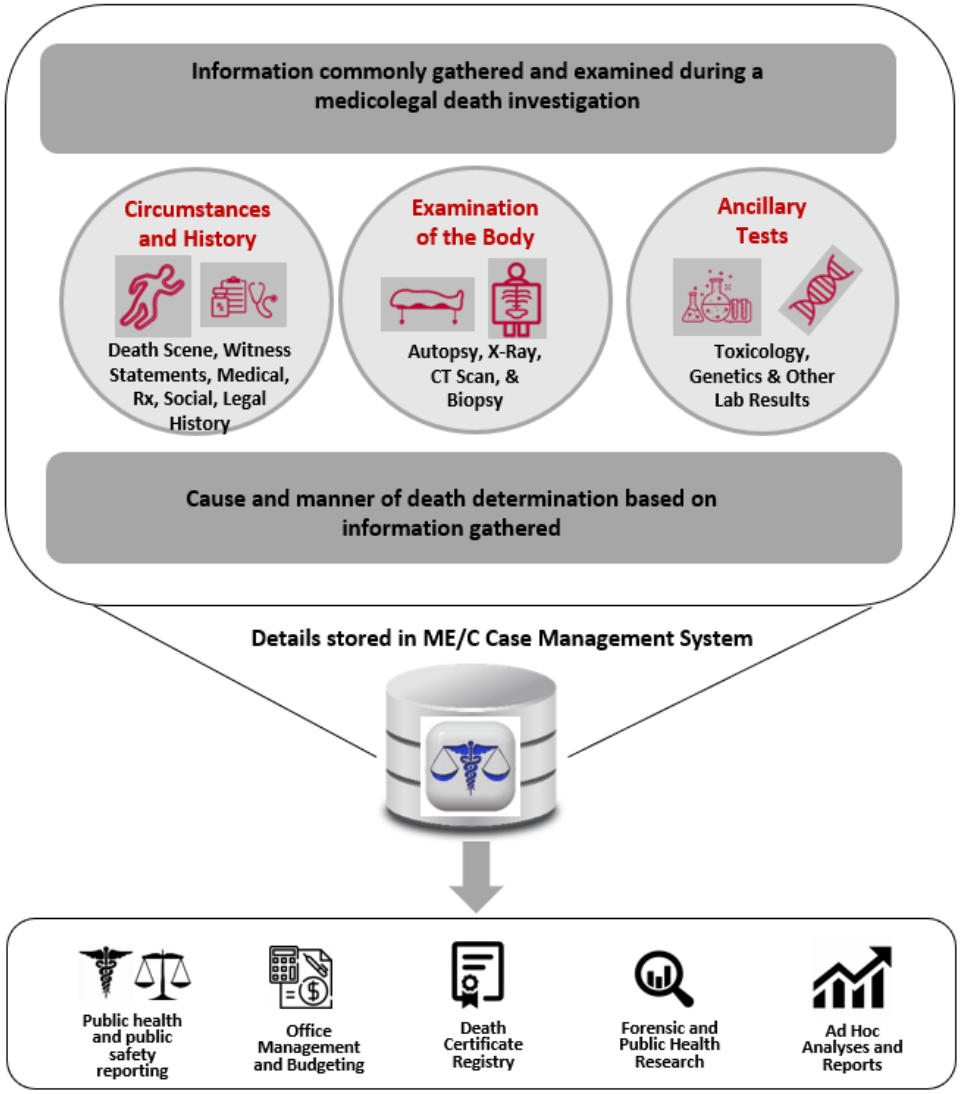
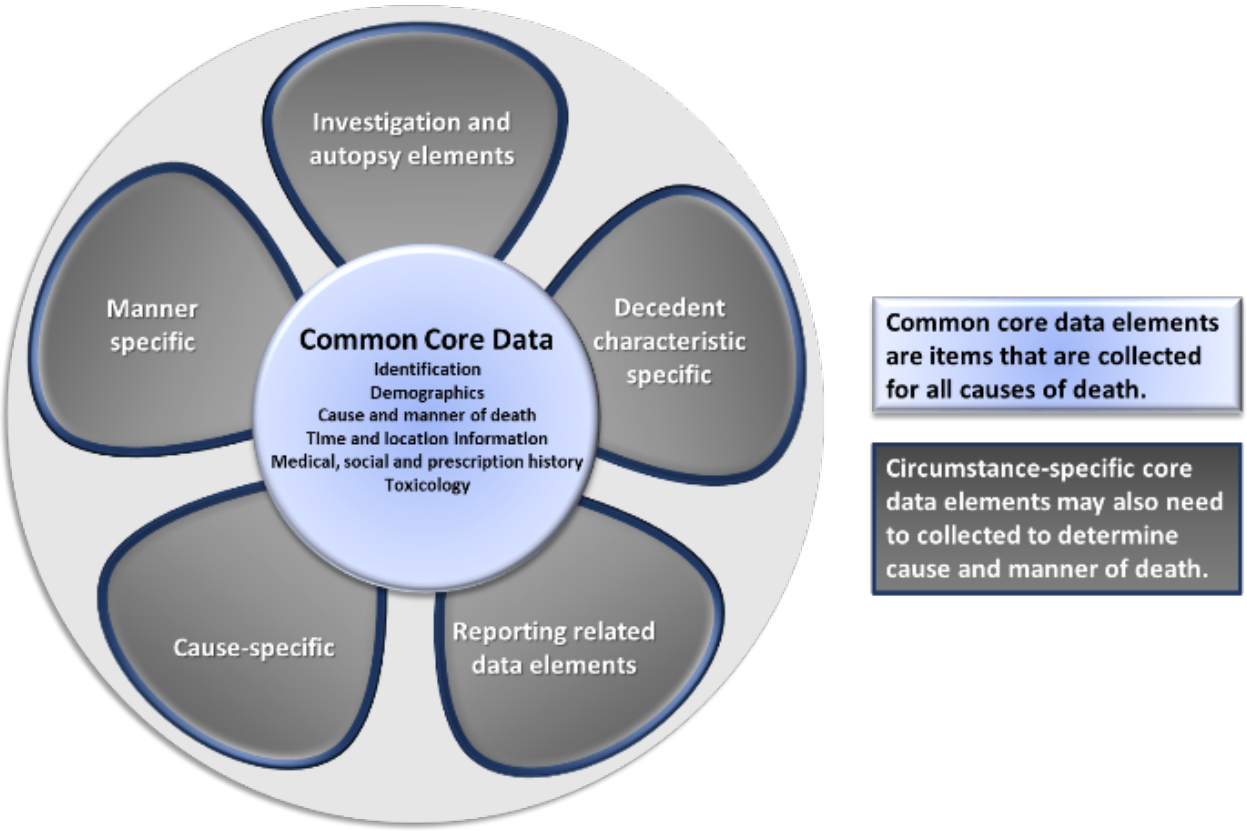


Figure 2: Data elements collected during the course of a medicolegal death investigation



Common core data elements include:

- Identification (e.g., name)
- Demographics
- Cause and manner of death
- Time and location information
- Medical, social and prescription history
- Toxicology

Circumstance-specific core data elements that are collected based on characteristics (petals of the daisy) include:

Cause-specific data elements (examples)

- Falls
- Motor vehicle
- Other transport (e.g., plane, train, bike)
- Drug/toxins
- Firearm
- Asphyxia
- Drowning
- Cutting/piercing
- Fire/burn/electrical
- Infectious diseases

Manner specific elements:

- Homicide
- Suicide
- Accident/unintentional injury
- Undetermined

Decedent characteristic specific elements

- Infant
- Child
- Elder
- Fetal
- LGBTQ
- Homeless

Investigation and autopsy elements

- Religious objections to autopsy

Reporting related data elements

- Work related
- Consumer product related
- Aviation related

Appendix A. Table of common core MDI data items, whether collected, and priority status by stakeholders

The following information is relevant to the data collection indicated in the Table.

- Six jurisdictions (Clark County NV, Los Angeles County CA, Jefferson County AL, Orange County CA, Johnson County IA and Washington DC) reviewed the suggested data elements and indicated whether their offices collected the information.

- The MDI Subcommittee indicated whether stakeholders typically requested or needed the information or if they were needed for processes in the office. Stakeholders and processes considered included: Vital Registrars and death certification process, Organ and Tissue procurement, Law Enforcement, Prosecutors, and other agencies, Family, Media, Forensic Pathologist, Chief ME/C, Hospital, trauma or other health care center, Researchers or academia, Public Health & Safety, Policy makers.

- Whether the data element aligns with or can be directly mapped to the existing standard for reporting from the death certificate referred to as the Vital Records Death Reporting (VRDR). The VRDR is a HL7 FHIR standard which has passed the ballot process and is approved for trial use.

		Stakeholders requesting											Offices collecting					
Common core data elements	Type	OPO/Tissue	LE/Prosecutor/CPS	Family	Media	FP	Chief ME/C	Hospital/Trauma	Research/Academia	Public Health & Safety	Policy	Vital Registrar	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
First name of decedent	Demographic	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y
Middle name of decedent	Demographic	Y	Y	Y		Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y
Last name of decedent	Demographic	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y
Age of decedent	Demographic	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Age unit that clarifies decedent's age	Demographic	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Race of decedent	Demographic	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
Sex of decedent	Demographic	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ethnicity of decedent	Demographic	Y	Y			Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Birth date of decedent	Demographic	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Social security number	Demographic					Y	Y		Y			Y	Y	N	Y	Y	Y	Y
Usual occupation of decedent	Demographic	Y				Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Decedent's marital status at time of death	Demographic	Y		Y		Y	Y		Y	Y	Y	Y	Y	N	N	Y	Y	Y
If unidentified, putative name if available	Demographic	Y	Y	Y		Y	Y		Y				Y*	Y	Y	?	Y	Y
Top line of cause of death statement	Cause_manner	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Second line of cause of death statement	Cause_manner	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Third line of cause of death statement	Cause_manner	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fourth line of cause of death statement	Cause_manner	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Other significant conditions	Cause_manner	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
Manner of death	Cause_manner	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified explanation of how injury occurred	Cause_manner		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Duration of condition on top line of cause of death	Cause_Manner					Y	Y		Y	Y	Y		N	Y	N	Y	Y	Y
Duration of condition on second line of cause of death	Cause_Manner					Y	Y		Y	Y	Y		N	Y	N	Y	Y	Y
Duration of condition on third line of cause of death	Cause_Manner					Y	Y		Y	Y	Y		N	Y	N	Y	Y	Y
Duration of condition on fourth line of cause of death	Cause_Manner					Y	Y		Y	Y	Y		N	Y	N	Y	Y	Y
Narrative description of circumstances and follow up notes	Narrative	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
Did the events leading to death occur while working?	Circumstances			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Does an injury constitute OSHA injury at work?	Circumstances					Y	Y	Y	Y	Y	Y		N	N	N	N	N	Y
Who last knew decedent to be alive or okay	Circumstances		Y	Y		Y	Y		Y	Y	Y		N	N	Y	?	Y	
How decedent was last known to be alive or okay	Circumstances	Y	Y	Y		Y	Y		Y	Y	Y		N	N	Y	?	Y	
Number of other persons known to be dead from same incident	Circumstances		Y		Y	Y	Y	Y	Y	Y	Y		N	N	Y	?	N	
If decedent was found dead or unconscious, who found decedent	Circumstances		Y	Y		Y	Y		Y	Y	Y		N	N	Y	N	Y*	
Death scene investigation findings	Circumstances	Y	Y	Y		Y	Y		Y	Y	Y							
Deaths in Custody	Circumstances																	
Suspected Child Abuse (for referrals)	Circumstances	Y	Y	Y		Y	Y		Y	Y	Y							
Suspected Domestic Violence (for referrals)	Circumstances		Y	Y		Y	Y		Y	Y	Y							
Suspected Elder Abuse (for referrals)	Circumstances		Y	Y		Y	Y		Y	Y	Y							
Informants/Witnesses	Circumstances																	
Cause specific information (seatbelt, helmet, co-sleeping)	Circumstances					Y	Y	Y	Y	Y	Y							
Safety Issues/ Mechanisms Identified at Scene	Circumstances				Y	Y	Y	Y	Y	Y	Y							
Social history, including IV drug use, prison record	Circumstances	Y	Y			Y	Y	Y	Y	Y	Y							
Date death reported to the medical examiner	Date_Time	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Date found dead, unconscious, or in distress (if found)	Date_Time	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Time found dead, unconscious, or in distress	Date_Time	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Date of injury/onset of events leading to death (if not found)	Date_Time		Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Time of injury or onset of natural events leading to death	Date_Time		Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	

OPO= Organ Procurement, LE=Law enforcement, FP= Forensic Pathologist, ME/C=Medical Examiner/Coroner, DC= Death Certificate

		Stakeholders requesting											Offices collecting					
Common core data elements	Type	OPO/Tissue	LE/Prosecutor/CPS	Family	Media	FP	Chief ME/C	Hospital/Trauma	Research/Academia	Public Health & Safety	Policy	Vital Registrar						
Date death was pronounced (if case material is human)	Date_Time	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time death was pronounced	Date_Time	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y
Date of examination or case review	Date_Time	Y	Y	Y	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	
Certified date of injury	Date_Time		Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Qualification/clarification of injury date	Date_Time		Y	Y		Y	Y	Y	Y	Y	Y		N	Y	N	N	N*	
Certified time of injury	Date_Time		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Qualification of certified date of death	Date_Time					Y	Y	Y	Y	Y	Y		N	Y	Y	N	Y	Y
Certified time of death	Date_Time	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
Date last known alive or alert	Date_Time	Y	Y	Y		Y	Y		Y	Y	Y		N	N	Y	?	Y	
Time last known alive or alert	Date_Time	Y	Y	Y		Y	Y		Y	Y	Y		N	N	Y	?	Y	
Year by which case is categorized	Date_Time	Y	Y			Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	
Date on which decedent arrived at hospital	Date_Time	Y	Y	Y		Y	Y	Y	Y	Y	Y		N	Y	Y	Y	Y	
Time at which decedent arrived at hospital	Date_Time	Y	Y	Y		Y	Y	Y	Y	Y	Y		N	Y	N	Y	Y	
Residence of decedent (street number and name)	Location		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Residence of decedent, city	Location		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Residence of decedent, county	Location		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Residence of decedent, state	Location	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Residence of decedent, zip	Location		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Categorization of place of death (e.g., dead on scene)	Location	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y*	Y	Y	Y	Y	
Type of place where events leading to death occurred	Location	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Address where found dead, unconscious, or in distress	Location	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
Address of injury or onset of natural fatal events	Location		Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	
Name of place where death was pronounced	Location	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	N	Y	Y	Y
Address where death was pronounced (street name and number)	Location		Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
City where death was pronounced	Location	Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y
County where death was pronounced	Location		Y		Y	Y	Y	Y	Y	Y	Y		Y	N	N	Y	Y	Y
State where death was pronounced	Location	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y
Zip code where death was pronounced	Location		Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	N	Y	Y
Certified type of place where injury occurred	Location		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified street address of injury	Location		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified city of injury	Location		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified county of injury	Location		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified state of injury	Location		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified zip code where injury occurred	Location		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Certified date of death	Location	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Name of or type of decedent residence	Location			Y		Y	Y		Y	Y	Y		N	Y	Y	?	Y	
Where decedent was last known to be alive or okay	Location		Y	Y		Y	Y		Y	Y	Y		N	N	Y	?	Y	
Name of hospital where decedent was first taken	Location	Y	Y	Y		Y	Y	Y	Y	Y	Y		N	Y	Y	Y	Y	Y
Address at which scene investigation was conducted	Location		Y	Y		Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	Y
Type of residence (e.g., nursing home, halfway house)	Location					Y	Y		Y	Y	Y							
Was surgery performed?	Med_History	Y				Y	Y	Y	Y	Y	Y		N	Y	N	Y	N*	
Date of surgery, if performed	Med_History	Y				Y	Y	Y	Y	Y	Y		N	Y	N	Y	N*	
Details of medical history	Med_History	Y		Y		Y	Y	Y	Y	Y	Y		N	Y	Y	?	Y	
Name of decedent's personal physician or health provider	Med_History	Y				Y	Y	Y	Y	Y	Y		N	Y	Y	Y	Y	
Type of agonal treatment or therapy	Med_History	Y		Y		Y	Y	Y	Y	Y	Y		N	N	N	N	N	
Recent falls or hip fracture	Med_History																	

OPO= Organ Procurement, LE=Law enforcement, FP= Forensic Pathologist, ME/C=Medical Examiner/Coroner, DC= Death Certificate

		Stakeholders requesting											Offices collecting						
Common core data elements	Type	OPO/Tissue	LE/Prosecutor/CPS	Family	Media	FP	Chief ME/C	Hospital/Trauma	Research/Academia	Public Health & Safety	Policy	Vital Registrar	Clark County, NV	Los Angeles, CA	Jeff Cnty AL	Orange County, CA	Johnson County IA		DC Standard applies
Family Medical History	Med_History	Y				Y	Y	Y	Y	Y	Y								
Specimen for which result is reported in ETOH	Tox		Y			Y	Y		Y	Y	Y		Y	Y	Y	Y	Y		
Toxicology results	Tox	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		
What specific tox tests performed - requested and results	Tox	Y	Y	Y		Y	Y	Y	Y	Y	Y								
Ancillary procedures by medical examiner	Exam/autopsy	Y	Y	Y		Y	Y	Y	Y	Y	Y		Y*	Y	Y	?	Y		
Will death certificate indicate an autopsy was performed?	Exam/autopsy			Y		Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y		
Will certificate indicate that autopsy findings were used?	Exam/autopsy			Y		Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y		
Specific Autopsy Findings - Autopsy Report	Exam/autopsy	Y	Y	Y		Y	Y	Y	Y	Y	Y								
Organ Weights	Exam/autopsy					Y	Y		Y	Y	Y								

OPO= Organ Procurement, LE=Law enforcement, FP= Forensic Pathologist, ME/C=Medical Examiner/Coroner, DC= Death Certificate

Appendix B. Stakeholders and process flows for MDI Data

The Subcommittee identified the perceived value of specific MDI data elements for the operation of the MDI offices, as well as the many stakeholders who rely on the information. The MDI community provides information on an ongoing basis and incurs significant challenges in doing so in a timely and consistent way. Currently, many MDI offices are routinely sharing information with the communities listed below:

- Chief medicolegal officials (i.e. medical examiners, coroners, justice of the peace).
- Forensic pathologists.
- Families of the deceased.
- Law enforcement and legal justice entities.
- Organ and tissue procurement organizations.
- Hospitals, trauma and other health centers.
- Forensic science and other research communities.
- Public health and public safety organizations.
- Policy makers.
- Media.

The following sub-sections describe the needs of these stakeholders in more detail, the types of data they typically request from the MDI community, and the value that the MDI-provided information creates for multiple organizations.

Chief MDI Officials

Chief MDI officials (e.g., chief medical examiner or coroner) routinely respond to questions from elected leaders, public health & public safety organizations, and other stakeholders to provide specific and up-to-date information to help support decision making (e.g., how many X died of Y). Standard data elements and improved mechanisms for querying and analyzing these data would help lighten MDI offices' burden, equip chief MDI officials to answer pressing inquiries in real-time, and ultimately help MDI officials to communicate more proactively with diverse audiences. For example, cause of death data and information gathered during autopsies can help chief MDI officials to notify public health and public safety partners about reportable conditions, such as infectious diseases or suspected abuse of a child, elderly person, or other vulnerable populations.

Strengthening MDI case management systems also helps MDI officials to conduct their work more efficiently and minimize negative impacts on commerce. When deaths occur in public places (such as on railways or roadways or in schools/universities), at popular events (such as sporting events, concerts, or NASCAR races) or in private establishments (such as worksites, shooting ranges, amusement parks, and restaurants), normal operations are interrupted, which often results in lost revenue for the organizations that are directly and indirectly impacted. (e.g., $x for every y minutes a train is shut down). Providing Chief MDI officials more granular information on the locations of deaths and their office's response times can help them minimize financial impacts on intrastate and interstate commerce.

Many of the data elements captured in MDI case management systems also help chief MDI officials to lead their offices more effectively. Detailed examples from each case can be used during de-briefings and after-action reviews, which can help the office to improve its operations. Chief MDI officials also need information on caseloads, response times, and turnaround times to 1) promote a healthy and

resilient workforce (e.g., determine burden on death investigators, forensic pathologists, and other members of the team; mitigate risk of injury or stress due long hours, shift work, and other demands of the job; identify additional human resource needs such as trainings for individuals and teams), 2) promote high-quality investigations and ensure accreditation by NAME and/or IAC&ME (e.g., meet criteria established by accrediting bodies autopsies, death certificates, investigative reports, etc.), 3) formulate budget requests, write grant proposals, and advocate for funding and other resources (e.g.,, autopsy tables, coolers), 4) prepare annual reports and evaluate MDI office's performance, and 5) determine where to locate new offices and what staffing levels are required. Chief MDI officials can also use MDI data standards to help write stronger and clearer requests for proposals when procuring a new case management system or making enhancements to their existing system.

Forensic Pathologists

Forensic pathology is at the core of each MDI office's mission. Most of the data gathered and stored by MDI offices help assist forensic pathologists in their cause of death determinations, which help answer common questions such as how and why people die, what happened in a particular case or incident, how can deaths be prevented, and other ways to improve public health and public safety. With many forensic pathologists working in regional offices, the need to get the information to the forensic pathologist in a timely way is critical. In addition, the forensic pathologist may be performing autopsies for coroners who will be signing the death certificate, and the need to get the information to these coroners quickly is critical.

More specific and up-to-date information from the medical history, social history, witness statements, and circumstances at the death scene can help forensic pathologists to allocate scarce MDI resources more efficiently and effectively. This type of information can help MDI offices determine whether an autopsy is needed, which ancillary tests (e.g., toxicology, histology, microbiology) to request, whether organs or tissues can be donated, and which specimens to preserve, as well as documenting chain of custody on these specimens. This type of information can also help forensic pathologists to respond to cultural sensitivities and support the spiritual/religious practices of diverse communities (e.g., burials by sundown, preferences for non-invasive examinations over autopsies, special preparations for disposition of the body) while maintaining the integrity of their investigations.

Since forensic pathologists routinely consult with experts across multidisciplinary teams, the timeliness and quality of ancillary tests often influence the timeliness and quality of forensic pathologists' cause of death determinations. If there were a consistent way for supporting organizations' laboratory information systems (e.g., systems used by tox labs, crime labs, etc.) to provide data to MDI offices and for MDI offices to receive data from these systems, then the ancillary test data could potentially flow in a more automated and computable manner. This could help strengthen the practice of forensic pathology by providing forensic pathologists the potential to query pertinent lab results (e.g., toxicology results) both within their own jurisdictions as well as from similar cases across the country. This could also assist forensic pathologists in their ability to interpret their findings within the context of larger sample sizes from which to draw inferences.

The data gathered and interpreted by forensic pathologists also offer significant benefits when aggregated within and across MDI jurisdictions. If forensic pathologists could query and analyze MDI data and data in a more facile manner, it would improve their ability to respond to data requests from researchers, public health and public safety organizations, the media, and other stakeholders. It would also assist forensic pathologists (and by extension the experts with whom they consult) in their internal evaluation and quality improvement efforts, which will ultimately help them more adequately,

appropriately, and efficiently investigate deaths. In addition, these enhanced data querying and analysis mechanisms could help forensic pathologists to facilitate justice, support the allocation of resources to their communities, and assist in the development of evidenced-based policies and regulations.

Death certification and facilitating peer review

Death certification is a key process for MDI. Exchanging information with the vital records office quickly and efficiently is critical to public health, for families to get death certificates, and for other purposes such as informing social security. The death certificate is used to prevent identity theft and other fraud prevention activities.

In addition, to ensure best quality certifications, consistent information in death records will facilitate any peer review process.

Families of the Deceased

MDI officials often help support families through the grieving process and require up-to-date information on the details of the case as well as where the case is in the investigative process to help communicate more effectively with the decedent's next of kin.

Details gathered during the investigation are needed to help families understand what happened (Did my loved one suffer? Could the death have been prevented?), gain clarity and peace of mind, and find resolution (possibly through the legal/criminal justice system). Additionally, information on the cause of death can help identify other family members who may be at risk, determine eligibility for life insurance, military, and other benefits, and indicate potential opportunities to participate in research studies that may help the living.

Families also often call MDI offices in search of their missing loved ones. Linking MDI information to missing persons registries, such as the National Missing and Unidentified Persons System[21], can help bring families the information they seek.

Law Enforcement, legal and justice Entities

MDI officials investigate deaths where they occur (e.g., homes, businesses, prisons, as well as public and semi-public places) and may be the first to see and gather suspicious information that is pertinent to law enforcement and actionable to legal/justice entities (e.g., prosecutors and defense attorneys). Data gathered on specific cases (e.g., locations, demographics, death scene circumstances, witness statements, etc.) can be used by law enforcement and justice/legal entities to more effectively direct scarce legal resources. For example, law enforcement and legal/justice entities rely on data gathered by MDI offices to help them conduct more efficient investigations, build cases, determine appropriate charges, determine who to interview, cross-examine witnesses more effectively, and provide sufficient evidence wherein the offender voluntarily pleads guilty to avoid a trial.

The aggregate data from MDI offices are also used to target law enforcement actions (e.g., enforce traffic laws near dangerous intersections, identify and arrest drug dealers), provide evidence needed to schedule drugs, identify where to invest resources, improve public safety outreach, evaluate

[21] National Missing and Unidentified Persons System, https://www.namus.gov/. NamUs is funded and administered by the National Institute of Justice and managed through a cooperative agreement with the UNT Health Science Center.

effectiveness of law enforcement responses to public safety threats (e.g., interdiction efforts to shut down factories illicitly manufacturing fentanyl and other novel psychoactive substances).

Organ and Tissue Procurement Organizations

After a death occurs, organ and tissue procurement organizations are often the first to request data from MDI offices. Timely and accurate information (e.g., the decedent's medical history, social history, age, date and time of death and/or last known alive, and date and time of refrigeration) is needed to help assess eligibility (i.e., confirm the absence of exclusion criteria).

Exchanging information in real-time with organ and tissue procurement organizations can help increase donation rates and improve the quality and quantity of organs and tissues donated. In addition, bringing MDI data elements into a common format and making them easily accessible for querying and analysis can help MDI offices to triage their work more efficiently and effectively, and improve communication between MDI offices, the organ and tissue procurement organizations, and families of the deceased.

Automating data flow has been shown to increase organ and tissue donations[22].

Hospitals, trauma and other healthcare centers

The health sector has strong interest in MDI data. Healthcare entities are rated and assessed on many factors, such as deaths that occur after discharge, which may ultimately impact their reimbursements from payers such as the Centers for Medicare and Medicaid. The information held in MDI offices can help healthcare entities to assess the impact of the care they provide.

In addition, MDI data can help trauma centers in their after-action reviews, quality improvement efforts, and research endeavors. Details on the cause of death and autopsy findings can help trauma centers to calculate survivability scores and correlate injury patterns to specific products (e.g., specific motor vehicles). This information can help trauma centers to answer questions such as what's survivable or what procedures should have been performed.

Forensic science and other research communities

Researchers from a wide array of disciplines have a strong interest in the data gathered and generated by MDI offices. Information on demographics of the decedent, cause and manner of death, medical history, circumstances and other factors such as location can help determine eligibility and assist researchers with the case ascertainment process (e.g., finding cases with rare diseases). These data (particularly demographic and location data) are also useful for correlating findings with other large data sets (e.g., Census data).

Research findings can help to increase medical knowledge and improve understanding of causality, identify potential risk factors, provide medical recommendations for families (e.g., genetic findings from MDI offices may suggest when to test next of kin for long QT syndrome), and develop more effective interventions/treatments.

MDI data are also routinely used by researchers to calculate incidence and help identify trends in mortality. This information is used to help build safer products (e.g., automobiles and car seats), advocate for and allocate resources to help prevent sudden or unexpected deaths and identify additional research needs.

[22] Presentation by Steve Clark at Public Health Informatics Conference, Atlanta, August 22, 2016.

Some research communities also collaborate closely with MDI offices to help meet MDI needs, such as developing more effective diagnostics (e.g., improved toxicology equipment or reference materials) or educational materials that are relevant to the MDI field.

Public Health and Public Safety Organizations

Public health and safety agencies rely on data from MDI offices to meet their missions, develop policies and recommendations, and target their outreach to help prevent sudden or unexpected deaths. MDI data are routinely used to identify health and safety threats and assess burden on communities by calculating population-level rates, identifying trends (e.g., fatal accident trends, rates of pregnancy related deaths, trends in drug overdoses), tracking deaths of interest (e.g., disasters, shootings, weather-related), and identifying vulnerable populations. The data are also used routinely to develop prevention strategies and to identify and fill gaps in knowledge, such as what can be done to protect our communities. In addition, public health and public safety organizations rely on information from MDI offices to respond to inquiries from policy makers, develop communication campaigns designed to educate the public, and target resources to improve the health and safety of their communities (e.g., more enforcement at specific intersections to reduce fatal motor vehicle traffic fatalities).

Policy Makers

More facile ways of querying and aggregating data across MDI jurisdictions (particularly at the national level) are needed to help address policy makers' needs. Policy makers depend on quick-response requests for information from MDI offices to have a more complete picture of the communities and populations they serve. This information helps policy makers to anticipate trends, generate ballpark cost and count estimates, and ultimately formulate stronger policies, regulations, and legislations.

Media

MDI offices typically have ongoing relationships with the media. The information exchanged can help preclude speculation, avoid misunderstandings, and reduce anxiety, particularly in high-profile cases such as mass shootings, disasters, and sudden or unexpected deaths of public figures. It can also promote public safety by educating communities about risks, trends, and protective factors. Many MDI offices also rely on the media to help identify unidentified decedents.

The practice of journalism is changing and becoming increasingly dependent upon data and information technology. While the laws governing access to MDI data vary from jurisdiction to jurisdiction, some MDI offices have developed web-based tools that allow members of the media to access/query a subset of MDI data, which has helped to enhance the MDI offices' relationship with the media and has led to fewer interruptions of MDI workflows. These types of innovations, which provide improved access to approved MDI information by authorized users, can lead to additional positive benefits for both parties. The media are provided stronger evidence upon which to base their stories, which may lead to increased ratings and more advertising revenue. MDI offices also benefit from having advocates in the media who understand the importance of the work MDI offices perform and who can help inform the public, address concerns, and promote peace of mind after sudden and unexpected deaths occur.